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# Turkish Journal of COLORECTAL DISEASE

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# Turkish Journal of COLORECTAL DISEASE





**All inquiries should be addressed to**

**TURKISH JOURNAL OF COLORECTAL DISEASE**

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## Reviewer Board

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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/.



### Permission Requests



### Instructions for Authors

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

### Material Disclaimer

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.

### Subscription Information

Turkish Journal of Colorectal Disease is sent free - of - charge to members of Turkish Society of Colon and Rectal Surgery and libraries in Turkey and abroad. All published volumes are available in full text free-of-charge online at

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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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# Instruction for Authors

## 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

"Turkish Journal of Colorectal Disease". Articles previously published in any language will not be considered for publication in the journal. Authors cannot submit the manuscript for publication in another journal. All changes in the manuscript will be made after obtaining written permission of the author and the publisher. Full text of all articles can be downloaded at the web site of the journal www.journalagent.com/krhd.

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Disclosure Statement
Cover Letter

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Text Formatting
Title Page
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Original Articles
Invited Review Articles
Case Reports
Technical Notes
Letters to Editor
Editorial Comments
Ethical Responsibilities of Authors
Research Involving Human Participants and/or Animals
Informed Consent
Payment

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### Copyright Transfer Statement

The scientific and ethical liability of the manuscripts belongs to the authors and the copyright of the manuscripts belongs to the Turkish Journal of Colorectal Disease. Authors are responsible for the contents of the manuscript and accuracy of the references. All manuscripts submitted for publication must be accompanied by the Copyright Transfer Form [copyright transfer]. Once this form, signed by all the authors, has been submitted, it is understood that neither the manuscript nor the data it contains have been submitted elsewhere or previously published and authors declare the statement of scientific contributions and responsibilities of all authors.

### Disclosure Statement

**Conflicts of interest:** Authors must state all possible conflicts of interest in the manuscript, including financial, consultant, institutional and other relationships that might lead to bias or a conflict of interest. If there is no conflict of interest, this should also be explicitly stated as none declared. All sources of funding should be acknowledged in the manuscript. All relevant conflicts of interest and sources of funding should be included on the title page of the manuscript with the heading

**"Conflicts of Interest and Source of Funding:"**

### Cover Letter

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.

### Manuscript Submission Guidelines

All manuscripts should be submitted via the online submission system. Authors are encouraged to submit their manuscripts via the internet after logging on to the web site www.journalagent.com/krhd.

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.

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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.

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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.

Upon request authors should be prepared to send relevant documentation or data in order to verify the validity of the results. This could be in the form of raw data, samples, records, etc.

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The author's institution may be informed.

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The author's institution may be informed.

**Research Involving Human Participants and/or Animals**

**Statement of human rights:** When reporting studies that involve human participants, authors should include a statement that the studies have been approved by the appropriate institutional and/or national research ethics committee and have been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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**The following statements should be included in the text before the References section:** Ethical approval: "All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards."

**For retrospective studies, please add the following sentence:** "For this type of study formal consent is not required."

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studies, the authors should indicate that the procedures followed were in accordance with animal rights as per the Guide for the Care and Use of Laboratory Animals http://oacu.od.nih.gov/regs/guide/guide.pdf and they should obtain animal ethics committee approval. When reporting experiments on animals, authors should indicate whether the international, national, and/or institutional guidelines for the care and use of animals have been followed, and that the studies have been approved by a research ethics committee at the institution or practice at which the studies were conducted (where such a committee exists).

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If articles do not contain studies with human participants or animals by any of the authors, please select one of the following statements:

"This article does not contain any studies with human participants performed by any of the authors."

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"This article does not contain any studies with human participants or animals performed by any of the authors."

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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.

**The following statement should be included: Informed Consent:** "Informed consent was obtained from all individual participants included in the study."

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### Payment

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### THE REVIEW PROCESS

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.

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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

All correspondences can be done to the following postal address or to the following e-mail address, where the journal editorial resides:

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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**

**Makale gönderilirken sunulması gereken formlar:**

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**Makale Gönderilirken Sunulması Gereken Formlar:**

**Telif Hakkı Devir Bildirimi**

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**Çıkar çatışmaları:** Yazarlar, finansal, kurumsal, danışmanlık şeklinde ya da herhangi bir çıkar çatışmasına yol açabilecek başka ilişkiler de dahil olmak üzere yayındaki ilgili tüm olası çıkar çatışmalarını belirtilmelidir. Herhangi bir çıkar çatışması yoksa da bu da açıkça belirtilmelidir. Tüm finansman kaynakları yazının içinde belirtilmelidir. Finansman kaynakları ve ilgili tüm çıkar çatışmaları yazının başlık sayfasında "Finansman ve Kaynak Çatışmaları:" başlığı ile yer almalıdır.

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Yazarlar, yazının içinde malzemenin elektronik ortam da dahil olmak üzere herhangi bir başka bir yerde yayımlanmak üzere gönderilmediğini veya planlanmadığını üst yazıda belirtmelidir. Yine "Kurumsal Değerlendirme Kurulu" (KDK) onayı alınıp alınmadığı ve 2013 yılı Helsinki Bildirgesi'ne eşdeğer kılavuzların izlenip izlenmediