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Turkish Journal of COLORECTAL DISEASE

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Aims and Scope

Turkish Journal of Colorectal Disease is an official journal of the Turkish Society of Colon and Rectal Surgery to provide epidemiologic, pathologic, diagnostic and therapeutic studies relevant to the management of small intestine, colon, rectum, anus and pelvic floor diseases. It was launched in 1991. Although there were temporary interruptions in the publication of the journal due to various challenges, the Turkish Journal of Colorectal Disease has been published continually from 2007 to the present. It is published quarterly (March, June, September and December) as hardcopy and an electronic journal at http://www.turkishjcrd.com/

The target audience of Turkish Journal of Colorectal Disease includes surgeons, pathologists, oncologists, gastroenterologists and health professionals caring for patients with a disease of the colon and rectum.

The Turkish name of the journal was formerly Kolon ve Rektum Hastalıkları Dergisi and the English name of the journal was formerly Journal of Diseases of the Colon and Rectum.

Turkish Journal of Colorectal Disease is indexed in **TÜBİTAK/ULAKBİM, Directory of Open Access Journals (DOAJ), British Library, ProQuest, Root Indexing, Idealonline, Gale/Cengage Learning, Index Copernicus, Turkish Citation Index, Hinari, GOALI, ARDI, OARE, J-GATE** and **TürkMedline.**

The aim of Turkish Journal of Colorectal Disease is to publish original research papers of the highest scientific and clinical value at an international level. Furthermore, review articles, case reports, technical notes, letters to the editor, editorial comments, educational contributions and congress/meeting announcements are released.

Turkish Journal of Colorectal Disease is an independent open access peer-reviewed international journal printed in Turkish and English languages. Manuscripts are reviewed in accordance with "double-blind peer review" process for both referees and authors. The Editorial Board of the Turkish Journal of Colorectal Disease endorses the editorial policy statements approved by the WAME Board of Directors. The journal is in compliance with the uniform requirements for manuscripts submitted to biomedical journals published by the International Committee of Medical Journal Editors (NEJM 1997;336:309-315, updated 2001).

Open Access Policy

This journal provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge. Open Access Policy is based on rules of Budapest Open Access Initiative (BOAI) http://www.budapestopenaccessinitiative.org/.

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Instructions for authors are published in the journal and at www.turkishjcrd.com

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Authors are responsible for the manuscripts they publish in Turkish Journal of Colorectal Disease. The editor, editorial board, and publisher do not accept any responsibility for published manuscripts.

If you use a table or figure (or some data in a table or figure) from another source, cite the source directly in the figure or table legend.

The journal is printed on acid-free paper.

Financial expenses of the journal are covered by Turkish Society of Colon and Rectal Surgery.

Editorial Policy

Following receipt of each manuscript, a checklist is completed by the Editorial Assistant. The Editorial Assistant checks that each manuscript contains all required components and adheres to the author guidelines, after which time it will be forwarded to the Editor in Chief. Following the Editor in Chief's evaluation, each manuscript is forwarded to the Associate Editor, who in turn assigns reviewers. Generally, all manuscripts will be reviewed by at least three reviewers selected by the Associate Editor, based on their relevant expertise. Associate editor could be assigned as a reviewer along with the reviewers. After the reviewing process, all manuscripts are evaluated in the Editorial Board Meeting.

Turkish Journal of Colorectal Disease's editor and Editorial Board members are active researchers. It is possible that they would desire to submit their manuscript to the Turkish Journal of Colorectal Disease. This may be creating a conflict of interest. These manuscripts will not be evaluated by the submitting editor(s). The review process will be managed and decisions made by editor-in-chief who will act independently. In some situation, this process will be overseen by an outside independent expert in reviewing submissions from editors.

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Amaç ve Kapsam

Türk Kolon ve Rektum Hastalıkları Dergisi, Türk Kolon ve Rektum Cerrahi Derneği'nin resmi dergisidir. Bu dernek; ince barsak, kolon, rektum, anüs ve pelvik taban hastalıkları gibi hastalıkların yönetimi ile ilişkili epidemiyoloijk patolojik, tanısal ve tedavi edici çalışmalar yapar. Derneğimiz 1991'de kurulmuştur. Çeşitli zorluklar nedeniyle geçici aksaklıklar olsa da Türk Kolon ve Rektum Hastalıkları Dergisi 2007'den bu yana aralıksız olarak basılmaktadır ve 3 ayda bir olmak üzere (Mart, Haziran, Eylül, Aralık) basılı dergi ve elektronik olarak (http://www.turkishjcrd.com/) yayımlanır.

Derginin hedef kitlesini; cerrahlar, patologlar, onkologlar, gastroenterologlar ve kolorektal hastalarına hizmet veren profesyoneller oluşturur. Derginin amacı; uluslararası düzeyde en yüksek bilimsel ve klinik değeri olan orijinal çalışmaları yayınlamaktır. Bunlara ek olarak derleme (review) makaleleri, olgu sunumları, teknik notlar, editöre mektuplar, editöryal yorumlar, eğitim yazıları ve kongre/toplantı duyuruları yer almaktadır.

Derginin Türkçe eski adı; Kolon ve Rektum Hastalıkları Dergisi ve İngilizce eski adı; Journal of Diseases of the Colon and Rectum'dur.

Kolon ve Rektum Hastalıkları Dergisi, **TÜBİTAK/ULAKBİM, Directory of Open Access Journals (DOAJ), British Library, ProQuest, Root Indexing, Idealonline, Gale/Cengage Learning, Index Copernicus, Türk Atıf Dizini, Hinari, GOALI, ARDI, OARE, J-GATE ve TürkMedline**'de indekslenmektedir.

Türk Kolon ve Rektum Hastalıkları Dergisi, İngilizce ve Türkçe olarak yayımlanan; bağımsız, hakemli, uluslararası bir dergidir. Eserler, hem hakemler hem de otörler tarafından "çift kör hakem denetimi (peer review)" yöntemi ile değerlendirilir. Türk Kolon ve Rektum Hastalıkları Dergisi'nin Editör Kurulu, World Association of Medical Editors (WAME) politikalarına bağlı olarak yürütülmektedir. Bu dergi, Uluslararası Tıp Dergisi Editörler Komitesi (NEJM 1997;336:309-315, updated 2001) tarafından bildirilen, biyomedikal dergilere gönderilen makalelerin uyması gereken standartlara uygunluk göstermektedir.

Açık Erişim Politikası

Bu dergi bilginin yer değiştirmesi ve toplum içinde bilgiye özgürce ulaşma olanağı sağlamak üzere açık erişime imkan vermektedir. Açık Erişim İlkesi "Budapeşte Açık Erişim Girişimi (BOAI)" http://www.budapestopenaccessinitiative.org/ kurallarına dayanmaktadır.

Derginin mali giderleri Türk Kolon ve Rektum Cerrahi Derneği tarafından karşılanmaktadır.

Yazarlar için Kılavuz

Yazarlar için kılavuz hem yayınlanan dergide hem de "http://www.turkishjcrd.com" web sayfasında bulunmaktadır.

Telif Hakkı Devri

Yazarlar Türk Kolon ve Rektum Hastalıkları Dergisi'nde yayınladıkları yazılardan kendileri sorumludurlar. Editör, editör kurulu ve yayıncı hiçbir sorumluluk kabul etmemektedir. Başka bir kaynaktan tablo ya da figür (veya tablo/figürden bir veri) kullandıysanız, direkt olarak tablo ya da figürü kaynak gösteriniz.

Dergi asitsiz kağıda basılmaktadır.

Derginin mali giderleri Türk Kolon ve Rektum Cerrahi Derneği tarafından karşılanmaktadır.

Editöryal Politika

Her yazının alınmasını takiben, bir kontrol listesi Editör Yardımcısı tarafından tamamlanır.

Editör yardımcısı, her yazıyı gerekli öğeleri sağladığı ve yazar kılavuzuna uyumu açısından kontrol eder, ardından editöre iletir. Editör değerlendirmesinin ardından her bir yazı için editör yardımcısı tarafından gözlemciler (reviewers) belirlenir. Genelde, her bir yazıyı ilgili uzmanlıkları göz önüne alınarak atanmış en az 3 gözlemci inceler. Yardımcı editör de diğer gözlemcilerle birlikte gözlemci olarak atanabilir. Gözlemci incelemesinin ardından yazılar editör kurul toplantısında değerlendirilir.

Türk Kolon ve Rektum Hastalıkları Dergisi'nin editör ve editör kurulu üyeleri aktif araştırmacılardır. Kendi araştırmalarının da Türk Kolon ve Rektum Hastalıkları Dergisi'nde yayınlanmasını pek ala arzu edebilirler. Bu durum çıkar sorunları doğurabilir. Bu yazılar, yazıyı yazan editör(ler) tarafından değerlendirilemez. Bu gibi durumlarda bu süreç, (editörlerin yazı başvurularında) yazıların uzman olan bağımsız kişiler tarafından incelenmesiyle aşılabilir.

Abonelik Bilgileri

Türk Kolon ve Rektum Hastalıkları Dergisi, Türk Kolon ve Rektum Cerrahisi Derneği üyelerine, Dünya'da ve Türkiye'deki kütüphanelere ücretsiz dağıtılmaktadır. Yayınlanmış tüm sayılar ücretsiz olarak şu linkte mevcuttur (http://www.turkishjcrd.com/).

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GENERAL INFORMATION

Turkish Journal of Colorectal Disease (TJCD) is the journal of Turkish Society of Colon and Rectal Surgery. The mission of the Journal is to advance knowledge of disorders of the small intestine, colon, rectum, anus and pelvic floor. It publishes invited review articles, research articles, brief reports and letters to the editor, and case reports that are relevant to the scope of the journal, on the condition that they have not been previously published elsewhere. Basic science manuscripts, such as randomized, cohort, cross-sectional, and case control studies, are given preference. Invited reviews will be considered for peer review from known experts in the area.

Manuscripts should be prepared according to ICMJE guidelines (www.icmje.org). All manuscripts are subject to editorial revision to ensure they conform to the style adopted by the journal. There is a double blind kind of reviewing system.

Reviewed and accepted manuscripts are translated from Turkish to English by the Journal through a professional translation service. Prior to printing, the translations are submitted to the authors for approval or correction requests, to be returned within 7 days. If no response is received from the corresponding author within this period, the translation is checked and approved by the editorial board.

Accepted manuscripts are published in both Turkish and English languages.

All manuscripts submitted to the Turkish Journal of Colorectal Disease are screened for plagiarism using the 'iThenticate' software. Results indicating plagiarism may result in manuscripts being returned or rejected.

Turkish Journal of Colorectal Disease does not charge any article submission or processing charges.

The abbreviation of the Turkish Journal of Colorectal Disease is "TJCD", however, it should be denoted as "Turk J Colorectal Dis" when referenced.

EDITORIAL POLICIES

All manuscripts will be evaluated by the scientific board for their scientific contribution, originality and content. Authors are responsible for the accuracy of the data. The journal retains the right to make appropriate changes on the grammar and language of the manuscript. When suitable the manuscript will be sent to the corresponding author for revision. The manuscript, when published, will become the property of the journal and copyright will be taken out in the name of the journal

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In the cover letter the authors should state if any of the material in the manuscript is submitted or planned for publication elsewhere in any form including electronic media. A written statement indicating whether or not "Institutional Review Board" (IRB) approval was obtained or equivalent guidelines followed in accordance with the Helsinki Declaration of 2013 update on human experimentation must be stated; if not, an explanation must be provided. The cover letter must contain address, telephone, fax and the e-mail address of the corresponding author.

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The ORCID (Open Researcher and Contributor ID) number of the correspondence author should be provided while sending the manuscript. A free registration can create at http://orcid.org.

Online Submission

Only online submissions are accepted for rapid peer-review and to prevent delay in publication. Manuscripts should be prepared as word document (*.doc) or rich text format (*.rtf). After logging on to the web www. journalagent.com/krhd double click the "submit an article" icon. All corresponding authors should be provided a password and an username after providing the information needed. After logging on the article submission system with your own password and username please read carefully the directions of the system to provide all needed information in order not to delay the processing of the manuscript. Attach the manuscript, all figures, tables and additional documents. Please also attach the cover letter with "Assignment of Copyright and Financial Disclosure" forms.

Manuscript Preparation Guidelines

Turkish Journal of Colorectal Disease follows the "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" (International Committee of Medical Journal Editors: Br Med J 1988;296:401-5).

Upon submission of the manuscript, authors are to indicate the type of trial/research and statistical applications following "Guidelines for statistical reporting in articles for medical journals: amplifications and explanations" (Bailar JC III, Mosteller F. Ann Intern Med 1988;108:266-73).

Preparation of research articles, systematic reviews and meta-analyses must comply with study design guidelines:

CONSORT statement for randomized controlled trials (Moher D, Schultz KF, Altman D, for the CONSORT Group. The CONSORT statement revised recommendations for improving the quality of reports of parallel group randomized trials. JAMA 2001; 285:1987-91) (http://www.consort-statement.org/);

PRISMA statement of preferred reporting items for systematic reviews and meta-analyses (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097.) (http://www.prisma-statement.org/);

STARD checklist for the reporting of studies of diagnostic accuracy (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA,

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Glasziou PP, Irwig LM, et al., for the STARD Group. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. Ann Intern Med 2003;138:40-4.) (http://www.stard-statement.org/);

STROBE statement, a checklist of items that should be included in reports of observational studies (http://www.strobe-statement.org/);

MOOSE guidelines for meta-analysis and systemic reviews of observational studies (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting Meta-analysis of observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008-12).

Text Formatting

Manuscripts should be submitted in Word.

Use a normal, plain font (e.g., 10-point Times Roman) for text.

Use the automatic page numbering function to number the pages.

Do not use field functions.

Use tab stops or other commands for indents, not the space bar.

Use the table function, not spreadsheets, to make tables.

Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).

Title Page

All manuscripts, regardless of article type, should start with a title page, containing:

The title of the article;

The short title of the article

The initials, names and qualifications of each author;

The main appointment of each author;

The name(s) of the institution(s) of each author;

The name and email address of the corresponding author;

Full disclosures of potential conflicts of interest on the part of any named author, or a statement confirming that there are no conflicts of interest;

The word count excluding abstract, references, tables, figures and legends;

The place and date of scientific meeting in which the manuscript was presented and it's abstract published in the abstract book, if applicable.

Article Types

Original Articles

This category includes original research including both clinical and basic science submissions. The work must be original and neither published, accepted, or submitted for publication elsewhere. Any related work, either SUBMITTED, in press, or published from any of the authors should be clearly cited and referenced.

All clinical trials must be registered in a public trials registry that is acceptable to the International Committee of Medical Journals Editors (ICMJE). Go to (http://www.icmje.org/faq.html). Authors of randomized controlled trials must adhere to the CONSORT guidelines, available at: www.consort-statement.org, and provide both a CONSORT checklist and flow diagram. We require that you choose the MS Word template at www.consort-statement.org for the flow chart and cite/upload it in the manuscript as a figure. In addition, submitted manuscripts must include the unique registration number in the Abstract as evidence of registration.

All authors are expected to abide by accepted ethical standards for human and animal investigation. In studies that involve human subjects or laboratory animals, authors must provide an explicit statement in Materials and Methods that the experimental protocol was approved by the appropriate institutional review committee and meets the guidelines of their responsible governmental agency. In the case of human subjects, informed consent, in addition to institutional review board approval, is required.

Original Articles should not exceed 3000 words (excluding abstract, references, tables, figures and legends) and four illustrations.

Original Articles should be organized as follows:

Abstract: The abstract must contain fewer than 250 words and should be structured as follows:

Aim: What was the purpose of the study?

Method: A brief description of the materials - patients or subjects (i.e. healthy volunteers) or materials (animals) - and methods used.

Results: What were the main findings?

Conclusion: What are the main conclusions or implications of the study?

Keywords: Below the abstract provide up to 6 key words or short phrases. Do not use abbreviations as keywords.

Introduction: State concisely the purpose and rationale for the study and cite only the most pertinent references as background.

Materials and Methods: Describe your selection of the observational or experimental subjects clearly (patients or experimental animals, including controls). Provide an explicit statement that the experimental protocols were approved by the appropriate institutional review committee and meet the guidelines of the responsible governmental agency. In the case of human subjects, state explicitly those subjects have provided informed consent. Identify the methods, apparatus/product** (with manufacturer's name and address in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods; provide references and brief descriptions of methods that have been published but are not well known, describe substantially modified methods, including statistical methods, give reasons for using them, and evaluate their limitations;

Results: Present the detailed findings supported with statistical methods. Figures and tables should supplement, not duplicate the text; presentation of data in either one or the other will suffice. Emphasize only your important observations; do not compare your observations with those of others. Such comparisons and comments are reserved for the discussion section.

Discussion: State the importance and significance of your findings but do not repeat the details given in the Results section. Limit your opinions to those strictly indicated by the facts in your report. Compare your finding with those of others. No new data are to be presented in this section.

Acknowledgments: Only acknowledge persons who have made substantive contributions to the study. Authors are responsible for obtaining written permission from everyone acknowledged by name because readers may infer their endorsement of the data and conclusions. Begin your text of the acknowledgment with, "The authors thank…".

Authorship Contributions: The journal follows the recommendations of the ICMJE for manuscripts submitted to biomedical journals. According to these, authorship should be based on the following four criteria:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and

Drafting the work or revising it critically for important intellectual content; and

Final approval of the version to be published; and

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

All other contributors to the paper should be credited in the 'Acknowledgments' section.

References: The author should number the references in Arabic numerals according to the citation order in the text. Put reference numbers in parenthesis in superscript at the end of citation content or after the cited author's name. Use the form of "Uniform Requirements for manuscript abbreviations in Turk Bilim Terimleri" (http:/www.bilimterimleri.com).

Journal titles should conform to the abbreviations used in "Cumulated Index Medicus".

Journals; Last name(s) of the author(s) and initials, article title, publication title and its original abbreviation, publication date, volume, the inclusive page numbers.

Example: 1. Dilaveris P, Batchvarov V, Gialafos J, Malik M. Comparison of different methods for manual P wave duration measurement in 12-lead electrocardiograms. Pacing Clin Electrophysiol 1999;22:1532-1538.

Book chapter; Last name(s) of the author(s) and initials, chapter title, book editors, book title, edition, place of publication, date of publication and inclusive page numbers of the extract cited.

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Example: 1. Schwartz PJ, Priori SG, Napolitano C. The Long QT Syndrome. In: Zipes DP, Jalife J, eds. Cardiac Electrophysiology. From Cell to Bedside. Philadelphia; WB Saunders Co. 2000:597-615.

Tables: All tables are to be numbered using Arabic numerals. Tables should always be cited in text in consecutive numerical order. For each table, please supply a table caption (title) explaining the components of the table. Identify any previously published material by giving the original source in the form of a reference at the end of the table caption. Footnotes to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data) and included beneath the table body.

Figures: Figures should work under "Windows". Color figures or grayscale images must be at least 300 dpi. Figures using "*.tiff", "*.jpg" or "*.pdf" should be saved separate from the text. All figures should be prepared on separate pages. They should be numbered in Arabic numerals. Each figure must have an accompanying legend defining abbreviations or symbols found in the figure. Figures could be submitted at no additional cost to the author.

Units of Measurement and Abbreviations: Units of measurement should be in Systéme International (SI) units. Abbreviations should be avoided in the title. Use only standard abbreviations. If abbreviations are used in the text, they should be defined in the text when first used.

Permissions: Authors wishing to include figures, tables, or text passages that have already been published elsewhere are required to obtain permission from the copyright owner(s) and to include evidence that such permission has been granted when submitting their papers. Any material received without such evidence will be assumed to originate from the authors.

Invited Review Articles

Abstract length: Not to exceed 250 words.

Article length: Not to exceed 4000 words.

Reference Number: Not to exceed 100 references.

Reviews should include a conclusion, in which a new hypothesis or study about the subject may be posited. Do not publish methods for literature search or level of evidence. Authors who will prepare review articles should already have published research articles on the relevant subject. The study's new and important findings should be highlighted and interpreted in the Conclusion section. There should be a maximum of two authors for review articles.

Case Reports

Abstract length: Not to exceed 100 words.

Article length: Not to exceed 1000 words.

Reference Number: Not to exceed 15 references.

Case Reports should be structured as follows:

Abstract: An unstructured abstract that summarizes the case.

Introduction: A brief introduction (recommended length: 1-2 paragraphs).

Case Report: This section describes the case in detail, including the initial diagnosis and outcome.

Discussion: This section should include a brief review of the relevant literature and how the presented case furthers our understanding to the disease process.

References: See under 'References' above.

Acknowledgments.

Tables and figures.

Technical Notes

Abstract length: Not to exceed 250 words.

Article length: Not to exceed 1200 words.

Reference Number: Not to exceed 15 references.

Technical Notes include description of a new surgical technique and its application on a small number of cases. In case of a technique representing a major breakthrough one case will suffice. Follow-up and outcome need to be clearly stated.

Technical Notes should be organized as follows:

Abstract: Structured "as above mentioned".

Indications

Method

Comparison with other methods: advantages and disadvantages, difficulties and complications.

References, in Vancouver style (see under 'References' above).

Acknowledgments.

Tables and figures: Including legends.

Letters to the Editor

Article length: Not to exceed 500 words.

Reference Number: Not to exceed 10 references

We welcome correspondence and comment on articles published in Turkish Journal of Colorectal Disease. No abstract is required, but please include a brief title. Letters can include 1 figure or table.

Video Article

Article length: Not to exceed 500 words.

Reference Number: Not to exceed 5 references

Briefly summarize the case describing diagnosis, applied surgery technique and outcome. Represent all important aspects, i.e. novel surgery technique, with properly labelled and referred video materials. A standalone video vignette, describing a surgical technique or interesting case encountered by the authors.

Requirements: The data must be uploaded during submission with other files. The video should be no longer than 10 minutes in duration with a maximum file size of 350Mb and 'MOV, MPEG4, AVI, WMV, MPEGPS, FLV, 3GPP, WebM' format should be used. Documents that do not exceed 100 MB can be uploaded within the system. For larger video documents, please contact iletisim@galenos.com.tr All videos must include a narration in English. Reference must be used as it would be for a Figure or a Table. Example: ".....To accomplish this, we developed a novel surgical technique (Video 1)." All names and institutions should be removed from all video materials. Video materials of accepted manuscripts will be published online.

Letters to the Editor

Article length: Not to exceed 500 words.

Reference Number: Not to exceed 10 references

We welcome correspondence and comment on articles published in Turkish Journal of Colorectal Disease. No abstract is required, but please include a brief title. Letters can include 1 figure or table.

Editorial Comments

Article length: Not to exceed 1000 words.

Reference Number: Not to exceed 10 references.

Editorials are exclusively solicited by the Editor. Editorials should express opinions and/or provide comments on papers published elsewhere in the same issue. A single author is preferred. No abstract is required, but please include a brief title. Editorial submissions are subject to review/request for revision, and editors retain the right to alter text style.

Ethics

This journal is committed to upholding the integrity of the scientific record. As a member of the Committee on Publication Ethics (COPE) the journal will follow the COPE guidelines on how to deal with potential acts of misconduct.

Authors should refrain from misrepresenting research results which could damage the trust in the journal, the professionalism of scientific authorship, and ultimately the entire scientific endeavor. Maintaining integrity of the research and its presentation can be achieved by following the rules of good scientific practice, which include:

The manuscript has not been submitted to more than one journal for simultaneous consideration.

The manuscript has not been published previously (partly or in full), unless the new work concerns an expansion of previous work (please provide transparency on the re-use of material to avoid the hint of text-recycling ("self-plagiarism").

A single study is not split up into several parts to increase the quantity of submissions and submitted to various journals or to one journal over time (e.g. "salami-publishing").

No data have been fabricated or manipulated (including images) to support your conclusions.

No data, text, or theories by others are presented as if they were the author's own ("plagiarism"). Proper acknowledgments to other works must be given (this includes material that is closely copied (near verbatim), summarized and/or paraphrased), quotation marks are used for verbatim copying of material, and permissions are secured for material that is copyrighted.

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Consent to submit has been received explicitly from all co-authors, as well as from the responsible authorities - tacitly or explicitly - at the institute/organization where the work has been carried out, before the work is submitted.

Authors whose names appear on the submission have contributed sufficiently to the scientific work and therefore share collective responsibility and accountability for the results.

In addition: Changes of authorship or in the order of authors are not accepted after acceptance of a manuscript.

Requesting to add or delete authors at revision stage, proof stage, or after publication is a serious matter and may be considered when justifiably warranted. Justification for changes in authorship must be compelling and may be considered only after receipt of written approval from all authors and a convincing, detailed explanation about the role/deletion of the new/deleted author. In case of changes at revision stage, a letter must accompany the revised manuscript. In case of changes after acceptance or publication, the request and documentation must be sent via the Publisher to the Editor-in-Chief. In all cases, further documentation may be required to support your request. The decision on accepting the change rests with the Editor-in-Chief of the journal and may be turned down. Therefore authors are strongly advised to ensure the correct author group, corresponding author, and order of authors at submission.

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All individuals have individual rights that are not to be infringed. Individual participants in studies have, for example, the right to decide what happens to the (identifiable) personal data gathered, to what they have said during a study or an interview, as well as to any photograph that was taken. Hence it is important that all participants gave their informed consent in writing prior to inclusion in the study. Identifying details (names, dates of birth, identity numbers and other information) of the participants that were studied should not be published in written descriptions, photographs, and genetic profiles unless the information is essential for scientific purposes and the participant (or parent or guardian if the participant is incapable) gave written informed consent for publication. Complete anonymity is difficult to achieve in some cases, and informed consent should be obtained if there is any doubt. For example, masking the eye region in photographs of participants is inadequate protection of anonymity. If identifying characteristics are altered to protect anonymity, such as in genetic profiles, authors should provide assurance that alterations do not distort scientific meaning.

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Each manuscript submitted to The Turkish Journal of Colorectal Disease is subject to an initial review by the editorial office in order to determine if it is aligned with the journal's aims and scope, and complies with essential requirements. Manuscripts sent for peer review will be assigned to one of the journal's associate editors that has expertise relevant to the manuscript's content. All accepted manuscripts are sent to a statistical and English language editor before publishing. Once papers have been reviewed, the reviewers' comments are sent to the Editor, who will then make a preliminary decision on the paper. At this stage, based on the feedback from reviewers, manuscripts can be accepted, rejected, or revisions can be recommended. Following initial peer-review, articles judged worthy of further consideration often require revision. Revised manuscripts generally must be received within 2 months of the date of the initial decision. Extensions must be requested from the Associate Editor at least 2 weeks before the 2-month revision deadline expires; The Turkish Journal of Colorectal Disease will reject manuscripts that are not received within the 3-month revision deadline. Manuscripts with extensive revision recommendations will be sent for further review (usually by the same reviewers) upon their re-submission. When a manuscript is finally accepted for publication, the Technical Editor undertakes a final edit and a marked-up copy will be e-mailed to the corresponding author for review and to make any final adjustments.

REVISIONS

When submitting a revised version of a paper, the author must submit a detailed "Response to the reviewers" that states point by point how each issue raised by the reviewers has been covered and where it can be found (each reviewer's comment, followed by the author's reply and line numbers where the changes have been made) as well as an annotated copy of the main document. Revised manuscripts must be submitted within 30 days from the date of the decision letter. If the revised version of the manuscript is not submitted within the allocated time, the revision option may be canceled. If the submitting author(s) believe that additional time is required, they should request this extension before the initial 30-day period is over.

ENGLISH LANGUAGE EDITING

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The Turkish Journal of Colorectal Disease publishes abstracts of accepted manuscripts online in advance of their publication in print. Once an accepted manuscript has been edited, the authors have submitted any final corrections, and all changes have been incorporated, the manuscript will be published online. At that time the manuscript will receive a Digital Object Identifier (DOI) number. Both forms can be found at www.journalagent.com/krhd. Authors of accepted manuscripts will receive electronic page proofs directly from the printer, and are responsible for proofreading and checking the entire manuscript, including tables, figures, and references. Page proofs must be returned within 48 hours to avoid delays in publication.

CORRESPONDENCE

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Yazarlara Bilgi

GENEL BİLGİ

Türk Kolon ve Rektum Hastalıkları Dergisi, Türk Kolon ve Rektum Cerrahisi Derneği'nin dergisidir. Derginin misyonu; ince bağırsak, kolon, rektum, anüs ve pelvik taban bozuklukları hakkındaki bilgiye katkı sağlamaktır. Dergi daha önce başka bir yerde yayınlanmamış olması koşuluyla, derginin kapsamı ile ilgili ve talep üzerine yazılan derleme makaleleri, araştırma makaleleri, kısa raporlar ve editöre mektuplar ve olgu sunumlarını yayınlamaktadır. Randomize, kohort, kesitsel ve vaka kontrol çalışmaları gibi temel bilim yazılarına öncelik verilir. Alanında bilinen uzmanlarca talep üzerine yazılan derlemeler dikkate alınacaktır.

Yazılar ICMJE yönergelerine göre (http://www.icmje.org/) hazırlanmalıdır. Tüm yazılar dergi tarafından benimsenen stile uygunluk sağlamak için editöryal kontrol ve düzeltmelere tabi tutulmaktadır. Derginin çift kör bir değerlendirme sistemi vardır. Değerlendirilen ve kabul edilen yayınlar Türkçeden İngilizceye veya İngilizceden Türkçeye derginin profesyonel çeviri hizmeti aracılığıyla tercüme edilir. Yayınlanmadan önce, çeviriler onay veya düzeltme istekleri için yazarlara gönderilir ve 7 gün içinde geri dönüş talep edilir. Bu süre içinde yanıt alınamazsa, çeviri kontrol ve yayın kurulu tarafından onaylanır.

Kabul edilen yayınlar hem Türkçe hem de İngilizce olarak yayınlanır.

Türk Kolon ve Rektum Hastalıkları Dergisi'ne gönderilen tüm yayınlar 'iThenticate' yazılımı kullanılarak intihal açısından taranır. İntihal saptanan durumlarda yayın iade veya reddedilir.

Türk Kolon ve Rektum Hastalıkları Dergisi, makale gönderme veya işlem ücreti adı altında herhangi bir ücret talep etmemektedir.

Türk Kolon ve Rektum Hastalıkları Dergisi'nin kısaltması "TJCD"dir, ancak, refere edildiğinde "Turk J Colorectal Dis" olarak kullanılmalıdır.

YAYIN POLİTİKASI

Tüm makaleler bilimsel katkıları, özgünlük ve içerikleri açısından bilimsel komite tarafından değerlendirilecektir. Yazarlar verilerinin doğruluğundan sorumludurlar. Dergi gerekli gördüğü yerlerde dil ve uygun değişiklik yapma hakkını saklı tutar. Gereğinde makale revizyon için yazara gönderilir. Dergide basılan yayın derginin malı haline gelir ve telif hakkı "Türk Kolon ve Rektum Hastalıkları Dergisi" adına alınmış olur. Daha önce herhangi bir dilde yayınlanmış makaleler dergide yayınlanmak üzere kabul edilmeyecektir. Yazarlar bir başka dergide yayınlanmak üzere olan makaleyi teslim edemez. Tüm değişiklikler, yazar ve yayıncının yazılı izin alındıktan sonra yapılacaktır. Tüm makalelerin tam metinleri derginin www.journalagent.com/krhd web sitesinden indirilebilir.

YAZAR KILAVUZU

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Açıklama bildirimi

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Bilgilendirilmiş Onam

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Üst Yazı

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Makale Yazım Kuralları

Tüm makaleler online başvuru sistemi üzerinden teslim edilmelidir. Yazarlar web sitesi www.journalagent.com/krhd adresinde oturum açtıktan sonra internet üzerinden yazılarını sunmalıdır.

Makale gönderimi yapılırken sorumlu yazarın ORCID (Open Researcher ve Contributor ID) numarası belirtilmelidir. http://orcid.org adresinden ücretsiz olarak kayıt oluşturabilir.

Online Başvuru

Gecikmeyi önlemek ve hızlı hakemlik için sadece çevrim içi gönderimler kabul edilir. Yazılar word belgesi (*.doc) veya zengin metin biçimi (*.rtf) olarak hazırlanmalıdır. www.journalagent.com/krhd adresinde web oturumu açtıktan sonra "Makale gönder" ikonuna tıklayın. Tüm yazarlar, gerekli bilgileri sisteme girdikten sonra bir şifre ve bir kullanıcı adı alır. Kendi şifre ve kullanıcı adınız ile makale gönderme sistemine kayıt olduktan sonra yazının işleme alınmasında bir gecikme olmaması için gerekli tüm bilgileri sağlamak için sistemin yönergelerini dikkatlice okuyunuz. Makaleyi ve tüm şekil, tablo ve ek dökümanları ekleyiniz. Ayrıca üst yazı ve "Telif Hakkı ve Finansal Durum" formunu ve yazının tipine göre aşağıda belirtilen kılavuzların kontrol listesini ekleyiniz.

Makale Hazırlama Kuralları

Türk Kolon ve Rektum Hastalıkları Dergisi "Biyomedikal Dergilere Gönderilen Makaleler için Gerekli Standartları" izler. (International Committee of Medical Journal Editors: Br Med J 1988; 296: 401-5).

Yazarlar yayınlarını gönderirken, çalışmalarının türünü ve uygulanan istatistik yöntemlerini "Tıbbi Dergilere Gönderilen Makaleler için İstatistiksel Raporlama Rehberi"ne uygun olarak belirtmelidir (Bailar JC III, Mosteller F. Ann Intern Med 1988;108:266-73).

Araştırma makalesi, sistematik değerlendirme ve meta-analizin hazırlanması aşağıdaki çalışma tasarımı kurallarına uymak zorundadır; (CONSORT statement for randomized controlled trials (Moher D, Schultz KF, Altman D, for the CONSORT Group.

The CONSORT statement revised recommendations for improving the quality of reports of parallel group randomized trials. JAMA 2001; 285:1987-91) (http://www.consort-statement.org/);

PRISMA statement of preferred reporting items for systematic reviews and meta-analyses (Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 2009; 6(7): e1000097.) (http://www.prisma-statement.org/);

STARD checklist for the reporting of studies of diagnostic accuracy (Bossuyt PM, Reitsma JB, Bruns DE, Gatsonis CA, Glasziou PP, Irwig LM, et al., for the STARD Group. Towards complete and accurate reporting of studies of diagnostic accuracy: the STARD initiative. Ann Intern Med 2003;138:40-4) (http://www.stard-statement.org/);

STROBE statement, a checklist of items that should be included in reports of observational studies (http://www.strobe-statement.org/);

MOOSE guidelines for meta-analysis and systemic reviews of observational studies (Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting Meta-analysis of observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283: 2008-12).

Metin Biçimlendirme

Yazılar Word programı ile hazırlanarak teslim edilmelidir.

- Metin için normal, düz yazı tipi kullanın (örneğin, 10 punto Times Roman).

- Sayfa numarası için otomatik sayfa numaralandırma işlevini kullanın.

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- Alan fonksiyonları kullanmayın.

- Girintiler için sekme durakları (Tab) kullanın, ara çubuğu ve diğer komutlar kullanmayın.

- Tablo yapmak için diğer işlevleri değil, elektronik tablo fonksiyonunu kullanın.

- Dosyanızı .docx formatında (Word 2007 veya üstü) ya da .doc formatında (eski Word sürüm) kaydedin.

Giriş sayfası

Tüm yazılar, makale türü ne olursa olsun, aşağıdakileri içeren bir başlık sayfası ile başlamalıdır:

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- Makalenin kısa başlığı;

- Yazarların isimleri, isimlerinin baş harfleri ve her yazarın akademik ünvanı;

- Her yazarın görevi;

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- Herhangi bir yazarın olası bir çıkar çatışması olduğunu teyit eden bir ifade, aksi takdirde çatışma olmadığını belirtir bir açıklama;

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- Varsa yayının yayınlanmış olduğu bilimsel toplantının tarihi, yeri ve varsa kongre özet kitabındaki özeti.

Makale Tipleri

Orijinal Makaleler

Bu kategori, klinik ve temel bilimde orijinal araştırmaları içerir. Yayın orijinal olmalı ve başka bir dergide yayınlanmış/gönderilmiş ya da kabul edilmiş olmamalıdır. Yazarlar, herhangi biri tarafından bir dergiye gönderilmiş, baskıda veya basılmış ilgili herhangi bir çalışmaya atıfta bulunmak istiyorlarsa açıkça atıfta bulunulmalı ve kaynak gösterilmelidir.

Tüm klinik çalışmalar, Uluslararası Tıp Dergisi Editörler Komitesince (ICMJE) kabul gören bir kayıt sistemine kayıtlı olmalıdır. Bunun için http://www.icmje.org/faq.html adresine müracaat edin. Randomize kontrollü çalışmaların yazarları da, www.consort-statement.org adresinden başvurulabilen CONSORT kılavuzuna uymalıdır ve yayınlarıyla birlikte CONSORT kontrol listesi ve akış diyagramı tebliğ edilmelidir. Akış şeması olarak www.consort-statement.org adresinde bulunan MS Word şablonunun kullanılması ve bunun yayının içinde bir alıntı veya bir figür olarak yerleştirilmesi gereklidir. Buna ek olarak, sunulan yayınlar her yayına spesifik verilen özel kayıt numarasını içermelidir.

Tüm yazarların, insan üzerindeki çalışmalar ve hayvan deneylerinde etik standartlara uymaları beklenmektedir. İnsan üzerindeki veya laboratuvar hayvanları içeren çalışmalarda, yazarların yayının Gereç ve Yöntem kısmında deney protokolünün ilgili kurumsal inceleme komitesi tarafından onaylandığını ve sorumlu devlet kurumu kurallarına uyduğunu açık bir dille açıklamaları gereklidir. İnsan üzerindeki çalışmalarda kurumsal inceleme kurulu onayına ek olarak, aydınlatılmış onam da bulunmalıdır.

Orijinal Makaleler (özet, kaynaklar, tablolar, rakamlar hariç) 3000 kelime ve dört figürü aşmamalıdır.

Orijinal Makaleler aşağıdaki gibi organize edilmelidir:

Özet: Özet 250 kelimeyi geçmemeli ve şunları içermelidir;

Amaç: Çalışmanın amacı nedir?

Yöntem: Kullanılan yöntem ve materyaller (örneğin hayvanlar) veya hastalar ya da konu (sağlıklı gönüllüler gibi) hakkında kısa bir açıklama içermelidir.

Bulgular: Ana bulgular nelerdir?

Sonuç: Çalışmanın ana sonuçları ve etkileri nelerdir?

Anahtar kelimeler: Özetin altında en az 3 anahtar kelime veriniz. Kısaltmaları anahtar kelime olarak kullanmayınız.

Giriş: Açık bir dille çalışmanın amaç ve gerekçesini belirtin ve çalışmanın arka planını açıklarken sadece en önemli kaynaklardan alıntı yapın.

Gereç ve Yöntem: Gözlemsel veya deneysel deneklerin (hastalar, deney hayvanları veya kontrol grupları dahil) seçim şeklini açıklayın. Deney protokolünün ilgili kurumsal inceleme komitesi tarafından onaylandığını ve ilgili devlet kurumu kurallarına uyduğunu açık bir dille açıklayın. İnsan çalışması durumunda, tüm şahısların aydınlatılmış onamlarının alındığını açık bir dille belirtin. Yöntem, cihaz ve ürünleri tanımlayın (Parantez içinde üretici firma adı ve adresi)** Uygulanmış olan tüm prosedürler, diğer çalışmacıların aynı deneyi tekrar edebilecekleri detay ve netlikte anlatılmalıdır. İstatistiksel yöntemler de dahil olmak üzere yerleşik ve yaygın olarak bilinen çalışma yöntemleri için kaynaklar belirtilmelidir. Yayınlanmış ancak yaygın olarak bilinmeyen yöntemler için ise kaynaklar ve kısa tanımlamalar verilmelidir. Kullanma sebepleri ve limitasyonları belirtilmelidir.

Bulgular: İstatistiksel yöntemlerle desteklenmiş bulgularınızı ayrıntılı olarak sunun. Şekil ve tablolar metni tekrar değil, takviye etmelidir. Verilerin hem metinde hem figür olarak verilmemesi gerekir. Metin veya figürden birisi olarak verilmesi yeterlidir. Sadece kendi önemli izlenimlerinizi belirtin. Kendi izlenimlerinizi diğerlerininkiyle karşılaştırmayın. Bu tür karşılaştırma ve yorumlar tartışma bölümünde yapılmalıdır.

Tartışma: Bulgularınızın önem ve anlamını vurgulayın ancak bulgular kısmında verilenleri tekrarlamayın. Fikirlerinizi yalnızca bulgularınızla kanıtlayabildiklerinizle sınırlı tutun. Bulgularınızı diğerlerininkiyle karşılaştırın. Bu bölümde yeni veriler bulunmamalıdır.

Teşekkür: Sadece çalışmaya ciddi katkılarda bulunmuş kişilere teşekkür edin. Yazarlar ismen teşekkür ettikleri herkesten yazılı izin almak zorundadır. Teşekkür kısmına "Yazarlar ….teşekkür eder" şeklinde başlayın.

Yazarlık ve Katkı Sağlayanlar: Dergi, biyomedikal dergilere gönderilen yayınlara yönelik ICMJE tavsiyelerini izler. Buna göre "yazarlık" aşağıdaki dört kritere dayalı olmalıdır:

Yazar;

- Yayının konsept veya dizaynına, çalışmanın verilerinin elde edilmesine, analizine ve yorumlanmasına önemli katkılar veren; ve

- İşi hazırlayan veya entellektüel içerik açısından eleştirel biçimde gözden geçiren; ve

- Yayınlanacak son şekli onaylayan; ve

- Çalışmanın her bir bölümünün doğruluğu ve bütünlüğü ile ilgili sorunları uygun bir şekilde inceleyen ve çözüm sağlayan sorumlu kişidir.

Bu şartların hepsini sağlamayan diğer tüm katılımcılar yazar değil, "Teşekkür" bölümünde anılması gereken katkı sağlamış kişilerdir.

Kaynaklar: Kaynakları 1'den başlayarak Arap rakamları ve alfabetik sıra ile verin. Kaynak numaraları cümle sonunda noktadan sonra üstte küçük rakamlar şeklinde (superscript) yazılmalıdır. Kısaltmalar için gerekli standartları http:/www.bilimterimleri.com adresinde bulunan Türk Bilim Terimleri Kılavuzu'ndan edinin.

Dergi başlıkları "Cumulated Index Medicus" kısaltmalarına uygun olmalıdır.

Dergiden: Yazar/yazarların soyadı ve adının ilk harfi, makale başlığı, dergi başlığı ve derginin özgün kısaltması, yayın tarihi, baskı, kapsayıcı sayfa numaralarını içermelidir.

Örneğin: 1. Dilaveris P, Batchvarov V, Gialafos J, Malik M. Comparison of different methods for manual P wave duration measurement in 12-lead electrocardiograms. Pacing Clin Electrophysiol 1999;22:1532-1538.

Kitap Bölümü: Yazar/yazarların soyadı ve adının ilk harfi, bölüm başlığı, kitap editörleri, kitap başlığı, basım, yayın yeri, yayın tarihi, kapsadığı sayfa numaralarını içermelidir

Örneğin: 1. Schwartz PJ, Priori SG, Napolitano C. The Long QT Syndrome. In: Zipes DP, Jalife J, eds. Cardiac Electrophysiology. From Cell to Bedside. Philadelphia; WB Saunders Co. 2000:597-615.

Tablolar: Tüm tablolar Arapça sayılarla numaralandırılmalıdır. Tüm tablolardan metin içerisinde numara sırası ile bahsedilmelidir. Her tablo için tablonun içeriği hakkında bilgi veren bir başlık verin. Başka yayından alıntı olan tüm tabloları tablonun alt kısmında kaynak olarak belirtin. Tabloda dipnotlar tablonun altında, üst karakter olarak küçük harflerle verilmelidir. İstatistiksel anlamlı değerler ve diğer önemli istatistiksel değerler yıldız ile işaretlenmelidir.

Şekiller: Şekillerin "Windows" ile açılması gerekir. Renkli şekiller veya gri tonlu görüntüler en az 300 dpi olmalıdır. Şekiller ana metinden ayrı olarak "*.tiff", "*.jpg" veya "*.pdf" formatında kaydedilmelidir. Tüm şekil ayrı bir sayfada hazırlanmalı ve Arap rakamları ile numaralandırılmalıdır. Her şekilde kendisindeki işaret ve sembolleri açıklayan bir alt yazı olmalıdır. Şekil gönderme için yazardan hiçbir ek ücret alınmaz.

Ölçü Birimleri ve Kısaltmalar: Ölçü birimleri System International (SI) birimleri cinsinden olmalıdır. Kısaltmalardan başlıkta kaçınılmalıdır. Sadece standart kısaltmalar kullanın. Metinde kısaltma kullanılırsa ilk kullanıldığı yerde tanımlanmalıdır.

İzinler: Yazarlar yayınlarına önceden başka bir yerde yayınlanmış şekil, tablo, ya da metin bölümleri dahil etmek isterlerse telif hakkı sahiplerinden izin alınması ve bu izin belgelerinin yayınla beraber değerlendirmeye gönderilmesi gerekmektedir. Böyle bir belgenin eşlik etmediği her materyalin yazara ait olduğu kabul edilecektir.

Davetli (Talep üzerine yazılan) Derlemeler

Özet uzunluğu: 250 kelimeyi aşmamalıdır.

Makale uzunluğu: 4000 kelimeyi aşmamalıdır.

Kaynak sayısı: 100 kaynağı aşmamalıdır.

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Derlemeler, üzerine konuyla ilgili yeni bir hipotez ya da çalışma oturtulabilecek bir sonuç içermelidir. Literatür taraması metodlarını veya kanıt düzeyi yöntemlerini yayınlamayın. Derleme makaleleri hazırlayacak yazarların ilgili konuda önceden araştırma makaleleri yayımlamış olması gerekir. Çalışmanın yeni ve önemli bulguları sonuç bölümünde vurgulanır ve yorumlanmalıdır. Derlemelerde maksimum iki yazar olmalıdır.

Olgu Sunumları

Özet uzunluğu: 100 kelimeyi aşmamalıdır.

Makale uzunluğu: 1000 kelimeyi aşmamalıdır.

Kaynak sayısı: 15 kaynağı aşmamalıdır.

Olgu Sunumları aşağıdaki gibi yapılandırılmalıdır:

Özet: Olguyu özetleyen bir yapılandırılmamış özet (gereç ve yöntem, bulgular, tartışma gibi bölümlerin olmadığı).

Giriş: Kısa bir giriş (tavsiye edilen uzunluk: 1-2 paragraf).

Olgu Sunumu: Bu bölümde ilk tanı ve sonuç da dahil olmak üzere olgu ayrıntılı olarak anlatılır.

Tartışma: Bu bölümde ilgili literatür kısaca gözden geçirilir ve sunulan olgunun, hastalığa bakışımızı ve yaklaşımımızı nasıl değiştirebileceği vurgulanır.

Kaynaklar: Vancouver tarzı, (yukarıda 'Kaynaklar' bölümüne bakınız).

Teşekkür

Tablolar ve şekiller

Teknik Notlar

Özet uzunluğu: 250 kelimeyi aşmamalıdır.

Makale uzunluğu: 1200 kelimeyi aşmamalıdır.

Kaynak Sayısı: 15 kaynağı aşmamalıdır.

Teknik Notlar, yeni bir cerrahi tekniğin açıklanmasını ve az sayıda olguda uygulanmasını içermektedir. Büyük bir atılım/değişikliği temsil eden bir tekniğin sunulması durumunda tek bir olgu yeterli olacaktır. Hastanın takip ve sonucu açıkça belirtilmelidir.

Teknik Notlar aşağıdaki gibi organize edilmelidir:

Özet: Aşağıdaki gibi yapılandırılmalıdır:

Amaç: Bu çalışmanın amacı nedir?

Yöntem: Kullanılan yöntemlerin, hastalar ya da sağlıklı gönüllülerin veya hayvanların tanımı, malzemeler hakkında kısa bir açıklama.

Bulgular: Ana bulgular nelerdir?

Sonuç: Bu çalışmanın ana sonuçları ve etkileri nelerdir?

Endikasyonları

Yöntem

Diğer yöntemlerle karşılaştırılması: Avantaj ve dezavantajları, zorluklar ve komplikasyonlar.

Kaynaklar: Vancouver tarzı (yukarıda 'Kaynaklar' bölümüne bakınız)

Teşekkür

Tablolar ve şekiller; alt yazıları dahil

Video Makale

Makale Uzunluğu: 500 kelimeyi aşmamalıdır.

Kaynak Sayısı: 5 kaynağı aşmamalıdır.

Tanıyı, uygulanan cerrahi tekniği ve sonucu açıklayarak olguyu kısaca özetleyiniz. Uygun şekilde adlandırılmış ve referans edilmiş video materyalleri ile tüm önemli noktaları, örn; yeni cerrahi tekniği, belirtiniz. Materyaller, yazarların cerrahi tekniğini anlattıkları veya karşılaştıkları ilginç vakalardan oluşmalıdır.

Teknik Gereklilikler: Veriler, makale yükleme sırasında diğer dosyalarla birlikte eklenmelidir. Video süresinin 10 dakikayı geçmemesi kaydıyla dosya boyutu maksimum 350 MB olmalı ve 'MOV, MPEG4, AVI, WMV, MPEGPS, FLV, 3GPP, WebM' formatlarından biri kullanılmalıdır. 100 MB'yi aşmayan video dokümanları sisteme yüklenebilir. Daha büyük video dokümanları için lütfen iletisim@galenos.com.tr adresinden bizimle iletişime geçiniz. Tüm video seslendirmeleri İngilizce olmalıdır. Video atıfları, Şekil veya Tablo atıfları ile aynı biçimde kullanılmalıdır. Örneğin; "….Bunu gerçekleştirmek için, yeni bir cerrahi teknik geliştirdik (Video 1)." Video materyallerinde isim ve kurumlar yer almamalıdır. Kabul edilen makalelerin video materyalleri online yayınlanacaktır.

Editöre Mektuplar

Makale uzunluğu: 500 kelimeyi aşmamalıdır.

Kaynak Sayısı: 10 kaynağı aşmamalıdır.

Türk Kolon ve Rektum Hastalıkları Dergisi'nde yayınlanan makaleler hakkında yorumlar memnuniyetle kabul edilir. Özet gerekli değildir, ancak lütfen kısa bir başlık ekleyiniz. Mektuplar bir şekil veya tablo içerebilir.

Editöryal Yorumlar

Makale uzunluğu: 1000 kelimeyi aşmamalıdır.

Kaynak Sayısı: 10 kaynağı aşmamalıdır.

Editöryal yorumlar sadece editör tarafından kaleme alınır. Editöryal yorumlarda aynı konu hakkında başka yerlerde yayınlanmış yazılar hakkında fikir veya yorumlar belirtilir. Tek bir yazar tercih edilir. Özet gerekli değildir, ancak lütfen kısa bir başlık ekleyiniz. Editöryal gönderimler revizyon/gözden geçirme talebine tabi tutulabilir. Editörler, metin stilini değiştirme hakkını saklı tutar.

Etik

Bu dergi, bilimsel kayıtların bütünlüğünü korumayı tahhüt etmektedir. Yayın Etik Komitesi (COPE) üyesi olarak, dergi olası olumsuz davranışlarla nasıl başa çıkılacağı konusunda Yayın Etik Komitesi (COPE) kılavuzlarını takip edecektir.

Yazarlar araştırma sonuçlarını yanlış sunmaktan; derginin güvenilirliğine, bilimsel yazarlık profesyonelliğine ve en sonunda tüm bilimsel çabalara zarar verebileceğinden dolayı, sakınmalıdır. Araştırma bütünlüğünün sürdürülmesi ve bunun sunumu, iyi bilimsel uygulama kurallarını takip ederek başarılır. Bu da şunları içerir:

- Yazılı eser değerlendirilmek üzere eş zamanlı birden fazla dergiye gönderilmemelidir.

- Yazılı eser daha önceki bir eserin geliştirilmesi olmadıkça, daha önce (kısmen ya da tamamen) yayınlanmamış olmalıdır. [Metnin yeniden kullanıldığı imasından kaçınmak için tekrar kullanılabilir materyallerde şeffaflık sağlayın ("self-plagiarism""kişinin kendinden intihali")].

- Tek bir çalışma; sunum miktarını arttırmak için birçok parçaya bölünmemeli ve zaman içinde aynı ya da çeşitli dergilere gönderilmemelidir. (örneğin "salam-yayıncılık" "salamizasyon").

- Veriler, sonuçlarınızı desteklemek için fabrikasyon (uydurma) ya da manüple edilmiş olmamalıdır.

- Yazarın kendine ait olmayan hiçbir veri, metin veya teori kendininmiş gibi sunulmamalıdır (intihal). Diğer eserlerin kullanımı, (eserin birebir kopyalanması, özetlenmesi ve/veya başka kelimeler kullanarak açıklanmasını da içeren) ya telif hakkı korunacak şekilde izin alınarak ya da tırnak işareti içinde birebir kopyalanarak uygun onay ile kullanılmalıdır.

Önemli not; Türk Kolon ve Rektum Hastalıkları Dergisi intihal taramak için bir program (iThenticate) kullanmaktadır.

- Eser sunulmadan önce sorumlu makamlardan ve çalışmanın yapıldığı enstitü/kuruluşlardan-zımnen veya açıkça-onay alınmasının yanı sıra tüm yazarlardan açıkça onay alınmış olmalıdır.

- Sunulan eserde yazar olarak ismi olanların, bilimsel çalışmaya yeterince katkısı olmuş olmalıdır ve ortak mesuliyet ve sorumluluğu olmalıdır.

Bununla beraber:

- Yazarlık veya yazarların sıra değişiklikleri eserin kabulünden sonra yapılamaz

- Yazının revizyon aşamasında, yayın öncesi veya yayınlandıktan sonra yazar isim eklenmesi veya çıkarılması istemi; ciddi bir konudur ve geçerli sebepler olduğunda değerlendirilebilir. Yazar değişikliği gerekçesi; haklı gerekçeli, inandırıcı ve sadece tüm yazarların yazılı onayı alındıktan sonra; ve yeni/silinmiş yazarın rolü silme hakkında ikna edici ayrıntılı bir açıklama ile kabul edilebilir. Revizyon aşamasında değişiklik olması halinde, bir mektup revise edilmiş yayına eşlik etmelidir. Yayına kabul edildikten veya yayınlandıktan sonra değişiklik olması halinde, bu istek ve gerekli dökümantasyonun yayıncı yoluyla editöre gönderilmesi gerekmektedir. Gerek görüldüğünde bu isteğin gerçekleşmesi için daha fazla doküman talep edilebilir. Değişikliğin kabul veya red kararı dergi editörü insiyatifindedir. Bu nedenle, yayının gönderilmesi aşamasında yazar/yazarlar; gönderecekleri ilgili yazar grubunun isim doğruluğundan sorumludur.

- Yazarlardan sonuçların geçerliliğini doğrulamak amacıyla verilerin ilgili belgelerinin istenmesi halinde bu verileri göndermek için hazır bulundurulmalıdır. Bunlar, ham veri, örnekler, kayıt vb. şeklinde olabilir.

Görevi kötüye kullanma ya da suistimal şüphesi halinde dergi COPE yönergeleri izleyerek bir soruşturma yürütecektir. Soruşturmanın ardından, iddia geçerli görünüyorsa, yazara sorunu gidermek için bir fırsat verilecektir.

Usulsüzlük, şüphe seviyesinde kaldığında; dergi editörü aşağıdaki yollardan birine başvurabilir;

- Makale halen şüpheli ise, reddedilip yazara iade edilebilir.

- Makele online yayınlanmış ise; hatanın mahiyetine bağlı olarak ya yazım hatası olarak kabul edilecek ya da daha ciddi durumlarda makale geri çekilecektir.

- Hatalı yayın ve geri çekme durumlarında açıklayıcı not yayınlanır ve yazarın kurumu bilgilendirilir.

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İnsan ve Hayvan Araştırmaları

İnsan Hakları Beyannamesi

İnsan katılımlı araştırmalar; 1964 Helsinki Deklarasyonu'na ve sonrasında yayımlanan iyileştirici ilkelere uygun olmalıdır ve yazarlar tarafından kurumsal ve/veya ulusal etik kurul komitelerine başvurulup onay alınmış olduğu beyan edilmelidir.

Araştırmanın 1964 Helsinki Deklarasyonu veya kıyaslanabilir standartlara göre yürütülmesi ile ilgili şüphe durumunda, yazarlar bu durumun nedenlerini açıklamak zorundadır ve bağımsız etik kurulları veya diğer değerlendirme kurulları aracılığıyla şüphelerin giderilmesi gerekmektedir.

Aşağıda belirtilen durumlar yazı içerisinde "Kaynaklar" bölümünden önce yer almalıdır:

Etik Kurul Onayı: "Çalışmada insanlara uygulanan tüm prosedürler kurumsal ve ulusal araştırma kurullarının etik standartlarına, 1964 Helsinki Deklarasyonu'na ve sonrasında yayımlanan iyileştirici ilkelere uygun olmalıdır."

Retrospektif çalışmalarda, aşağıda belirtilen cümle yer almalıdır.

"Bu tür çalışmalarda yazılı onam gerekmemektedir."

Hayvan Hakları Beyannamesi

Araştırmalarda kullanılan hayvanların refahına saygı gösterilmelidir. Hayvan deneylerinde, yazarlar hayvanların bakımında ve kullanımında uluslararası, ulusal ve/veya kurumsal olarak oluşturulmuş kılavuzlara uymalıdır ve çalışmalar için kurumdaki veya çalışmanın yapıldığı veya yürütüldüğü merkezdeki (eğer böyle bir merkez varsa) Klinik Araştırmalar Etik Kurulundan onay alınmalıdır. Deneysel hayvan çalışmalarında "Guide for the care and use of laboratory animals http://oacu.od.nih.gov/regs/guide/guide.pdf doğrultusunda hayvan haklarını koruduklarını belirtmeli ve kurumlarından etik kurul onay raporu almalıdırlar.

Hayvanlar ile yürütülen çalışmalarda, aşağıda belirtilen durumlar yazı içerisinde 'Kaynaklar' bölümünden önce yer almalıdır:

Etik Kurul Onayı: "Hayvanların bakımı ve kullanımı ile ilgili olarak uluslararası, ulusal ve/veya kurumsal olarak oluşturulmuş tüm kılavuzlara uyulmuştur."

Eğer uygun bulunduysa (komitenin bulunduğu merkezde): "Hayvan çalışmalarında yapılan tüm uygulamalar kurumsal veya çalışmanın yürütüldüğü merkez tarafından belirlenmiş etik kurallara uyumludur."

Eğer makale insan ya da hayvan katılımlı bir çalışma değilse, lütfen aşağıda yer alan uygun durumlardan birini seçiniz:

"Bu makalenin yazarları insan katılımlı bir çalışma olmadığını bildirmektedir."

"Bu makalenin yazarları çalışmada hayvan kullanılmadığını bildirmektedir."

"Bu makalenin yazarları insan katılımlı veya hayvan kullanılan bir çalışma olmadığını bildirmektedir."

Bilgilendirilmiş Onam

Bütün bireyler ihlal edilemeyecek kişisel haklara sahiptir. Çalışmada yer alan bireyler, elde edilen kişisel bilgilere, çalışmada geçen görüşmelere ve elde edilen fotoğraflara ne olacağı konusunda karar verebilme hakkına sahiptir. Bundan dolayı, çalışmaya dahil etmeden önce yazılı bilgilendirilmiş onam alınması önemlidir. Bilimsel olarak gerekli değilse ve katılımcılardan (veya katılımcı yetkin değilse ebeveynlerinden veya velilerinden) basılması için yazılı onam alınmadıysa, katılımcılara ait detaylar (isimleri, doğum günleri, kimlik numaraları ve diğer bilgileri) tanımlayıcı bilgilerini, fotoğraflarını ve genetik profillerini içerecek şekilde yazılı formda basılmamalıdır. Tam gizlilik sağlanmasının zor olduğu durumlarda, bilgilendirilmiş onam formu şüpheyi içerecek şekilde düzenlenmelidir. Örneğin fotoğrafta katılımcıların göz kısmının maskelenmesi gizlilik açısından yeterli olmayabilir. Eğer karakteristik özellikler gizlilik açısından değiştirilirse, örneğin genetik profilde, yazar yapılan değişikliğin bilimsel olarak sorun oluşturmadığından emin olmalıdır.

Aşağıdaki ifade belirtilmelidir:

Bilgilendirilmiş Onam: "Çalışmadaki tüm katılımcılardan bilgilendirilmiş onam alınmıştır."

Eğer makalede katılımcıların tanımlayıcı bilgileri yer alacaksa, aşağıdaki ifade belirtilmelidir:

"Makalede kişisel bilgileri kullanılan tüm katılımcılardan ayrıca bilgilendirilmiş onam alınmıştır."

DEĞERLENDİRME SÜRECİ

Türk Kolon ve Rektum Hastalıkları Dergisi'ne gönderilen tüm yazılar, sisteme yüklendikten sonra ilk önce editöryal kurul tarafından derginin amaç ve hedeflerine uygunluk ve temel şartları sağlama yönünden değerlendirilecektir. Yazılar, konusunda uzman dergi hakemlerine değerlendirilmek üzere gönderilecektir. Tüm kabul edilen yazılar yayımlanmadan önce, istatistik ve İngiliz dili konusunda uzman editörler tarafından değerlendirilecektir. Sayfaların ilk gözden geçirilmesinden sonra, hakem yorumları ön karar vermek için Editör'e gönderilecektir. Bu aşamada, ilk değerlendirmede bulunanların düşüncesi doğrultusunda, yazı kabul edilebilir, reddedilebilir veya yazıda düzeltme yapılması istenebilir. İlk değerlendirme sonrasında değerli bulunan makaleler için genellikle düzeltme istenir. Düzeltilen makaleler ilk karardan sonraki 2 ay içerisinde tekrar dergiye gönderilmelidir. Süre uzatmaları yardımcı editörden 2 aylık süre bitmeden en az 2 hafta önce talep edilmelidir. Türk Kolon ve Rektum Hastalıkları Dergisi tarafından, 2 aylık düzeltme süresi sona erdikten sonra, yazı kabul edilmeyecektir. Düzeltme yapılan yazılar sisteme tekrar yüklendikten sonra değerlendirilmek üzere (genellikle ilk değerlendirmeyi yapan hakeme) gönderilecektir. Sonuç olarak yayımlanma kararı verildikten sonra, baskı öncesi Teknik Editör tarafından son kez değerlendirilecektir ve iletişim kurulacak olan yazara gözden geçirme ve son düzenlemeleri yapmak üzere işaretlenmiş bir nüshası elektronik ortamda gönderilecektir.

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Bunun yanı sıra ana revize yazı, kabul mektubu tarihinden itibaren 30 gün içinde teslim edilmelidir. Yazının revize edilmiş versiyonunun tanınan süre içinde verilmemesi durumunda, revizyon seçeneği iptal edilebilir. Yazar(lar) ek sürenin gerekli olduğunu düşünüyorsa, ilk 30 günlük süre bitmeden, uzatmayı talep etmelidir.

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REVIEW

Obstructed Defecation Syndrome

Outlet Obstrüksiyonu Sendromu

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ABSTRACT

Chronic constipation is a common problem affecting about 2-30% of population in the western societies. About 30-50% of the constipated patients suffer from obstructed defecation. Contrary to colonic constipation stool reaches the rectum, but he or she feels a blocage and is unable to propel the stool. It has two subtypes; mechanical and functional. The functional type is also known as pelvic floor dyssynergy, anismus, spastic pelvic floor, descending perineal syndrome. Mechanical type includes rectocele, enterocel, pelvic organ prolapsus, intussusception, rectal prolapse. Here we attempted to discuss the structures responsible for defecation, etiology, diagnosis and treatment of outlet obstruction.

Keywords: Konstipation, obstructe defecation, pelvic floor diseases, rectocele

ÖZ

Kronik konstipasyon batı toplumlarında nüfusun %2-30 kadarını etkileyen yaygın bir şikayettir. Bu hastaların yaklaşık %30-50 kadarında obstrükte defekasyon-outlet obstrüksiyonu söz konusudur. Bu sendromda kolonik kabızlığın aksine feçes rektuma ulaşır fakat kişi bunu çıkarmakta zorlanır. Obstrükte defekasyon iki alt grupta incelenir: mekanik ve fonksiyonel. Fonksiyonel obstrüksiyon pelvik taban dissinerjisi, anismus, spastik pelvik taban, desendan perine sendromu gibi pekçok isimle anılır. Mekanik tipte rektosel, enterosel, intususepsiyon, pelvik organ prolapsusu, rektal prolapsus gibi mekanik nedenler sözkonusudur. Bu yazıda normal defekasyon mekanizmasından sorumlu yapıları, outlet obstrüksiyon sendromunun etiyoloji, tanı ve tedavisini vermek istedik.

Anahtar Kelimeler: Konstipasyon, obstrükte defekasyon, pelvik taban hastalıkları, rektosel

Introduction

Chronic constipation is a common problem affecting 2-30% of the population in Western societies. Of constipated patients 30-50% have "obstructed defecation syndrome" (ODS). In these patients, removing the stool reaching the rectum is a problem. There are two types of ODS: Functional and mechanical.

In recent years, various pathophysiological processes involved in functional gastrointestinal disorders have been identified: Imbalance in the bacterial flora of the gut, increased intestinal permeability, immune deficiency, neural and hormonal interaction between the brain and the gut. For this reason, the term "bowel-brain interaction disorder" was suggested.[1,2]

Definition

ODS is the inability of the pelvic floor muscles, especially the puborectal (PR) muscle, to relax during straining, and even paradoxically contracting the anarectal angle (ARA) further narrowing the ARA -like a flap valve- and preventing the passage of stool.

It causes symptoms such as excessive straining, pain, feeling of frequent defecation but unsuccessful defecation, incomplete emptying, small pieces of defecation or hard and thick stools, a feeling of rectal fullness. Since the patient

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is unable to push the stool completely, he/she may feel tenesmus or pelvic fullness, have urgent defecation, need positioning, need enema, and press to the perineum or need digital disimpaction. The patient defecates less than 3 per week.

The anatomical and physiological problems that lead to this syndrome are not fully understood. It includes all pelvic floor anomalies that cause incomplete evacuation of feces from the rectum. Delivery and conditions that cause continuous and recurrent increase in abdominal pressure (obesity, chronic cough, excessive straining) may cause nerve damage by causing excessive stretching of the pelvic floor. ODS may be due to anatomical changes (rectocele, enterocele) or functional disorders [paradoxical puborectal (PR) contraction]. It is often associated with rectocele or rectal intussusception. Rectocele or rectal prolapse can be treated surgically. However, rectal hyposensitivity affects the results of the surgery. When there is rectal sensory impairment, the problem is not solved after subtotal colectomy - ileorectal anastomosis. Today, psychological tension is thought to negatively affect bowel functions. Especially in functional disorders, sexual abuse should also be questioned.

Effective Structures in Defecation Mechanism

Defecation Muscles

External anal sphincter (EAS), internal anal sphincter (IAS), PR muscle, levator ani, longitudinal muscle.

Importance of the Puborectal Muscle

In normal defecation, PR muscle relaxes, the rectoanal angle is flattened, and the stool passes into the anal canal. Failure of the PR muscle to relax leads to functional outlet obstruction. In both sexes, it gives fibers to the external urethral sphincter and the deep part of the EAS. It also gives fibers to the vaginal sphincter and prostatic sphincter.

Levator Tunnel

The levator tunnel is a tube consisting of the intrahiatal organs - the anal canal, the prostate in men, the vagina in women, and the muscle surrounding the urethra, extending from the levator hiatus to the perineum. The back of the tunnel is longer than the front. The back is 3-4 cm and the front is 2.5-3 cm in lenght. This tunnel has two layers which are both striated muscles: Inner suspensory ring and outer PR muscle. The inner ring is relaxant and opens the anal canal at defecation. The outer muscle is constrictor.

Hiatal Ligament

Levators are connected to the intrahiatal organs by a fascia called the hiatal ligament. It starts from the inner edge of the levators, divides into multiple fanlike septa and attaches to the upper part of the anal canal, bladder neck, and upper part of the vagina. It makes the puboprostatic and pubovesical ligaments in front. It provides harmony between the levator and organs in defecation and micturition. Prolapse develops in the weakness of this ligament.

Rectal Hyposensitivity

Rectal hyposensitivity is the inability to detect rectal distension, which can be diagnosed during anorectal (AR) physiology tests. It is common in functional outlet obstructions, and there may also be fecal incontinence. It is usually determined by the increased threshold volume during the balloon removal test. It is not clear whether it is due to impairment in afferent nerve conduction. Although its etiology is not well known, there are findings indicating that it is caused by pelvic nerve damage and wrong toilet habits.

Defecation Mechanism

When stool enters the rectum, reflex contraction and loosening of IAS occur. For defecation, relaxation of the EAS and straining is required. The pushing is necessary to increase the intra-abdominal pressure. There are two reasons for increased intra-abdominal pressure: The detrusor presses the muscles and leads to levator contraction. The anal canal is not affected because it is below the levator. When the levators contract, their funnel shape flattens, they rise and are pulled laterally. This pulls on the hiatal ligament, which opens the AR junction and expands the ARA. Simultaneously, the suspensory ring and longitudinal muscle contract and further expand the ARA.

Assessment of Constipation

Constipation is often used to describe difficult, prolonged defecation or difficulty in evacuating a small amount of hard stool. The patient may have other symptoms such as bloating, nausea, and pelvic pain. Therefore, objective scoring systems were developed depending on the patient's complaints.[3,4] (Tables 1, 2, 3, 4)

Tests

- Clinical evaluation
- GITT (Gastrointestinal transit time)
- Colonoscopy
- Defecography
- Colposistography
- Anal manometry
- Balloon push test
- Electromyography - measurement of pudendal nerve conduction
- Endorectal ultrasound (ERUS)
- Dynamic magnetic resonance imaging

Table 1. Wexner classification (Cleveland Clinic Florida Constipation Scoring)

Number of defecations	Score
1-2 times in 1-2 days	0
2 in a week	1
Once a week	2
<1 per week	3
<1 per month	4
Painful difficulty in evacuation of stool	
Never	0
Rarely	1
Sometimes	2
Usually	3
Always	4
Feeling of incomplete evacuation of stool	
Never	0
Rarely	1
Sometimes	2
Usually	3
Always	4
Pain-abdominal pain	
Never	0
Rarely	1
Sometimes	2
Usually	3
Always	4
Time spent on the toilet (minutes)	
<5	0
5-10	1
10-20	2
20-30	3
>30	4
Help-type	
Unaided	0
Stimulant laxative	1
Digital disimpaction or using enema	2
Failed defecation attempt in 24 hours	
Never	0
1-3	1
3-6	2
6-9	3
>9	4
Constipation time (years)	
0	0
1-5	1
5-10	2
10-20	3
>20	4

Table 2. Modified Longo classification

Score	Question	Never	<1 per week	1-6 per week	Everyday
1	Medication for defecation (enema, laxative, etc.)	0	1	2	3
2	Difficulty evacuating	0	1	2	3
3	Digital disimpaction, pressing	0	1	2	3
4	Going to the toilet again	0	1	2	3
5	Feeling of incomplete evacuation	0	1	2	3
6	Pushing for evacuation	0	1	2	3
7	Long time to evacuate	0 <5 min	1 6-10 min	2 11-20 min	3 >20 min
8	Affecting the life	0 (none)	1 (mild)	2 (moderate)	3 (severe)

Examination

Anocutaneous reflex, stool and its consistency in the anus, hemorrhoids, fissure, prolapse, invagination, rectocele are checked. It is evaluated whether there is anal tone, clenching, anorectal mass and fecaloma. During defecation, the parodoxal contraction of the pelvic floor can be evaluated by palpation of the PR muscle with digital rectal examination while the patient is straining. Descending of perineum, mucous discharge, and mucous prolapse may be observed during straining.

Table 3. Renzi scoring

Symptom	Never	Rarely	Sometimes	Usually	Always
Overstrain	0	1	2	3	4
Feeling of incomplete evacuation	0	1	2	3	4
Use of enemas, laxatives	0	1	2	3	4
Suppression from the vagina, perineum	0	1	2	3	4
Abdominal discomfort, pain	0	1	2	3	4

Table 4. Altomare scoring

Score	0	1	2	3	4
Average time spent on the toilet	<5 min	6-10 min	11-20 min	21-30 min	>30 min
Number of defecation attempts per day	1	2	3-4	5-6	>6
Perianal, anal, vaginal suppression	Never	>1 month	<1 week	1 per week	Every day in a week
Use of laxatives	Never	>1 month	<1 week	1 per week	Every day in a week
Use of enemas	Never	>1 month	<1 week	1 per week	Every day in a week
Insufficient, repeated defecation	Never	>1 month	<1 week	1 per week	Every day in a week
Straining at defecation	Never	<25%	<50%	<75%	100%
Stool consistency	Soft	Solid	Solid and little in amount	Development of fecaloma	

Gastrointestinal Transition Time-Colon Transition Time

Twenty radiopaque markers or isotopically labeled solid fragments are swallowed. It is evaluated with abdominal radiography on 1, 3, and 5 days. Markers are seen in the entire colon even after a week in those with a long transition period. In patients with ODS, markers are seen in the distal colon or rectum.

Defecography

The patient drinks 150 mL of diluted barium solution (for small intestine imaging) 45 min before the procedure. Barium mixed with potato starch or methylcellulose is introduced into the rectum in a normal stool consistency. There is no consensus about the amount (120-300 mL). Images of the rectum are taken laterally at rest, at straining and at maximum squeezing. Then the patient is asked to evacuate his/her rectum. By giving contrast to the bladder and vagina, pelvic organs can be fully evaluated (Dynamic cystoproctography).

Interpretation

Rest: The anal canal is closed. The pelvic floor is determined according to the pubococcygeal line (the line drawn from the lower edge of the symphysis pubis to the sacrococcygeal junction). Perineal prolapse is measured from this line to the AR junction. The AR junction, the line drawn between ischial tuberosity and the tip of the coccyx are used as steady points. The caudal displacement of the AR junction is interpreted as the rise or fall of the pelvic floor. It is up to 1.8 cm at rest. It is less in young people and more in older people. Prolapsing up to 3 cm from the resting level during defecation is considered normal.

The ARA is the angle between the anal canal axis and the posterior rectal wall parallel to the longitudinal axis of the rectum. It is about 90 degrees, but wider angles, especially in males, may be normal. PR muscle compression is evident at rest. PR length is determined by measuring the distance between ARA and symphysis pubis. ARA is an indirect sign of PR activity. When the muscle contracts, the angle narrows and when it relaxes it expands.

Evacuation: It provides important information about the rectal structure and function. There are 5 elements in normal proctography:

- Increase in ARA
- Deletion of the PR compression
- Opening of the anal canal
- Evacuation of rectal contents
- No significant prolapsing in the pelvic floor

In a normal person, the anal canal should be fully opened within a few seconds, evacuation should begin immediately

and be complete. ARA increases by 20-30 degrees and PR length increases by 3-4 cm.

Recovery: After evacuation, the anal canal closes, ARA and pelvic floor return to their original state.

The second evaluation parameter is the displacement of the AR junction at straining. Normally; PR ring compression occurs on the posterior wall of the rectum, and the angle of up to 90^0 at rest narrows to 75^0 in voluntary squeezing, and the AR junction rises. PR ring compression disappears, pelvic floor descends approximately 3.5 cm. At defecation, the PR ring compression disappears completely and ARA increases.

It shows rectoanal invagination.

MR Defecography

It has the capacity to create multiplan images. Anal canal, ARA, levator muscles, vagina, and their status with respect to the pubo-coccygeal line can be evaluated very well. Compression of the PR muscle to collapse the rectum, excessively narrow AR angle and prolonged evacuation of the rectum are signs of pelvic dysynergy. Perirectal soft tissues cannot be evaluated in conventional defecography. MR defecography provides useful information in this respect.[6]

Dynamic Transperineal Ultrasound

A simple and inexpensive method that dynamically evaluates the pelvic floor in the anterior, middle and posterior regions.

Colposistography

Defecography + voiding cystography + vaginal opacification and pelvicography.

Anorectal Manometry

It is performed to determine motor and sensory abnormalities of the anorectum. While the patient is trying to defecate, 4 types of pressure changes are observed. Normally, intrarectal pressure increases, PR muscle and sphincter relax. In Type I, pushing (intrarectal pressure >45 mmHg) is sufficient but anal pressure is increased. In Type II, pushing (intrarectal pressure <45 mmHG) and anal sphincter relaxation are insufficient, contraction of the anal sphincter may be seen. Type III is characterized by increased intrarectal pressure (>45 mmHg) and no or very little anal sphincter relaxation. Type I and Type III are classified as dyssynergic defecation.

Balloon Expulsion Test

Expulsion of the balloon inflated with 50-100 cc from the rectum. Patients with ODS cannot remove the balloon.

Electromyography

Tonic activity inhibition of pelvic floor muscles (including PR muscle) is measured in straining and defecation. The patient lies on his/her left side and a needle or wire electrode is inserted into the PR muscle to measure it. In pelvic dyssynergia, increased activity is observed in the PR muscle during straining.

Ultrasonography

Endoanal, endorectal, dynamic anorectal, transvaginal and dynamic transperineal US can be performed.

Dynamic ERUS

The distance between the peritoneum and the anal verge is measured at rest, then the difference between the two is measured at straining. The length and thickness of the anal sphincter and PR muscle are measured at rest, voluntary squeezing, and defecation (straining). With voluntary squeezing, the thickness of the sphincter increases while its length decreases. The length of the anal sphincter increases and its thickness decreases in expulsion. The PR muscle relaxes, increases in length and decreases in thickness. The position of the patient and the procedure may give conflicting results.

Although clinically asymptomatic, patients with vaginal delivery, anal surgery or trauma may have sphincter damage. The defect can only be in IAS or EAS, or both. If these defects are not diagnosed, they may lead to incontinence after the procedures for ODS. IAS and submucosa thickness increase in all quadrants in rectal prolapse.

Although there are some differences in the Rome IV criteria compared with Rome III criteria, which is a consensus study for constipation, there are no differences affecting the treatment and clinical management.[7]

The pathogenesis of ODS is still controversial. Two main reasons have been identified:

1.Excessive straining at defecation leads to stress neuropathy, which leads to pelvic floor weakening and prolapse of perineum. Difficult vaginal deliveries are also effective in ODS. There is damage to the pelvic tissue innervation and soft tissue in women who give vaginal delivery. Trauma to the pelvic floor soft tissues can lead to defects in the endopelvic fascia and support tissue. Nerve damage secondary to stretching due to vaginal delivery, chronic and recurrent increase in intra-abdominal pressure, obesity, and chronic cough may be a predisposing factor in ODS. Rectal sensation may also be impaired. It may also occur due to cutting of the lateral ligaments after pelvic surgery - rectopexy, hysterectomy, etc.

2. In cadaver studies with rectocele and intussusception, an increase in the capacity of the rectal ampulla and thinning or loss of the muscle layer of the anterior rectum have been observed. This has also been demonstrated by transanal and transvaginal US in patients with ODS.

Inability to relax the anal sphincters or paradoxical contraction of the PR muscle is the most common functional cause. The most common mechanical causes are rectocele, rectal invagination, enterocele, genital prolapse, and descending perineum. Functional ODS is also called as anismus, spastic pelvic floor or pelvic floor dyssynergia. The EAS and PR muscle work paradoxically during defecation.[8] (Table 5, 6)

Rectocele

Patients with rectocele may also have gynecological and urological symptoms. Therefore, the patient can be admitted to a urologist, gynecologist or general surgeon whichever symptom is at the forefront. Rectocele can be seen in defecography at a rate of 85% and intussusception 35% in asymptomatic women.[9]

It is also called posterior prolapse. The rectal wall protrudes into the vagina from the posterior wall of the vagina with an anteroposterior length of more than 2 cm. This is considered as a defect in the rectovaginal septum. However, there are those who find the anatomical importance and even the existence of the rectovaginal septum controversial. The rectovaginal septum consists of dense collagen and elastic fibers and longitudinal smooth muscle bundles from the longitudinal muscles of the rectum wall. It forms an incomplete wall between the rectum and vagina and is complemented by the perineal body caudally. Laterally, it attaches to the pelvic sidewall. It is seen as a V-shaped hyperechoic layer between vagina and rectum with endoanal ultrasound (EAUS) in normal women. In those with rectocele, the septum is seen as thinned or deleted in the midline. It may be pushed towards the vagina or bagged

Table 5. Etiology of obstructed defecation syndrome

Functional	Morphological
Anismus; spastic pelvic floor	Rectocele
Pelvic floor dyssynergia	Enterocele, sigmoidocele
Hirschprung disease	Rectal prolapse
Chagas disease	Rectal invagination
Hereditary or acquired	Descending perineum syndrome
Internal anal sphincter myopathy	Uterus, vaginal prolapse
Central nervous system lesions	Stenosis in the anorectum due to various treatments
Pharmacological	Rectal tumors
Psychopathological	

Table 6. Pathophysiology of obstructed defecation syndrome

Mechanism	Cause
Mechanical outlet obstruction	Rectal intussusception External prolapse Enterocele
Spread of pressure	Rectocele Descending perineum syndrome Total rectal prolapse
Functional outlet obstruction	Inability of inhibition of the internal anal sphincter Hirschprung disease, Chagas disease, hereditary diseases Internal sphincter myopathy Inability of pelvic floor muscles to relax Paradoxical puborectal contraction Medulla spinalis lesions Multiple sclerosis
Rectal sensory impairment	Idiopathic megarectum Rectal hyposensitivity

during the straining. The efficiency of rectocele diagnosis with dynamic EAUS is 87%. In women with rectocele, ERUS also shows the thickness of the rectal mucosa, defects and irregularities in the muscularis propria, as well as deletion of the rectovaginal septum. It is the most common anatomic change that can be seen with inspection and digital rectal and vaginal examinations in women while straining. They are classified according to their position (low, middle, high), according to their size (small; less than 2 cm, moderate; 2-4 cm, large; more than 4 cm), and according to their level (Type I; protruding to the upper vagina, Type II; extending to the introitus, Type III; extending from the introitus). Another classification is the Baden - Walker classification. This classification is for all pelvic organ prolapses.[10] According to this:

Stage 0; no prolapse

Stage 1; lower border of the prolapsed organ is 1 cm proximal to the hymen

Stage 2; distal of the prolapsed organ is 1 cm proximal or distal to the hymen

Stage 3; lower border of prolapsed organ is <1 cm proximal or <2 cm distal from hymen

Stage 4; distal of the prolapsed organ is >2 cm distal from hymen.

However, rectocele may not be the cause of ODS symptoms. Those smaller than 2 cm are usually asymptomatic. When larger than 3 cm, barium is left in the defecography and if there is no anismus, it can be considered as a cause of ODS. Along with other anatomical changes - occult rectal prolapse, sigmoidocele and anismus can be found. Causes are:

- Aging
- Vaginal delivey (large baby)
- Menopause

Feces accumulates in the rectocele. Rectocele may not impair evacuation, but remaining feces in it causes a feeling of not fully evacuating.

Megarectum

It is defined as the rectum diameter greater than 6 cm in the pelvis inlet or a total rectum capacity greater than 450 mL in manometry.

Primary or secondary megarectum is due to rectal sensory impairment or high compliance.

Hirschprung Disease

Absence of rectal inhibitory reflex.

Descending Perineum Syndrome

Perineum prolapsus is usually due to excessive strain and weakening of the perineum muscles and stretching damage of the pudendal nerve. This may be due to obstetric trauma or excessive straining. However, its exact etiology is unknown. The AR angle goes down by more than 3.5 cm in straining and the angle becomes 130^0 or more at rest and 155^0 or more in straining. Incontinence is usually seen. Sometimes the anterior rectal wall protrudes into the anal canal, and the overhanging mucosa turns into a plug that blocks the anal canal. But it can also be seen in those with prolapsed incontinence.

Dyskinetic Puborectal Muscle Syndrome (Spastic Pelvic Floor Syndrome)

In defecation, the pelvic floor does not descend and the PR muscle contracts paradoxically. The compression of the PR ring becomes evident. Defecation is prolonged and not complete.

Dynamic US is valuable in diagnosis. Anal sphincters contract and thicken and the ARA cannot expand.

Intussusception and Rectal Prolapse

Rectal intussusception is the concentric invagination of the rectal wall in straining and defecation. It has different degrees: It is defined as rectal, rectoanal or external. It is classified as:

- Intrarectal prolapse
- Intraanal prolapse
- External -total rectal prolapse

It usually starts 6-8 cm proximal to the anal canal.

Rectal mucosal prolapse is simply invagination of the rectal mucosa.

It is more common in multiparous women, suggesting pelvic floor injury. Normally, rectal intussusception may be seen to some extent. This is the result of ODS, not the cause. It is found to be related with solitary rectal ulcer.

Depth according to the distance from the anterior wall of the anal canal to the anterior end of the rectocele:

<2 cm; small

2-4 cm; medium

>4 cm; large-wide

Minors are normally found in women, frequent in multiparous women.

In defecography, transverse or oblique folding of the rectal wall thicker than 3 cm is seen in the form of a funnel or ring on straining. Folds thinner than 3 cm indicate mucosal prolapse and are not critical.

Surgery does not give good results in those with functional impairment. They benefit from biofeedback.

Enterocele-Sigmoidosel

The peritoneum herniates into the area between the vagina or rectum in the pouch of Douglas along the ventral wall

of the rectum. The peritoneum lies in the form of a sac. Oral contrast is given so that it can be viewed. The distance between rectum and vagina increases. It can usually be shown at the end of the evacuation, may contain small intestine, sigmoid colon or omentum.

It causes mechanical obstruction. Enterocele is small bowel prolapse. The small intestine shifts downward and pushes the vagina from the top. There should be contrast material in the small intestine and vagina for diagnosis. Small, occult enteroceles can be identified with EAUS. In defecography, the area between the rectum and vagina is enlarged and the intestines fill this area. If there is no radiopaque material in the intestines, the enlargement of this area or the presence of air in this area is an indirect sign.

Causes:

It is especially seen if the vaginal wall is weakened after hysterectomy.

- Advanced age
- Vaginal delivery of overweight babies
- Multiparity
- Obesity
- Menopause

If it causes symptoms or impairs quality of life, it is considered pathological. Enterocele gives a feeling of pelvic fullness and usually does not cause ODS. Sigmoidosel is less common and it can cause ODS. MR imaging is good in the diagnosis of both.

Complications of Enterocele - Rectocele Surgery

- Pain
- Bleeding
- Infection
- Bladder, uterus injury
- Urinary fistula
- Urinary incontinence
- Vaginal stenosis

Functional Disorders

There is a large group of patients who cannot completely evacuate the rectum but have no structural defects. It is clinically determined by their inability to push the rectal balloon. This is also called as anismus, spastic pelvic floor syndrome, pelvic floor dyssynergia or paradoxical PR syndrome. It has been shown with electromyogram (EMG) that the pelvic floor muscles do not contract properly during evacuation, but this can normally happen. The innervation of the pelvic floor and the inability to increase the intraabdominal pressure are blamed. In proctography, PR compression is more prominent and anal canal and ARA are narrow. Delay in opening the anal canal and incomplete evacuation are seen in those with ODS. Biofeedback gives good results in these patients.

Medical Treatment

- Lifestyle changes: Drinking plenty of water and a diet rich in fiber are recommended. Psyllium or its similars (matamusil, benefiber, citrucel) can be given for fiber supplement. The aim is to take 30 grams of fiber per day.
- Laxatives
- Yoga: Relaxation and strengthening of the pelvic floor muscles
- Those with depression and anxiety: Psychotherapy
- Those with ODS and rectal hyposensitivity: Biofeedback

After approximately 6 weeks of medical and biofeedback treatment, ODS is evaluated and further procedures are decided.

- Anismus: Botulinum toxin injection transanally to the PR muscle
- Those with pudendal neuropathy and rectal hyposensitivity: Transanal electro-stimulation, sacral nerve stimulation

Botox Injection

If conservative methods do not provide benefit in patients with sensitive and painful levator ani and PR muscle in palpation, Botox injection may reduce pain. There are 7 types of botulinum toxin. Their antigenic properties are different. BTX-A binds extracellular glycoprotein structures in presynaptic nerve endings and prevents acetylcholine secretion. Lack of acetylcholine causes neuromuscular blockade and muscle paralysis. It is injected into Levator ani (PR muscle) and EAS, and its effectiveness decreases due to the development of antibodies in repeated injections.[11] It should not be done in patients who have injection pain but do not have levator sensitivity on examination.

For anal sphincter and levator ani injection, a finger is inserted into the anus, the needle is advanced 2 cm intersphincterically and injected. If the anal canal is long, you can go further. Injection is made at 3 and 9 o'clock. For levator ani, the needle is inserted 3-4 cm lateral to the anal verge (lateral to the EAS) and advanced medially. The levator is fixed with the finger in the anal canal, the tip of the needle is felt with the finger, but the mucosa is not punctured and it is injected.[11]

Biofeedback

Biofeedback is a method that aims to perceive physiological functions by using tools that provide information about the system, to learn how to change it to improve the problem, and to perform these functions without tools and with perseverance over time. It is based on the understanding that mind is superior to tissue. Thus, the body's responses can be changed. These instruments are; EMG, thermometer,

electrocardiogram (EKG), photoplethysmography (blood flow measurement with the sensor worn on the finger), electroencephalography (EEG), pneumograph, capnometer, and anal manometer, etc. It can be used to modulate respiratory rate, heart rate or high blood pressure. Anal biofeedback is used in fecal incontinence or functional outlet obstruction. The aim is to strengthen the rectoanal inhibitory reflex, increase rectal sensitivity (the result is evaluated by sensing the balloon in small volumes and contracting the EAS in the balloon expulsion test), and increasing the duration and strength of the EAS contraction. The duration of each session, the interval and how long the sessions will be held, and whether they can be performed at home are controversial. Sessions usually take 30-60 minutes. Generally, manometric controlled anal relaxation and defecation simulated biofeedback that provides muscle coordination are used. In one study, 63% of patients had an improvement in symptoms after 5 sessions.[12]

Rectal Sensitivity Training

A balloon is placed in the rectum and inflated until rectal fullness is felt. It saves time for the contraction of the EAS and tries to prevent incontinence. In those with urgent defecation or excessive rectal sensitivity, the aim is to teach to tolerate an increasingly larger volume. The strengthening of EAS is done by measuring with EMG, skin electrodes, manometric pressure, intra-anal EMG or ERUS. During anal muscle exercise, muscle activity or anal canal pressure is measured. A balloon is placed in the rectum, upper anal canal and lower anal canal, and the rectal balloon is inflated to trigger rectoanal inhibitor reflex (RAIR). The aim is to teach the EAS to stretch when RAIR develops.

Sacral Nerve Stimulation

There are studies showing that it is beneficial in those who do not respond to conservative treatment.[13]

Rectocele Surgery

- Transanal
- Transabdominal
- Transvaginal
- Combined

The use of synthetic or biological mesh in rectocele repair, especially in transvaginal repairs, has been reported. It can cause erosions. An advantage has not been demonstrated.[14] In transvaginal repair, endopelvic fascia and levators can be exposed better and the integrity of the rectum wall is intact.

Transrectal repair should not be performed in patients with rectocele and incontinence. As the rectum wall is plicated transanally, the anal canal may shorten and IAS may be affected.[15]

In transperineal repair, a transverse incision is made over the bulbocavernous and transvers perineal muscles. The plan between the EAS and vaginal mucosa is dissected. Since sphincteroplasty and levatoraplasty can be performed at the same time, it can be recommended in patients with rectocele and incontinence.[16]

Transanal Surgical Methods

- **Partial incision of the PR muscle:** Transanally can be performed if non-surgical methods are unsuccessful. There is high risk of fecal incontinence.
- **Delorme surgery (transanal excision):** Suitable for patients at risk of postoperative fecal incontinence. Recurrence is high. The operation time is long. Anal sphincter injury, temporary incontinence, and constipation may be seen.
- **PPH-STARR:** In those with intussusception and hemorrhoids.
- **STARR (transanal rectal resection with double stapler)**: Those with rectocele or internal intussusception.

It removes a full-thickness area from the rectum, strengthens the rectovaginal septum, and the prolapsed rectum removed.

- **Contour - transtar**: If excess tissue is to be removed.
- **Bresler procedure**: Transanal repair with endoscopic linear stapler.
- **TRREMS procedure**: Transanal repair of rectocele with single circular stapler and rectal mucosectomy.
- **TST-STARR:** Tissue selective treatment.

Bressler Surgery

Transanally, the lower and upper ends of the rectocele are lifted with a tool in the middle and cut longitudinally with a linear stapler. It is only performed in rectocele and ODS caused by rectocele.[17,18]

Modified Bresler Surgery

Transanally, the anterior wall of the rectum is lifted with three clamps (usually 1.5-7 cm proximal to the dentate line, ie to include the upper and lower ends of the rectocele). The removed wall is cut longitudinally with a linear stapler. The stapler line is reinforced with 2-0 vicryl (Bresler process). On the posterior wall, 2,3,4 cm proximal to the dentate line between 2-10 o'clock, three rows of purse strings passing through the mucosa and submucosa are placed to include half of the wall, and they are cut with a circular stapler. If necessary, sutures are placed on the stapler line with 3-0 vicryl for hemostasis. The rectum is fixed transversely and longitudinally.[19]

STARR

It is performed in ODS caused by rectal intussusception and prolapse. Prolapsed tissue on the anterior and posterior walls is removed in full thickness with 2 circular staplers. A

stapler corrects the anterior rectocele and intussusception, if any, and repairs the muscle defect in the anterior wall. The second stapler removes the intussusception at the back. It removes mechanical obstruction with prolapsed tissue, decreases the volume of the rectum, and improves rectum compliance.[20]

About 2 cm above the dentate line, 3 rows of pürse strings passing through the mucosa, submucosa and muscle layer are placed on the anterior wall at 180 degrees to include the rectocele. The stapler is closed, taking care not to include the back wall of the vagina. The stapler line can be reinforced with 2/0 or 3/0 vicryl. The same is done on the back wall. Although the results are good in the early period in those with rectocele and intussusception, long-term results are controversial.[21]

Stapler resection complications:

- Bleeding
- Urinary retention
- Puborectal dysynergy
- Recurrent ODS
- Rectal diverticulum
- Stenosis
- Granuloma in the anastomosis area
- Sigmoid volvulus
- Rectovaginal fistula
- Emergency feeling of defecation
- Fecal incontinence
- Pelvic sepsis

It is not applied to those with sphincter weakness.

Removable tissue is limited.

Visualization is difficult.[22]

Finally;

- Rectocele should not be considered pathological when seen in examination or defecography. It is common in healthy women.
- Anatomical findings should be evaluated with the patient's complaints and their effect on quality of life.
- Genital prolapse and enterocele should be evaluated in patients with ODS symptoms.
- Mechanical causes should be ruled out.
- Benefits of diagnostic methods should be fully understood.
- Conservative treatments are important in functional disorders.

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REVIEW

Artificial Intelligence in Pre-operative Assessment of Patients in Colorectal Surgery

Kolorektal Cerrahide Hastaların Ameliyat Öncesi Değerlendirilmesinde Yapay Zeka

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ABSTRACT

The pre-operative assessment of patients in colorectal surgery has become an important focus in the last decade to optimize the patients and reduce the post-operative morbidity and mortality. Various scoring systems have been developed in the past but are usually limited by its use in real world clinical setting. Artificial intelligence (AI) in medicine is increasingly evaluated for its use for diagnostic and prognostic value. This is coincided with the development of big data where electronic health records are increasingly used in hospitals. AI has the potential to assist in the pre-operative risk assessment of patient from all aspects by composing the readily available data comprising of basic demographics, biochemistry, and radiology results. In this review, we discuss about the potential use of AI in pre-operative assessment of patients in colorectal surgery, the current issues and limitations and future development.

Keywords: AI, pre-operative, assessment, data, colorectal

ÖZ

Kolorektal cerrahide hastaların preoperatif değerlendirilmesi, hastaları optimize etmek ve postoperatif morbidite ve mortaliteyi azaltmak için son on yılda önemli bir odak haline gelmiştir. Geçmişte çeşitli puanlama sistemleri geliştirilmiştir, ancak genellikle bunların gerçek dünya klinik uygulamasında kullanımı sınırlı kalmıştır. Tıpta yapay zekanın (YZ) tanısal ve prognostik açısından kullanımı giderek daha fazla test edilmektedir. Bu, elektronik sağlık kayıtlarının hastanelerde giderek daha fazla kullanıldığı büyük verinin gelişmesiyle aynı zamana denk gelmektedir. YZ, temel demografik veriler, biyokimya ve radyoloji sonuçlarından oluşan hazır verileri oluşturarak hastanın ameliyat öncesi risk değerlendirmesine her yönden yardımcı olma potansiyeline sahiptir. Bu derlemede, kolorektal cerrahide hastaların ameliyat öncesi değerlendirilmesinde YZ'nin potansiyel kullanımını, güncel sorunları, sınırlamaları ve gelecekteki gelişmeleri tartışacağız.

Anahtar Kelimeler: YZ, ameliyat öncesi, değerlendirme, veri, kolorektal

Introduction

Colorectal surgery forms a significant core of general surgery, in both elective and emergency settings. As the life expectancy increases, the global population will be further burdened with chronic diseases expectedly. Similarly, the incidence of other conditions such as diverticular disease and colorectal malignancy are predicted to increase.[1,2] With an increasing older population, clinicians will face a significant dilemma of weighing the risks and benefits of surgical intervention of increasing complexity against underlying comorbidities.

There has been long-term optimism that artificial intelligence (AI) will be able to address various areas of deficiency in medicine. AI represents an umbrella term of increasing models of machine learning. AI is believed to mimic human cognitive abilities including "learning" and "problem solving". Models include Bayesian inference, decision trees,

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linear discriminants, support vector machines, logistic regression and artificial neural networks (ANN).[3,4]

The recent surge in interest in AI spans various medical specialties and coincides with the popularisation of the concept of "big data".[5,6] Traditionally, this has involved large and complex data sets that cannot be easily analysed. More recently, however, big data has been described using the 5 Vs: volume, velocity, variety, variability and value. Hospital systems, meanwhile, are constantly being improved as evidenced by the progressive widespread use of electronic health records. These data, whilst readily available, are often untapped but can be utilised in various AI models. For example, in the field of gastroenterology, the prospectively collected database of an enormous number of digital images of polyps is currently used for machine learning so that the AI model can assist in further enhanced detection and discrimination of polyps in colonoscopy.[3]

In this review, the discussion will focus on data that are readily available in our daily clinical practice and the potential use of AI in integrating these data into meaningful composite data to guide pre-operative management in colorectal surgery.

How does AI Work?

Traditionally, machine learning was the most common form of AI where mathematical algorithm is built upon a given set of data and provides an output (prediction or prognostication). Deep learning is a newer form of machine learning, which has shown its promise through both ANN and convolutional neural networks. ANN can provide remarkable performance in diagnostic and prognostic prediction through appropriate learning process and adjusting the value of the connection weight to optimise the best result. The availability of big data has helped overcome its limitations of overfitting.

Five main stages are employed in developing and deploying machine learning models (Figure 1):

1. Ingestion: Identifying data sources and collecting data in batch, real time or streaming.

2. Store: Data need to be stored and joined. Metadata can exist on premise and/or in the cloud.

3. Train: Using various methods (e.g. AutoML, Python, R and SSML), machine learning models can be developed.

4. Deploy: Models needs to be packaged and registered for deployment.

5. Consume: Models can be consumed in various ways depending on the deployment pathway. For example, by using RESTFUL APIs, models can be integrated in new or existing applications and reports.

What is Already Available and What Else do We Need?

Big data are already present in our daily clinical practice, be it in written or electronic form. Conventional research methods rely on manual search of health records, which can be time consuming, prone to errors and labour intensive. For prospective databases to be successful, they require dedicated research personnel and the commitment of all clinicians to ensure data adequacy and integrity. The lack of participation stems from common themes, such as involvement is "time consuming", "too cumbersome" and "irrelevant to their personal practice". Although many hospitals are moving towards using electronic health records, which may address some of these issues, a lack of uniformity and governance may hinder other aspects.

During the hospital admission, patient's demographics such as age, gender, nationality, race and occupation are recorded. Clinical details are also collected-symptoms and clinical signs (such as heart rate, blood pressure, respiratory rate, oxygen saturation and temperature and abdominal examination findings) that are part of usual documentation. Biochemistry results such as haemoglobin, platelet count, white cell count, C-reactive protein, renal function, liver function, iron studies and tumour markers are easily accessible. Imaging results including computed tomography (CT), magnetic resonance imaging and/or positron emission tomography with endoscopic results are the current standard of care in the workup of colorectal disease. Hence, we need an automatic integration system for these data to be inputted into AI for various purposes as explained in the following sections.

AI in Pre-operative Scoring Systems

Various scores/classifications have been developed in the past but frequently overlooked in the clinical setting because of impracticality.[7,8] For example, the POSSUM score consists of 18 parameters to estimate the risk of morbidity and mortality in patients undergoing general surgery.[9] Although most of the parameters are relevant, often one size does not fit all. They are mostly utilised for standardisation in research protocols. Hence, most clinicians often based the fitness of patients for surgery on their bedside clinical judgement, which can be affected by the level of experience.

The American Society of Anaesthesiologist score, though universal and easy to use to gauge the fitness of patients prior to both elective and emergency surgery, cannot be used for prognostication.[9] More recently, the National Emergency Laparotomy Audit that originated from the UK is increasingly used to provide a calculated mortality risk in emergency surgery. Although the 30-day mortality did not differ between the pre-use and post-use period, a

significant decrease was found in unplanned admissions to the intensive care unit.[10] Likewise, some of the parameters are not transferable to the elective setting or tailored to certain emergency procedures.

The ideal pre-operative scoring system should be applicable to both elective and emergency settings. With the availability of big data, different variables can be fed into the AI for machine learning to create a new score and independently and continuously self-validate its sensitivity and specificity. Having a unique score for individual procedures may be even possible!

AI in Pre-operative Imaging and Decision Making

The pre-operative use of modern imaging techniques for diagnosis, prognostication and surgical planning is increasing. Some studies have shown that the use of AI in this area can demonstrate a reliably high degree of sensitivity and specificity in diagnosis.[11]

Despite improved imaging techniques, detection of certain "lesions" in staging CT scans still pose a dilemma in its significance. For instance, it is not uncommon to detect small pulmonary nodules for which consensus on their identity and significance may not be reached even in the setting of a multidisciplinary meeting. Given that their significance can alter the management of the patient, the use of AI may help differentiate benign from malignant lesions, as shown in a study where AI has a higher sensitivity and specificity in the detection of lung cancer nodules.[12]

AI has the capability to reconstruct the area of interest from two-dimensional data obtained from imaging and endoscopic findings and project them to a three-dimensional structure to clearly display the tumour in relation to the surrounding vital structures for pre-operative surgical planning.[13] This is extremely useful in anticipated difficult cases such as local tumour invasion where pre-emptive involvement of urological and vascular expertise and management can minimise morbidity.

AI in Predicting Post-operative Outcomes

Post-operative complications often lead to unplanned return to theatre, unplanned critical care need or prolonged hospital stay and readmissions. Some of the most undesired complications in colorectal surgery are anastomotic leak, wound infection, pneumonia and thromboembolic events. Tools to evaluate individual patient risk of complications can help counsel patients and determine most feasible options that minimise risk.[4] Radiological investigations have unused big data that could be interpreted by AI for risk assessment of these potential morbidities. Firstly, the role of aorto-iliac classification index on CT scan has been evaluated to correlate with the risk of anastomotic leak in colorectal surgery.[14] This is relevant in the older population that is usually burdened with chronic atherosclerotic disease.

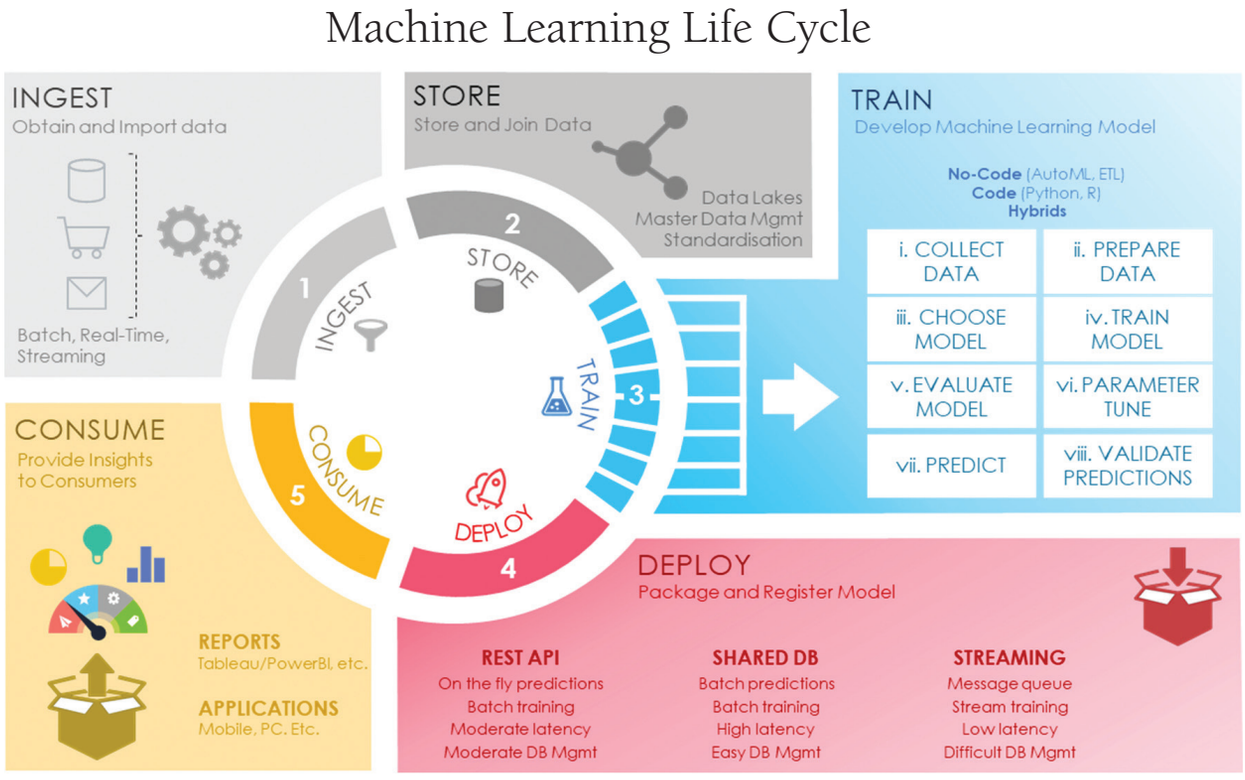

Figure 1. A graphic illustration of the five stages of machine learning life cycle

Secondly, on the CT scan, the radiological quantitative measurement of visceral adiposity has been reported to be a far more accurate surrogate marker for complications than body mass index.[15] The association of body mass index with surgical outcomes, especially in the emergency setting, has been paradoxical. Benjamin et al.[16] showed that underweight and class III obesity were associated with increased complications, whereas mild obesity was protective. With the increasing obesity endemic, this will help further stratify patients with high-risk status and optimise them pre-operatively through weight reduction. Thirdly, the measurement of psoas muscle area as a marker for sarcopenia has been shown to be an independent prognostic factor for post-operative complication.[17,18]

When considered together with other underlying factors, AI has the capability to simplify this and provide an objective "final score" that can be used to inform shared decision making.

How do We Use It? Comprehensive Assessment by AI and Practical Clinical Utility

AI was envisaged to produce a comprehensive risk assessment encompassing the results of pre-operative scoring and the aforementioned imaging findings to identify patients who have high-risk status and frailty who would benefit from a period of prehabilitation in terms of nutrition, muscle strength and psychological training.[19]

We illustrate in the following an example of the clinical use of AI (Figure 2). By using non-clinical data from the Patient Administration Systems and a simple machine learning stack (e.g. SQL, Jupyter Lab, Sci-Kit Learn, Flask and HTML5), a proof of concept such as below can be developed and locally hosted to assess the risk of inpatient mortality.

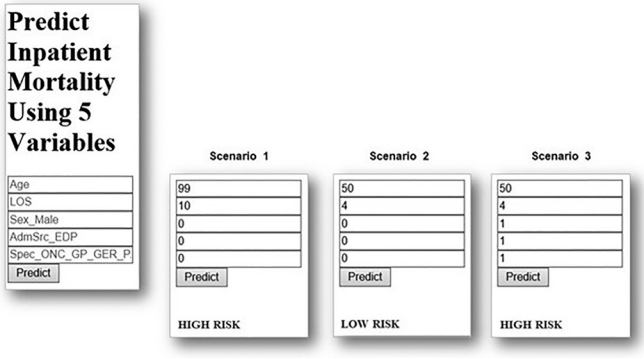

Figure 2. An example of using AI with five simple variables to predict inpatient mortality risk

AI: Artificial intelligence

To simplify the use of this model, only five features were selected after analysis of over 30 variables:

1. Age-patient's age in years as an integer
2. Length of stay-expected or actual length of stay in days as an integer
3. Sex- "1" for male; "0" for female
4. Admitted by emergency department-was the patient admitted from emergency department? "1" for yes; "0" for no
5. Specialty of admitting doctor- "1" if any of the following specialty: general surgery, oncology, general practice, geriatrics, palliative, cardiology

Remember that the risk assessment from AI does not consider the patient and family wishes. Ultimately, the outcome produced by AI should be used as an adjunct to guide decision rather than to replace the open discussion between all parties.

Other Uses: AI for Colorectal Diseases for Management

The global network of connection has enabled multinational collaborations and the establishment of national registries. AI can create and cross-link all registries to create an even "bigger" set of big data. This has the benefits of recruiting a large number of patients in a short period of time for the following purposes:

(i) Monitoring of effectiveness and side effects of a new neoadjuvant or adjuvant therapy. For instance, long-term oncological data in patients who are placed on a "watch and wait" strategy for locally advanced rectal cancer following complete clinical response is still unknown.[20] Another new strategy where total neoadjuvant chemotherapy is employed for rectal cancer is an area of interest.[21]

(ii) Monitoring of complications and long-term value of a new procedure. For example, the recent interest in complete mesocolic excision and/or central vascular ligation for colonic cancers has sparked a debate on whether it should be undertaken owing to its potential serious complications and contradictory evidence on its benefits long-term oncologic outcome. This can be addressed by creation of a multinational registry through AI.[22]

(iii) Study of rare colorectal diseases such as gastrointestinal stromal tumour,[23] primary colonic lymphoma[24] and neuroendocrine tumour.[25] The clinical presentation, risk factors and clinical outcomes will enhance better understanding of the tumour biology and advise future management strategies.

Potential Issues with AI

Despite the promise that AI offers, the clinician must be aware of its current strengths and limitations. At present, AI consists mainly of supervised learning through input of

data. The quality of big data still relies on the type of data and its method of collection. The systems are not universally linked, and extraction of important outcomes is difficult. For example, the Bi-National Colorectal Cancer Audit is not mandatory for all colorectal cancer surgery; therefore, voluntary contribution of data will not accurately reflect practice across these countries.[26] Data privacy legislation that varies between jurisdictions and states is also a hindrance to data sharing without individual consents. For the future, appropriate storage of big data should instil confidence in protecting confidentiality and privacy of patients. State and national health departments should collaborate to obtain the consent through an "opt-out" policy.

We hoped that current limitations can be overcome so that the current phase of supervised AI can be propelled into unsupervised learning and finally the establishment of a "final score". AI should be reinforced with continuous learning using prospective data that share the universal language to improve sensitivity and specificity and provide real-time decision. This will hopefully address the potential issues of overfitting and spectrum bias with current AI.

Conclusion

The current development of AI promises to bring about an exciting paradigm shift in clinical management, especially in the pre-operative assessment of patients in the field of colorectal surgery. The future AI is anticipated to be integrated to routine clinical care to reduce the post-operative morbidity and mortality.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: Z.Q.N., J.K.J., M.T., Concept: Z.Q.N., J.K.J., M.T., Design: Z.Q.N., J.K.J., M.T., Data Collection or Processing: Z.Q.N., J.K.J., M.T., Analysis or Interpretation: Z.Q.N., J.K.J., M.T., Literature Search: Z.Q.N., J.K.J, M.T., Writing: Z.Q.N., J.K.J., M.T.

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RESEARCH ARTICLE

Parasitic Infestation in Patients Undergoing Appendectomy: Retrospective Analysis of 7,344 Cases

Apendektomi Uygulanan Hastalarda Parazitik İstila: 7.344 Olgunun Retrospektif Analizi

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ABSTRACT

Aim: To evaluate the incidence, type and relationship with inflammation of parasitic infestation in patients undergoing appendectomy based on histopathological data.

Method: Retrospective examination was made of 7,344 appendectomy specimens. Parasitic infestation cases were evaluated in respect of age, gender, type of parasite and its relationship with inflammation.

Results: Evidence was found as to the presence of parasites was in 24 (0.32%) of the appendectomy materials examined. *Enterobius vermicularis* was observed in 22 and *Ascaris lumbricoides* in 2 of the cases. The patients with parisitic infestation comprised 12 (50%) males and 12 (50%) females with a mean age of 36.5 years (range: 12-74 years). Inflammation was observed in 8 (33.3%) patients and not observed in 16 (66.7%) patients.

Conclusion: Acute appendicitis may be caused by parasites. Negative appendectomy rates were higher in patients with parasite in appendix lumen. However, it remains controversial whether every parasite infestation causes an appendicitis inflammatory response.

Keywords: Acute appendicitis, *Enterobius vermicularis*, parasite

ÖZ

Amaç: Apendektomi geçiren hastalarda parazitik enfestasyon insidansını, türünü ve enflamasyonla ilişkisini histopatolojik verilere dayanarak değerlendirmek.

Yöntem: 7.344 apendektomi örneğinin retrospektif incelemesi yapıldı. Parazitik enfestasyon olguları yaş, cinsiyet, parazit tipi ve enflamasyonla ilişkisi açısından değerlendirildi.

Bulgular: İncelenen apendektomi materyallerinin 24'ünde (%0,32) parazit varlığına dair kanıt bulundu. Olguların 22'sinde *Enterobius vermicularis* ve 2'sinde *Ascaris lumbricoides* görüldü. Parazit istilası olan hastalar 12 (%50) erkek ve 12 (%50) kadındı ve yaş ortalaması 36,5 yıl (aralık: 12-74 yaş) idi. Sekiz (%33,3) hastada enflamasyon görülürken, 16'sında (%66,7) enflamasyon görülmedi.

Sonuç: Akut apandisit parazitlerden kaynaklanabilir. Apendiks lümeninde parazit bulunan hastalarda negatif apendektomi oranları daha yüksekti. Bununla birlikte, her parazit istilasının apandisit iltihabına neden olup olmadığı tartışmalıdır.

Anahtar Kelimeler: Akut apandisit, *Enterobius vermicularis*, parazit

Introduction

The appendix vermiformis (AV) is a narrow, blind-ended tubular organ connected to the cecum. Inflammation of the AV is known as acute appendicitis, and this is one of the most common inflammatory diseases of the gastrointestinal tract. A decrease in blood flow caused by obstruction in the appendiceal lumen, mucosal ischaemic damage and development of bacterial infection has influenced the pathogenesis of acute appendicitis. Acute inflammation is not observed in approximately 20% of patients undergoing appendectomy.[1]

Lymphoid hyperplasia, faecalites, fruit and vegetable seeds, barium enemas and tumours are the main components of the

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aetiology of acute appendicitis. Although parasites have been reported to cause appendicitis only by occluding the lumen with acute inflammation or by creating an inflammatory reaction, the role of parasites in the pathogenesis of appendicitis has not been clearly defined.[2,3] *Enterobius vermicularis* (*EV*), *Ascaris lumbricoides* (*AL*), *Schistosoma* spp. and *Taenia* spp. are parasites that can cause acute appendicitis. Among these, the most widespread cause of acute appendicitis is *EV*.[4,5]

This study aimed to retrospectively evaluate patients with parasitic infestation who underwent appendectomy and were diagnosed with acute appendicitis.

Materials and Method

Electronic records of 7,344 patients who underwent appendectomy and who had acute appendicitis were analysed retrospectively. The analysis covered the period from January 2009 to January 2020. The study was performed in Ankara Training and Research Hospital General Surgery Clinic. For this type of study, informed consent is not required. Patients with parasitic infestation were evaluated in terms of age, gender, type of parasite and presence of inflammation.

Results

A total of 7,344 patients underwent appendectomy. Parasites were seen in 24 appendectomy specimens. Among those with parasitic infestation, 12 (50%) were men and 12 (50%) were women, with a mean age of 36.5 (range: 12-74) years. *EV* was seen in 22 (91.6%) patients, and *AL* in 2 (8.4%) patients. Acute inflammation was observed in 7 (31.8%) of *EV* cases but not in 15 (68.2%). None of the *AL* cases had signs of acute inflammation (Table 1).

Table 1. Demographic parameters and histological findings of the patients

No. of case	Age	Gender	Species of parasite	Acute inflammation	Non-acute inflammation (negatif laparotomi)
1	38	Female	*Enterobius vermicularis*	No	Yes
2	31	Female	*Enterobius vermicularis*	No	Yes
3	30	Female	*Enterobius vermicularis*	Yes	No
4	23	Female	*Enterobius vermicularis*	Yes	No
5	20	Female	*Enterobius vermicularis*	No	Yes
6	19	Female	*Enterobius vermicularis*	No	Yes
7	27	Male	*Enterobius vermicularis*	Yes	No
8	64	Male	*Enterobius vermicularis*	No	Yes
9	29	Male	*Enterobius vermicularis*	No	Yes
10	34	Female	*Enterobius vermicularis*	No	Yes
11	29	Female	*Enterobius vermicularis*	No	Yes
12	27	Male	*Enterobius vermicularis*	No	Yes
13	59	Male	*Enterobius vermicularis*	Yes	No
14	27	Female	*Enterobius vermicularis*	Yes	No
15	48	Male	*Ascaris*	No	Yes
16	31	Female	*Enterobius vermicularis*	No	Yes
17	54	Male	*Enterobius vermicularis*	Yes	No
18	41	Male	*Enterobius vermicularis*	Yes	No
19	31	Female	*Ascaris*	No	Yes
20	36	Male	*Enterobius vermicularis*	No	Yes
21	74	Male	*Enterobius vermicularis*	No	Yes
22	50	Female	*Enterobius vermicularis*	No	Yes
23	44	Male	*Enterobius vermicularis*	No	Yes
24	12	Male	*Enterobius vermicularis*	No	Yes

Discussion

Acute appendicitis is the most frequently observed condition that requires emergency surgery.[6] Acute appendicitis most commonly occurs in the second and third decades of life and affects approximately 8.6% of men and 6.7% of women.[7] Acute appendicitis can be caused by parasites, as they occlude the appendiceal lumen or lead to secondary inflammation.[8] Acute inflammation findings may not be present in the histopathological examination of appendectomy specimens of parasitosis.[9] Karatepe et al.[8] showed that inflammation was not found in 25% of appendectomy specimens, while Ilhan et al.[10] reported a rate of 52.7%. In the present study, acute inflammation findings were not observed in 70.9% of appendectomy specimens with parasite invasion (Table 2).

EV is the most frequent helminthic infection worldwide and is transmitted through faecal-oral transmission.[11] In general, it is a common intestinal parasite in boys and girls and is more common in underdeveloped countries and regions with low socioeconomic status.[12] Most people infected with *EV* are asymptomatic. Nevertheless, if symptoms develop, the most frequent one is anal pruritus.[13] In addition, *EV* infections cause ileocolitis, enterocutaneous fistulas, urinary tract infections, mesenteric abscess, salpingitis and acute appendicitis. Mature forms of *EV* are most often located in the ascending colon, cecum, appendix and terminal ileum.[14,15] The relationship between *EV* and acute appendicitis was first discovered at the end of the 19th century.[16] Studies have established that *EV* caused pathological changes in the appendix, including lymphoid hyperplasia to acute phlegmatic appendicitis, gangrene appendicitis and peritonitis.[4] In other studies, *EV* is present in 0.35%-12.5% of specimens of patients undergoing appendectomy for acute appendicitis.[12,13,14,15,16,17] Akkapulu and Abdullazade[18] reported an *EV* incidence rate of 0.62%. In present study, the incidence of *EV* was 0.32%. Appendectomy is not an adequate treatment for cases with *EV*, since it does not eliminate the main cause in these patients and anti-helminthic treatment should also be administered.[19] In the present study, anti-helminthic treatment was given to patients with parasites.

Study Limitations

Ascariasis is one of the most common helminthic diseases and is most commonly caused by *AL*. It is most common in the jejunum and proximal ileum. *AL* can often mimic acute appendicitis clinically, but rarely causes acute appendicitis. In a rectrospective analysis of 324 appendectomy specimens, *AL* was detected in only 3 (0.9%) patients; none of whom had histopathological findings of acute appendicitis.[20] Wani et al.[21] showed that while histolopathological findings of acute appendicitis were not observed in 8 (72.7%) of 11 patients with *AL*, acute appendicitis findings related to ascariasis were detected in 3 (27.2%) patients. In the present study, *AL* was seen in only two patients, neither of which had any histopathological findings associated with acute appendicitis.

Conclusion

In conclusion, parasites are among the possible aetiological causes of acute appendicitis. *EV* is the most common parasite in specimens of patients undergoing appendectomy. Negative laparotomy rates have been seen to be higher in the presence of parasitic invasion in the appendix. To reduce negative laparotomy rates and to minimise related side effects, patients with abdominal pain should be checked whether they have intestinal parasites, and this should be considered in the differential diagnosis. Patients with parasitic infestations should be given anti-helminthic therapy.

Ethics

Ethics Committee Approval: Ankara Training and Research Hospital Ethics Committee (date: 15.01.2021/no: 542).

Informed Consent: Retrospective study.

Peer-review: Externally peer reviewed.

Table 2. Data obtained from countries included in this study

Author	Country	Total materials	Total, n (%)	Acute inflammation, n (%)	No acute inflammation, n (%)
Karatepe et al.[8]	Turkey	5,100	24 (0.5)	18 (75)	6 (25)
de Silva et al.[4]	Brazil	1,600	24 (1.5)	12 (50)	12 (50)
Zakaria et al.[2]	Saudi Arabia	1,600	88 (5.5)	54 (61.4)	34 (38.6)
Gialamas et al.[14]	Greece	1,085	7 (0.64)	1 (14.3)	6 (85.7)
Ilhan et al.[10]	Turkey	3,863	19 (0.49)	9 (47.4)	10 (52.6)
Current study	Turkey	7,344	24 (0.33)	7 (29.1)	17 (70.9)

Authorship Contributions

Surgical and Medical Practices: K.K., A.Ş., M.S., A.D., Concept: K.K., A.D., Design: K.K., M.S., Data Collection or Processing: K.K., M.S., Analysis or Interpretation: K.K., A.Ş., A.D., Literature Search: K.K., A.Ş., Writing: K.K., A.Ş.

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RESEARCH ARTICLE

How Were Experiences of Stoma for Nursing Students?

Hemşirelik Öğrencilerinin Stoma Deneyimleri Nasıldı?

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ABSTRACT

Aim: The purpose of this study was to determine the experiences of baccalaureate nursing students with stoma bags and adaptors over 24 hours.
Method: The study was semi-experimental. Participants included 80 students from two nursing faculties with 10 students per class. The students were chosen by random sampling. Stoma adaptors were worn as a pouch and removed after 24 hours. A data collection form was used to gather the students' demographic and descriptive characteristics, previous degree of knowledge and experience about stomas, and experiences and feelings they had during the process. In the data analysis, percentages and the chi-square test were used.
Results: Among the students, 86.3% stated they worried continuously that the stoma bag would leak and 30.0% stated they were anxious because of the stoma. Four main themes emerged from the answers: (1) restriction in social activities, (2) restriction in physical activities, (3) worry about a stoma leakage, and (4) effect on body image. All of the students said that they understood better how stoma patients felt and that it was a good experience for them.
Conclusion: These experiences and feelings are important for baccalau reate nursing students to have more awareness about living with a stoma.
Keywords: Baccalaureate, experience, nursing student, ostomy

ÖZ

Amaç: Bu çalışmanın amacı, lisans hemşirelik öğrencilerinin stoma torbası ve adaptörleri ile 24 saat boyunca yaşadıkları deneyimlerini belirlemekti.
Yöntem: Çalışmamız yarı deneyseldir. Örneklemde her sınıftan 10 öğrenci olmak üzere iki hemşirelik fakültesinden 80 öğrenci yer aldı. Öğrenciler rastgele örnekleme ile seçildi. Öğrencilere takılan stoma adaptör ve torbaları 24 saat sonra çıkarıldı. Öğrencilerin demografik ve tanımlayıcı özelliklerini, stoma hakkındaki önceki bilgi ve deneyimlerini ve süreç boyunca yaşadıkları deneyim ve duygularını öğrenmek için bir veri toplama formu kullanıldı. Verilerin analizinde sayı-yüzde ve ki-kare testi kullanıldı.
Bulgular: Öğrencilerin %86,3'ü stoma torbasının sızdıracağından sürekli endişelendiğini ve %30,0'ı stoma nedeniyle endişeli olduğunu belirtti. Yanıtlardan dört ana tema ortaya çıktı: (1) sosyal aktivitelerde kısıtlama, (2) fiziksel aktivitelerde kısıtlama, (3) stomadan sızıntı endişesi ve (4) beden imajı üzerindeki etki. Tüm öğrenciler stoma hastalarının nasıl hissettiğini daha iyi anladıklarını ve bunun kendileri için iyi bir deneyim olduğunu söylediler.
Sonuç: Bu deneyimler ve duygular, lisans hemşirelik öğrencilerinin stoma ile yaşama konusunda daha fazla farkındalığa sahip olmaları için önemlidir.
Anahtar Kelimeler: Lisans öğrencisi, deneyim, hemşirelik öğrencisi, ostomi

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Introduction

A stoma helps patients live longer, improves their lives and helps them return to healthy and productive lives. However, patients with a stoma have physical, social and psychological problems, regardless of the reason for the stoma surgery.[1,2] Hence, nurses have important roles in preoperative and postoperative stoma care. Nurses should evaluate patients receiving preoperative care and provide supportive counselling to the patients and their families. Postoperatively, nurses should help patients and their families gain the technical skills necessary for stoma care and encourage them to participate in the care process. Moreover, nurses should help patients express their feelings by talking about self-esteem, body image and sexuality.[3,4]

Most clinical nurses gain basic knowledge and skills about stomas during their bachelor's degree education. Baccalaureate nursing students should learn about their roles and responsibilities in stoma care. They should also be aware of the physiological, psychological and social effects of a stoma on patients. Baccalaureate nursing education should be planned and organised in accordance with these needs. It is important to understand the feelings of patients with a stoma and their difficulties. Therefore, nurses must develop empathy for them. In this study, empathy is defined as nurses putting themselves into the individual's or patient's shoes. An empathic approach is part of help given to an individual or a patient. Nurses can understand individuals/patients, identify their needs and obtain positive results from nursing interventions only when they demonstrate empathy for individuals or patients.[5,6] Baccalaureate nursing students benefit from learning methods that provide opportunities to an empathic approach. The learning methods of "concrete experience" and "active experience" from Kolb are beneficial for developing empathy for patients with a stoma. "Concrete experience" enables students to learn using their feelings, whereas "active experience" enables students to learn by doing or experiencing.

The learning methods of "concrete experience" and "active experience" in baccalaureate education make it easier to

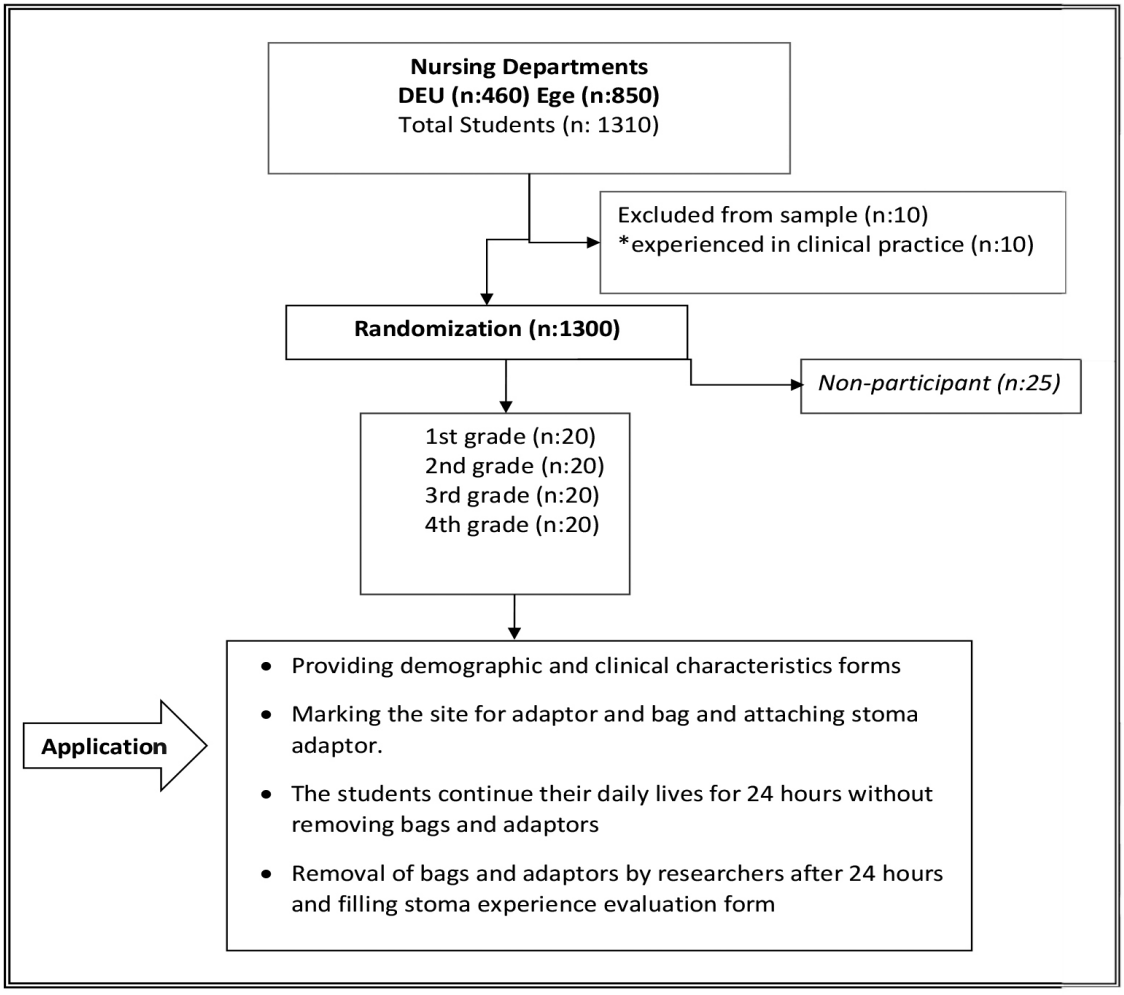

Figure 1. Study sample diagram

teach students how to develop an empathic approach to stoma care. Requiring students to live and continue their daily activities with a stoma bag and adaptor for 24 h effectively helps them understand the feelings of patients with a stoma.[7,8] Therefore, interventional studies are required to facilitate students' understanding and feeling regarding the experience of patients with a stoma. These studies will increase the awareness of nursing students about the lives of patients with a stoma. Nurses with a high awareness will improve the quality of stoma care.

To our knowledge, one study evaluated awareness and experiences of baccalaureate nursing students regarding how to approach patients with a stoma.[9] Thus, the present study was carried out to learn the experiences of baccalaureate nursing students after carrying a stoma bag for 24 h. Moreover, this study aimed to learn the degree of knowledge of students about stomas, to determine the physical, social and psychological effects of carrying a stoma bag and to learn their feelings about this experience.

Materials and Methods

Study Design

This quasi-experimental study did not employ a control group. This study aimed to determine the experiences of students carrying stoma bags for 24 h.

Study Population

The sample population was composed of nursing students from two universities located in Western Turkey. A total of 80 nursing students were chosen, regardless of gender, with 10 students each from first, second, third and fourth years. Forty students participated from each university.

Using Gpower 3.1, the estimated sample size was 80 students. This calculation was based on 80% power and 5% effect size. The sample group was determined by randomisation to avoid selection bias. Students who fit the sampling criteria were listed and numbered. The randomisation of students from each grade was made using a "random number table". New students were chosen again using a random number table in place of students who were not willing to participate in the study or could not be contacted.

Selection Criteria

Students who graduated from high school nursing education or worked in the clinic as nurses were excluded. In Turkey, the nursing education is implemented in two different educational programmes: at the high school and university levels.

Data Collection

Researchers collected data using a questionnaire prepared according to the literature. This form consisted of three sections. The first section had seven questions regarding demographic and descriptive characteristics (including age, gender, name of the school and class). The second section contained 16 yes or no questions about the students' degree of knowledge and experiences about stomas. The third section contained 13 questions about their experiences, ability to continue daily activities and feelings during the process. The questions were evaluated on a 3-point Likert scale (1, never; 2, sometimes; or 3, always). In one open-ended question, students were asked to express their feelings about living with stoma bags for 24 h. In this study, students completed the questionnaires in an empty, quiet and warm environment with sufficient lighting and enough chairs for the participants.

The researchers marked the stoma sites on the bodies of the students. Stoma adaptors were worn as a pouch after marking the sites. To protect the privacy of the students, they wore the stoma bags and adaptors in a private room and were removed by the researchers in the same room. To make it as realistic as possible, 25-50 mL of tap water was added to the stoma bags. The bags were then attached to stoma adaptors. After 24 h, the adaptors and bags were removed by the researchers.

Data Analysis/and Treatment

Data analysis was made using SPSS (IBM 20.0) software. Descriptive data, students' existing knowledge and experiences about stomas and their thoughts, experiences and feelings about living with a stoma bag are presented as percentages. The chi-square test was used for the comparison of gender, degree of knowledge about stomas and feelings.

Students' answers to the question "What was it like to live with a stoma for 24 hours?" were categorised and documented separately, and four main themes were identified.

Results

The average age of the students was 21.52±1.56 years, 66.3% were female and 56.25% had theoretical education about stomas. Demographic and descriptive characteristics of the students are presented in Table 1. First and second year students had no knowledge about stomas. Other students (n=45) gained knowledge from the bachelor's curriculum (66.7%), conferences and courses (17.8%) and their own searches (15.6%).

Students who had theoretical education about stomas were asked about stoma care and knowledge (Table 2). More than 75% of students who claimed to have knowledge about stomas correctly answered questions about the activities patients with stoma should do. For example, 93.3% of the students said that this statement is true: "Preoperative stoma site marking reduces the risk of complications". However,

only 48.9% of the students gave the correct answer to the question about patients' sexual life after stoma surgery.

Students' experiences with the stoma are shown in Table 3. Most of the students said, "I was worried the stoma bag would leak" (86.3%) and "I was worried the stoma bag would burst or leak during sleeping" (86.3%). They also expressed these feelings were continuous. In addition, 71.2% of the students said there had been times when they wanted to remove the stoma bags, 63.8% said they needed to hide the stoma bags, 62.5% stated that the stoma bags were

Table 1. Demographic and descriptive characteristics of the students (n=80)

	X ± SD	Range
Age	21.52±1.56a	19-25
Characteristics	Number (n)	Percentage (%)
Gender		
Female	53	66.3
Male	27	33.7
Cohabitants		
Family	13	16.3
Friends	67	83.7
Place of residence		
Home	38	47.5
Dormitory	42	52.5
Receipt of theoretical education/information about stoma		
Yes	45	56.25
No	35	43.75

a: Values given are mean ± SD: Standard deviation

Table 2. Stoma care knowledge of the students (n=45) who had theoretical education about stoma

Statements/questions	Right		Wrong	
	n	%	n	%
Women with stoma can't get pregnant.	6	13.4	**39**	**86.6**
It is harmful for people with stoma to travel by flight.	4	8.9	41	**91.1**
People with stoma should not swim.	10	22.2	35	**77.8**
People with stoma can do mild exercises like walking and riding bicycles.	**40**	**88.9**	5	11.1
People with stoma can do religious practice like performing prayer.	**40**	**88.9**	5	11.1
Preoperative stoma site marking reduces the risk of complications.	**42**	**93.3**	3	6.7
A healthy stoma is bright pink and above skin level.	**39**	**86.7**	6	13.3
In order to prevent infection, alcohol based products must be used for the cleaning of stoma and peristomal area.	13	28.9	32	**71.1**
It does no harm for people with stoma to gain weight	10	22.2	35	**77.8**
When a new food is added to the diet of person with stoma, it must be given in small amounts together with other foods.	**30**	**66.7**	15	33.3
There is a high incidence of skin irritation in ileostomy as there are digestive enzymes in intestinal content.	**35**	**77.8**	10	22.2
People with stoma can resume their sexual activity 6 months after the surgery.	**22**	48.9	23	**51.1**

limiting their activities, 61.3% reported that they thought about emptying the stoma bags and 67.5% said they had problems while bathing.

When students were asked about their feelings regarding the stoma, 31.3% were "bored because of the stoma", 30.0% were "anxious because of the stoma", 23.7% were "ashamed of having the stoma" and 15.0% "preferred to be alone because of the stoma". No significant difference was found between the gender of the students or knowledge status and feelings about the stoma (Table 4) (p=0.175, p≥0.05, χ^2=3,488; p=0.235, p≥0.05, χ^2=2,896).

Students were asked the open-ended question "how was it to live with a stoma for 24 hours?" Four main themes were obtained from the responses: restriction in social activities, restriction in physical activities, worry about stoma leakage and effect on body image. Most students used the same words when describing their feelings. They also said that they better understood patients with a stoma. Nine students described how the stoma limited their social activities by saying, "The stoma limited my life", I even had my meal in my room because I did not want to be in public" and "I did not want to go out in case those around me could realise". Six students described how the stoma limited their physical activities by saying, "It limited my movements extremely", "I felt dependent", "I had difficulties in doing my activities" and "I thought about the stoma in everything I did". Six

Table 3. Experiences of the students (n=80) with stoma bags

Statements	Never		Sometimes		All the time	
	n	%	n	%	n	%
It was hard for me to accept my body image.	**39**	**48.8**	**41**	**51.3**	-	-
My stoma prevented me from going to school or going out.	**51**	**6.8**	11	13.8	18	22.4
I needed to hide my stoma (by wearing loose dresses etc.).	20	25	9	11.2	**51**	**63.8**
I was concerned that my friends or family would know that I had an ostomy.	**34**	**42.4**	23	28.8	23	28.8
I was worried in case my stoma bag would burst or leak during sleeping.	2	2.5	9	11,2	**69**	**86.3**
My stoma limited my activities.	17	21.3	13	16.3	**50**	**62.5**
I had problems while bathing. I thought that the bag or the adaptor would detach.	9	11.2	17	21.3	**54**	**67.5**
I thought about emptying my stoma bag.	17	21.2	14	17.5	**49**	**61.3**
I was worried in case my stoma bag would leak.	6	7.5	5	6.2	**69**	**86.3**
I was worried about adaptor detachment.	21	26.3	14	17.5	**45**	**56.2**
I had times that I wanted to remove my stoma bag.	13	16.3	10	12.5	**57**	**71.2**

Table 4. Comparison of feelings on stoma with students' gender and knowledge status

Feelings on stoma									
	Embarrassment-isolation		Worry		Anxiety		Total		
	n	%	n	%	n	%	n	%	
Gender									
Female	15	78.9	26	68.4	12	52.2	53	66.2	p=0.175
Male	4	21.1	12	21.6	11	47.8	27	33.8	x^2=3.488
									p>0.05
Degree of knowledge									
Informed	11	57.9	18	47.4	16	69.6	45	56.3	p=0.235
Not informed	8	42.1	20	52.6	7	30.4	35	43.7	x2=2.896
Total	19	100	38	100	23	100	80	100	p>0.05

students expressed their discomfort about the possibility of a stoma bag leak by saying, "I was worried that it would leak and there would be a stain on my dress" and "I could not sleep because I was especially afraid that it could burst or leak". Five students described how their body image was affected by saying, "I needed to cover the stoma with my hands", "I thought about how I could hide it and I thought about wearing loose dresses" and "I had the need to hide it all the time" and I thought people were watching me".

Other than these statements, the students also said they realised the importance of having properly functioning intestines. All students said this experience was quite beneficial for them, and they now understood more about the feelings of patients with a stoma.

Discussion

In this study, more than 75% of the students who claimed to have knowledge about stomas gave correct answers to questions about activities that patients with a stoma should do. For example, 93.3% of the students found the statement "preoperative stoma site marking reduces the risk of complications" to be true. Thus, most of the students had knowledge about stomas and living with stomas (Table 2). Nevertheless, only 48.9% of the students gave the right answer to the question regarding sexual life after stoma surgery. The high percentage of correct answers in all items, other than resuming sexual life, showed that the students had sufficient knowledge of stoma. In countries with conservative culture, such as Turkey, sexuality is generally a taboo, and students are lacking awareness about the sexuality of patients with stoma. Thus, nearly half of the students had incorrect information about the sexual life of patients with a stoma. Patients with a stoma have problems resuming sexual activity.[2,10] In a qualitative study, Dorum interviewed and evaluated the experiences of 19 patients with a stoma. These patients with stoma experience difficulties in their sexual life that were ignored by nurses, adversely affecting the quality of life of these patients.[11,12] Therefore, baccalaureate nursing students who will perform stoma care should have more knowledge about possible problems on the sexual life of patient after undergoing stoma surgery.

Statements of students after their experiences with having a stoma are given in Table 3. Living with a stoma adversely affected students' body image, social relation, daily activities and roles as students. Nine students also described how the stoma limited their social activities by saying, "The stoma limited my life, I even had my meal in my room because I did not want to be in public" and "I did not want to go out in case those around me could realise". Five students described how their body image was affected by saying, "I needed to cover the stoma with my hands", "I thought about how I could hide it and I thought about wearing loose dresses" and "I had the need to hide it all the time. I thought people were watching me". The students' answers to "what was it like to live with a stoma for 24 hours?" were consistent with their experience.

Only one study addressed the experiences of baccalaureate nursing students with a stoma. The study enrolled 134 nursing students who carried stoma bags and adaptors for 16-20 hours and shared their experiences in a blog designed for the study. They said their activities were restricted by the stoma, had bad feedback from friends and needed to hide the adaptor.[9] Importantly, in both studies, students were uncomfortable, preferred not to be seen by others and wanted to hide the stoma. Other studies have shown that patients with a stoma feared bag detachment, faecal leakage and presence of unpleasant smell.[13,14] These fears negatively affected the social lives of the patients, so these patients isolated themselves from the society.[13,14] In Dorum's qualitative study, patients with a stoma stated that they had problems with their daily activities and they could not talk about it even with their families.[11] Persson and Hellström noted in their qualitative study that the patients felt guilty about faecal leakage and felt bad because of the smell and full bag when they woke up in the morning.[15] Patients also stated not going to a swimming pool or sauna with their friends as they thought their friends would say derogatory things about their stomas.[15] Patients with a stoma less likely see their friends and families, limit their social activities, quit their jobs or reduce work hours and change jobs.[15,16] In our study, students had experiences, reactions and feelings similar to the experiences of patients. Thus, having a stoma influenced individuals negatively even during simulated conditions. Therefore, these student experiences are important to develop empathy and better understand the patients.

When the students described how they felt about living with a stoma, they said they were bored, anxious and embarrassed. Patients with a stoma also have psychological problems related to their stoma. Depression, anxiety, anger, difficulty of adaptation and isolation are among these psychological problems. In this study, six students expressed their discomfort about stoma bag leakage by saying "I was worried that it would leak and there would be a stain on my dress" and "I could not sleep because I was especially afraid that it could burst or leak". Moreover, nine students described how the stoma limited their social activities by saying "The stoma limited my life. I even had my meal in my room because I did not want to be in public" and "I did not want to go out in case those around me could realise". In the study by Persson and Hellstrom, patients said they stopped going to parties and meeting with friends because they

are worried about odour leakage and they preferred to be alone.[15] In Dorum's qualitative study, patients with ostomy were ashamed of the stoma and isolated themselves to hide their stomas.[11] The statements of the students paralleled those of the patients with a stoma. These results show that students' experience of carrying a stoma bag for 24 h could be an effective aid to understanding the concerns of patients about a stoma bag burst or leakage.

After living with a stoma for 24 h, the students said that living with a stoma would have been very difficult and that accepting changes in body image and social and psychological adaptation would have been much harder if they actually had stomas. Moreover, they realised the value of their intestines. Sharing the same feelings with patients and having awareness about the difficulties of living with a stoma will increase students' understanding of patients with stomas.

In this study, no significant difference was found between the gender of the students or the degree of knowledge and feelings of living with a stoma (Table 4). Students' gender had no effect on their feelings of living with a stoma ($p=0.175$, $p\geq0.05$, $\chi^2=3,488$). The degree of knowledge about stomas had no effect on the feelings of living with a stoma ($p=0.235$, $p\geq0.05$, $\chi^2=2,896$).

Study Limitations

To our knowledge, this study is the first of its kind. This study shows that the experience of having an ostomy made all students uncomfortable. With these feelings, students were expected to acquire more awareness about the feelings of patients with a stoma and better enable them to choose the appropriate nursing interventions for stoma care.

Conclusion

Students had negative experiences about living with a stoma for 24 h. These negative experiences and feelings are important to improve awareness of baccalaureate nursing students about living with a stoma. In the education of baccalaureate nursing students, it will be beneficial to use educational methods, such as learning by doing, which will help increase their awareness to conditions under evaluation. For more valid results, a study of students' experiences with larger sample size is necessary.

Ethics

Ethics Committee Approval: The study was approved by Dokuz Eylül University Non-invasive Ethics Committee (decree no: 2013/12-15, dated: 04.04.2013).

Informed Consent: Written informed consent was obtained from all patients who participated in this study.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Concept: F.V., K.Y., T.Ö., Design: F.V., A.D.E., Data Collection or Processing: K.Y., A.K., S.K.Ç., Analysis or Interpretation: A.D.E., K.Y., Literature Search: K.Y., A.K., F.V. Writing: A.D.E., K.Y., F.V.

Conflict of Interest: No conflict of interest was declared by the authors.

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RESEARCH ARTICLE

Does the Long Duration of Defunctioning Stoma Lead to Increased Rates of Coloanal Anastomosis Stenosis?

Uzun Süreli Saptırıcı Stoma, Koloanal Anastomoz Darlığının Artmasına Neden Olur Mu?

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ABSTRACT

Aim: The aim of this study was to evaluate whether the long duration of defunctioning stoma was associated with increased rates of coloanal anastomosis stenosis.

Method: Medical records of all adult patients diagnosed with rectal cancer and who underwent low anterior resection and defunctioning stoma at two centres were retrospectively analysed. All patients underwent colonoscopy to evaluate the coloanal anastomosis state. The primary outcomes of this study were evaluation of the rate of anastomotic stenosis and comparison of the durations between patients with anastomotic stenosis and those without stenosis.

Results: Between April 2009 and December 2017, 72 patients with rectal cancer underwent resection with defunctioning stoma at two centres, and 69 of them were included in this study. The median patient age was 65 (28-92) years. Defunctioning ileostomy was performed in 50 (73%) patients, whereas defunctioning colostomy was performed in 19 (27%) patients. The median stoma duration of the patients with anastomotic stenosis (n=19) was significantly longer than that of patients without stenosis (n=50) [at 15 (7-41) and 7 (2-25) months, respectively, p=0.002].

Conclusion: This study showed that a long duration of defunctioning stoma was associated with increased rates of coloanal anastomosis stenosis.

Keywords: Anastomosis stenosis, defunctioning stoma, low anterior resection

ÖZ

Amaç: Bu çalışmanın amacı, uzun süreli saptırıcı stomanın artmış koloanal anastomoz darlığı oranları ile ilişkili olup olmadığını araştırmaktır.

Yöntem: Rektal kanser tanısı alan ve iki merkezde düşük anterior rezeksiyon ve saptırıcı stoma uygulanan tüm erişkin hastaların tıbbi kayıtları retrospektif olarak incelendi. Koloanal anastomoz durumunu değerlendirmek için tüm hastalara kolonoskopi yapıldı. Bu çalışmanın birincil çıkarımları, anastomoz darlığı oranının değerlendirilmesi ve anastomoz darlığı olan hastalar ile darlığı olmayanlar arasındaki sürelerin karşılaştırılmasıydı.

Bulgular: Nisan 2009 ile Aralık 2017 tarihleri arasında 72 rektum kanserli hastaya iki merkezde aşağı anterior rezeksiyon ile beraber saptırıcı stoma yapıldı ve bunlardan 69'u bu çalışmaya dahil edildi. Hastaların ortalama yaşı 65 (28-92) ve 50 (%73) hastaya saptırıcı ileostomi yapılırken, 19 (%27) hastaya saptırıcı kolostomi uygulandı. Anastomoz darlığı olan hastaların (n=19) ortanca stoma süresi, darlığı olmayan hastalardan (n=50) anlamlı olarak daha uzundu [sırasıyla; 15 (7-41) ve 7 (2-25) ayda, p=0,002].

Sonuç: Bu çalışma, uzun süreli saptırıcı stomanın artmış koloanal anastomoz darlığı oranları ile ilişkili olduğunu göstermiştir.

Anahtar Kelimeler: Anastomoz darlığı, saptırıcı stoma, aşağı anterior rezeksiyon

What does this paper add to the existing literature?

Coloanal anastomosis stenosis is thought to be associated with various factors. This study aimed to evaluate whether a long duration of defunctioning stoma was associated with increased rates of coloanal anastomosis stenosis. We showed that the long duration of stoma was associated with increased rates of coloanal anastomosis stenosis. Therefore, early closure of stoma should be considered.

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Introduction

Anastomotic leak is one of the serious early complications observed after low anterior resection with coloanal anastomosis. These leaks are associated with increased morbidity and mortality.[1,2] The incidence of anastomotic leaks following low anterior resections is 3%-26%.[3,4,5] Therefore, most surgeons prefer to perform defunctioning stoma to protect patients against septic complications of anastomotic leaks. However, defunctioning stoma has been associated with complications such as stomal ischaemia/necrosis, retraction, mucocutaneous separation, parastomal abscess, parastomal hernia and prolapse.[6] Furthermore, defunctioning stoma requires additional operation for closure. Anastomotic stenosis is a late complication associated with coloanal anastomosis that may require endoscopic dilatation or surgical revision, particularly before the stoma closure, if present.

The incidence of stenosis after colorectal anastomosis ranges from 0% to 30%.[7] These stenoses are thought to be associated with various factors, such as radiation[8], anastomotic ischaemia, leakage[9] and anastomosis technique. We hypothesised that a long duration with defunctioning stoma may be another factor contributing to coloanal anastomosis stenosis.

This study aimed to evaluate whether a long duration of defunctioning stoma was associated with increased rates of coloanal anastomosis stenosis.

Materials and Methods

Medical records of all patients diagnosed with rectal cancer who underwent low anterior resection and defunctioning stoma at two centres between 2009 and 2017 were retrospectively analysed. Patients with inflammatory bowel disease and those who were lost to follow-up were excluded from the study. Colonoscopy was performed in all patients who underwent stoma closure to evaluate the coloanal anastomosis before the stoma closure. Those who are still living with a stoma were invited to the hospital, and colonoscopy was performed to evaluate the coloanal anastomosis. The duration of stoma was defined as the time from the index operation to control colonoscopy before the stoma closure or the time from the index operation up to the last control colonoscopy in patients who did not undergo stoma closure. Anastomotic stenosis was defined as the narrowing in which the colonoscope could not pass through the coloanal anastomosis. Patients' demographic characteristics, comorbid diseases and whether they underwent chemoradiotherapy were retrospectively analysed. The primary outcomes were to evaluate the coloanal anastomosis stenosis rate and compare the durations between patients with anastomotic stenosis and those without stenosis. The secondary outcome was to compare other factors that contributed to the anastomotic stenosis between the two groups.

This study was approved by Marmara University Faculty of Medicine Ethics Committee, and all patients provided written informed consent.

Statistical Analysis

Data were analysed using the Statistical Package for Social Sciences for Windows version 23 (SPSS Inc., Chicago, IL, USA). Analysis was performed using the t-test or Mann-Whitney U test for continuous data and Fisher's exact test or the chi-square test for categorical data. All tests were two-sided, and p values <0.05 were considered significant.

Results

Between April 2009 and December 2017, 72 patients with rectal cancer underwent low anterior resection with defunctioning stoma at two centres. Three patients were lost to follow-up, and a total of 69 patients were included in this study. The median patient age was 65 (28-92) years, and 61% (n=42) were men. All patients undergo surgery for rectal tumour. Neoadjuvant radiotherapy was administered in 24 (35%) patients. The total mesorectal excision technique with coloanal anastomosis using circular stapler 31-4.8 mm was performed in all patients. The index operation was performed laparoscopically in 21 (30%) patients. Defunctioning ileostomy was performed in 50 (73%) patients; however, defunctioning colostomy was performed in 19 (27%) patients. Moreover, 45 (65%) patients underwent adjuvant chemotherapy, and 12 (17%) patients underwent concomitant adjuvant radiotherapy (Table 1). In total, 36 (52%) patients received radiotherapy either before or after surgery. Stoma closure was performed in 61 (90%) patients. Control colonoscopy revealed coloanal anastomosis stenosis in 19 (28%) patients. The median stoma duration of patients with anastomotic stenosis was significantly longer than that of patients without stenosis [15 (7-41) and 7 (2-25) months, respectively, p=0.002] (Table 2).

Age, gender, comorbidity, neoadjuvant chemoradiotherapy, smoking and alcohol consumption between the two groups were not significantly different (Table 2). Successful dilatation was achieved in 12 (63%) of the 19 patients with anastomotic stenosis after performing balloon dilatation. Of these 12 patients, 7 (58%) underwent stoma closure thereafter. Re-resection and re-anastomosis were performed in four (57%) of seven patients with dilatation failure, and 10 (14%) patients have permanent stoma (Figure 1).

Discussion

Coloanal anastomotic stenosis is thought to be associated with various factors, such as radiation[8], anastomotic ischaemia, leakage[9] or anastomosis technique. In this study, we hypothesised that a long duration with defunctioning stoma may be another factor contributing to coloanal anastomosis stenosis. We found that the median stoma duration in patients with anastomotic stenosis was significantly longer than that in patients without stenosis (p=0.002).

Anastomotic stenosis is not uncommon after coloanal anastomosis. Furthermore, whether anastomotic stenosis is associated with defunctioning stoma remains unclear.

This study fills this gap in research and highlights the less discussed issues in clinical practice. To the best of our knowledge, this is the first study to investigate and address

Table 1. Patients' demographic and clinical characteristics (n=69)

Age [median (min-max)]	**65 (28-92)**
Gender	
Male Female	61% (n=42) 39% (n=27)
Neoadjuvant radiotherapy	35% (n=24)
Adjuvant radiotherapy	17% (n=12)
Laparoscopic resection	30% (n = 21)
Type of defunctioning stoma	
Loop ileostomy Loop colostomy	73% (n=50) 27% (n=19)
Median stoma duration	7 (2-25) months
Anastomotic stenosis	27% (n=19)
Balloon dilatation	17% (n=12)
Re-resection	1.5% (n=1)

min: Minimum, max: Maximum

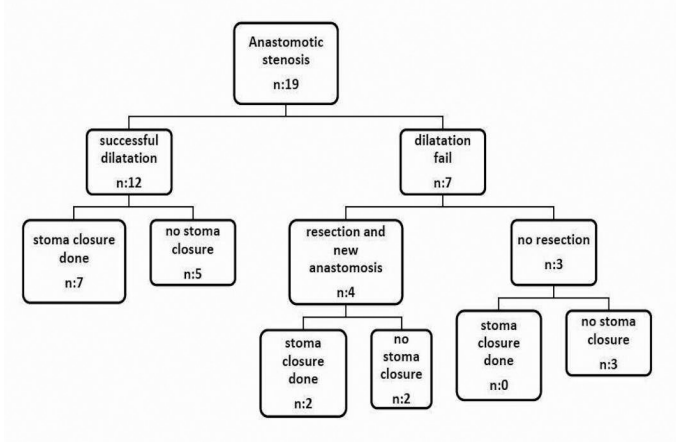

Figure 1. Outcomes of patients with anastomotic stenosis

Table 2. Comparison of the treatment groups according to coloanal anastomosis stenosis

	Patients with anastomosis stenosis (n=19)	No stenosis (n=50)	p value
Age	61 (36-73)	66 (28-92)	0.05
Gender			
Male Female	12 (63%) 7 (37%)	30 (60%) 20 (40%)	1.0
Neoadjuvant radiotherapy	3 (16%)	21 (42%)	0.05
Adjuvant radiotherapy	6 (31%)	6 (12%)	0.08
Adjuvant chemotherapy	11 (58%)	35 (70%)	0.3
Median stoma duration	15 (7-41)	7(2-25)	0.002
Comorbidity			
DM HT CAD CRF	3 (16%) 3 (16%) 2 (%11) 0 (0%)	13 (68%) 18 (95%) 3 (16%) 3 (16%)	0.5 0.15 0.6 0.6
Smoking	9 (47%)	19 (38%)	0.6
Alcohol consumption	0 (0%)	4 (0.8%)	0.6

DM: Diabetes mellitus, HT: Hypertension, CAD: Coronary artery disease, CRF: Chronic renal failure

this issue. According to our findings, early closure of the defunctioning stoma is recommended to prevent increased coloanal anastomosis stenosis rates. Although some studies have emphasised the median duration of a stoma, the importance of this period has not been demonstrated and thus remains ambiguous. We believe that this ambiguity has been addressed in our study, and we hope that this result can help surgeons select the appropriate strategies in the future.

However, the retrospective design, small number of patients and loss to follow-up of some patients are considered limitations of this study. This study was planned after a clinical observation that the coloanal anastomosis stenosis rate appears to be higher in patients with long duration of defunctioning stoma. This stenosis can be explained by the loss of the continuous dilatation effect of stool passage through the anastomosis, whereas the defunctioning stoma remains *in situ*. Although several factors, including radiotherapy, were investigated, the stoma duration was the only significant factor between the two groups in the study. This indicates that the duration is an independent factor that affects stenosis as much as or more than radiotherapy. Because this factor can be prevented easily by early stoma closure, it may have a big effect on our practice in dealing with defunctioning stoma.

Previous studies have reported various stoma durations based on different factors. Sier et al.[10] evaluated possible predictors of prolonged interval between the construction and reversal of defunctioning stoma. They showed that age, end ileostomy, higher body mass index and preoperative radiotherapy were independent factors for non-reversal.[10] However, they did not investigate the stoma duration as a potential risk factor for anastomotic stenosis that may lead to non-reversal. Several prospective studies have shown that closure in less than 2 weeks was associated with lower or equal morbidity compared with later closure.[11,12] In our study, this period was 7 months. The long duration was due to post-operative adjuvant chemotherapy, and some patients preferred late closure and others were afraid of closure complications; therefore, they preferred to keep the stoma. We think that the main cause of longer stoma duration (median stoma time of 15 months) in patients with stenosis is the permanent stoma, as observed in 10 patients who have not undergone stoma closure during follow-up. Furthermore, dilatation procedures lead to further delay of stoma closure in patients with stenosis. However, most of the cases of late closures in this study are due to patient preference, overcrowded workload of the medical institution or recommendation of some surgeons to wait up to 2 years after surgery to guarantee a disease-free status in that time.

Because the stoma duration was defined as the time between the index operation and control colonoscopy, colonoscopy was performed after the index operation in different intervals among patients during adjuvant treatments or as per patients' preferences. The incidence of stenosis after coloanal anastomosis ranges from 0% to 30%.[13,14] In this study, stenosis was observed within this range; however, it was relatively high (27%), which can be explained by the long duration as the single significant independent factor that affects the stenosis. Beamish et al.[15] showed that loop ileostomy-associated faecal stream diversion results in intestinal dysbiosis and likely influences the development of impaired intestinal function. This can be the factor triggering stricture.[15] Diversion colitis is invariably present in all diverted segments of the colon. It is usually asymptomatic but can present with tenesmus, rectal discharge, bleeding per rectum and abdominal pain. Major macroscopic changes include mucosal nodularity, erythema and friability. Microscopic features are predominantly those of lymphoid follicular hyperplasia, apthous ulceration and chronic inflammatory changes. We think that such chronic inflammatory changes may be a predisposing factor for stenosis.[16]

Study Limitations

In this study, the median stoma duration was long; therefore, exposure to trigger factors was higher. In this study, all anastomoses were performed using a stapled technique. The medical literature has shown that neither stapled technique nor handsewn methods for colorectal anastomosis would be superior particularly for anastomotic stenosis.[17] Previous studies have reported the negative effects of neo/adjuvant radiotherapy on anastomosis. Qin et al.[18] investigated clinical features and risk factors of surgical complications after intersphincteric resection for low rectal cancer following neoadjuvant chemoradiotherapy in 132 patients. Their results showed that radiation colitis was an independent prognostic factor of anastomotic leakage post-operatively and that anastomotic leakage was an independent prognosis factor of anastomotic stenosis post-operatively.[18] In a comprehensive study by Matthiessen et al.[19], risk factors for anastomotic leakage after an anterior rectal resection were investigated. The obtained result confirmed that preoperative radiotherapy is a risk factor for anastomotic leakage and hence anastomotic stenosis.[19] In our study, this effect was found to be borderline, which may be related to the small number of patients included. Hiranyakas et al.[20] investigated possible factors associated with post-operative colorectal anastomotic stenosis and found that the majority of patients who had anastomotic stricture were men (79%).

This may be related to technical difficulties in performing anastomosis in the deep narrow male pelvis.[20] This ratio was 89% in a study by Sun et al.[21]. In our study, the majority of patients with anastomotic stenosis were men (63%). However, no significant difference in gender was found between patients with and without anastomotic stenosis. None of the previous studies have investigated the effect of long stoma duration on coloanal anastomosis stenosis.

Some studies have supported the early closure of the stoma. They reported that a temporary ileostomy can be closed immediately after the first operation and was associated with low morbidity and mortality.[22,23,24] There is no consensus regarding the timing of defunctioning stoma colsure after low anterior resection. However, early closure is recommended in recent studies.[25]

Furthermore, Choi et al.[26] reported that ileostomy closure during adjuvant chemotherapy was clinically safe, and interruption of chemotherapy due to ileostomy closure did not change oncologic outcomes. A recent randomised controlled trial showed that early stoma closure does not carry an increased risk of post-operative complications, reduces cost towards stoma care and leads to better a quality of life.[27] Thus, an overall trend is toward early closure of temporary ileostomy, which is recommended in suitable patients. Stenosis is a late complication of coloanal anastomosis occurring after a long period. Thus, early functioning of the anastomosis should be considered a way to prevent stenosis. Further prospective studies with large number of patients are needed.

Conclusion

This study showed that the long duration of defunctioning stoma was associated with increased coloanal anastomosis stenosis rates. Because this factor can be prevented by early stoma closure, it should be considered in clinical practice, and surgeons should promote closure of defunctioning stoma as early as possible.

Ethics

Ethics Committee Approval: This study was approved by Marmara University Faculty of Medicine Ethics Committee.

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: H.B., W.A., İ.T., Concept: H.B., W.A., Design: H.B., W.A., Data Collection or Processing: H.B., W.A., Analysis or Interpretation: H.B., W.A., İ.T., Literature Search: H.B., W.A., Writing: H.B., W.A.

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RESEARCH ARTICLE

The Prognostic Factors on Survival Rates for Patients with Stage II-III Colon Cancer

Evre 2-3 Kolon Kanserli Hastaların Sağkalım Oranlarını Etkileyen Prognostik Faktörler

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ABSTRACT

Aim: A substantial portion of colon cancer is diagnosed at stage II or III. While high survival rates are obtained with curative surgery in stage I, conversely, in stage IV curative surgery has no place, and survival rates are significantly lower despite chemotherapy. Survival rates vary greatly in stage II and III colon tumors, which are treated with combination of curative surgery and chemoterapy. This study aimed to analyse the prognostic factors on survival of stage II-III colon cancers.

Method: One hundred seventy four patients with stage II or III colon cancer in the follow-up of Dokuz Eylül University Faculty of Medicine Oncology Clinic between January 1999 and August 2010 were included in the study. Prognostic factors defined in the literature were investigated retrospectively in this patient population. The factors that were found to be significant according to the univariate analysis were evaluated by multivariate analysis and independent factors were found.

Results: In univariate analysis, presence of obstruction or perforation at admission, preoperative high carcinoembryonic antigen level, presence of lymphatic invasion (LI) and inadequate number of total lymph nodes removed were the poor prognostic indicators for disease-free survival. Of these, the presence of obstruction or perforation at admission was the only independent prognostic factor in multivariate analysis. Inadequate number of total lymph nodes removed and presence of LI were found to be associated with decreased overall survival in both univariate and multivariate analyzes.

Conclusion: Presence of obstruction or perforation at admission, inadequate number of total lymph nodes removed and the presence of LI were associated with poor prognosis in patients with stage II and III colon cancer.

Keywords: Colon cancer, prognostic factor, survival

ÖZ

Amaç: Kolon kanserinin önemli bir kısmı evre 2 veya 3'te tanı alır. Evre 1'de küratif cerrahi ile yüksek sağkalım sonuçları sağlanırken, tersine evre 4'te küratif cerrahinin yeri olmadığı gibi kemoterapiye rağmen sağkalım oranları oldukça düşüktür. Küratif cerrahi ve kemoterapi kombinasyonu ile tedavi edilen evre 2 ve 3'te ise sağkalım oranları büyük değişkenlik gösterir. Bu çalışmanın amacı evre 2-3 kolon kanserlerinde sağkalımı etkileyen prognostik faktörleri araştırmak idi.

Yöntem: Ocak 1999 ve Ağustos 2010 arasında Dokuz Eylül Üniversitesi Tıp Fakültesi Onkoloji Kliniği'nin takibindeki evre 2 veya 3 kolon kanserli 174 hasta çalışmaya alındı. Literatürde tanımlanmış prognostik faktörler bu hasta grubunda retrospektif olarak incelendi. Tek değişkenli analizde anlamlı bulunan faktörler çok değişkenli analize alındı ve bağımsız prognostik faktörler bulundu.

Bulgular: Tek değişkenli analizde, başvuru sırasında obstrüksiyon veya perforasyon varlığı, preoperatif yüksek karsinoembriyonik antijen seviyesi, lenfatik invazyon (Lİ) varlığı ve yetersiz çıkarılan toplam lenf nodu sayısı, hastalıksız sağkalımı etkileyen kötü prognostik göstergelerdi. Bunlardan, sadece başvuru sırasında tıkanma veya perforasyon varlığı, çok değişkenli analizde bağımsız prognostik faktör olarak belirlenmiştir. Yetersiz çıkarılan toplam lenf nodu sayısı ve Lİ varlığı, hem tek değişkenli hem de çok değişkenli analizlerde genel sağkalımın azalması ile ilişkili bulundu.

Our article was presented at the 17th Turkish Colon and Rectum Surgery Congress as an oral notification in 2019.

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Sonuç: Başvuru sırasında obstrüksiyon veya perforasyon varlığı, çıkarılan total lenf nodu yetersizliği ve Lİ varlığı evre 2 ve 3 kolon kanseri olan hastalarda kötü prognoz ile ilişkili bulunmuştur.
Anahtar Kelimeler: Kolon kanseri, prognostik faktör, sağkalım

Introduction

According to the current data of the World Health Organization, colon cancers are the third most common malignancy worldwide.[1] The incidence of colon cancer is almost equal in both men and women. Advanced age and family history are major risk factors for colon cancer. Genetic syndromes such as familial adenomatosis polyposis and hereditary non-polyposis colorectal cancer constitute 2%-4% of the cases.[2] Approximately 10% of patients with colon cancer have a family history without genetic predisposition.[3] Other risk factors include low fibre, high fat diet, obesity and physical inactivity.[4]

Colon cancer, when diagnosed at an early stage, has minimal morbidity and mortality as it is a curable malignancy when managed with appropriate surgical intervention.[5] While survival rates in stage 1 tumours reach 93% with curative surgery, the chance of surgery is eliminated in stage 4 tumours, but this rate decreases to 8% despite chemotherapy. The situation is quite different in stage 2 and stage 3 tumours, which are grouped as locally advanced colon cancer. In these cancers, survival rates vary between 64% and 78% with the combination of curative surgery and chemotherapy.[5] However, after curative surgical resection, some patients may have recurrent distant metastases, which accounted for 25% and 50%-60% in 5 years for stage II and stage III colon cancers, respectively.[2] The risk of recurrence can be estimated based on the clinical and histological characteristics of the cancer. The risk increases with high stage, elevated level of preoperative carcinoembryonic antigen (CEA), inadequate number of lymph nodes removed and obstruction or perforation at admission. Metastasis to regional lymph nodes is the most powerful factor in predicting whether the disease will benefit from surgical resection.[6,7,8]

This study aimed to investigate the prognostic factors affecting disease-free and overall survival (OS) in patients with stage II and III colon cancers who underwent curative surgical resection.

Materials and Methods

This cohort study included patients with stage II and III colon cancers who received follow-up treatment at Dokuz Eylül University Faculty of Medicine Medical Oncology Institute from January 1999 to August 2010. Patients aged <18 years, patients with stage I and IV colon cancers as well as patients with rectal cancer were excluded from the study. Demographic characteristics including age, gender and body mass index (BMI) and risk factors including diabetes mellitus (DM) and family history were recorded. Data on prognostic factors including the presence of obstruction or perforation at admission, preoperative CEA level, disease stage, tumour invasion grade (T), number of total lymph nodes removed, number of metastatic lymph nodes (N), histopathological type, histologic grade, perineural invasion (PVI), lymphatic invasion (LI), tumour location and presence of surgical margin positivity were obtained from the manual and/or electronic file system. The inadequate number of total lymph nodes removed is considered less than 12. For the determination of survival parameters, the date of diagnosis, relapse and death were also recorded. The interval from diagnosis to the first relapse was defined as disease-free survival (DFS), while OS was defined as the interval from diagnosis to death. The disease stage was determined according to the TNM classification and staging system proposed by the American Joint Committee on Cancer.

The study was approved by the Non-interventional Research Ethics Committee of Dokuz Eylül University.

Statistical Analysis

Data analysis was performed with SPSS 15.0 software. Descriptive statistics were performed by using mean and standard deviation for normally distributed variables and median and interquartile intervals for normally distributed variables. Chi-square or Fisher's exact tests were used to compare the frequencies between groups. Survival analysis was performed using Kaplan-Meier test, including survival curve graphics that indicate DFS and OS. P value <0.05 was accepted as significance level. Log-rank test was used for comparison of survival curves. Prognostic factors with p value less than 0.05 were also evaluated with Cox-regression test for multivariate analysis.

Results

Of the 667 patients, 278 were eligible for the study. However, five patients with stage I and 59 patients with stage IV colon cancer and 40 patients with rectal cancer were excluded. Finally, 174 patients with stage II and III colon cancer were included in the study. Moreover, 58% of the patients were male, the median age (IQR) was 61 (49-68) years and the median BMI (IQR) was 25 (22-28) kg/m^2. The median OS

(IQR) was 45 (28-69) months, whereas the median DFS (IQR) was 35 (22-64) months. In this study, 19 (17%) patients had a family history of colon cancer, while 95 (83%) patients had no family history. Sixty patients could not be evaluated because of missing data.

Of the 174 patients, 76 (43.7%) had stage II and 98 (56.4%) had stage III. The median DFS duration (IQR) was 41.5 (25-69) months in the stage II colon cancer group and 34 (18-62) months in the stage III colon cancer group. The median OS (IQR) was 50.5 (28-75) months in the stage II colon cancer group and 43 (27-68) months in the stage III colon cancer group. The 5-year survival rates including DFS (Figure 1) and OS (Figure 2) for patients with stage II and III colon cancer were not significantly different (Table 1).

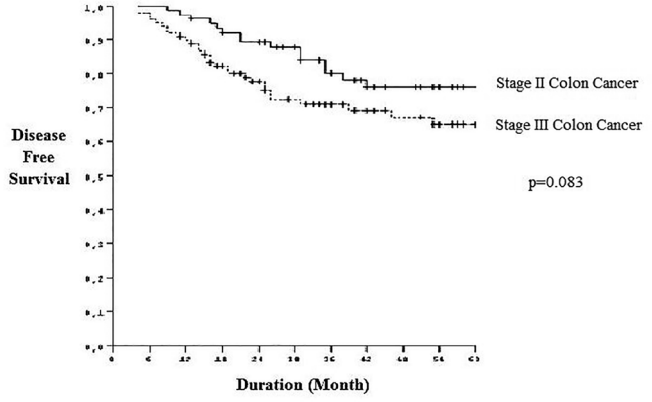

Figure 1. Disease free survival curve of patients with colon cancer according to tumor stage

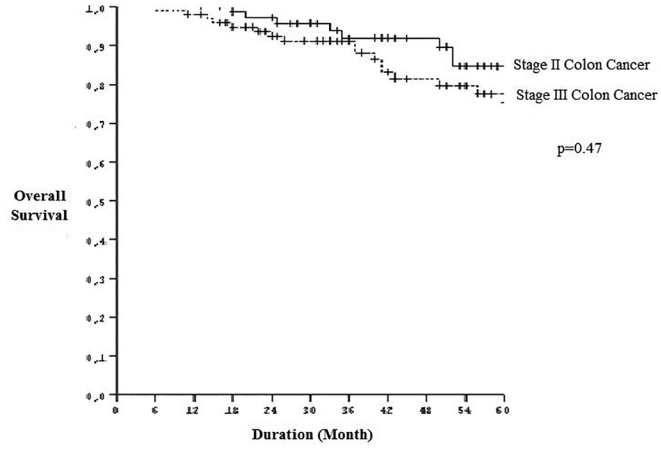

Figure 2. Overall survival curve of patients with colon cancer according to tumor stage

In this study, no effect of age, gender, obesity and DM was observed on survival rates (Table 1). Among the prognostic factors, the number of metastatic lymph nodes, presence of surgical margin positivity, presence of PVI, presence of PNI, histopathological type and tumour location were unrelated with both DFS and OS rates.

The 5-year DFS and OS rates according to the depth of tumour invasion were 62.5% and 75% for T2, 78.2% and 89.2% for T3 and 59.7% and 65.9% for T4, respectively. However, the difference was not significant (Table 1).

A significant decrease was found in the survival rate in patients with LI. The 5-year DFS rate was 83.7% vs 66.8% in patients without LI and with LI, respectively (p=0.018). The 5-year OS rate was 93.6% and 67.7% in patients without LI and with LI, respectively (p=0.022), as shown in Table 1.

The 5-year survival durations were significantly longer in the group with ≥12 total lymph nodes removed. In 33 (20%) patients, <12 lymph nodes were removed, whereas in 133 (80%) patients, ≥12 lymph nodes were removed. The median DFS (IQR) was 26 (16-51) months in the group with <12 and 38 (24-66) months (p=0.019) in the group with ≥12 lymph nodes removed. The median OS (IQR) was 41 (28-68) months in the group with <12 and 43 (28-68) months (p=0.004) in the group with ≥12 lymph nodes removed.

In this study, 46 (26.4%) patients underwent urgent surgery for obstruction or perforation. The median DFS (IQR) was 27 (16-51) months vs 39 (24-67) months in patients with vs without obstruction or perforation (p=0.004). However, the 5-year OS rate was not significant between the groups with and without obstruction/perforation (p=0.153).

Of the 106 patients whose preoperative CEA levels were measured, 65 had normal CEA levels, while 41 had high CEA levels. The 5-year DFS (IQR) were 42 (24-63) months and 34 (18-45) months for patients with normal and high CEA level, respectively (p=0.019). No significant difference was found between the two groups for the 5-year OS duration (p=0.156, Table 1).

Factors that had a significant contribution on DFS according to the univariate analysis (including presence of LI, number of lymph nodes removed, obstruction or perforation at admission and preoperative CEA level) were assessed by multivariate analysis. Obstruction or perforation at admission was the only independent prognostic factor (p=0.009). Of the prognostic factors that were significant on OS in the univariate analysis (number of lymph nodes removed and presence of LI), both had independent effect according to the multivariate analysis (p=0.004 and p=0.018, respectively).

Table 1. Clinical and pathological factors affecting the survival of patients with stage II and III colon cancer

Clinicaland Patient pathological factors	(n/N)	5-year DFS Rate	Univariate p value	Multivariate p value	5-year OS rate	Univariate p value	Multivariate p value
Stage							
Stage II	76/174	70.6%	0.083	–	81.5%	0.47	–
StageIII	98/174	69.2%			75.2%		
Obesity							
Absent	146/170	70.9%	0.26	–	89.8%	0.66	–
Present	24/170	60%			65.3%		
Diabetes mellitus							
Absent	127/155	69,2%	0.81	–	78.1%	0.43	–
Present	28/155	72.9%			78.2%		
pT							
T2	5/173	62.5%	0.067	–	75%	0.063	–
T3	97/173	78.2%			89.2%		
T4	69/173	59.7%			65.9%		
pN							
N0	75/172	75.6%	0.163	–	81.1%	0.473	–
N1	65/172	68.4%			81.7%		
N2	32/172	62.1%			63.1%		
Surgicalmargin							
Negative	134/164	71.2%	0.83	-	82.2%	0.215	-
Positive	30/164	69.9%			62.6%		
PVI							
Absent	95/123	78.1%	0.075		82.2%	0.531	–
Present	28/123	57.3%			74.1%		
PNI							
Absent	40/130	79.5%	0.199	–	83.5%	0.945	–
Present	90/130	58.2%			70.5%		
Histopathologictype							
ADC	156/174	71.5%	0.221	–	77,9%	0.184	–
Mucinous ADC	17/174	63.9%			86,9%		
Signetcell ADC	1/174	0%			0%		
Location							
Right side	79/171	71.9%	0.76	–	76.8%	0.31	–
Leftside	85/171	65.8%			82.3%		
LI							
Absent	62/124	83.7%	**0.018**	0.451	93.6%	**0.022**	**0.018**
Present	62/124	66.8%			67.7%		
TLN removed							
<12	33/166	51.1%	**0.019**	0.068	67.1%	**0.002**	**0.004**
≥12	133/166	75%			81.2%		
O/P							
Absent	128/174	75.9%	**0.004**	**0.009**	82%	0.15	–
Present	46/174	54%			67.1%		
Preoperative							
CEA level							
≤5 ng/mL	65/106	80.3%	**0.019**	0.177	84.3%	0.15	–
>5 ng/mL	41/106	53.6%			69.8%		

DFS: Disease free survival, OS: Overall survival, pT: Primary tumor, pN: Regional lymp nodes, PVI: Perivascular invasion, PNI: Perineural invasion, ADC: Adenocarcinoma, LI: Lymphatic invasion, TLN: Total lymp nodes, O/P: Obstruction/perforation, CEA: Carcinoembrionic antigen

Discussion

Colon cancer is one of the most common malignancies worldwide. Many factors are known to affect survival rates. In this study, according to the survival analysis in patients with stage II and stage III colon cancers, high preoperative CEA level, obstruction or perforation at admission, presence of LI and inadequate number of lymph nodes removed were associated with poor prognosis. While the independent poor prognostic factor for the DFS was obstruction or perforation at admission, they were the inadequate number of lymph nodes removed and the presence of LI for the OS.

Studies have shown a relationship between high CEA level and poor survival. However, some studies do not support this result.[6,9] Mixed results were detected in the present study. The high preoperative CEA level was found to be associated with a significant decrease in DFS in the univariate analysis, but it was not true for OS.

Data on the prognosis of colorectal cancers presenting with obstruction are conflicting.[10,11,12,13,14] Niedzwiecki et al.[10] demonstrated that presentation with obstruction or perforation had no prognostic effect on survival rates of colon cancers. Similarly, Liu et al.[11] stated that obstruction did not have any contribution on prognosis in their study of obstructive colon malignancies. However, in the multivariate analysis of the study conducted by the Gastrointestinal Tumor Study Group, obstruction was found to be an important prognostic indicator independent of the Dukes stage.[15,16] According to the records of Massachusetts Hospital, the 5-year survival rate was lower (31%) for the obstruction or perforation group undergoing curative surgery in comparison with the control group (59%).[15] In this study, the 5-year DFS rates were consistent with literature, i.e. 54% vs 75.9% for those with obstruction or perforation compared with those without obstruction or perforation. This difference was also significant in the multivariate analysis. However, the same relationship could not be established for OS rates.

The effect of the presence of LI on prognosis is controversial owing to the varying results reported in previous studies.[17,18,19] Our data suggest that the presence of LI had a negative effect on both DFS and OS rates in the univariate analysis, but this effect persisted on OS alone in the multivariate analysis.

Despite differing views on the number of lymph nodes that should be removed for adequate and reliable staging, the guidelines state that at least 12 lymph nodes should be removed for histologically accurate evaluation of the lymph nodes.[20,21] A study stated that the number of removed lymph nodes affects the prognosis regardless of the stage.[22] In this study, ≥12 lymph nodes removed was a good prognostic factor. Both DFS and OS were significantly longer in patients with ≥12 total lymph nodes removed based on the univariate analysis.

In the multivariate analysis, the total number of lymph nodes removed was determined as an independent prognostic factor for OS, but it was not significant for DFS. The Intergroup (INT-0089) trial evaluated 2,768 patients with lymph node-positive and 648 patients with lymph node-negative colon cancer and concluded that increased number of total lymph nodes removed was associated with prolonged survival.[23] Inadequate lymph node dissection adversely affected DFS and OS rates in patients with lymph node-positive cancer, whereas it did not significantly contribute to survival in patients with lymph node-negative cancer. The depth of tumour invasion (T) and regional or distant lymph node metastasis of the tumour (N) in the TNM stage are considered the most important prognostic factors.[24] According to the 119,363 disease data analysis of the Surveillance, Epidemiology and End Results Programme (SEER) between 1991 and 2000, 5-year survival rates in the node-negative group were 93.2%, 84.7% and 72.2% for patients with T1-2, T3 and T4, respectively. Survival rates were 83.4% for T1-2 and 64.1% for T3-4 in patients with lymph node-positive cancer involving 1-3 lymph nodes. The 5-year survival rates of patients with ≥4 lymph nodes dropped to 44.3% independent of T.[25,26] Unexpectedly, survival rates of patients with T2 stage were found to be worse than that of patients with T3 stage in this study. The possible reason was that all patients with T2 stage had node-positive (N1) cancer, whereas patients with T3 stage showed heterogeneity as having node-negative and positive cancer. This suggests that nodal metastasis is the most important factor in prognosis, as shown in SEER. When patients were examined according to lymph node involvement, the 5-year DFS and OS rates were the highest in patients with node-negative cancer while decreased in patients with lymph node-positive cancer. However, these results were not significant.

The contribution of factors such as gender, age, diabetes, obesity and tumour location to prognosis could not be shown in this study, which was consistent with the results of previous studies.[15,27,28,29]

Histopathology and grade of the tumour, PVI, surgical margin positivity and presence of PNI whose prognostic significance varies according to level of evidence[30,31,32] were not related with survival in this study. This result, which contradicts with the literature, may be related to the fact that pathologic factors were examined by different pathologists, which may vary over a long period such as 1999-2010.

Study Limitations

The main limitations of the study were its retrospective and single-centre design. Another limitation is the lack of a balanced distribution between the groups when patients were grouped according to the presence of prognostic factors.

Conclusion

In this study, the presence of obstruction or perforation at admission, inadequate number of total lymph nodes removed and the presence of LI were associated with poor prognosis for patients with locally advanced colon cancer. We believe that multicentre and prospective studies are required for more conclusive and reliable results.

Ethics

Ethics Committee Approval: Dokuz Eylül University Non-interventional Research Ethics Committee (date: 11.08.2011/decision no: 2011/27-07).

Informed Consent: Retrospective study.

Peer-review: Externally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: Ö.K., A.U.Y., Concept: Ö.K., A.U.Y., Design: Ö.K., A.U.Y., Data Collection or Processing: Ö.K., A.U.Y., Analysis or Interpretation: Ö.K., Y.G., İ.B., Literature Search: Ö.K., Y.G., İ.B., Writing: Ö.K.,Y.G., İ.B.

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RESEARCH ARTICLE

The Analysis Appendiceal Neuroendocrine Neoplasia with Clinicopathological Findings

Apendisyel Nöroendokrin Neoplazilerin Klinikopatolojik Bulgularla Analizi

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ABSTRACT

Aim: Neuroendocrine cell groups seen in the appendix are defined as proliferative phenomenon similar to early neuroendocrine cell proliferation seen in other organs of the gastrointestinal tract. Neuroendocrine tumors (NET) account for 0.3-0.6% in in appendectomy materials. Rarely, appendicular collusion tumors have also been reported. Here, we presented appendiceal neuroendocrine neoplasms including rare cases.

Method: Appendectomy materials were reviewed between 2011-2020 and cases with neuroendocrine cell hyperplasia and NET were included in the study. The demographics of the cases, the size of the tumors, their localization, their dissemination, and their lymphovascular, perineural and mesoappendix invasions were evaluated, along with their clinical follow-ups.

Results: There were 4,433 appendectomy cases; 10 had neuroendocrine cell hyperplasia and 50 (1.1%) had NET. Fourty-for cases were grade 1 and six of them were grade 2. The mean diameter of tumors was 0.7 cm (0.1-2.5 cm). In 36 cases, the tumor was localized in tip, in nine in body, and in five in tip + body. Tumor invaded submucosa in 14, muscle tissue in 17, subserosa/mesoappendix in 19. Two cases were in the collusion tumor group and low grade appendiceal mucinous neoplasia was detected as the secondary tumor. Two of the cases, whose clinical follow-ups were still continuing, died.

Conclusion: In our study, the rate of NETs was slightly higher than the literature. Careful microscopic examination with accurate sampling is important in the detection of these tumors most of which are microscopic in size. Also, as in our study, two different tumors can take place simultaneously in the appendix.

Keywords: Appendix, collision tumor, neuroendocrine tumor

ÖZ

Amaç: Apendikste görülen nöroendokrin hücre grupları, gastrointestinal sistemin diğer organlarında da görülen erken nöroendokrin hücre proliferasyonuna benzer proliferatif fenomen olarak tanımlanmaktadır. Nöroendokrin tümörler (NET) ise nadir olup, apendektomi materyallerindeki insidensi %0,3-0,6 arasında değişmektedir. NET'e eşlik eden farklı histolojik tümörlerden oluşan nadir apendisyel kollüzyon tümörler literatürde bildirilmiştir. Çalışmamızda nadir özellikli olguları da barındıran apendiks yerleşimli nöroendokrin neoplazi olgularımızın klinikopatolojik bulgularını literatür bilgileri eşliğinde sunmayı amaçladık.

Yöntem: Çalışmamızda 2011-2020 yılları arasındaki apendektomi materyallerine ait kesitler gözden geçirildi. Nöroendokrin hücre hiperplazisi ve NET morfolojisine sahip olgular çalışmaya dahil edildi. Olguların demografik özellikleri, tümörlerin boyutu, lokalizasyonu, yayılımı, lenfovasküler, perinöral ve mezoapendiks invazyonları ile klinik takipleri değerlendirildi.

Bulgular: İncelenen 4.433 apendektomili olgu içinde 10'u nöroendokrin hücre hiperplazisi ve 50'si (%1,1) NET tanısına sahipti. Kırk dört olgu grade 1, 6 olgu grade 2 idi. Ortalama tümör çapı 0,7 cm'di (0,1-2,5 cm). İki olguda tümör boyutu 2 cm ve üstündeydi. Olguların 36'sında tümör apekste, dokuzunda gövdede ve beşinde apeks + gövdede lokalizeydi. Tümör olguların 14'ünde submukozaya, 17'sinde kas dokusuna, 19'unda subseroza/mezoapendikse yayılım göstermekteydi. Üç olguda lenfovasküler inazyon saptandı. İki olgu kollüzyon tümör grubunda olup, düşük dereceli apendisyel müsinöz neoplazi ikinci tümör olarak saptandı. Klinik takipleri devam eden olgulardan ikisi eks oldu.

Sonuç: Genellikle histopatolojik inceleme ile tanı alan NET'lerin oranı çalışmamızda literatürde belirtilen orandan hafif yüksekti. Çoğunluğu mikroskobik boyutta olan bu tümörlerin tespitinde doğru ve yeterli makroskopik örnekleme ile dikkatli mikroskobik inceleme önem taşımaktadır. Ayrıca çalışmamızda olduğu gibi, iki farklı tümör apendikste eş zamanlı yer alabilir.

Anahtar Kelimeler: Apendiks, kollüzyon tümör, nöroendokrin tümör

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Introduction

Epithelial neoplasias of the appendix are rare, and they generally present with acute appendicitis and detected incidentally.[1] Neuroendocrine cell groups that are observed in the appendix are described as proliferative phenomena that show similiarities to the early neuroendocrine cell proliferation also observed in other organs of the gastrointestinal tract. They are observed as small patchy groups, and most of them can be detected during microscopic examination.[2] Neuroendocrine tumours (NETs), however, are rare, and they are observed between 0.3% and 0.6% of appendectomy cases.[3] Although appendiceal collision tumours are quite rare, which include tumours with different histological types that accompany NETs, they have also been reported in the literature.[4,5] Herein, we presented cases of neuroendocrine neoplasias, which were located in the appendix, including rare ones.

Materials and Methods

In this study, we reviewed sections (immunohistochemical slides that were stained with haematoxylin and eosin) belonging to appendectomy materials in the pathology archive, which were sent to our department between 2011 and 2020. Patients with neuroendocrine cell proliferation and NET morphology were included in the study. Demographics of the patients (age and gender) and tumour size, localisation (tip, body and tip + body), depth of invasion (mucosa, submucosa, muscular propria and subserosa/mesoappendix), histological grade (grades I, II and III), surgical margin, lymphovascular and perineural invasions and clinical follow-ups were evaluated.

Statistical Analysis

Statistical analysis was conducted on the NET group. Data were completed by transferring them to the IBM SPSS Statistics programme. In data analysis, categorical variables are presented in the frequency distribution as number and percentage, and in the complementary statistics, numerical variables are presented as mean and standard deviation. The chi-square test was used to investigate the relationship between the categorical variables, and $p<0.05$ was accepted to indicate significance.

Results

General Characteristics of the Neuroendocrine Neoplasia Group

In this study, 4,433 appendectomy materials were examined. Sixty patients were allocated to the neuroendocrine neoplasia group, including 19 female patients and 4 male patients. The mean age was 33.5 (11-82) years.

Among these patients, one patient was diagnosed with neuroendocrine cell proliferation, and NETs in four patients were detected in the appendectomy material because their operations were not related to appendicitis.

Cases Diagnosed as Neuroendocrine Cell Proliferation

Ten patients were diagnosed with neuroendocrine cell proliferation (male, n=4; female, n=6). The mean age of these patients was 31.3±11.73 (12-56) years. Among the lesions, some were smaller than 1 mm and some were microscopically detected; nine of them were localised in the tip and one was localised in the body. In three patients, the lesion was observed in the submucosa, and in eight patients, it was observed in the mucosa (Figure 1).

Cases Diagnosed as NET

In this study, 50 (1.1%) patients were diagnosed with NET, including 15 female patients and 35 male patients. The mean age was 36.06±16.89 (11-82) years. Four (0.09%) were paediatric patients.

The mean tumour diameter was 0.7 cm (0.1-2.5 cm). In 72% of the patients, the diameter of the tumour was <1 cm. In 2 patients, the tumour size was ≥2 cm.

In the histopathological examination, the tumour was localised in the tip in 36 patients, in the body in 9 patients, and in the tip + body in 5 patients. The tumour disseminated into the submucosa in 14 patients, to the muscular tissues in 17 patients and to the subserosa/mesoappendix in 19 patients (Figure 2). Lymphovascular invasion was detected in three patients. Perineural invasion was not detected in any of the patients. No tumour was observed in the surgical margins. According to the Ki-67 proliferative indexes, 44 patients had grade I (88%), while 6 patients had grade II (12%).

While the two patients who were diagnosed of grade I NET belonged to the collision tumour group, the secondary

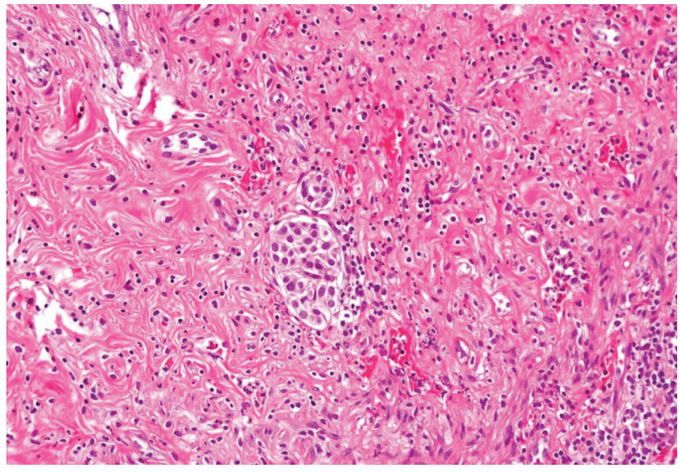

Figure 1. Neuroendocrine hyperplasia was detected in the submucosa through miscoscopic examination, haematoxylin and eosin staining, x200

tumour that was accompanying them was a low-grade mucinous neoplasm (DDMN) (Figure 3). Both patients were 41 years old and female. Both tumours, 1.2 cm and 0.6 cm in size, were localised in the body. Other patients with NETs had diverticula (n=3) and acute appendicitis (n=43) as additional findings.

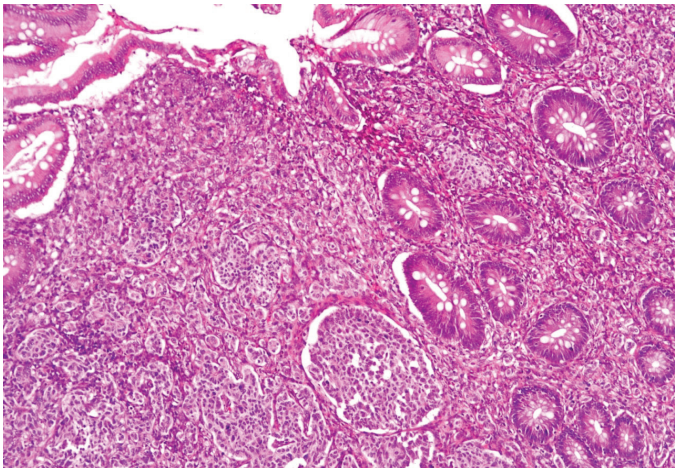

Figure 2. NET with solid islands of different sizes and uniform and round shape, showing infiltration among crypts, haematoxylin and eosin staining, x100

NETs: Neuroendocrine tumors

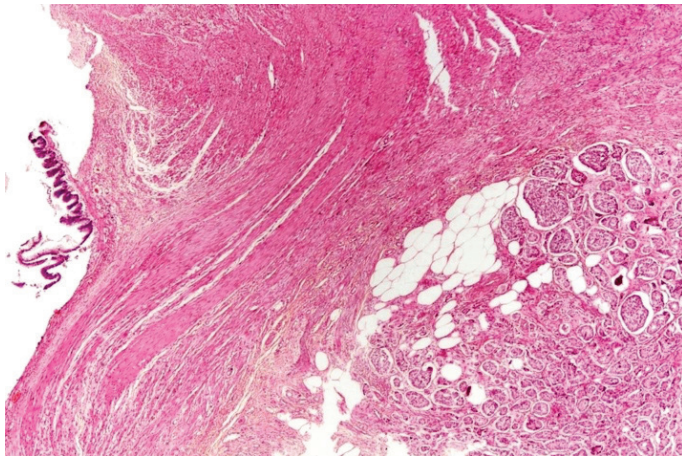

Figure 3. Low-grade mucinous neoplasia involving dysplastic epithelium (on the left) and collision tumour with a NET component that infiltrated into the muscular tissue (on the right), haematoxylin and eosin staining, x40

NET: Neuroendocrine tumor

Table 1. Clinicopathologic findings of patients diagnosed with neuroendocrine tumour

	Men n (%)	Women n (%)	Total n (%)	p*
Tumour localisation				
Tip	25 (71.4%)	11 (73.3%)	36 (72%)	
Body	5 (14.3%)	4 (26.7%)	9 (18%)	0.218
Tip + body	5 (14.3%)	0 (0%)	5 (10%)	
Tumour size				
<1 cm	25 (71.4%)	11 (73.3%)	36 (72%)	0.891
>1 cm	10 (28.6%)	4 (26.7%)	14 (28%)	
Tumour dissemination (depth of invasion)				
Submucosa	11 (31.4%)	3 (20%)	14 (28%)	
Muscular tissue	10 (28.6%)	7 (46.7%)	17 (34%)	0.444
Subserosa/mesoappendix	14 (40%)	5 (33.3%)	19 (38%)	
Lymphovascular invasion				
Positive	2 (5.7%)	1 (6.7%)	3 (6%)	0.897
Negative	33 (94.3%)	14 (93.3%)	47 (94%)	
Histological grade[6] (according to the Ki-67 proliferative index)				
Grade I	32 (91.4%)	12 (80%)	44 (88%)	0.348
Grade II	3 (8.6%)	3 (20%)	6 (12%)	
Surgical margin				
Positive	0 (0%)	0 (0%)	0 (0%)	-
Negative	35 (100%)	15 (100%)	50 (100%)	

*Chi-square test

According to the chi-square test, no significant relationship was found between gender and other parameters. No significant relationship was found between the tumour size and lymphovascular or perineural invasion (p>0.05) (Table 1). However, a significant relationship was found between the tumour size and its localisation, dissemination (depth of invasion) and histological grade (p<0.05). Moreover, the frequency to have tumours >1 cm among of cases with the tumour located in the tip was significantly higher than that of cases with the tumour located in the tip or in the tip + body (p=0.000). The frequency to have tumours >1 cm was significantly higher among cases with tumour dissemination into the subserosa/mesoappendix than among cases with tumour dissemination into the submucosa (p=0.008). The frequency of having tumour size >1 cm was significantly higher among grade II cases than among grade I cases (p=0.044) (Table 2).

Furthermore, while no significant relationship was found between the histological grade and tumour localisation (p>0.05), a significant relationship was noted between the tumour grade and size, dissemination (depth of invasion) and lymphovascular invasion (p<0.05). This finding suggest that the frequency of having a grade II disease was significantly higher in patients with tumours >1 cm than among patients with tumours <1 cm (p=0.044). The frequency of having a grade II disease was significantly higher for patients who had a tumour dissemination to the subserosa/mesoappendix than among patients with other dissemination types (p=0.045). The frequency for the patients in which lymphovascular invasion was not observed to have grade I was significantly higher than it is for patients in which lymphovascular invasion was observed (p=0.035) (Table 3).

Treatment in the Neuroendocrine Neoplasia Group

Among the 2 patients with a NET >2 cm, right hemicolectomy in addition to appendectomy was performed only in one of the patients. No additional surgical treatment was performed after the appendectomy for the other patients with NET and neuroendocrine cell hyperplasia.

Survival Among the Neuroendocrine Neoplasia Group

The mean duration of follow-up was 49.2 (1-102) months. Two patients died on the course of follow-up. While one of the patients died after 19 months, another died 1 month after the diagnosis because of intestinal ischaemia and perforation. Follow-up of other included patients are still on-going. No recurrence or metastases were detected at this time.

Discussion

Appendiceal neuroendocrine neoplasia originates from the enterochromaffin and enteroglucagon cells that are diffuse endocrine system cells located in the mucosa and

Table 2. Relationship between the tumour size and other parameters in patients with neuroendocrine tumour

	Tumour size <1 cm n (%)	Tumour size >1 cm n (%)	Total n (%)	p*
Tumour localisation				
Tip	32 (88.9%)	4 (28.6%)	36 (72%)	
Body	4 (11.1%)	5 (35.7%)	9 (18%)	**0.000**
Tip + body	0 (0%)	5 (35.7%)	5 (10%)	
Tumour dissemination (depth of invasion)				
Submucosa	13 (36.1%)	1 (7.1%)	14 (28%)	
Muscular tissue	14 (38.9%)	3 (21.4%)	17 (34%)	**0.008**
Subserosa/mesoappendix	9 (25%)	10 (71.4%)	19 (38%)	
Lymphovascular invasion				
Positive	1 (2.8%)	2 (14.3%)	3 (6%)	0.186
Negative	35 (97.2%)	12 (85.7%)	47 (94%)	
Histological grade6 (according to the Ki-67 proliferative index)				
Grade I	34 (94.4%)	10 (71.4%)	44 (88%)	**0.044**
Grade II	2 (5.6%)	4 (28.6%)	6 (12%)	

*Chi-square test

submucosa.[2,6] The proliferative phenomenon, which is described as early neuroendocrine cell proliferation, can usually be detected microscopically. However, there is no clear information regarding the underlying medical or genetic structure, which can predispose patients to this proliferation.[2] Appendiceal NETs are observed as the fifth most frequent type of NETs among gastrointestinal NETs, followed by the small intestine, rectum, pancreas and stomach.[6] It is the most frequently observed tumour group among the primary tumours of the appendix, but its incidences vary between 0.3% and 0.6%.[2,3,7] NETs are generally detected incidentally during histopathological examination of patients who underwent surgery for acute appendicitis.[8,9] Thus, sufficient macroscopic sampling and careful microscopic examination are crucial to detect these tumours. In this study, neuroendocrine cells were of microscopic size and were detected incidentally. In addition, the frequency of NETs was higher than that reported in the literature. These findings show the importance of microscopic and macroscopic examinations.

These tumours, which can be observed in every age group and mostly on women, more often occur in the second and third decades of life.[9] In this study, they were more often detected in male (70%) patients, which is different from what the literature suggested. NET may be found among appendiceal epithelial tumours in the paediatric group; although no study reported its frequency, it is a rare phenomenon just as NETs in adults.[10] In this study, only a few patients in the paediatric age group had NETs.

NETs may be missed easily in radiological examinations because of their small sizes. Most of these tumours are localised in the tip, and 80% are <1 cm in size.[2,6,8] The tumour localisation and sizes in this study were compatible with literature data.

NETs are graded according to the mitotic activity and Ki-67 proliferative index.[11] According to the World Health Organization, NET grade I is designated by a mitotic count of <2 per 2 mm^2 (40x magnification) and Ki-67 <3%, NET grade II by a mitotic count of 2-20 per 2 mm^2 and Ki-67 3%-20%, NET grade III by a mitotic count of >20 per 2 mm^2 and Ki-67 >20% and neuroendocrine carcinoma (NEC) by a mitotic count of >20 per 2 mm^2 and Ki-67 >20%. In 81%-91% of the cases, the Ki-67 ratio of the tumours was <3%, which were found to be grade I tumours (2,6). Grade II tumour diagnosis is less frequent (9%-14%). Mixed neuroendocrine-nonneuroendocrine neoplasm (MINEN), which is in the NET grade III, NEC and collision tumour groups, is quite rarely found in the appendix.[6,7,12] NET cases that were included in our study had grade I and grade II differentiations. No patients were diagnosed with grade III, NEC or MINEN.

Collision tumours are described as the clonal proliferation of two histologically different tumour types that are independent of each other and consequently regarded to

Table 3. Relationship between the grade and other parameters in patients diagnosed with neuroendocrine tumour

	Grade I n (%)	Grade II n (%)	Total n (%)	p*
Tumour localisation				
Tip	34 (77.3%)	2 (33.3%)	36 (72%)	
Body	6 (13.6%)	3 (50%)	9 (18%)	0.061
Tip + body	4 (9.1%)	1 (16.7%)	5 (10%)	
Tumour size				
1 cm↓	34 (77.3%)	2 (33.3%)	36 (72%)	**0.044**
1 cm↓	10 (22.7%)	4 (66.7%)	14 (28%)	
Tumour dissemination (depth of invasion)				
Submucosa	14 (31.8%)	0 (0%)	14 (28%)	
Muscular tissue	16 (36.4%)	1 (16.7%)	17 (34%)	**0.045**
Subserosa/mesoappendix	14 (31.8%)	5 (83.3%)	19 (38%)	
Lymphovascular invasion				
Positive	1 (2.3%)	2 (33.3%)	3 (6%)	**0.035**
Negative	43 (97.7%)	4 (66.7%)	47 (94%)	

*Chi-square test

be in the same tumour group that includes NETs and low-grade mucinous neoplasia.[4,5,12] These tumours, which are observed as neoplasia that are independent of each other, but still adjacent, are quite rare and usually reported as case reports. Because they are rarely observed, there is no recommended method for patient management regarding postoperative follow-up. High emphasis is placed on radiological screening with regular intervals and on tumour indicators if they increased before the surgery.[5,12] In our study, two patients were diagnosed with collision tumour. The secondary neoplasia that accompanied NET was a DDMN. In the literature, DDMNs are mostly observed in women.[13] While NETs were more often observed in men in this study, both NET cases were found in women. Owing to the negative surgical margins and low recurrence rates of this tumour type, clinical follow-ups were regarded sufficient for the postoperative management.

Appendectomy is sufficient for the treatment of NETs <1 cm and with negative surgical margin. Right hemicolectomy is the recommended additional treatment for tumours >2 cm with lymphovascular invasion or tumours that showed deep infiltration in the mesoappendix, which are among the parameters associated with prognosis.[1,8,9] In this study, some patients had tumours >2 cm, and some had lymphovascular and mesoappendix invasion. However, hemicolectomy was performed in patient with tumour >2 cm. For other patients who were clinically followed, no recurrence or metastases were detected during their follow-ups.

The tumour size and localisation, histological grade, lymphovascular invasion and infiltration in the mesoappendix are among the prognostic factors of appendiceal NETs.[2,7,14] Having tumour >2 cm, lymphovascular invasion and mesoappendix infiltration may increase the probability of nodal metastases. While no clear relationship was shown between tumour localisation and prognosis, tumours localised in the surgical margins of the appendix may be appropriate candidates to prove such relationship in terms of incomplete excision and recurrence.[7] In previous studies, while most Grade I and II cases showed a more silent clinical picture, a more common picture regarding the illness may be observed in a smaller number of patients.[15] While a study reported that the proliferative index is not correlated with survival[16], another study reported that the metastatic potential may be related to the Ki-67 proliferative index.[17] In the present study, lymph node metastasis was detected in patients with Ki-67 proliferative index over 2%. This emphasises that the probability of metastasis may increase as the grade increases and that these cases should be followed up more closely. Only a few studies in the literature have evaluated the relationship between prognostic parameters. A study did not found a correlation between the mesoappendix infiltration and tumour size.[18] In this study, we examined the relationship between sex, tumour size, histological grade and other tumour parameters. A significant relationship was detected between the tumour size and localisation, dissemination (depth of invasion) and histological grade. Tumours >1 cm were more frequently localised in the tip, more frequently showed subserosa/mesoappendix infiltration, which differs from the literature, and had more grade II histological differentiation. In addition, a significant relationship was detected between the grade's tumour size and its dissemination (depth of invasion) and lymphovascular invasion. Accordingly, grade II differentiation was often detected in tumours >1 cm and in tumours that showed subserosa/mesoappendix infiltration. Moreover, tumours without lymphovascular invasion were mostly grade I tumours.

The prognosis of the NETs is usually very good, and the 5-year survival rate varies between 95% and 100%.[6] In our study, except for the 2 patients who died 1 month and 24 months after their diagnosis, other patients are still on follow-up.

Conclusion

In conclusion, the frequency of NETs that were diagnosed by histopathological examination in this study was slightly higher than that in the literature. Our two cases of collision tumour diagnosis, which consisted of NET accompanied by low-grade mucinous neoplasia, were among the quite rare cases in the literature. Two different tumours can coexist in the appendix, as may be seen in our study. The possibility of a NET that may be accompanying another tumour, as we detected in the appendix, and the possibility of another tumour in the appendix in which NET had been detected should always be considered.

Ethics

Ethics Committee Approval: University of Health Sciences Turkey, Prof. Dr. Cemil Taşçıoğlu City Hospital (number: 48670771-514.10).

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Concept: S.Ş.E., D.K.A., Design: S.Ş.E., D.K.A., S.H.K., A.A., Data Collection or Processing: S.Ş.E., D.K.A., A.A., Analysis or Interpretation: S.Ş.E., S.H.K., A.A., Literature Search: S.Ş.E., D.K.A., Writing: S.Ş.E., D.K.A., S.H.K., A.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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RESEARCH ARTICLE

A Cross Sectional Evaluation of Patients with Ostomy in Turkey

Türkiye'de Stoma Açılan Hastaların Kesitsel Değerlendirilmesi

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ABSTRACT

Aim: Despite recent technological developments, a stoma formation is needed for the treatment of many diseases, especially in colorectal surgery. Due to the radical principles of cancer treatment, the number of patients living with stoma is increasing. However, there is no study that quantitatively evaluates the stoma patients nationally. In this study, it was aimed to retrospectively evaluate the demographic data, indications, preferred types of stoma and the outcomes of patients who had a stoma formation in our country in the last three years.

Method: In our country, there are 3 companies that operate in the field, provide materials for 95% of stoma patients. The data of patients who had a stoma between 2017 and 2019 were collected from these companies retrospectively by protecting personal privacy of patients. The distribution of indications and type of stoma acording to indications were determined. Average age, stoma closure rates and mortality rates were calculated. All data are presented as numbers and percentages and categorical variables are shown as median (minimum-maximum), continuous variables are shown as ± standard deviation.

Results: The most common indication for stoma creation was colorectal malignancy (58.4%) and followed by mechanical bowel obstructions (29.6%). Other malignancies (4.16%), inflammatory causes (4.58%), traumatic causes (1.88%) and congenital anomalies (1.17%) constituted a total of 11% stoma indications. It was observed that. ostomies opened due to colorectal malignancy,were closed in 40% of patients with loop ileostomy, 30.1% of patients with loop colostomy, and only 13% of patients with end colostomy.

Conclusion: We aimed to obtain a national perspective by evaluating the patients who had a stoma in the last 3 years and to show up the distribution of stoma formation indications in our country. We have determined the demographic data of patients with stoma and calculated the stoma closure and mortality rates according to stoma types. Although this study is a cross-sectional evaluation of patients in the whole country, weak point of our study is there are deficiencies in our evaluation due to the lack of retrospective data. We think that prospective studies should be planned by detailing subgroups.

Keywords: Ileostomy, colorectal malignancy, colostomy, stoma

ÖZ

Amaç: Ülkemizde stomalı bireyleri niceliksel olarak inceleyen çalışma henüz bulunmamaktadır. Bu çalışmada ülkemizde son üç yıl içinde stoma açılmış olan hastaların demografik verilerinin, endikasyonlarının, tercih edilen stoma tiplerinin ve hastaların akıbetlerinin retrospektif olarak değerlendirilmesi amaçlanmıştır.

Yöntem: Ülkemizde stoma alanında faaliyet göstermekte olan ve stoma hastalarının stoma malzemelerini sağlayan 3 firmanın 2017-2019 yılları arasında, malzeme temin ettiği stoma hastalarının bilgileri, kişisel verilerin gizliliği kurallarına dikkat edilerek retrospektif olarak derlenmiştir. Endikasyona göre hastalara hangi tip stoma açıldığı, bu hastaların cinsiyete göre dağılımı (minimum-maksimum), yaş ortalamaları, stoma kapatılma oranları, ölüm oranları hesaplanmıştır.

Bulgular: En sık stoma oluşturma endikasyonunun kolorektal malignite olduğu ve tüm stomaların %58,4'ünü oluşturduğu görüldü. Bunu mekanik barsak tıkanıklıkları (%29,6) takip etmekte idi. Diğer maligniteler (%4,16), enflamatuvar sebepler (%4,58), travmatik sebepler (%1,88) ve doğumsal

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anomaliler (%1,17) toplamda yaklaşık %11 oranında stoma açılmasına endikasyon oluşturmaktaydı. Kolorektal malignite nedeni ile açılan stomalar değerlendirildiğinde loop ileostomi uygulanan hastların %40'ının, loop kolostomi uygulanan hastaların %30,1'inin stoması kapatılabilmişken, uç kolostomi uygulanan hastaların sadece %13'ünün stomasının kapatıldığı görülmüştür.

Sonuç: Ülkemizde son 3 yıl içinde stoma açılmış olan hastaları değerlendirerek ulusal anlamda geniş bir perspektif elde etmeyi amaçladık. Stoma ile yaşamak durumunda olan hastaların demografik verilerini, kaçının stomasının kapatılabildiğini ve stoma tiplerine göre stoma kapatılma ve ölüm oranlarını tespit ettik. Stomalı bireylerin analizini gerçekleştirdiğimiz bu çalışma, ulusal anlamda gerçekleştirilen ilk çalışma olmasına rağmen, retrospektif verilerdeki eksiklikler nedeni ile değerlendirmemizde yetersizlikler mevcuttur. Alt grupların detaylandırılarak, prospektif özellikte çalışmaların planlanması gerektiğini düşünüyoruz.

Anahtar Kelimeler: İleostomi, kolon kanseri, kolostomi, stoma

Introduction

The word "ostomy" is derived from the word "stoma" which means "mouth" in ancient Greek. Medically, it is an artificial opening where a luminal organ in the abdomen is mouthed to the abdominal wall by surgical intervention. It is frequently used in conditions such as inflammatory bowel diseases, trauma, congenital anomalies, mechanical bowel obstructions, and especially colorectal cancer.[1,2] Stomas can be permanent or temporary according to their indication, or they are named as "end" or "loop" according to the type of anastomosis created between the intestine and the abdominal wall. The most common types of stoma created are transverse colostomy and ileostomy.[3]

Anastomotic leakage is a serious problem in colorectal surgery. It is seen in approximately 10-15% of patients.[4] It has been reported that anastomotic leakage after rectum resection results in mortality with a probability of 6-22%.[5] Many studies have shown that diverting stomata do not reduce the rate of anastomotic leakage.[6] However, stomata accelerate healing by preventing local and systemic septic reactions in case of a clinical leak.[7] When comparing protective ileostomy created after distal colorectal resection and colostomy, ileostomy was found to be superior in terms of infection, hernia and complications related to stoma.[8] In a multi-center randomized study, it has been shown that a stoma that is planned to be temporary has a 19% chance of being permanent.[9] Although the chance of stoma closure depends to some extent on the urgency of ostomy formation; risk factors such as advanced age (>65 years of age), major comorbidity (American Society of Anesthesiologists score >2), surgical complications and advanced tumor are emphasized in the literature.[10,11]

Our study aimed to obtain quantitative data by reviewing information such as which type of stoma general surgeons preferred according to indications, stoma closure rates, number of patients with stoma and death. Especially in accordance with the radical treatment principles of patients with cancer, the number of patients who survive with stoma is gradually increasing. However, it is not possible to determine the number of patients with stoma at any time, as a different number of stomata are created and closed every day.[12] With the advancement of information and technology use, the number of studies in this field is increasing. Systematic reviews have been published in the world literature on issues such as stoma and peristomal complications, morbidity, and stoma care and management.[13,14,15,16] However, there is no study examining individuals with stoma quantitatively in Turkey yet.

In this study, we aimed to retrospectively evaluate the demographic data, indications, preferred types of stoma and the outcomes of patients who had a stoma in our country in the last three years as the "Stoma Study Group" established within the Turkish Society of Colon and Rectal Surgery. With the results to be obtained from these data, it was aimed to reveal the tendencies of surgeons working in our country about stoma, to determine the distribution of patients in our country by evaluating the number of patients who needed stoma annually, and to better organize the training/service needs in this field.

Materials and Methods

This study was approved by the İstanbul Medipol University Non-invasive Ethics Committee (date: 26.11.2020, decision no: 863). Age, gender, surgery dates, surgery indications, stoma types (loop stoma, end stoma, colostomy, ileostomy, etc.) of the patients who were provided stoma materials between 2017-2019 were requested in Microsoft Excel® format without address, telephone number and identity information to protect personal data from 3 companies operating in the field of stoma in our country. Data on a total of 28,316 individuals with stoma were accessed and screened by a single investigator. Of the patients 3,701 were excluded from the study because they received stoma service due to urostomy. Of the remaining 24,615 patients, 1,516 were excluded from the study because of missing information on their diagnoses and 542 were excluded because of missing information on which type of stoma was created, and the evaluation was made on a total of 22,557 patients. Stomata created with the diagnosis of colon cancer, rectal cancer, congenital anorectal anomalies, urological and gynecological

malignancies, benign inflammatory diseases, trauma and mechanical bowel obstruction were classified according to stoma type and years (Table 1). Indications such as diverticular disease, inflammatory diseases such as ulcerative colitis and Crohn's colitis, enterocutaneous fistula, enteroenteral fistula, large pressure sores, volvulus, and intestinal obstruction due to adhesion were evaluated as benign diseases. Stomata created due to urological and gynecological malignancies were evaluated as malignant diseases. According to the indication, which type of stoma was created in the patients (loop ileostomy, end ileostomy, loop colostomy, end colostomy), distribution of these patients by gender, mean age, stoma closure rates, and death rates were calculated. All data are given as numbers and percentages.

Results

When we evaluated patients who had stoma between January 2017 and December 2019 in Turkey, it was seen that 8,260 (36.6%) patients had stoma in 2017, 7,261 (32.2%) in 2018 and 7,036 (31.2%) patients in 2019. Of the patients 13,546 (60%) were male, 9,011 (40%) were female. When the distribution of patients was examined according to the type of stoma created, it was determined that 32.4% (7,297) had loop colostomy, 32% (7,218) loop ileostomy and 27% (6,272) end colostomy. The least created ostomy type was 7.8% (1,770) end ileostomy (7.8%/1,770). It was found that within 3 years, 27.8% (6,274) of patients with stoma had their stoma closed, and 17.3% (3,924) died (Table 1).

It was observed that the most common indication for stoma creation was colorectal malignancy (13,198 patients) and constituted 58.4% of all stomata. Mechanical intestinal obstructions (29.6%) followed colorectal malignancy. Other malignancies (4.16%), inflammatory causes (4.58%), traumatic causes (1.88%) and congenital anomalies (1.17%) were indications of stoma creation at a total rate of approximately 11% (Table 2). When we evaluated these numbers according to years, it was seen in Table 2 that the number of stoma creation in each indication tended to decrease in three years.

When we evaluated the colorectal malignancies, we found that 4,886 (37%) patients had loop colostomy, 3,609 (27.3%) patients loop ileostomy, 3,832 (29%) patients end colostomy, and 871 (6.5%) patients underwent end ileostomy. It was observed that stoma was closed in 40% of patients who underwent loop ileostomy and 30.1% of patients who underwent loop colostomy, while stoma was closed in only 13% of patients who underwent end colostomy. When the mortality rates of colorectal malignancies with stoma were evaluated according to the type of stoma, it was determined that 15.1% of patients with loop ileostomy, 17.4% of patients with end ileostomy, 21.1% of patients with loop colostomy and 19.3% of patients with end colostomy died. Three-year total closure rate of stoma in patients with colorectal malignancy was 27.8%, while the rate of patients who died was 18.9%. The three-year total closure rate of stoma in male patients was 27.3%, and the rate of patients who died was 17%. In women, these rates

Table 1. Demographic data

		Stoma number	%
Gender	Male Female	13,546 9,011	60 40
Age		Mean: 57.2	
Distribution by years	2017 2018 2019	8,260 7,261 7,036 22,557	36.6 32.2 31.2
Stoma type	Loop ileostomy End ileostomy Loop colostomy End colostomy	7,218 1,770 7,297 6,272	32 7.8 32.4 27.8
Stoma closure		6,274 (mean age: 53.8)	27.8
Ex		3,924 (mean age: 63.3)	17.3

were determined as 28.5% and 22%, respectively (Table 3). It was observed that stoma was created in 1,035 (4.58%) patients due to benign inflammatory reasons, 260 (25.1%) of these patients were subjected to stoma closure procedure, and 100 (9.6%) patients died. It was found that 106 (24.9%) of 425 (1.88%) patients with stoma created due to trauma were closed, while 28 (6.5%) patients died. In mechanical bowel obstruction, which was the second most common cause of stoma creation after colon cancer, it was found that the stoma of 29.6% of the patients was closed within 3 years, and 16.4% of them died. Only mortality rate in advanced gynecological and urological malignancies was higher (18.5%) than stoma closure rate (15.2%) (Table 4).

Table 2. Distribution of stoma indications by years

Category	2017	2018	2019	Total	%
Colon cancer	2,275	2,323	2,186	6,784	30
Rectal cancer	2,487	2,032	1,895	6,414	28.4
Congenital anomalies	106	83	76	265	1.17
Other malignancies	315	351	274	940	4.16
Inflammatory causes	318	353	364	1,035	4.58
Traumatic causes	180	127	118	425	1.88
Mechanical intestinal obstruction	2,579	1,992	2,123	6,694	29.6
Total	8,260	7,261	7,036	22,557	

Table 3. Stoma closure of colorectal malignancies and number of deaths

Stoma type	Gender	Stoma number/%	Stoma closure/%	Ex/%
Loop ileostomy	Female	1,414/10.7	621/44	263/18.5
	Male	2,195/16.6	827/37.6	315/14.3
	Total	3,609/27.3	1,448/40.1	578/15.1
End ileostomy	Female	332/2.5	80/24	77/23.2
	Male	539/4	110/20.4	75/13.9
	Total	871/6.5	190/21.8	152/17.4
Loop colostomy	Female	1,896/14.5	573/30.2	469/27.7
	Male	2,990/22.5	943/31.5	562/18.7
	Total	4,886/37	1,516/31	1,031/21.1
End colostomy	Female	1,532/11.6	02/13.2	326/21.2
	Male	2,300/17.4	318/13.8	416/18
	Total	3,832/29	520/13.5	742/19.3
Total		13,198	3,674/27.8	2,503/18.9

Table 4. Stoma closure and number of deaths in patients with stoma created except for colorectal malignancy

Indication	Stoma number/%	Stoma closure/%	Ex/%
Congenital anomalies	265	104/39.2	17/6.4
Benign inflammatory causes	1,035	260/25.1	100/ 9.6
Traumatic causes	425	106/24.9	28/6.5
Mechanical bowel obstruction	6,694	1,987/29.6	1,102/16.4
Other malignancies	940	143/15.2	174/18.5
Total	9,359	2,600/27.7	1,421/15.1

Discussion

In this cross-sectional study, we aimed to reveal the tendencies of surgeons working in our country about stoma, and to determine the distribution in our country by evaluating the number of patients who needed stoma annually. We aimed to create a national prediction by determining the percentage of deaths of patients with stoma, stoma closure rate, stoma indications and stoma types. Although it is not prospective, we think that this study, which is a cross-sectional evaluation of our country, is important in terms of providing information to healthcare professionals working in the field of general surgery.

When we evaluated the patients who had stoma from January 2017 to December 2019, we saw that stoma was created in 9,438 patients annually. When we excluded patients with urostomy, the average number of stoma created was 8,205 per year, and it was shown that the most important cause of stoma creation was colorectal cancer.

Since there is no comprehensive study on this subject in our country, data on the number of patients with stoma is insufficient. In our study, when we reviewed the data of 3 companies operating in our country that provided materials to patients with stoma, we saw that the number of stoma created in 3 years was 28,316. The number of patients with stoma in the world is not clearly known. The German Ostomy Society, a charity organization, acknowledges that it will not be possible to measure the actual number of patients with ostomy at any given time.[17] It was reported that approximately 700,000 individuals from all age groups had stoma (ileostomy, colostomy or urostomy) in the member countries of the European Union Commission in 2011.[18] In China, it is stated that approximately 1 million people have permanent colostomy.[19] Different data and future predictions stand out in the ostomy report published by the European Ostomy Association in 2017, according to the countries. According to this report, the number of patients with ostomy in Germany is given as approximately 150,000 and it is stated that these numbers are not accurate.[20] Data from Denmark and England show that 2,000 people per million in Northern Europe currently live with stoma.[21,22] It is estimated that the number of patients with stoma in Spain, of which population is 47 million, is approximately 70,500.[23] It is thought that 500,000 people have stoma in the United States and 120,000 new surgeries are performed each year. The United Ostomy Associations of America predicts that this number will grow at an annual rate of 3%.[24] Although an increase in the number of stomata created every year in the United States was expected, it was determined that 8,260 stomata were created in 2017, 7,261 in 2018 and 7,036 in 2019 in our country, and it was observed that the number of patients with stoma creation tended to decrease every year.

In our study, the average age of patients with stoma was 57.25. It was stated that the average age of patients with a stoma in the United States of America is 68.[24] According to the data published by the European Ostomy Association, 46,000 of 70,500 patients with stoma in Spain were over the age of 45 and half of them were over 65 years old.[23] We see that the average age of individuals with stoma in our country is low compared to the United States of America and European countries. Since the average age of patients with stoma is low in our country, the necessity to increase the quality of life of patients is more critical for our country, which has young patient polpulation with stoma.

In our study, 58.4% of patients with stoma were operated due to colorectal malignancy, while this rate was higher in the Netherlands with 67%. The rate of stoma (41.6%) created for reasons other than malignancy such as trauma, congenital anomaly and inflammatory diseases was found to be higher in our study compared to the Netherlands (33%).[25] According to GLOBOCAN 2018 (Estimated world cancer incidence, deaths and frequency) data of the International Agency for Research on Cancer-IARC; colorectal cancer was the third most common cancer among men and women in the world, and more than half (55%) of colorectal cancers were seen in developed countries.[26] In our study, we saw that there were 6,694 patients who were operated due to mechanical intestinal obstruction, although the rate of stoma created due to colorectal cancer was lower compared to European countries. It was not known how many of these patients who had a stoma due to mechanical bowel obstruction were due to colorectal malignancy. We could say that the number of patients with stoma created due to colorectal malignancy seemed low (58.4%) for this reason in our study. However, considering that some of the patients with stoma created due to mechanical bowel obstruction were created due to colorectal malignancy, we could say that the data in our study were compatible with the literature.

It was observed that 60% of 22,557 patients included in our study had colostomy and 40% had ileostomy or jejunostomy. Loop ileostomy, end ileostomy, loop colostomy and end colostomy were performed on the patients, and the rates were found to be 32%, 7.8%, 32.4% and 27.8%, respectively. However, we could not find any data about whether the created stomata were temporary or permanent. Considering the colorectal malignancies, it was determined that 40% of the patients who underwent loop ileostomy and 30.1% of the patients who underwent loop colostomy were able to be closed, while the stoma of only 13% of the patients who underwent end colostomy was closed. When the mortality rates of colorectal malignancies with stoma were evaluated according to the type of stoma, no significant difference was

found. There was no significant difference in stoma closure and mortality rates in male and female patients according to the type of stoma and indications. However, apart from congenital anomalies, we could say that the closure rates of stomata due to benign causes were much lower than colorectal malignancy (Table 4).

The 2-month cost of a patient with stoma in our country to the Social Security Institution has been determined as 491 TL. The annual stoma care cost of a patient with stoma is approximately 3,000 TL.[27] However, most of the patients use a more comfortable and high quality stoma model by paying additional fees, and it is thought that the cost is much higher than expected throughout the country. As in all European countries and the United States of America, the total number of patients with stoma is not clearly known in our country. According to the data we have collected, stoma is created in an average of 9,438 patients annually in our country and the cost of stoma in our country increases by 30 million Turkish Liras each year.[28] Although the number and cost of patients whose stoma expenses are paid by private health insurance or who is without insurance are not known, it is possible to predict that the costs we give may be higher. When compared with Europe, it is seen that the cost of stoma per person is approximately the same as in our country.[24]

The history of cancer registry activities in Turkey is not very long. With the introduction of mandatory cancer notification, the "Cancer Control Department" was established in 1983 with the Legislative Decree No. 181 to carry out cancer registration activities. One of the main duties of the Cancer Control Department is to collect qualified cancer records in a reliable and accurate manner. Looking at the picture on a global scale, Hamburg Cancer Registration Unit was established in 1926. The cancer registry in Slovenia has been publishing incidence, prevalence and survival rates in the Slovenian population since 1950. As these examples showed, cancer registry activities started in the early 1900s in many developed countries on a global scale. In Turkey, the collection of cancer data was started in 2000 with the "Cancer Registration Center Regulation". For this reason, we think that efforts to establish a strong registry system, which is the first step of cancer control in our country, are insufficient. Turkey is a member of international organizations such as International Agency for Research on Cancer (IARC), The Middle East Cancer Consortium, European Network For Cancer Registries and Union for International Cancer Control. We would like to emphasize the importance of attending congresses and meetings organized annually by these organizations on cancer registration. We think that obtaining accurate cancer data, which we consider to be the most important stage of the cancer control program, should be considered more important. Although serious improvements have been made in the quality of our data, we can say that there is not an adequate registry system. The data of patients who have to live with stoma should be recorded and cost analysis should be made. We believe that with the improvement in the registry system, it is necessary to follow the patients for whom the stoma closure procedure can be performed and to direct them to reference centers, both to increase patient comfort and to reduce stoma care costs nationally.

Conclusion

In our study, we aimed to obtain a national perspective by evaluating the patients who had a stoma in the last 3 years in our country. As the "Stoma Study Group" established under the roof of the Turkish Colon and Rectum Surgery Association, this study, in which we analyzed individuals with stoma, had the distinction of being the first nationally conducted study. There were inadequacies in our evaluation due to the deficiencies in the retrospective data, and this constituted the limitation of our study. It should be planned to carry out prospective studies by detailing the subgroups.

Ethics

Ethics Committee Approval: İstanbul Medipol University Non-invasive Ethics Committee (decision no: 863/date: 26/11/2020).

Informed Consent: Retrospective study.

Peer-review: Externally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: İ.S., A.K., Concept: G.Y., D.H., M.İ.P., H.Ç., İ.S., A.K., Design: G.Y., D.H., M.İ.P., T.M., H.Ç., İ.S., A.K., Data Collection or Processing: G.Y., D.H., T.M., H.Ç., İ.S., A.K., Analysis or Interpretation: G.Y., D.H., M.İ.P., H.Ç., İ.S., A.K., Literature Search: G.Y., D.H., T.M., H.Ç., İ.S., A.K., Writing: D.H., İ.S., A.K.

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RESEARCH ARTICLE

Transanal Minimally Invasive Surgery (TAMIS) Using Single Incision Laparoscopic Surgery (SILS) Port for the Management of Benign Rectal Neoplasms: A Single Center Study

SİLS Port Kullanılarak Yapılan Transanal Minimal İnvaziv Cerrahi (TAMIS): Tek Merkez Kısa Dönem Sonuçları

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ABSTRACT

Aim: Conventional transanal excision was described decades ago for treatment of benign rectal neoplasms. However, the chalanges of this technique leads to use alternative approachs. We evaluated the results of transanal minimally invasive surgery (TAMIS) with single incision laparoscopic surgery (SILS) port in treatment of benign rectal neoplasms.

Method: Data of the patients who underwent TAMIS with SILS port in one center were retrospectively analyzed. SILS port was placed through in the anal canal and ultrasonic sealing device was used for excision the tumors. Complications during or after surgery were reported. Patients were followed-up by rectal examination with rectoscopy and recurrences were evaluated.

Results: Between July 2015 and March 2020, 20 patients underwent TAMIS at one center. The median age of the patients was 67 (37-79). The procedure was performed in all of the patients with a lithotomy position. Full-thickness defect after complete resection of the lesion was observed in 5 (25%) patients. However, abdominal cavity was not exposed through the TAMIS procedure in any of the patients. The rectal wall defect was not repaired in any of the patients. No major complication occured in the patients. The hospital stay was 1 (1-4) days. The surgical margin was negative in 19 patients (95%). After the follow-up period of 9 (1-43) months, 3 (17%) patients had a recurrence and further surgery was performed.

Conclusion: TAMIS using SILS port for the management of rectal neoplasms is a safe and effective for treatment benign rectal lesions.

Keywords: Rectal adenoma, single-incision laparoscopic surgery port, TAMS

ÖZ

Amaç: Benign rektal neoplazmların tedavisi için geleneksel transanal eksizyon on yıllar önce tanımlanmıştır. Bununla birlikte, bu tekniğin zorlukları, alternatif yaklaşımların kullanılmasına yol açar. Bu çalışmada benign rektal neoplazmların tedavisinde tek insizyon laparoskopik cerrahi (SILS) portu ile transanal minimal invaziv cerrahi (TAMIS) sonuçlarını değerlendirdik.

Yöntem: Merkezimizde SILS portu ile TAMIS uygulanan benign rektal neoplazmalı hastaların verileri retrospektif olarak incelendi. SILS portu anal kanal içerisine yerleştirildi ve tümörlerin eksizyonu için ultrasonik mühürleme cihazı kullanıldı. Ameliyat sırasında veya sonrasında komplikasyonlar rapor edildi. Hastalar proktoskopi ve rektal muayene ile takip edilerek nüksler değerlendirildi.

Bulgular: Temmuz 2015 ile Mart 2020 arasında 20 hastaya TAMIS uygulandı. Hastaların ortanca yaşı 67 (37-79) idi. Tüm hastalarda litotomi posizyonunda ameliyat edildi. 5 (%25) hastada lezyonun tam olarak çıkarılmasından sonra tam kat defekt görüldü. Ancak hiçbir hastada abdominal boşluğa girilmedi. Hiçbir hastada rektal duvar defekti onarılmadı. Hastalarda majör komplikasyon izlenmedi. Hastanede kalış süresi 1 (1-4) gündü. 19 hastada (%95) cerrahi sınır negatifti. 9 (1-43) aylık takip süresinden sonra 3 (%17) hastada nüks görüldü ve ileri cerrahi yapıldı.

Sonuç: Rektal neoplazmların yönetimi için SILS portunu kullanılan TAMIS, benign rektal lezyonların tedavisi için güvenli ve etkilidir.

Anahtar Kelimeler: Rektal adenom, transanal minimal invaziv cerrahi, TAMİS

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Introduction

Transanal excision (TAE) was described decades ago for the treatment of early-stage rectal cancers and benign neoplasia of the rectum. However, this conventional approach has some limitations such as difficult accessibility in some tumour locations, and difficulties may occur during surgery.[1] This approach limited the surgeon's ability to perform high-quality oncological excisions. Therefore, minimally invasive techniques were introduced as an alternative approach to overcome the disadvantages of conventional TAE. One of the minimally invasive techniques was transanal endoscopic microsurgery, which was introduced in early 1980s; since then, it demonstrated greater effectiveness than traditional TAE for the resection of rectal masses.[2] However, some limitations and disadvantages such as cost-effectiveness and specialised instrumentation requirements limit the widespread use of this technique. Therefore, transanal minimally invasive surgery (TAMIS) was described more recently as an alternative and more cost-effective technique with similar function.[3] Intraluminal full-thickness excision of rectal neoplastic lesions can be achieved easily by TAMIS. This technique is cost effective and does not require special instruments; thus, it was described as a giant leap forward in this field.[4]

In this study, we evaluated the short-term outcomes of patients with benign rectal neoplasms who underwent TAMIS using the single-incision laparoscopic surgery (SILS) port in a single centre.

Materials and Methods

Data of patients with benign rectal neoplasm who underwent rectal lesion excision using TAMIS in one centre were retrospectively analysed. Patients who underwent colonoscopic evaluation and pathological confirmation for adenoma that cannot be removed with colonoscopy were included in this study. Patients who have undergone rectal surgery, diagnosed with rectal cancer, and declined surgery by TAMIS technique were excluded. Preoperative workup including digital rectal examination, complete blood count, liver function tests, coagulation profiles and total colonoscopy was performed in all patients. The distance from the anal verge was measured during colonoscopy. All procedures were carried out after obtaining informed consent from the patients. Antithrombotic prophylaxis by low-molecular-weight heparin and mechanical bowel preparation was applied in all patients before surgery.

This study was approved by Marmara University Faculty of Medicine Ethics Committee, and all patients provided written informed consent.

TAMIS Technique

The patient was placed in the lithotomy position, general anaesthesia was inducted and anal dilatation was subsequently performed. The SILS port (Covidien, Mansfield, MA, USA) was placed through the anal canal and fixed to the anoderm by four stiches with No. 1 silk sutures in four different sides (Figure 1). Pneumorectum was established with CO_2 insufflation through the SILS port. A 5-mm 30° laparoscopic camera was inserted through the 5-mm trocar. The rectum was explored up to the upper part. Then, the mucosa adjacent to the tumour was grasped by a non-rotaticulated grasper to elevate the lesion (Figure 2). Laparoscopic harmonic scalpel (Ultracision™, Model HAR 36, Ethicon Endo-surgery, Cincinnati, OH, USA) was used for tumour dissection and excision (Figure 3). After haemostasis was completed, the specimen and the single port were removed simultaneously (Figures 4 and 5). Demographic characteristics, tumour localisation, pathological features, postoperative mortality, morbidity and recurrence rates were analysed. Patient follow-up was performed according to the pathological examination results of the specimen. Patients with benign pathology were followed up by rectal examination and rectoscopy every 3 months in the first year and every 6 months in the second year. Colonoscopy was performed annually after the second year for patients without any recurrences. Patients diagnosed with cancer based on the definitive pathological report or developed recurrent adenoma undergo further surgery by low anterior resection or abdominoperineal resection (APR).

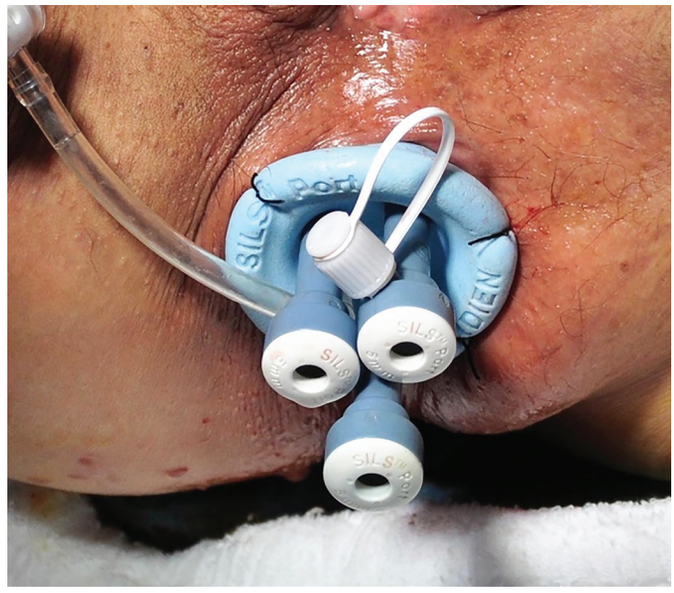

Figure 1. Single-incision laparoscopic surgery port was placed through the anal canal

Results

Between July 2015 and March 2020, 20 patients with rectal adenoma who were admitted to Marmara University General Surgery Department were eligible for the TAMIS technique. The median age of the patients was 67 (37-79) years, and 10 (50%) were male. The most common presentation of the patients was rectal bleeding (n=9, 45%), followed by constipation and anaemia. Tenesmus, pain and mucus defecation were less common symptoms upon presentation. The median distances of the rectal tumours from the anal verge were 6.4 (2-10) cm. The median tumour diameter was 3 (2-5) cm. Pathology reports of colonoscopic biopsies revealed tubulovillous adenoma in all patients. The American Society of Anaesthesiologist (ASA) score was 1 or 2 in most (82%) patients. Full-thickness defect after complete resection of the lesion was described by exposing the perirectal adipose tissue, which was observed in 5 (25%) patients (Figure 6). However, the abdominal cavity was not exposed through the TAMIS procedure in any of the patients. The rectal wall defect was not repaired in any of the patients. Postoperative computed tomography of cases with full-thickness defects showed free air at the perirectal area, but free abdominal air was not observed in any of them. TAMIS was not converted to open or laparoscopic surgery. Oral nutrition was started on the first postoperative

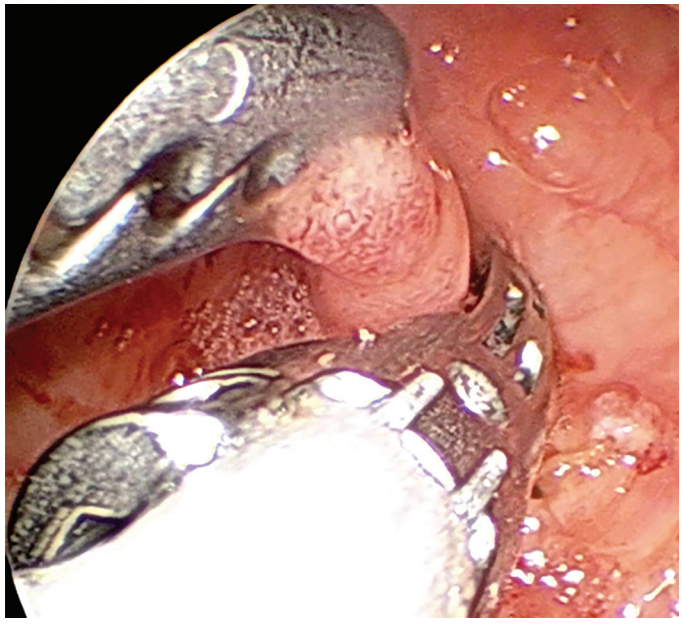

Figure 2. Elevation of the lesion using a non-rotaticulated grasper

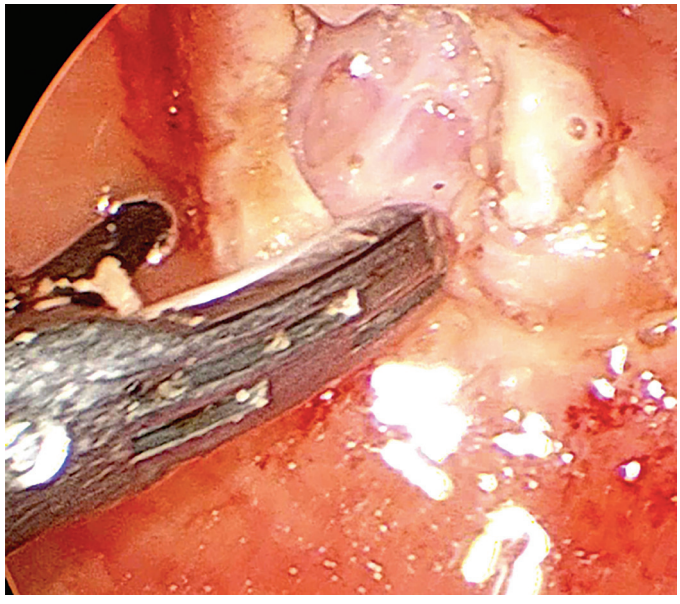

Figure 3. Dissection and excision the tumour using laparoscopic ultrasonic sealing device

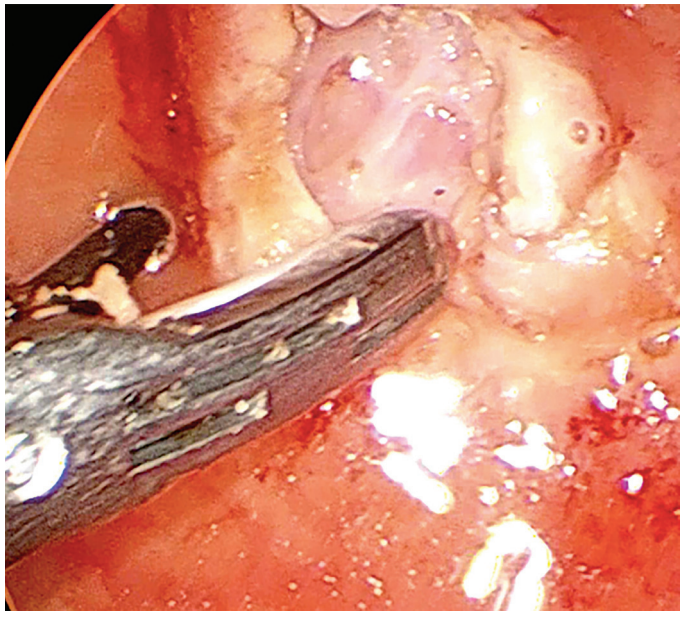

Figure 4. After complete excision, the tumour was grasped and removed together with the single port

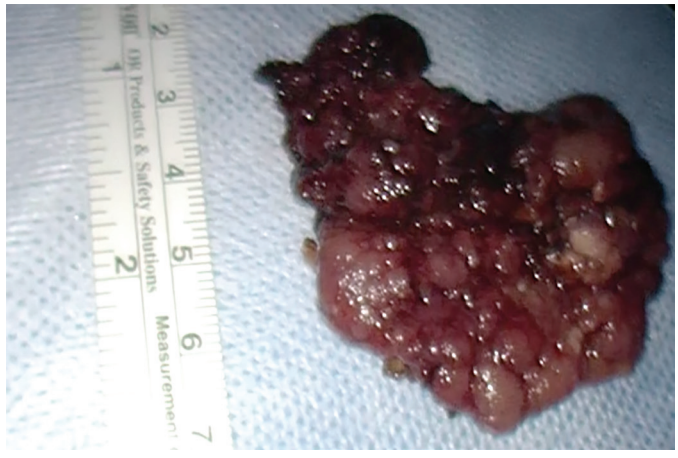

Figure 5. Macroscopic view of the specimen

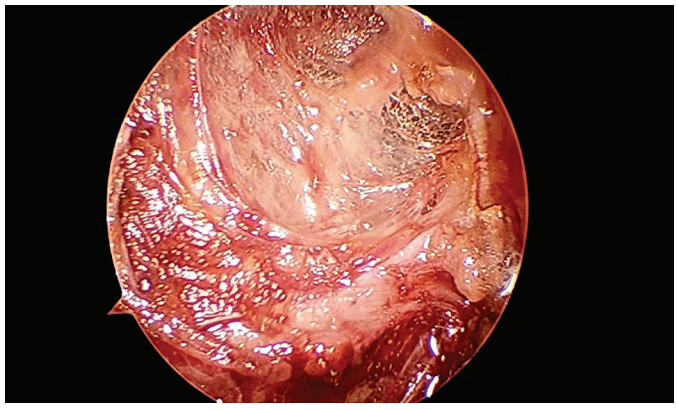

Figure 6. Full-thickness defect after complete resection of the lesion

day in all patients. The median hospital stay was 1 (1-3) days. Scrotal emphysema occurred in two patients, which resolved spontaneously. The definitive pathology reports revealed adenocarcinoma in two (10%) patients after TAMIS. APR was performed in one patient, and the final pathology was ulcer, fibrosis with tumour negative 9 lymph node. In the other patient, a stage T1 tumour was found, and follow-up without surgery was preferred due to the old age and poor general condition of the patient. Positive surgical margin was reported in 1 (5%) patient. The median follow-up duration was 9 (1-43) months. Moreover, 3 (15%) patients had a recurrence of adenoma during the follow-up. However, TAMIS was not attempted again because we thought that a repeat TAMIS will be a high-risk procedure. Therefore, low anterior resection was performed for all of them (Table 1).

Table 1. Demographic features and outcomes of all the patients

	N=20
Median age (years)	67 (37-79)
Gender	
Male	10 (50%)
Female	10 (50%)
ASA score	7 (35%) 11(55%) 2 (10%) 0
Presentation symptom	
Rectal bleeding	9 (45%)
Constipation	5 (25%)
Anemia	5 (25%)
Abdominal pain	4 (20%)
No symptom (diagnosis during screening colonoscopy)	3 (15%)
Weight loss	1 (5%)
Anal pain	1 (5%)
Tenesmus	1 (5%)
Median tumor distance from the anal verge (min-max) (cm)	6.4 (2-10)
Complications	
Hemorrhage	0 (0%)
Urinary retention	0 (0%)
Perirectal abscess	0 (0%)
Scrotal emphysema	2 (10%)
Median length of hospital stay (min-max) (days)	1 (1-4)
Follow-up (months)	9 (1-43)
Positive surgical margin	1 (5%)
Tumor recurrence	3 (15%)

ASA: American Society of Anaesthesiologist, min: Minimum, max: Maximum

Discussion

In this study, outcomes of 20 patients who underwent TAMIS using the SILS port for the treatment of benign rectal tumours in one centre were evaluated. Results showed that this approach is safe and effective and has favourable outcomes within a short follow-up period. Inclusion of consecutive patients to prevent selection bias and the use of the SILS port as standard and a single energy source in all patients are considered the strengths of this study.

The literature has not established indication of TAMIS in terms of age, gender or ASA classification. Patients up to age 90 years can successfully undergo TAMIS.[5] Previous studies with high-volume series showed 4%-20% of cases with positive surgical margin after TAMIS.[6] Positive surgical margin was observed particularly in patients with anterior lesions who underwent surgery in the lithotomy position and in first few cases performed during the learning curve.[7] In the present study, the positive margin rate was low (5%), which was compatible with the literature. Recent studies have shown 6%-22% of recurrence after TAMIS.[3,5,6,8] In the present study, recurrence was observed in 3 (15%) patients, which is similar to rates reported previously. Some studies have also reported that TAMIS can be performed for lesions located 3-15 cm from the anal verge.[8,9,10,11] However, in the present study, TAMIS was performed for lesions including those located 2 cm to the anal verge. There was no consensus about the size of lesions eligible for TAMIS. Previous studies with a large sample size have reported a median lesion

diameter of 3.1 (0.8-4.75) cm.[4] Similarly, in the present study, the median lesion diameter was 3 (2-5) cm.

Because of the possibility of an invasive component, full-thickness excision was considered necessary when local excision was performed for malignant lesions.[7] Some previous studies have suggested that lesions with malignant characteristics should be treated with full-thickness resection without compromising the deep plane of the tumour and that 1 mm negative margin is sufficient for adenomas. Therefore, preoperative evaluation of lesions is important.[12] Strict patient selection is required to optimise results. Lee et al.[6] developed an algorithm, and TAMIS was performed for curative purposes if the lesion was benign or had no high-risk features. In the present study, full-thickness excision was not attempted since all analysed patients have rectal adenoma diagnosis confirmed by colonoscopy with biopsy. Full-thickness excisions can be sewn using TAMIS even if the peritoneum is entered. Full-thickness resection for neoplasms located in the anterior wall of the upper third of the rectum (above the peritoneal reflection) inevitably leads to penetration into the peritoneal cavity. Chen et al.[7] reported 4 (16%) patients who had an intraoperative peritoneal cavity penetration through the anterior rectal wall. In another study, these patients were informed that trans-abdominal access may be required to close the defect.[6] In the present study, none of the patients had perforation into the peritoneal cavity. Therefore, neither trans-abdominal access nor defect closure was required in any of the patients. Fortunately, the full-thickness defect observed in five patients was under peritoneal reflection. Although closure of the defect with clip or suture has been suggested in small series, a meta-analysis evaluated 489 patients and showed that outcomes were not different between patients with or without defect closure.[13] In this study, we preferred not to stitch up the defect after the resection. In previous studies, some patients were discharged on the surgery day. By contrast, some patients were discharged on the 25th postoperative day because of complications.[5]

Study Limitations

However, in the present study, the median hospital stay was 1 (1-3) day, which was sufficient and cost effective for this kind of procedure. Postoperative morbidity was recorded in up to 11% of patients in large series that included haemorrhage, urinary retention, scrotal or subcutaneous emphysema and perirectal abscess.[6] TAMIS was performed in 20 patients in this study, and no major complication occurred in these patients. TAMIS can be performed in either the lithotomy or prone position.[14] We preferred the lithotomy position in all patients since this position was mostly preferred by the anaesthesiology team, and we thought that using a 30° camera facilitates the excision of rectal lesions in any location irrespective of the patient position. Retrospective design, small-sample size and short follow-up period are limitations of this study.

Conclusion

TAMIS using the SILS port is a safe and effective technique for the treatment of benign rectal lesions. Defect closure is not usually necessary. Further studies with more patients and long-term follow-up are needed.

Ethics

Ethics Committee Approval: This study was approved by Marmara University Faculty of Medicine Ethics Committee.

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: T.K.U., W.A., Concept: T.K.U., W.A., Design: T.K.U., W.A., Data Collection or Processing: T.K.U., W.A., Analysis or Interpretation: T.K.U., W.A., Literature Search: T.K.U., W.A., Writing: T.K.U., W.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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RESEARCH ARTICLE

Feasibility of Single-port Reversal of Left-sided Colostomy in the Presence of Incisional Hernia; Promising Results

Kesi Fıtığı Varlığında Sol Taraflı Kolostominin Tek Portlu Tersine Çevrilmesinin Fizibilitesi; Umut Verici Sonuçlar

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ABSTRACT

Aim: Stoma reversal in patients with concomitant abdominal wall defects can be cumbersome with the risk of many postoperative complications. Present study was conducted to evaluate feasibility and safety of single port restoration of left-sided colostomy in patients with concomitant incisional hernia.

Method: All patients with concomitant incisional hernia undergoing single-port reversal of left-sided colostomy (SPRLC) between 2012 and 2020 were included. Primary outcomes were surgical success rate and 30-day postoperative complication rate. Secondary outcome was subsequent hernia repair after successful stoma reversal.

Results: Twelve patients were included for analysis. Single-port reversal was possible in five patients, conversion to open surgery was needed in one patient and conversion to multiport laparoscopy in six patients. There was no postoperative mortality, reoperations or anastomotic leakages. Seven patients (58%) encountered no postoperative complications, surgical site infection occurred in four patients, pneumonia in one patient. Median postoperative stay was 4 (range; 3-12) days. Two patients pursued hernia repair after successful stoma reversal.

Conclusion: SPRLC is feasible and can be considered as an attractive alternative to open approach in patients with a colostomy and concomitant incisional hernia. It can be considered as a step-wise approach for future abdominal wall repair.

Keywords: Single-port, hernia, ventral/surgery, incisional hernia, colostomy

ÖZ

Amaç: Eşlik eden karın duvarı defektleri olan hastalarda stomanın tersine çevrilmesi, birçok postoperatif komplikasyon riski ile birlikte külfetli olabilir. Bu çalışma, eşlik eden kesi fıtığı olan hastalarda sol taraflı kolostominin tek port restorasyonunun uygulanabilirliğini ve güvenliğini değerlendirmek için yapılmıştır.

Yöntem: Çalışmaya 2012 ve 2020 yılları arasında sol taraflı kolostominin tek portlu tersine çevrilmesi (SPRLC) uygulanan, kesi fıtığı olan tüm hastalar dahil edildi. Birincil sonlanımlar; cerrahi başarı oranı ve 30 günlük postoperatif komplikasyon oranıydı. İkincil sonlanım, başarılı stoma tersine çevrilmesi ardından fıtık onarımıydı.

Bulgular: Analize 12 hasta dahil edildi. Beş hastada tek portun tersine çevrilmesi mümkün oldu, 1 hastada açık cerrahiye ve 6 hastada çok portlu laparoskopiye geçiş gerekli oldu. Postoperatif mortalite, reoperasyon veya anastomoz kaçağı olmadı. Yedi hastada (%58) postoperatif komplikasyon görülmedi, 4 hastada yüzeyel cerrahi alan enfeksiyonu, 1 hastada pnömoni meydana geldi. Ortalama postoperatif kalış süresi 4 (dağılım 3-12) gündü. İki hastada başarılı stoma tersine çevrilmesinden sonra fıtık onarımı yapıldı.

Sonuç: SPRLC mümkündür ve kolostomi ile eşlik eden kesi fıtığı olan hastalarda açık yaklaşıma iyi bir alternatif olarak düşünülebilir. Daha sonra yapılacak karın duvarı onarımı için adım adım bir yaklaşım olarak düşünülebilir.

Anahtar Kelimeler: Tek port, fıtık, ventral/cerrahi, insizyonel fıtık, kolostomi

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Introduction

Hartmann's procedure is often used for surgical emergencies of colorectal, gynaecological or vascular nature.[1] Feared and common complications are superficial or deep site infections, wound dehiscence with subsequent laparostomy or incisional hernia, all resulting in significant morbidity and impaired quality of life. Repair of these hernias results in higher risk of postoperative complications due to the possibility of bacterial contamination.[2,3] Classic or laparoscopic stoma reversal in patients with incisional hernias cannot be performed without extensive adhesiolysis, which can be cumbersome and harbours the risk of advertent or inadvertent enterotomies, potentially resulting in enterocutaneous fistulas.[4,5] Moreover, possible contamination of prosthetic devices or dissection planes in case of mesh placement or component separation makes simultaneous abdominal wall reconstruction unattractive because of increased infectious risks. A combined procedure with stoma reversal and complex hernia repair can result in a higher risk of anastomotic leakage.[6] These considerations led to a high threshold for stoma reversal in those patients.

Recently, a novel application of the single-port laparoscopy access system was described. By inserting this device in the abdominal fenestration of the colostomy, stoma reversal can be performed minimal invasively in a safe and controlled manner and achieves favourable outcomes.[7,8] With this technique, adhesiolysis of the midline is unnecessary; therefore, the stoma can be reversed without extensive mobilisation or adhesiolysis and without simultaneous repair of the ventral hernia.

This study aimed to assess the feasibility and safety of single-port reversal of left-sided colostomy (SPRLC) in patients with concomitant incisional hernia. We postulate that SPRLC is feasible and safe in patients with a left-sided colostomy combined with a moderate to complex hernia.

Materials and Methods

All consecutive patients who underwent SPRLC between November 2012 and March 2020 were assessed for inclusion in this study. During this period, all stoma procedures of end colostomies were performed with the single-port technique. All procedures were performed or supervised by experienced colorectal surgeons or consultants with extensive skills in laparoscopy and minimally invasive surgery.

The inclusion criteria for this study were patients with a left-sided colostomy and concomitant incisional abdominal wall hernia undergoing SPRLC. The exclusion criteria were single-port reversal of right-sided (ascending) colostomy or ileostomy procedures.

The operative procedures of the SPRLC were described in detail in a previous study.[7] Briefly, the colostomy was mobilised beyond the fascia into the abdomen, and the anvil for the CDH29 circular stapler (Ethicon Endo-Surgery, Cincinnati, OH, USA) was placed in the descending colon before returning it to the abdominal cavity through the original colostomy site. A pneumoperitoneum was established after placement of the GelPOINT Path Access Platform (Applied Medical, Los Angeles, CA, USA). Where necessary, the splenic flexure or transverse colon was mobilised, and adhesiolysis was performed under direct vision. Continuity was restored after adhesiolysis and proper visualisation of the rectal stump with the use of the CDH29 circular stapler. All wounds were closed intracutaneously.

All patients were treated following the enhanced recovery after surgery protocol. Patients were discharged from the hospital when they were able to tolerate normal food, pass stool, were able to mobilise similar to preoperative levels of mobilisation and had adequate control of pain with use of oral analgesia. The minimum follow-up period was 30 days postoperatively.

Patient characteristics (including sex, age and body mass index), index surgery characteristics (such as reason for surgery and initial postoperative complications) and surgical details (i.e. time interval between index surgery and SPRLC, duration of SPRLC and conversion) were collected using the electronic patient database.

Primary outcomes were surgical success rate, which was defined as technical success rate of the single-port approach for stoma reversal and 30-day postoperative complication rate. Postoperative complication was defined as infections [such as surgical site infection (SSI) and intra-abdominal abscess], urogenital complications (such as urinary tract infection and urine retention), ileus or gastroparesis, pulmonary complications (such as pneumonia and exacerbation of chronic obstructive pulmonary disease) and blood-related complications (such as rectal blood loss, thrombosis or haematoma in wound or bleeding from an anastomosis). In this study, anastomotic leakage, re-interventions under local or general anaesthesia and intensive care unit (ICU) admission were considered major complications. The secondary outcome was subsequent hernia repair after SPRLC.

All patients gave informed consent during outpatient clinic counselling for SPRLC. Approval of the institutional review board or ethics committee was not required because of the observational nature of this study. This report was prepared in concordance with the STROBE guidelines (http://www.equator-network.org/reporting-guidelines/strobe/).

Results

A total of 105 patients underwent single-port reversal of continuity in Elisabeth-TweeSteden Hospital, Tilburg, Netherlands. Of these patients, 93 did not meet the inclusion criteria (Figure 1). Twelve patients were included in this study, including 7 men and 5 women with a median age of 60.9 (range; 27.6-76.9) years, median body mass index of 29.0 (range; 22.7-61.1) kg/m^2 and median and mean abdominal wall defect of 120 and 173.6 (range; 49-450) cm^2, respectively. Most common indications for index surgery were complicated diverticulitis and malignancy. The mean time between the index surgery and SPRLC was approximately 2 years, and the median time was 536 (range; 190-2384) days. An overview of patient characteristics and surgical and postoperative outcomes can be found in Tables 1 and 2.

Surgical Details

Of the 12 procedures, 42% (n=5) were technically successful by solely using the single-port approach. Six patients needed additional placement of one or two 5-mm trocar.

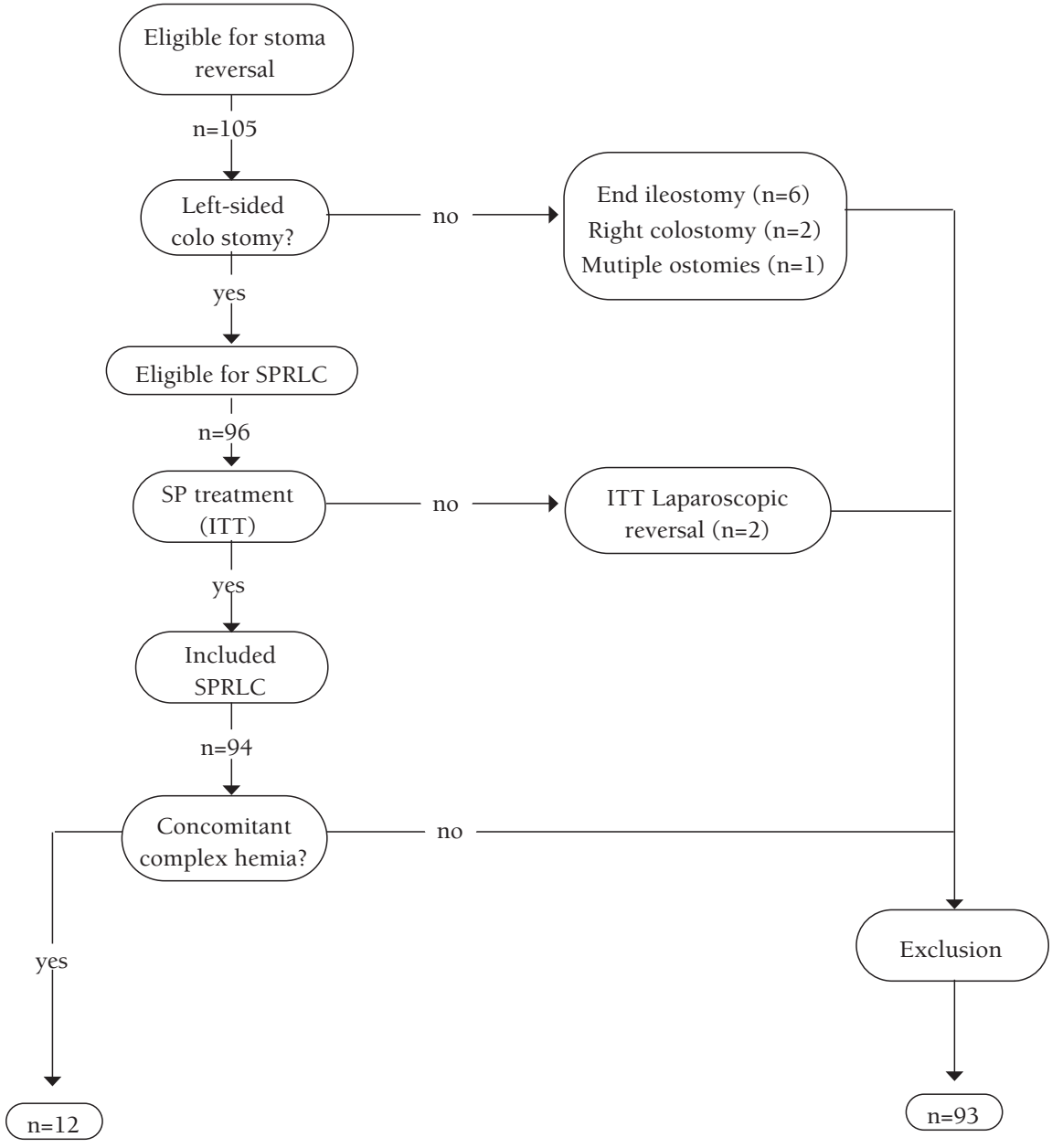

Figure 1. Flow chart of patient inclusion

SPRLC: Single-port reversal of left-sided colostomy, SP: Single-port, ITT: Intention to treat

Reasons for the additional trocar placement were needed for extensive laparoscopic adhesiolysis (n=5), mobilisation of the splenic flexure (n=1) or suture reinforcement of the anastomosis after positive air leak testing (n=1). Conversion to open midline laparotomy was needed in one patient because of iatrogenic injury to adhesive small bowel during placement of the single-port device. All procedures were technically successful in restoring intestinal continuity. The mean duration of operation was 137 (range; 85-197) min, and the duration of operation was not recorded in one patient. Figure 2 presents images of the abdomen before and after SPRLC.

Postoperative Results

No 30-day postoperative mortality, reoperations or anastomotic leakage was recorded in these patients. Moreover, seven (58.3%) patients did not have postoperative

Table 1. Patient characteristics

Number	Sex (M/F)	BMI (kg/m²)	Age* (years)	ASA class	Indication and type of index surgery	Year of index surgery	Adverse events in initial postoperative course	Dimensions abdominal wall defect@
1	F	26.3	66.0	3	Malignancy, open left hemicolectomy	2012	Relaparotomy for anastomotic leakage	7x7 cm#
2	F	61.1	47.3	3	Complicated diverticulitis, open sigmoidectomy	2012	Relaparotomy for anastomotic leakage, superficial and deep SSI	30x15 cm@
3	F	25.1	61.1	3	Complicated diverticulitis, open sigmoidectomy	2013	Multiple relaparotomies for wound dehiscence	18x13 cm#
4	M	24.8	65.6	1	Sigmoid volvulus, converted sigmoidectomy	2015	Relaparotomy for anastomotic leakage, superficial and deep SSI	15x8 cm#
5	M	30.2	61.8	3	Complicated diverticulitis, open Hartmann's procedure	2015	Superficial SSI	10x10 cm#
6	M	22.7	76.9	2	Complicated diverticulitis, open sigmoidectomy	2013	Relaparotomy for anastomotic leakage, superficial and deep SSI	8x15 cm#
7	M	32.9	59.3	3	Endovascular aortic aneurysm repair	2015	Laparotomy for sigmoid ischaemia, superficial SSI	20x17 cm@
8	F	30.5	72.4	2	Complicated diverticulitis, laparoscopic sigmoidectomy	2018	Laparotomy for anastomotic leakage, superficial and deep SSI	18x15 cm@
9	M	31.5	56.3	2	Malignancy, converted left hemicolectomy with stoma	2013	Superficial SSI	11x10 cm@
10	F	27.8	60.8	2	Malignancy, open left hemicolecomy with stoma	2016	Relaparotomy for stoma revision	7x7 cm@
11	M	32.1	27.6	1	Complicated diverticulitis, laparoscopic lavage	2014	Relaparotomy for Hartmann's procedure	7x7 cm@
12	M	27.8	62.2	1	Open iliac aneurysm repair	2012	Relaparotomies for thrombectomy and sigmoid ischaemia, superficial SSI	16x12 cm@

*Age at the time of the single-port left-sided colostomy reversal, @Defect measured using CAT scans,

#Defect measured during physical examination, BMI: Body mass index, ASA class: American Society of Anesthesiologists classification, SSI: Surgical site infection

complications within 30 days after surgery, and five patients developed one postoperative complication. Four (33.3%) patients developed an SSI of the old stoma fenestration; all were treated conservatively by removing the sutures and applying regular wound dressings. One patient experienced a major complication and needed ICU observation due to postoperative pneumonia and recovered without other postoperative adverse events. The median postoperative stay was 4.0 (range; 2-16) days.

Hernia Repair

Two patients underwent abdominal wall reconstruction due to persisting symptoms of incisional hernias after recovery from SPRLC. One patient died of peritoneal metastases while considering hernia repair. Most other patients (n=7) reported satisfaction with their abdominal condition and life following SPRLC. Two patients without symptoms of their hernia expressed their wish to pursue abdominal wall repair for purely cosmetic reasons and therefore withheld from surgery. They declined abdominal wall reconstruction after counselling and shared decision making.

Discussion

This study shows that SPRLC is a feasible, safe and effective technique for stoma reversal in patients with a left-sided colostomy and a concomitant incisional hernia. The median length of stay was short with 4 (range; 2-16) days, and there was no anastomotic leakage or need for reoperations or re-interventions. The postoperative complication rate was acceptable. Postoperative pneumonia was the only major complication in this study, which was considered inherent to intra-abdominal operations and not specifically linked to the use of the single-port approach. We believe that

Table 2. Surgical and postoperative outcomes

Number	Sex (M/F)	Age at SPRLC	Year SPRLC	Days until SPRLC	Surgical time (min)	Extra 5 mm trocar	Reason for extra trocar placement	LOS (days)	Postoperative complication	Calvien-Dindo classificatioin	Hernia repair after SPRLC
1	F	66.0	2014	760	85	1	Mobilisation splenic flexure	12	Pneumonia	4	No
2	F	47.3	2015	1193	91	1	Extensive adhesiolysis	4	Superficial SSI (stoma wound)	1	Yes
3	F	61.1	2017	1294	133	1	Extensive adhesiolysis, anastomosis suture reinforcement	5	No	-	No
4	M	65.6	2016	481	128	0	-	3	Superficial SSI (stoma wound)	1	No
5	M	61.8	2015	246	128	0	-	2	No	-	No
6	M	76.9	2014	255	-	0	-	5	No	-	No
7	M	59.3	2017	706	115	1	Extensive adhesiolysis, aiding visibility small pelvis	4	No	-	No
8	F	72.4	2019	359	163	1	Extensive adhesiolysis	3	No	-	No
9	M	56.3	2015	591	174	*	-	5	Superficial SSI (both wounds)	1	No
10	F	60.9	2017	331	197	0		3	No	-	No
11	M	27.6	2015	190	149	0		3	Superficial SSI (stoma wound)	1	No
12	M	56.9	2014	508	148	2	Extensive adhesiolysis	3	No	-	Yes

*Conversion to open, SSI: Surgical site infection, F: Female, M: Male, SPRLC: Single-port reversal of left-sided colostomy

the minimally invasive characteristics of these procedures resulted in the short postoperative length of stay and low postoperative morbidity. To the best of our knowledge, this is the first study that evaluates the single-port approach in reversing left-sided colostomy in patients with concomitant incisional hernia.

Upon reviewing available literature, the postoperative complication rates of reversal of left-sided colostomies vary between 3% and 50%[4,9,10], and the most common complication is SSI in over 25% of the patients.[11] Although no differences were found in the postoperative mortality after laparoscopic or open reversal of left-sided colostomy (which can be up to 5%), the laparoscopic approach results in lower postoperative minor and major complications such as SSI, cardiopulmonary complications, anastomotic leakage and need for reoperations.[11] Furthermore, it is important to appreciate the difference in the severity of SSI of the former stoma fenestration, which is relatively small compared with SSI of a laparotomy wound. Moreover, SSI of a laparotomy wound in the presence of prosthetic devices or after component separation can have catastrophic results.

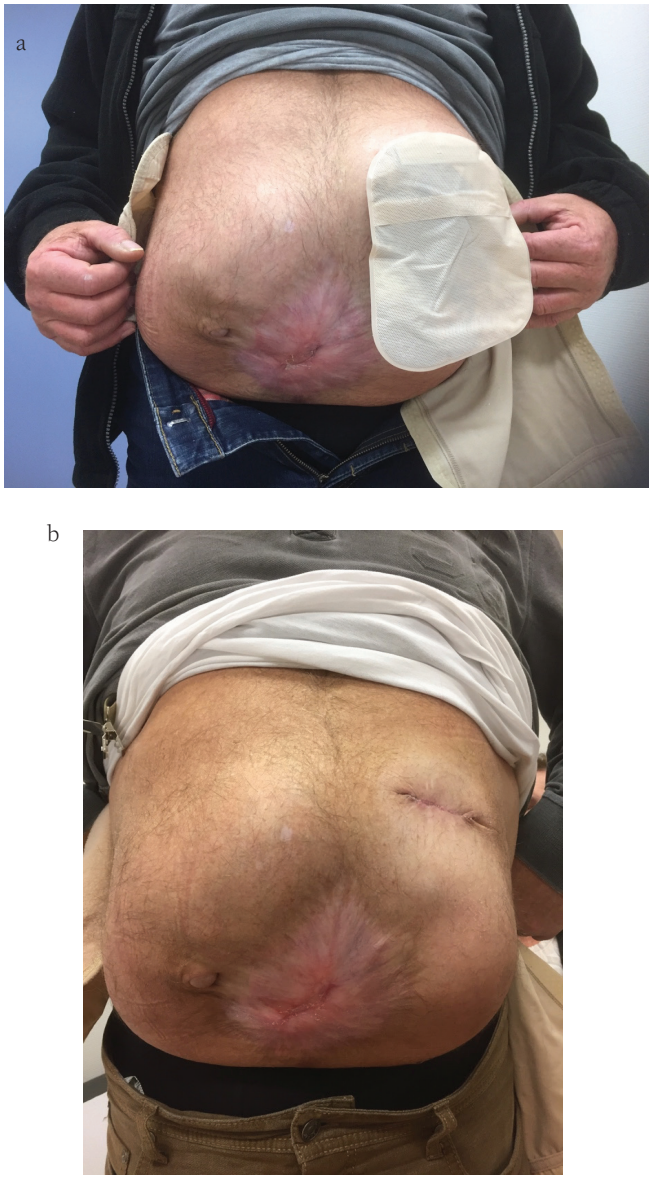

Figure 2. a) Picture of a patient with a left-sided colostomy and complex hernia before SPRLC, b) Picture of the same patient after SPRLC

SPRLC: Single-port reversal of left-sided colostomy

Complex hernias have great influence on the perceived quality of life of the patients.[12] However, no investigations have shown whether the presence of a hernia, presence of a stoma or combination of the two is most bothersome. Many patients pursue repair; however, because of the high rates of postoperative morbidity, most surgeons are hesitant to offer restorative surgery. We found a surprising low rate of subsequent hernia repair after SPRLC in two patients, so far. This may suggest that patients suffer more from the presence of the colostomy (albeit combined with the hernia) than from the hernia per se. This may be an interesting avenue for further research.

Complex hernias are challenging and difficult to repair- the optimal reconstructive strategy remains unclear.[13] Some studies have shown that concomitant stoma reversal with hernia repair can result in unacceptable high rates of postoperative morbidity and increased length of hospital stay compared with patients without stoma reversal.[6,13] Either mesh infection or refraining from mesh enhancement might lead to higher recurrence rates and postoperative complications than the two separate procedures. After successful stoma reversal, the abdominal wall can be restored with optimal mesh reinforcement without possible risk of contamination. Therefore, single-staged reversal of the complex hernia and stoma reversal might not be advised as primary choice of treatment.

We postulate that by using the single-port approach, stoma reversal is possible without dissection of the midline and therefore without the need to repair the incisional hernia during the same procedure. SPRLC results in lesser adhesiolysis and shorter duration of the procedures and thus reducing the patients' surgical trauma. All these factors lower the rates of postoperative morbidity when compared with conventional open procedures.[7,8] After successful restoration of continuity, the patient can subsequently choose whether additional reconstruction of the abdominal wall is desirable, without the additional risk of the presence of the stoma or stoma reversal.

Study Limitations

The small number of patients in this study is a major limitation, and we were unable to compare our results with those of open stoma reversal procedures in patients with

incisional hernia, which was also due to the very specific characteristics of this small subgroup of patients. In our opinion, open stoma reversal with or without hernia repair is not desirable and is not our primary approach. Our experience with open stoma reversal with concomitant repair of incisional hernia is therefore limited.

This new technique shows favourable results in postoperative complication rate and length of stay, thus lowering our threshold to offer this approach in our patients with a stoma combined with abdominal wall defects. We believe that the single-port approach is a feasible and effective solution for stoma reversal in patients with left-sided end colostomy with a complex hernia. SPRLC could be a part of the staged treatment for patients with incisional hernia and colostomy and could be safely offered and performed by colorectal surgeons with sufficient laparoscopic experience. Further research is necessary to evaluate the results in a larger cohort and to evaluate the applicability of this technique for the reversal of other types of stomas.

Conclusion

The SPRLC is feasible and can be considered a serious and attractive alternative to an open approach in patients with a left-sided end colostomy and concomitant incisional hernia. It shows promising results in terms of postoperative complication rate and length of stay and can be safely offered and performed by surgeons with sufficient laparoscopic experience.

Ethics

Ethics Committee Approval: Retrospective study.

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: Y.T.L., S.C., D.K.W., J.H., D.Z., Concept: Y.T.L., S.C., D.K.W., J.H., D.Z., Design: Y.T.L., S.C., D.K.W., J.H., D.Z., Data Collection or Processing: Y.T.L., S.C., D.K.W., J.H., D.Z., Analysis or Interpretation: Y.T.L., S.C., D.K.W., J.H., D.Z., Literature Search: Y.T.L., S.C., D.K.W., J.H., D.Z., Writing: Y.T.L., S.C., D.K.W., J.H., D.Z.

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RESEARCH ARTICLE

Novel Sphincter-preserving Therapies for Recurrent Anal Fistulas

Tekrarlayan Anal Fistüller için Yeni Sfinkter Koruyucu Tedaviler

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ABSTRACT

Aim: There is still a need for more effective methods of treatment for the patients with recurrent, crypto-glandular anal fistulas due to a high rate of recurrences with threatening risk of fecal incontinence. The aim of this study was to compare the rate of fistula healing after application of either platelet-rich plasma (PRP) or porcine-derived paste (PDP).

Method: Medical records of 50 patients with anal fistulas were retrospectively evaluated. The patients were divided into two groups. Group I, treated with PRP, consisted of 25 patients, whereas the group II, supplied with PDP consisted also of 25 patients. Fistula closure evaluated clinically was the primary endpoint of the study.

Results: Closure of anal fistulas was achieved in 16 (64%) patients from the group I, and in 9 (36%) from the group II and that difference was statistically significant (p=0.048). There was no significant difference between both groups regarding demographic characteristics except for higher mean age of the patients within the group I (p=0.010).

Conclusion: Preliminary results of PRP application in the patients with recurrent, crypto-glandular anal fistulas showed a higher rate of fistulas closure compared to the treatment with PDP.

Keywords: Crypto-glandular anal fistula, platelet-rich plasma, porcine-derived paste

ÖZ

Amaç: Fekal inkontinans riski ile birlikte yüksek nüks oranları nedeniyle tekrarlayan, kripto-glandüler anal fistülü olan hastalarda daha etkili tedavi yöntemlerine hala ihtiyaç vardır. Bu çalışmanın amacı, plateletten zengin plazma (PZP) veya domuzdan elde edilen macun (DEM) uygulamasından sonra fistül iyileşme oranını karşılaştırmaktı.

Yöntem: Anal fistülü olan 50 hastanın tıbbi kayıtları geriye dönük olarak değerlendirildi. Hastalar iki gruba ayrıldı. PZP ile tedavi edilen Grup 1 ve DEM ile tedavi edilen grup 2 25'er hastadan oluşuyordu. Klinik olarak değerlendirilen fistül kapanması çalışmanın birincil sonlanım noktasıydı.

Bulgular: Grup 1'den 16 (%64), grup 2'den 9 (%36) hastada anal fistül kapatıldı ve bu fark istatistiksel olarak anlamlıydı (p=0,048). Grup 1'deki hastaların yaş ortalamalarının yüksek olması dışında her iki grup arasında demografik özellikler açısından anlamlı fark yoktu (p=0,010).

Sonuç: Tekrarlayan, kripto-glandüler anal fistülü olan hastalarda PZP uygulamasının ilk sonuçlarına göre, DEM ile tedaviye kıyasla daha yüksek oranda fistül kapanması sağlanmıştır.

Anahtar Kelimeler: Kripto-glandüler anal fistül, plateletten zengin plazma, domuzdan elde edilen macun

Introduction

Anal fistulas remain a challenge to surgeons because of their high recurrence rate.[1] A refractory disease course might prompt multiple surgical interventions with possible risk of damage to the anal sphincters with subsequent faecal incontinence. Therefore, patients should receive conservative treatment.[2] Consequently, at present, several sphincter-saving methods are offered, such as mucosal advancement flap (MAF) and ligation of intersphincteric

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fistula tract (LIFT) or less invasive ones, such as video-assisted anal fistula treatment (VAAFT), negative pressure wound therapy (NPWT), setons, fibrins and plugs, but associated with a higher risk of recurrence. An attempt to close the internal opening without jeopardising the function of the sphincter is a major advantage of those methods.[3] Application of platelet-rich plasma (PRP) or porcine-derived paste (PDP) has appeared recently in the field of anal fistula therapy. PRP is an autologous product obtained from the whole blood. The value of plasma lies on its ability to soak the adjacent soft tissues relative to fistulous tract with high concentration of platelet-derived growth factors to accelerate the healing process.[4] By contrast, PDP consists of collagen retrieved from porcine dermis, which becomes a scaffold promoting formation of a fresh granulation tissue and subsequent fistula closure.[5] This study aimed to assess preliminary results of recurrent anal fistula treatments with PRP in comparison with PDP.

Materials and Methods

Medical records of 50 patients with primary or recurrent high anal fistulas of cryptoglandular origin treated between 2017 and 2020 were retrospectively evaluated. Patients were divided into two groups: The PRP group consisted of 25 patients, including 13 (52%) male and 12 (48%) female, with median age of 32 [interquartile range (IQR): 29-39] years. The PDP group consisted of 25 patients, including14 (56%) male and 11 (44%) female, with median age of 38 (IQR: 32-41) years. Previous anal operations such as excision, fistulotomy, MAF and LIFT were performed in 19 (76%) patients from the PRP group and in 18 (72%) patients from the PDP group (Table 1). Patients underwent digital rectal examination and probing and/or dyeing of fistulous tracts under anaesthesia. High trans-sphincteric fistulas were diagnosed if more than the lower one-third of the anal sphincter was involved.[2] Application of either PRP or PDP was preceded with loose seton pre-treatment in all patients with purulent discharge. Then, application of bio-products was preferred for patients with a relatively long and narrow fistulous tract and with a small bore internal orifice, especially if PDP application was considered. The use of PRP or PDP depends on the surgeon and type of anal fistula. The length of the fistulous tract and the diameter of the internal opening were assessed after digital rectal examination. Curettage and cauterisation of fistulous tracts to remove the epithelium and infected granulation tissue, followed by irrigation of those canals, trimming of external orifices and simple closure of the internal orifice, were performed in all patients. The procedure was accomplished with application of PRP in the first group and PDP in the latter group. Then, 15 mL of whole blood was centrifuged just before the procedure to obtain 1 mL of PRP, using a commercial kit (Xerthra PRP Kit, Biovico, Poland). The concentrate was administered into adjacent tissues surrounding fistulous tracts, beginning from the internal orifice towards the external orifice. The penetration depth was controlled with the index inserted into the anal canal or by transrectal ultrasonography (TRUS). The procedure was repeated three times every fortnight according to the protocol until the therapeutic effect was achieved, and applications can be repeated if it was clinically justified. Then, a fistulous canal was filled with the paste Permacol (Covidien, Mansfield,

Table 1. Characteristics of the patients

Patients and methods		PRP group (n=25)	Percent	PDP group (n=25)	Percent	Significance
Gender	Male	13	52%	14	56%	0.777
	Female	12	48%	11	44%	
Age (in years)		Me=31 (range: 29-39)		Me=38 (range: 32-41)		0.010
Previous anal surgery		19		18		
	Excision	10		10		
	Fistulotomy	6		3		
	MAF	2		3		
	LIFT	1		2		
Fistula type	Trans-sphincteric	24		23		
	Supra- sphincteric	1		2		

MAF: Mucosal advancement flap, LIFT: Ligation of intersphincteric fistula tract

MA) in one procedure. The external orifices were left open in all patients. Fistula closure was defined as the absence of discharge after gentle finger compression of an external orifice and of perianal tissues. The closure was confirmed by TRUS.[6] Patients were evaluated in an outpatient department within 1, 6 and 12 months following final PRP or PDP application. The evaluation consisted of digital rectal examination, TRUS and completion of the Wexner questionnaire.[7] Patients with non-cryptoglandular fistulas, e.g. Crohn's, post-radiation and cancerous anal fistulas, were excluded from this investigation.

Statistical Analysis

Analysed data were presented as medians with range or IQR. Categorical data were presented as percentages. Differences in components of demographic characteristics among two groups were detected by Mann-Whitney U tests or chi-square test. The chi-square test was also used to examine the significance of the fistula closure rate between the groups. Changes in the Wexner score within and between groups were identified by Wilcoxon signed-rank tests or Mann-Whitney U tests, respectively. A p-value less than 0.05 was considered significant. All analyses were performed using the statistical package STATISTICA v. 13.1 (Stat Soft. Inc., Tulsa, OK, USA). The application of PRP and PDP in anal fistulas was approved by the Bioethics Committee at the University. All participants/patients signed an informed consent before this study.

Results

Complete closure of anal fistulas was achieved in 16 (64%) patients from the PRP group compared with 9 (36%) patients from the PDP group, and the difference was significant (p=0.048). The healing time ranged from 4 to 8 weeks in the PRP group with application of PRP repeated 3-5 times. Closure of anal fistulas in the PDP group occurred within 4–12 weeks. In the PRP group, anal fistula remained closed in 19 patients at the sixth month and in 16 patients at the 12th month, but were healed in 11 and 9 patients in the PDP group, respectively. No significant difference in demographic characteristics was found between the groups, except for the higher mean age of the patients in the PRP group (p=0.010). Mild to moderate form of faecal incontinence, such as gases or liquid stools, was recognised in half of the patients from both groups before therapy and the change in the Wexner score after treatment was not significant (PRP, p=0.120; PDP, p=0.065).

Discussion

Conservative surgery is indicated for most complex and recurrent anal fistulas because of the high recurrence rates and avoidance of damage to the sphincters with subsequent faecal incontinence. Several sphincter-saving methods such as MAF, LIFT, VAAFT, NPWT, fibrins and plugs have been introduced recently.[3] All these methods, except for MAF with efficacy approaching 50%, require further clinical investigation, since representative randomised trials have not yet been available.[8] As regards LIFT, it relies on the identification of the space between the internal and external sphincters and on mobilisation and partial excision of the fistulous tract within that space. The efficacy of LIFT is below 50%.[9] By contrast, VAAFT enables accurate debridement of fistulous tracts under sight control and closure of the internal opening. Equipment costs are major disadvantages of VAAFT. However, preliminary results of VAAFT are encouraging, with more than half of fistula closure.[10] Vacuum therapy shows its potential for the management of anal fistulas. NPWT can be defined as a sphincter-saving procedure, because the anal sphincter is left intact. Moreover, it is a more effective kind of surgical drainage than use of loose setons.[11] With regard to fibrins, the fistulous tract is sealed with fibrin glue, starting from the external opening. A major advantage is the opportunity to repeat the procedure several times as necessary. The low efficacy of fibrins of 14%-60% is a major drawback.[12] Conversely, a plug is a bioabsorbable prosthesis made from porcine intestinal submucosa. It serves as scaffolding for host cell proliferation. As major advantage, it can be performed multiple times, but its efficacy is approximately 30% because of frequent rejections.[13] The PDP consists of collagen type I and elastin fibres retrieved from porcine dermis. During the manufacturing process, cells are removed to reduce immunological response against foreign antigens. The collagen also undergoes cross-linking, which results in increased resistance to degradation, reduction of tissue antigenicity, higher durability and greater strength. Importantly, the paste is a slowly absorbable material, and the collagen becomes a scaffold that enables cellular infiltration and neovascularisation. The dissolution process takes on average a few months, after which the paste is replaced with patient's dense and strong scar tissue. If compared with synthetic pastes, biological pastes induce milder inflammatory response and a more orderly collagen deposition. In addition, the cross-linked materials showed greater resistance to collagenase digestion. The major drawback is the relatively low efficacy, mainly due to frequent leakage of the paste from the fistulous tract before the occurrence of cellular infiltration and neovascularisation.[5,14]

PRP is an autologous product obtained from whole blood through gradient density centrifugation. Results achieved after PRP application were better than those after PDP and other aforementioned conservative methods. The plasma

not only serves as a fibrin tissue adhesive and a scaffold for cellular infiltration, but also promotes wound healing by increasing cellular proliferation, angiogenesis and collagen synthesis owing to a high concentration of platelet-derived growth factors within the soft tissues adjacent to the fistulous tracts. Mechanical compression of the fistulous tract by injecting plasma into the tissues adjacent to anal fistulas is another PRP mode of action. Finally, it carries no risk of allergies and transmitting infections, since it is an autologous product.[4]

Study Limitations

This study has several limitations, such as a retrospective study design and a small sample size. However, the study might be considered in further meta-analyses.

Conclusion

Preliminary results of local PRP application in patients with recurrent, cryptoglandular anal fistulas showed a higher rate of fistula closure than PDP treatment. However, application of either PRP or PDP might be repeated several times if recurrences occur. Both methods could be combined with other conservative, sphincter-saving methods of surgery in a selected group of patients mainly with recurrent, high cryptoglandular anal fistulas. Such methods might be recommended as novel sphincter-saving procedures for recurrent anal fistulas.

Ethics

Ethics Committee Approval: The application of platelet-rich plasma as well as of a porcine-derived acellular dermal paste in anal fistulas was approved by the Bioethics Committee at the University.

Informed Consent: All participants/patients signed an informed consent before this study.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: J.H., J.C., T.B., Concept: T.B., Design: J.H., Data Collection or Processing: J.C., Analysis or Interpretation: B.K., Literature Search: J.C., Writing: J.H.

Conflict of Interest: No conflict of interest was declared by the authors.

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CASE REPORT

Laparoscopic Management of Caecal Lipoma Presenting with Ileocolic Intussusception

İleokolik İntususepsiyonla Başvuran Çekal Lipomlu Bir Hastanın Laparoskopik Yönetimi

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ABSTRACT

Colonic lipomas are rare benign submucosal tumors of the gastrointestinal system. The smaller tumors are usually asymptomatic whereas the larger ones often present with abdominal pain, bleeding or obstruction. The management of incidentally detected, asymptomatic colonic lipoma is not well defined. However, definitive surgical or endoscopic intervention is indicated once the tumor starts causing symptoms. In cases where surgery is required, laparoscopy is the preferred approach considering its well-established advantages over open approach. Here, we report a case of caecal lipoma that presented with ileo-colic intussusception and was managed by laparoscopic right hemicolectomy.

Keywords: Colonic lipoma, intussusception, laparoscopic right hemicolectomy

ÖZ

Kolonik lipomlar gastrointestinal sistemin nadir görülen benign submukozal tümörleridir. Küçük tümörler genellikle asemptomatiktir, oysa büyük olanlar genellikle karın ağrısı, kanama veya tıkanma ile kendini gösterir. Tesadüfen saptanan asemptomatik kolon lipomunun yönetimi iyi tanımlanmamıştır. Bununla birlikte, tümör semptomlara neden olmaya başladığında kesin cerrahi veya endoskopik müdahale endikedir. Ameliyatın gerekli olduğu durumlarda, açık yaklaşıma göre iyi tanımlanmış avantajları düşünüldüğünde laparoskopi tercih edilen yaklaşımdır. Burada, ileokolik intususepsiyon ile başvuran ve laparoskopik sağ hemikolektomi ile tedavi edilen bir çekal lipomlu hastayı sunmaktayız.

Anahtar Kelimeler: Kolonik lipom, intususepsiyon, laparoskopik sağ hemikolektomi

Introduction

Colonic lipoma is a rare tumour of the gastrointestinal tract with an incidence of 0.15%-4.4%.[1] These are usually asymptomatic and are detected incidentally during colonoscopy, surgery or autopsy. However, large lesions tend to be symptomatic because of complications. When symptomatic, common presentations are non-specific abdominal pain, bleeding, obstruction and intussusception.[2,3,4,5] Symptomatic lipomas are indications for endoscopic or surgical intervention. Herein, we report our experience of a case of colon lipoma that presented with intussusception and was managed by laparoscopic resection.

Case Report

A 52-year-old woman presented with a history of recurrent colicky, abdominal pain and bloating for 2 years. She did not have fever, weight loss, vomiting or gastrointestinal bleed. There was no associated comorbidity, and her past medical history was not significant. Physical examination revealed mild tenderness in the right lower quadrant. The abdomen was soft, slightly distended, but no lump was palpable. The laboratory workup was normal with no evidence of anaemia or leucocytosis.

An abdominal computed tomography (CT) scan was obtained that showed characteristic bowel within-bowel configuration of intussusception, with invaginated mesenteric fat and

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vessels. A round, well-demarcated, homogeneous colonic tumour located near the hepatic flexure was suspected as the lead point of intussusception. The lesion had characteristic densitometry value of -90 Hounsfield units (Figure 1a, 1b). In view of pathognomonic CT findings, the diagnosis of colonic lipoma was established.

Colonoscopy showed a large, globular submucosal mass with stalk at the hepatic flexure consistent with benign polypoidal neoplasm (Figure 2). The colonoscopic biopsy was unhelpful, as histopathology revealed normal colonic mucosa. In view of recurrent symptoms and diagnosis of intussusception, laparoscopic right hemicolectomy was performed. The post-operative course was uneventful, and the patient was discharged on day 5 after surgery. Gross and histopathological examination was consistent with a large, benign submucosal lipoma (Figure 3a, 3b). Patient remains symptom-free at a follow-up of 2 months.

Discussion

Although rare, lipomas are the second most common benign tumour of colon after adenomatous polyp.[1] Lipomas may arise from any part of the gastrointestinal tract, and the colon is the most common site, followed by small intestine and stomach. Most (70%) of the large bowel lipomas occur in the ascending colon.[1,2,3] It commonly affects individuals in fifth or sixth decade of life with slight female predominance.[6]

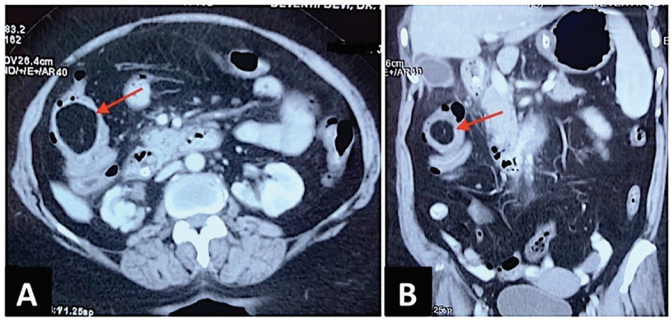

Figure 1. (A and B) Abdominal computed tomography images showing right colonic lipoma with characteristic fat equivalent lesion density (arrows)

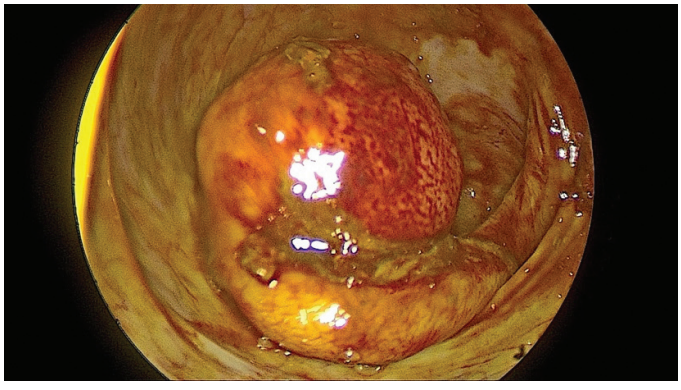

Figure 2. Colonoscopic view showing a large, pedunculated mass with intact overlying mucosa

Colonic lipomas are often found incidentally during colonoscopy, imaging or surgery for unrelated conditions. Most colonic lipomas are clinically silent, but if large enough (>2 cm), patients may present with non-specific abdominal pain, altered bowel habits, gastrointestinal bleeding, bowel obstruction or intussusception.[1,2,3,4,5] Among symptomatic cases, altered bowel habit (71%), abdominal pain (43%) and bleeding (28%) are the common complaints.[7] Our patient too presented with abdominal pain and distension due to ileo-colic intussusception.

Characteristic radiological and colonoscopic findings may help in preoperative diagnosis of colonic lipoma. At barium enema, these are seen as an ovoid, well-demarcated radiolucent mass. The "squeeze sign" is defined as the fluctuation in size and shape of the lesion with colonic peristalsis and is considered pathognomonic of lipoma.[8] A barium enema study was not performed in our patient. Instead, colonoscopy and abdominal CT scans were used for the diagnosis. On CT, the lipoma appears as well-circumscribed, homogeneous lesion with fat equivalent density (-80 to -120 HU).[9] Colonoscopy is imperative to locate, visualise and biopsy the lesion. Owing to the submucosal location of lipomas, simple colonoscopic biopsy has low diagnostic yield. Moreover, in the presence of intussusception, the accurate localisation may not be possible at colonoscopy, as the lesion is drawn into the lumen distal to it. In our patient, the lesion was erroneously reported at the hepatic flexure because of the presence of ileo-colo-colic intussusception. Colonoscopy allows direct visualisation of the lipoma and can help in distinguishing it from carcinomas and other mucosal lesions. Lipomas typically appear as smooth, round submucosal mass and may display the characteristic features such as the "tenting sign"

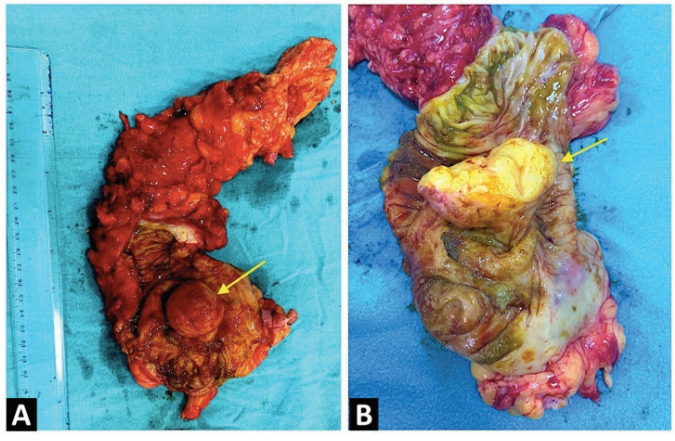

Figure 3. A) Gross appearance of the resected specimen showing submucosal tumour in the caecum (arrow); B) cut section showing fat containing pedunculated tumour just above the ileocaecal valve

(easily lifting the mucosa over lipoma with biopsy forceps), "cushion sign" (indentation of lipoma when pressed with biopsy forceps) and "naked fat sign" (spilling of fat out of the tumour after repeated biopsies).[7,8]

The management strategy for colonic lipomas mainly depends on the size, clinical symptoms and preoperative diagnosis. Lipoma excision is indicated when the lesion is large, symptomatic or malignancy is suspected. Endoscopic resection is appropriate for pedunculated, small (<2 cm) lipomas, as the risk of colon perforation increases when it is attempted for large (>2 cm), sessile, intramural lesions.[10]

Multiple operative techniques ranging from enucleation of the lipoma to more radical colonic resection have been described. Nowadays, laparoscopy is being widely used in managing colonic lipomas.[9] Since our patient had presented with ileo-colic intussusception, laparoscopic right hemicolectomy was performed. The laparoscopic approach had the advantages of improved cosmesis, decreased length of hospital stay, decreased adhesion formation, less pain and faster return of bowel function.

Lipomas should be considered in the differential diagnosis of colonic tumours with suggestive radiological findings. For large, symptomatic tumours, surgery is still the standard treatment. Laparoscopic approach is not only safe but also advantageous in managing these benign lesions.

Ethics

Informed Consent: Was obtained from the patient.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: S.K., S.S., A.A., Concept: S.K., S.S., Data Collection or Processing: S.K., S.S., V.R.C., Analysis or Interpretation: S.K., SS, V.R.C., A.A., Literature Search: S.K., S.S., V.R.C., Writing: S.K., S.S., V.R.C., A.A.

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CASE REPORT

A Case of Intestinal Obstruction Caused by Gossypiboma Recognized 9 Years Later

Dokuz Yıl Sonra Fark Edilen Gossipibomanın Neden Olduğu Bir Barsak Tıkanıklığı Olgusu

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ABSTRACT

The term gossypiboma is used to describe a retained surgical sponge after operation. It is a rare but serious complication which is seldom reported because of the medicolegal implications. Gossypiboma can even remain silent and present years after the operation. We report a case of a 38-year-old lady who presented with abdominal pain, nausea, vomiting and absence of defecation for three days. She had a history of cesarean section 9 years ago. At tomography, a encapsulated, well-organised, calcified solid mass was seen in the middle of abdominal cavity. A diagnostic laparotomy was planned. On exploration, it was observed that there was a large gossypiboma attached to the small intestine and surrounding structures. Though rare, gossypiboma should be kept in mind as a differential diagnosis in postoperative cases presenting as abdominal pain and symptoms of intestinal obstruction even years after the operation.

Keywords: Complication, gossypiboma, intestinal obstruction

ÖZ

Gossipiboma terimi, ameliyattan sonra kalan cerrahi materyali tanımlamak için kullanılır. Medikolegal problemler nedeniyle bildirimi nadir yapılan, nadir ve ciddi bir komplikasyondur. Gossipiboma sessiz kalabilir ve operasyondan yıllar sonra ortaya çıkabilir. Bu olgu sunumunda; karın ağrısı, bulantı, kusma ve üç gündür dışkılama yokluğu ile başvuran 38 yaşında bir bayan olgusunu sunmaktayız. Hastanın sadece 9 yıl önce sezaryen öyküsü vardı. Tomografide karın boşluğunun ortasında kapsüllenmiş, iyi organize olmuş, kalsifiye solid kitle görüldü. Tanısal laparotomi planlandı. Eksplorasyonda ince barsak ve çevresindeki yapılara yapışık büyük bir gossipiboma olduğu görüldü. Ameliyattan yıllar sonra karın ağrısı ve barsak tıkanıklığı semptomları ile ortaya çıkan postoperatif olgularda nadir de olsa gossipiboma ayırıcı tanı olarak akılda tutulmalıdır.

Anahtar Kelimeler: Komplikasyon, gossipiboma, intestinal obstrüksiyon

Introduction

Gossypiboma is a surgical sponge left behind in the surgical area after surgical plan integrity is achieved.[1] It is an unexpected unlikely complication. Because clinical findings of gossypibomas largely vary, diagnosis can be difficult. Because of this variability, gossypibomas can cause serious morbidity in patients.

While most gossypiboma cases are detected in the early postoperative period, some cases may go unnoticed for years.[2] Imaging methods can help make a definitive diagnosis. In these cases, the recommended treatment option is surgery. Gossypiboma can be considered a prediagnosis in patients with a previous surgical history and an intra-abdominal mass. This paper presents a case of intestinal obstruction caused by a gossypiboma.

Case Report

A 38-year-old female patient was admitted to the emergency clinic with complaints of intensifying abdominal pain,

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nausea, vomiting and absence of defecation for 3 days. The patient vomited three times daily and without blood, and the vomitus contained food. She had undergone caesarean section at another hospital 9 years ago. Within 9 years, she had intermittent constipation. She received medical treatment for the constipation. Until this stage, no further investigation was made. Thus, definitive diagnosis was not made, and her treatment was arranged.

On physical examination, she had respiratory rate of 28 breaths/minute, blood pressure of 105/55 mmHg and heart rate of 117 beats/minute. Physical examination was remarkable for abdominal distension, diffuse tenderness and decreased bowel sounds. Subfebrile temperature (37.8 °C) was reported. The patient had a septic appearance.

Laboratory tests revealed a white blood cell count of 13,800/mm^3 and a red blood cell count of 3.2x106 mm^3. The haemoglobin level was 11.8 g/dL, and C-reactive protein level was 27 (0-5) mg/L.

Because of septic clinical appearance, contrast-enhanced computed tomography (CT) of the abdominopelvic cavity was performed. An encapsulated, well-organised, calcified 73x49x47 mm^3 size solid mass was seen in the middle part of the abdominal cavity. Proximal small intestine segments were enlarged because of the mass. Presumably, both bowel and colon segments adhered to the mass (Figure 1).

The patient was taken for emergency explorative laparotomy. During surgery, the mass was actually tense and encapsulated, measuring 80x50x50 mm^3 in size, and densely adhered to the surrounding small bowel, right colonic segment and omentum. The mass was open partially during dissection, revealing thick pus and a retained sponge (Figure 2, 3). During dissection, the full thickness of the jejunal segment was opened, which was repaired with partial resection and double-layer anastomosis. Moreover, ileal and right colonic serosal injuries occurred, and one-layer repair was performed. Two drainage catheters were placed in the abdominal cavity: one in front of the anastomosis and the other in the pelvic cavity. The catheter adjacent to the anastomosis was removed on postoperative day 5, and the other catheter was removed on postoperative day 7. The postoperative period was uneventful. The patient was discharged on postoperative day 7. On postoperative day 20, the patient was admitted to the emergency clinic. After evaluation, the patient was diagnosed with intestinal obstruction and was then hospitalised. After 2 days follow-up with medication, the patient was discharged without any problem.

Figure 1. Intra-abdominal computed tomography image of a gossypiboma

Discussion

In 1884, Wilson first used the term gossypiboma to describe a surgical sponge left in the surgical area. Gossypiboma

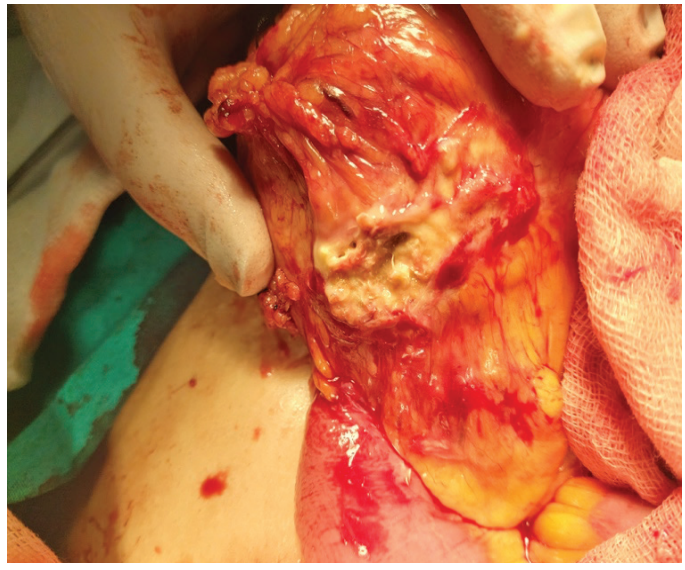

Figure 2. Intraoperative image of the gossypiboma before dissection

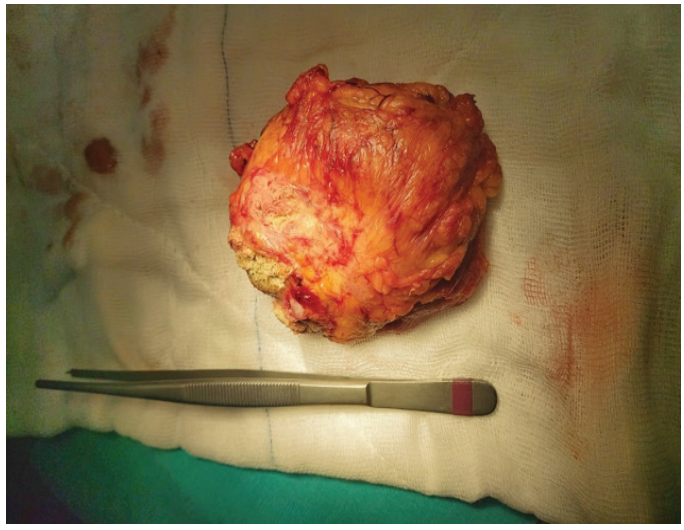

Figure 3. Intraoperative image of the gossypiboma after dissection

occurs in 0.01%-0.001% of surgeries.[3] The most important criterion in the diagnosis is the surgical history of the patient.

According to Durmaz et al.[4], gossypiboma is especially seen after abdominopelvic surgeries. However, it can be also seen after urologic, orthopaedic, thoracic and neurosurgical surgeries. It can occur in various clinical conditions, such as acute abdomen, nausea, vomiting, tenesmus or diarrhoea, gastrointestinal tract bleeding[5], intestinal obstruction[6], gastric outlet obstruction[7], visceral perforation, or abscess. It can be also found intraluminally because of migration.[8] It can pass into internal organs and cause many types of fistula, such as organ-to-organ fistula or organ-to-cutaneous tissue fistula.[9] Weight loss may be a clinical symptom in prolonged cases.

Radiological imaging can provide valuable information. The curved or banded radiopaque lines on plain X-ray imaging can be helpful. By contrast, CT should be preferred for definitive diagnosis. CT reveals a rounded mass with a dense central part and an enhancing wall or gas bubbles or deposition of calcifications. In some cases, CT reveals gossypiboma mimicking liver hydatid cyst or a subhepatic or suprahepatic cystic mass. On magnetic resonance imaging, gossypibomas may appear as low-signal-intensity lesions on T2-weighed images with wavy, stripped, or spotted appearances.[10]

After diagnosis of gossypiboma, treatment of all cases is surgical. On exploration of the abdomen, the foreign body may not be visible directly, because surgical tampons can be surrounded by omentum and intestines. Visceral organ necrosis and fistulas can be detected because of chronic compression and inflammation. Surgical intervention includes resection anastomoses and mass resections according to the type of gossypibomas.

In all surgical cases, surgical sponges should be counted truely. Especially, in open surgeries, marked sponges should be used if possible. Small sponges should not be used unless necessary. Nurses should be warned to count surgical sponges during surgery. Before closing the incision, the surgeon must ensure that all used surgical sponges are counted. Surgical fields should be checked again and again carefully in suspicious cases. Moreover, marked surgical sponges should be checked with radiography at the operating room. This case implies that all operating room staff should exercise maximum care to prevent this complication.

Ethics

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Financial Disclosure: The author declared that this study received no financial support.

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TECHNICAL NOTES

Sponge Single-port Laparoscopy-assisted Transanal Total Mesorectal Excision for Low Rectal Cancer: a Technical Report

Alt Rektum Kanserinde Sünger Tek-port Laparoskopi Yardımlı Transanal Total Mezorektal Eksizyon: Teknik Rapor

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ABSTRACT

Laparoscopic colorectal surgery is a surgical technique as safe as open surgery. Transanal total mesorectal excision (TaTME), which is a new approach in rectum surgery, is the resection of the rectum with the perianal approach with the help of endoscopic instruments. Although there are specially designed tools for this approach, it can also be done with the help of other options. Our patient, who we prepared for the operation with the diagnosis of rectal cancer, was operated with a standard technique using a manually prepared sponge-port during the Coronavirus disease-19 pandemic period. After resection, the specimen was taken out transrectally, coloanal anastomosis was performed with 2/0 vicryl one by one, and the operation was completed with a protective ileostomy. Operation time was 245 minutes. The patient who did not develop postoperative complications was discharged on the 5th day. The wide series results should be followed in order to compare the oncological and clinical results of TaTME with open and standard laparoscopic TME results, which allows to perform the tumor surgical margin macroscopically with the dissection.
Keywords: Laparoscopic surgery, rectal cancer, single-port, sponge port, transanal total mesorectal excision

ÖZ

Laparoskopik kolorektal cerrahi açok cerrahiye güvenli bir alternatif haline gelmiştir. Rektum cerrahisinde yeni bir yaklaşım olan transanal mezorektal eksizyon (TaTME), rektumun perianal yaklaşımla endoskopik aletler yardımıyla serbestlenmesidir. Bu yaklaşım için özel tasarlanmış aletler olmakla birlikte, başka seçenekler yardımıyla da yapılabilir. Rektum kanseri tanısıyla hastamız Koronavirüs hastalığı-19 pandemi dönemi malzeme alım kısıtlaması olduğu için manuel hazırlanan sünger-port kullanılarak opere edildi.

Endoskopik diseksiyon tekniği ile rektumun tümü transanal yolla diseke edilebilir. Hastamızın spesmeninde histopatolojik olarak cerrahi sınırın temiz ve mezorektal fasianın intakt olduğu teyit edildi. Rezeksiyon sonrası spesmen transrektal yolla dışarı alınırken elle koloanal anastomoz yapıldı ve koruyucu ileostomi ile operasyon tamamlanırken, operasyon 245 dk sürdü. Postoperatif komplikasyon gelişmeyen hasta 5. gün taburcu edildi. Rektum kanserinde alttan yukarı doğru diseksiyon prensibiyle, tümör cerrahi sınırı makroskobik olarak izlenerek yapılabilmeye olanak sağlayan transanal TaTME, onkolojik ve klinik sonuçları ile açık ve standart laparoskopik TME sonuçları ile mukayese edilmesi için geniş seri sonuçları takip edilmelidir.
Anahtar Kelimeler: Laparoskopik cerrahi, rektal kanser, tek-port, sünger port, transanal total mezorektal eksizyon

Introduction

Recent developments aim at reducing surgical trauma without compromising oncological principles. The most logical way to do this is to use natural openings.

Surgery performed through natural orifices by avoiding abdominal incisions [natural orifice transluminal endoscopic surgery (NOTES)] may theoretically have some advantages over open and standard laparoscopic surgery. Compared

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to traditional laparoscopic surgery, NOTES offers many potential advantages for selected patients with rectal cancer, such as avoiding transabdominal incisions and their associated complications. Transanal total mesorectal excision (TaTME) is also a technique that has been developed in recent years. The technical difficulties of this surgery are; the increase in morbidity and conversion to open surgery in cases such as narrow pelvis, large tumor size, and distal rectal tumor in male patients.[1,2]

In rectum cancer surgery, in the abdominal approach, starting from the proximal rectum, TME is completed from superior to inferior. In the transanal TME technique, mobilization of the rectum is performed with the help of endoscopic instruments and with a specially made single port, transanally. In this technique, dissection is made from the inferior to the superior and is an important technique in determining the distal surgical margin.[3]

In our article, we presented a patients in whom a tumor was detected 3 cm away from the anal verge in rectum and TaTME was performed with the help of conventional endoscopic instruments.

Case Report

A 56-year-old male patient was admitted to the general surgery outpatient clinic with the complaint of rectal bleeding. In the physical examination, the mass was palpated at 3 cm on the rectal examination. Rectal cancer was diagnosed as a result of the pathological examination of the biyopsy material obtained with the colonoscopy. He was evaluated preoperatively by magnetic resonance imaging (MRI) for local staging and by computed tomography for distant metastasis. MRI report was as follows: "A mass lesion narrowing the lumen from the anterior wall along the approximately 3.5 cm segment in the distal part of the rectum is observed. The planes between the tumor and the prostate are preserved". It was determined that the mass was approximately 3 cm away from the anal verge. After the preoperative bowel preparation, he was operated in lithotomy position. After the distal rectum was washed with povidone iodine, the rectum wall was fully opened over the dentate line, and the proximal rectal stump was closed by a purse string suture with no 0 prolene (Figure 1). The sponge-port prepared was placed in the anus without dilatation after the rectum was again washed with povidone iodine (Figure 2). The place where the rectum would be excised was determined with a 30-degree-angled endoscope accompanied by a low pressure (10 mmHg) pneumoperirectum, just distal to the purse string and marked with a monopolar hook. With atraumatic grasper and hook cautery, first posterior, then anterior and finally lateral dissections were completed and it was proceeded towards proximal (Figure 3). Mucosa and submucosa were dissected circularly. The rectum muscles were cut from the same plane and the areolar area was entered. Dissection of the rectourethral area was continued up to the peritoneum and all circular areas were dissected in the same way. In posterior dissection, the rectococcygeal ligament was cut and the endopelvic fascia was opened and the presacral area was entered. Hypogastric nerve fascia was preserved during the procedures. Finally, lateral dissection was performed preserving the iliac vessels. The smoke generated by cautery during the operation was evacuated to the outside with the feeding-aspirator system placed manually at the trochar air

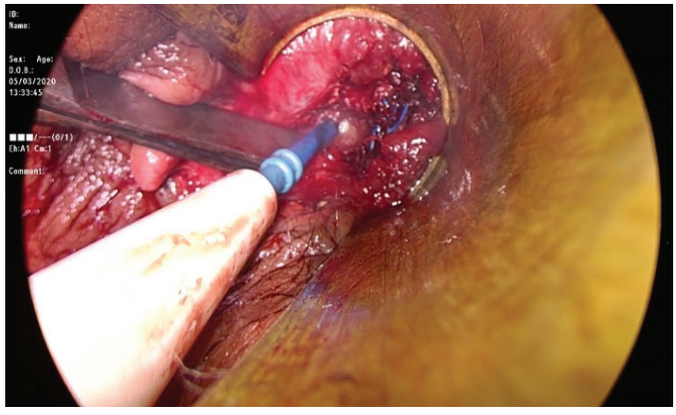

Figure 1. Closing the proximal rectal stump by crossing the purse string suture with number 0 prolene

Figure 2. Sponge single-port

outlets in a way that would not decrease the inside pressure. In this way, the field of view was clearly preserved. While performing this dissection, the descending colon, splenic flexure and sigmoid colon were freed laparoscopically with a standard approach. Connection was established with the transanal excision site by opening peritoneal reflection. The sigmoid column was separated with a 60-mm laparoscopic linear cutter stapler and the specimen was removed transanally. Coloanal anastomosis was performed with 2/0 Vicryl sutures one by one sutures without tension in the proximal part of the colon. The operation was completed by opening a protective loop ileostomy for the safety of the anostomosis.

The patient started to be fed orally at the 4th hour postoperatively, and the patient, who was followed up for anostomosis follow-up, was discharged on the 5th postoperative day without any problem. As a result of the pathology, the radial and distal surgical margins were clean and the mesorectal fascia was confirmed to be intact. Pathological TNM staging was reported as pT2N0M0. No complications or recurrence were detected in the 7-month outpatient clinic follow-up. During this period, the patient did not have any complaints about sexual and anorectal functions. During this period, protective loop ileostomy was closed under general anesthesia 3 months after the first operation. There were no postoperative complications or dysfunction.

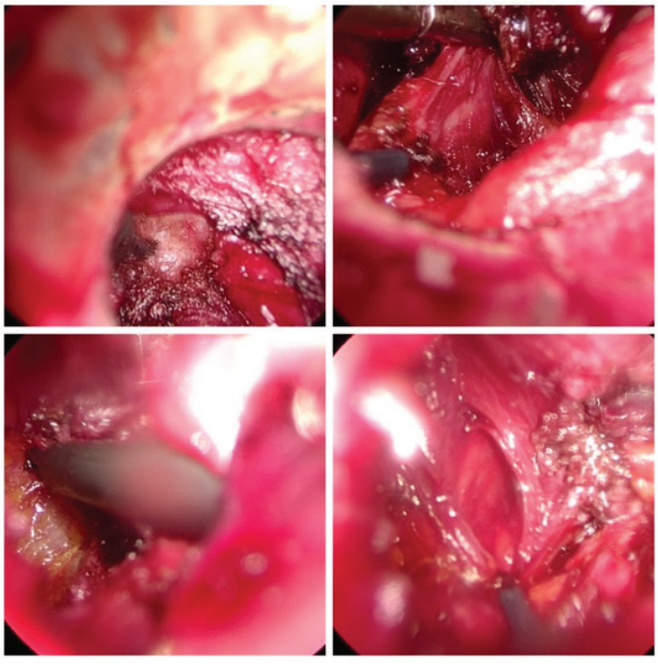

Figure 3. Dissection plan starting just distal to the purse string by entering with a 30 degree angled endoscope accompanied by a low pressure (10 mmHg) pneumoperirectum

Discussion

With the development of surgical techniques, much better results are obtained, especially in colorectal surgery. First laparoscopic surgery, then single port surgery and then surgical techniques made from natural orifices are used to increase patient comfort without compromising oncological principles.

Especially in male narrow pelvis, in low rectal cancers that form a large mass, there may be a transition from laparoscopy to open surgery due to some technical reasons. Another important problem is to provide an acceptable clean distal surgical margin for mid-to-low rectal tumors. After inserting a distal stapler, it may be difficult to determine the distance from the tumor and to control the adequate surgical-oncologic distance.[4]

TaTME or TEM imaging is an alternative safe and feasible technique, which is thought to provide potential solutions to many technical difficulties of laparoscopic rectal surgery such as distal rectum dissection, oncological surgical margin determination, low-level distal anostomosis and avoiding larger abdominal incisions.[5]

Transanal dissection with TEM proctoscope was described in 2010. In this technique, the lower end of the rectum was closed with a purse-string suture and the rectum was dissected with the help of TEM instruments and harmonic scalpel all around.[6,7,8]

In classical laparoscopic colorectal surgery, the rectum is dissected transabdominally from top to bottom. However, the surgery to be performed from the bottom up with the dissection starting from the bottom of the tumor may theoretically overcome some difficulties. With this prediction, the perirectal NOTES approach was described. While using a colonoscope in one of these approaches, standard laparoscopic instruments with a transanal SILS port were used in the other.[3]

The cost of these operations is high due to the use of special materials. For this reason, a single-sponge-port, which was prepared manually in terms of a cost-effective approach, was described during the Coronavirus disease-19 pandemic period. The same approach was used as the technique used in the classical TaTME operation, and the second surgical team started the operation at the same time.

In this transanal surgery, the bacterial load of the rectum should be removed and followed closely to prevent postoperative anastomotic leakage from pelvic infection. As a matter of fact, in our patient, washing with povidone iodide was performed both before and after separating the distal rectum.

There are studies showing that TaTME has a significant effect in selected patients with low-grade rectal cancer. Although

the results show that the short-term results of this new technique are satisfactory, prospective randomized studies with higher number of patients and long-term follow-up are needed to validate this technique, especially in terms of oncological and functional results.[9,10]

In conclusion, TaTME may contribute reduction in the rate of inadequate oncologic surgery and in the rate of transition to open surgery by allowing macroscopic evaluation of the distal surgical margin with the distal to proximal dissection principle. TaTME, which has potential advantages in patients with low rectal cancer, can be performed with the help of standard laparoscopic instruments.

Ethics

Informed Consent: Obtained.

Peer-review: Externally and internally peer reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Z.S., İ.Z., İ.S., G.Ç., B.T., S.A., Concept: M.Z.S., İ.Z., İ.S., G.Ç., B.T., S.A., Design: M.Z.S., İ.Z., İ.S., G.Ç., B.T., S.A., Data Collection or Processing: M.Z.S., B.T., S.A., Analysis or Interpretation: M.Z.S., İ.S., B.T., S.A., Literature Search: M.Z.S., B.T., S.A., Writing: M.Z.S, İ.S., B.T., S.A.

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TECHNICAL NOTES

Double-stapled Colorectal Anastomosis with Bean-shaped Rectal Doughnut Eliminating Dog Ears

Çift Stapler Kolorektal Anostomozda Rektal Halkanın Fasülye Formunda Çıkarılması ile Kulak Oluşumunun Engellenmesi

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ABSTRACT

The double-stapling technique defined by Knight and Griffen in 1980 has found widespread use in colorectal surgery. However, theoretically, the remaining dog ears on each side of the intersecting line between linear and circular stapler lines may have decreased blood supply and may contain tumor cells. Various modifications have been published in the literature to overcome these disadvantages of the double stapling technique. In this article, a modified technique that provides to excise the whole linear stapling line and to not leave the dog ears behind was introduced.

Keywords: Colorectal anastomosis, dog ears, double-stapling technique

ÖZ

Knight ve Griffen tarafından 1980 yılında tanımlanan çift stapler tekniği kolorektal cerrahide yaygın kullanım alanı bulmuştur. Bununla birlikte, teorik olarak, linear ve sirküler stapler hatlarının kesiştiği hattın her iki tarafında kalan kulakların (dog ears), kanlanmasının bozulabileceği gibi tümör hücreleri de içerebileceği hakkında tereddütler belirtilmektedir. Çift stapler tekniğinin bu dezavantajlarının üstesinden gelmek için tanımlanan çeşitli modifikasyonların yayınlandığı çalışmalara literatürde rastlanmaktadır. Bu makalede, dog ears oluşmasını engellemek üzere rektal linear stapler hattının tamamının çıkarılmasını sağlayan modifiye bir teknik tanıtıldı.

Anahtar Kelimeler: Kolorektal anostomoz, dog ears, çift stapler tekniği

Introduction

After Ravitch and Steichen performed end-to-end low rectal anastomosis with the end-to-end anastomosis instrument (EEA), and Nance defined to use the EEA together with a linear stapler on the upper gastrointestinal system in 1979, Knight and Griffen reported a modified stapler technique using linear and circular staplers together for colorectal anastomosis in 1980.[1,2,3] In this double-stapling technique (DST), a horizontal closure of the lower rectal segment with a linear stapler was made. Then, an anastomosis with a circular stapler across the horizontal line was performed. DST provided some advantages compared with the traditional hand-sewn technique or single-stapled anastomosis technique (SST), such as significantly less contamination, being easily performed and the ability to anastomose the bowel segments with different diameters.

However, DST technique has at least two crossing staple lines and causes two corners called "dog ears" on each side. There were some concerns in literature that this technique may be complicated with anastomotic leakage from those "ears" because of weak blood circulation in these regions. This concern seems logical. However, some experimental studies opposing this concern were reported. Julian and Ravitch[4] reported, in a dog model, that there were no leakages, even though the linear staples were usually removed with the doughnuts deformed, crushed or cut. Zilling showed, in a pig model, that the intersecting staple lines in the colonic and small bowel anastomoses did not reduce the anastomotic

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blood flow to a dangerous ischaemic level.[5] On the contrary, Roumen reported, in another experimental study on pigs, that double-stapled intersecting anastomoses could resist lower pressure compared with well-organised staple lines performed by a single circular stapler.[6] Nevertheless, Kawada suggested that resection of dog ears is not required because of technical difficulties and similar clinical results, especially if the intersecting line is placed close to the edge of the rectal stump.[7] In conclusion of these contradictory results, although there is no exact evidence on the higher rate of anastomotic leakage caused by DST, the dog ears on each side of the intersecting line between the linear and circular staple lines may have a decreased blood flow theoretically, and therefore, they may be the soft belly of this technique.

Because of these contradictory results, some authors have defined new techniques that had the advantages of DST but did not cause crossing lines and dog ears. They aimed to reduce the rate of anastomotic leakage and provide a well-organised complete linear staple line of the rectal stump that does not leave behind dog ears, to provide an accurate oncological diagnosis without suspicion, because dog ears may contain tumour cells.

Method

The colon is prepared according to the planned resection. The proximal segment is transected and closed in such a manner that a bulky cylinder, which does not cause eversion around the anvil shaft, is left behind by over-and-over purse-string suture technique. If required, an "O" suture may be applied over the purse-string suture.

An approximately 1.5 cm segment of the rectum is cleaned from the surrounding fat tissue and cut in either a transverse, oblique or vertical manner by the linear stapler (GIA8048S, Covidien) at the border of the planned resection site.

After digital dilatation, the circular stapler (CDH33, Ethicon Endo-Surgery Inc.) is gently introduced into the anal canal and driven on the staple line. The bowel is perforated by the spike of the stapler at just above the central part of the linear staple line, if it is transverse, or just its right side, if it is vertical or oblique (Figure 1 and 2).

The tightness of the rectal stump is lessened by drawing back the stapler in the rectum slightly. Then, the linear staple line is shaped as a tennis racket by using two 2-0 monofilament sutures around the spike. Care should be taken to leave sufficient space around the spike (Figure 3 and 4). During this procedure, the spike does not cause tissue disruption or laceration because it leans on the staple line.

The anvil shaft is attached to the stapler. When the stapler is closed, it is drawn back slightly, which helps lessen the tightness of rectal stump, and the tennis racket formed by the linear line can be pushed into the retainer. The handle of the racket is moved into the deepest part of the retainer (Figure 5). By firing the stapler, the procedure is terminated, and a slightly oblique inverting end-to-end colorectal anastomosis is performed.

Discussion

The authors, suggesting that the dog ears are a problem in DST, tried new techniques combining the advantages of DST and the anastomosis ability with inversion characteristics of SST without causing dog ears, such as suturing in the linear staple line, modified DST eliminating one dog ear

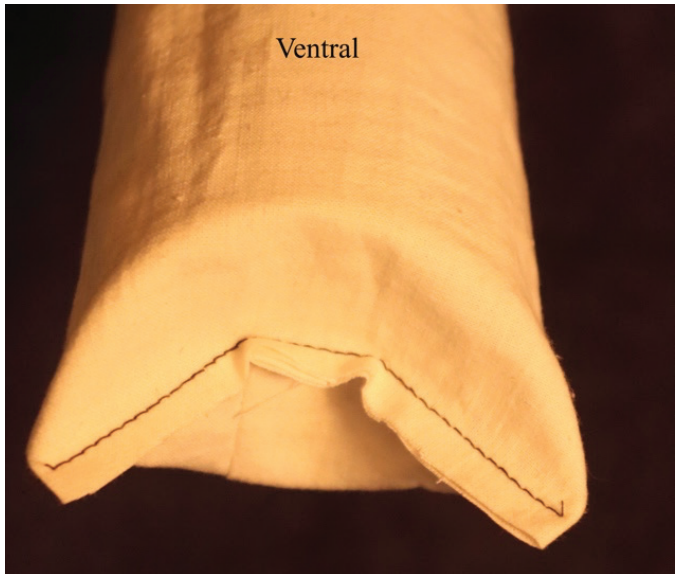

Figure 1. The linear staple line and dog ears on each side in the model. A longer staple line causes more prominent dog ears

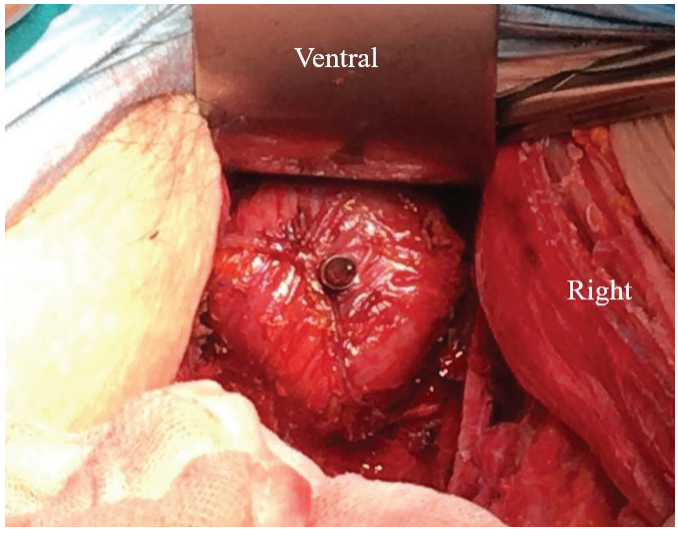

Figure 2. An operation view showing perforation of the rectal stump by the spike of the staple. Note that the perforation site is just ventral to the centre of the linear staple line

and transanal invagination or eversion methods by KOL™ circular stapler.

In this study, the author introduced a technique that he used in his clinical practice. This technique had small differences from the suture techniques described previously. Hazama sutured the staple line between two corners over the trocar by one suture.[8] Roumen performed a similar technique by two sutures.[6] Asao used a mattress suture creating an omega form and suggested usage of a second suture if required.[9] Kang used a simple running suture, and Chen banded the two corners together with a suture around the trocar laparoscopically.[10,11] Contrary to those authors, Foppa did not use a suture in the technique of "reverse smile".[12]

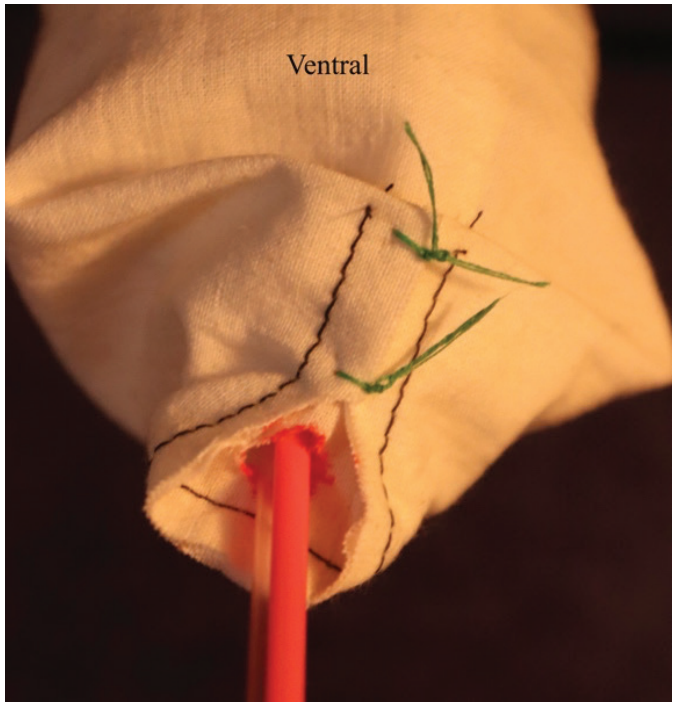

Figure 3. Forming a tennis racket shape by two sutures in the model. Note that sufficient space is left around the spike

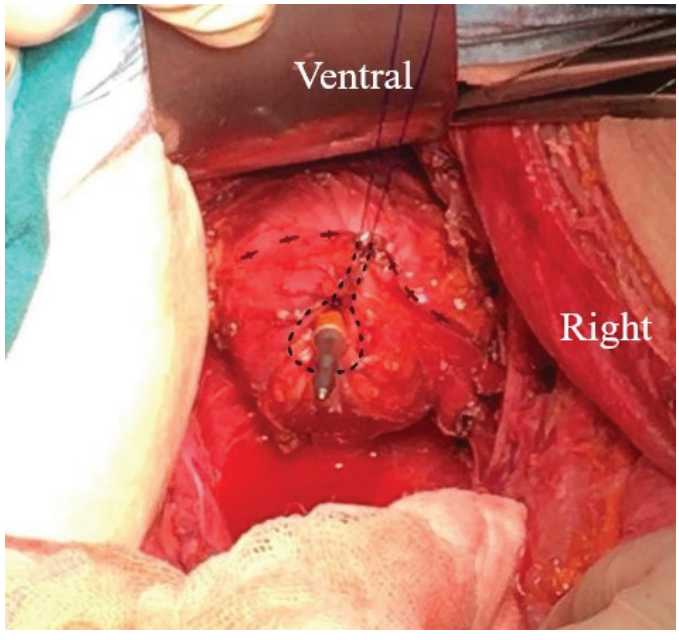

Figure 4. An operation view of the tennis racket shape. The dotted line marked the staple line, and the dashed line marked the rectal wall folding in the handle of the racket

In the technique reported in this study, the author suggested forming a bulky cylinder around the anvil shaft to take out the spike of the stapler. The perforation site was just ventral to the centre of the staple line on the rectal stump. A tennis racket shape was formed using the staple line.

In the completed anastomosis, the size of the site of the distal doughnut perforated by the spike is larger, and the remaining rectum is in a truncated cylinder shape instead of a whole cylinder (Figure 6). The oblique surface of this truncated cylinder was anterior or on the right side. The dorsal side of the rectal stump is slightly longer than the ventral side, and thanks to this, the tightness of the dorsal staple line may be lesser. It is shown that the doughnuts are in different sizes and the rectal doughnut including the linear staple line is bean-shaped instead of circular (Figure 7).

This technique was performed in various clinics and periods by only one trained surgeon, and therefore, a comparative series to evaluate the clinical results of this technique could not be provided, and the specific rate of the anastomotic leakage of this technique was not identified yet.

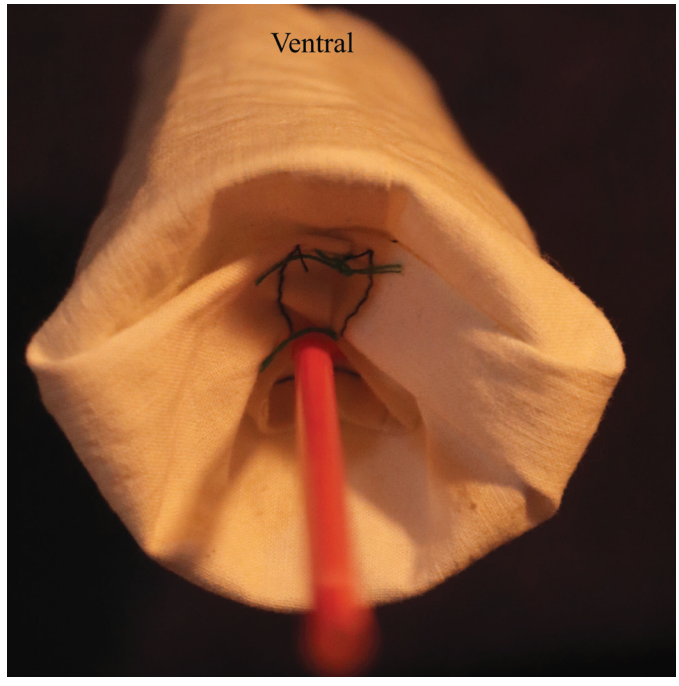

Figure 5. Pulling the tennis racket into the retainer of the stapler in the model. Note that the handle of the racket contains three folds of the wall, and it moves into the deepest part of the retainer

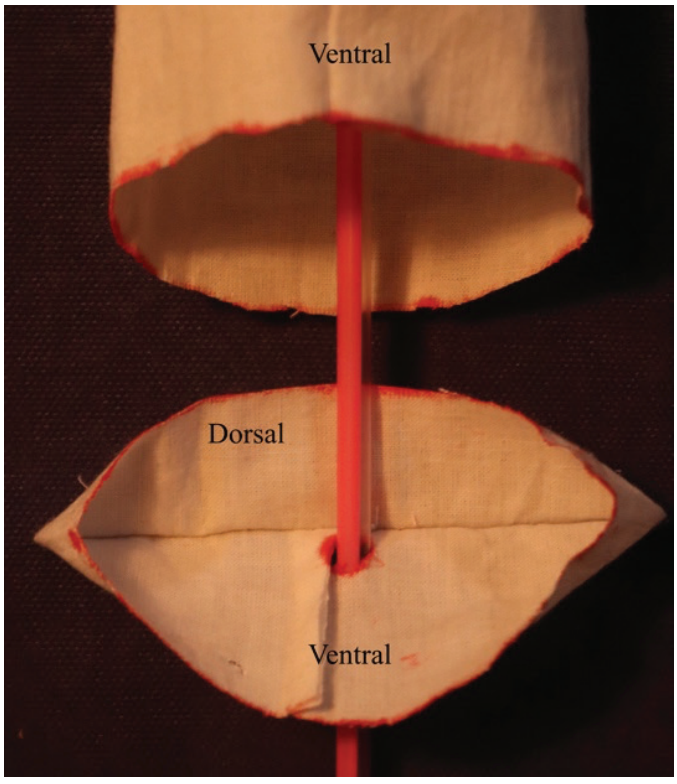

Figure 6. Forming the bean-shaped doughnut and the truncated cylinder in the model

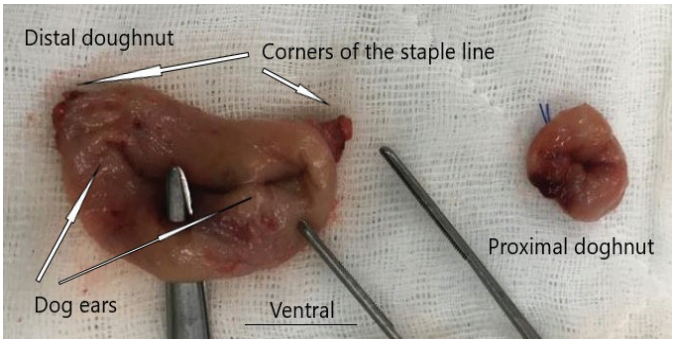

Figure 7. The proximal and distal doughnuts in an operation. Note the differences in diameters and shapes. The proximal doughnut is circular and small. The distal one is bigger and bean-shaped and contains all the linear staple line, including dog ears

This technique may be used in both open and laparoscopic operations in all segments, and it may provide an anastomosis eliminating dog ears even in the wide rectal stumps with long staple lines after anterior resections or sigmoidectomies. The factor determining the resectable length of the staple line is the volume of the stapler's retainer.

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Ethics

Informed Consent: For this type of study, formal consent is not required.

Peer-review: Internally peer reviewed.

Financial Disclosure: The author declared that this study received no financial support.

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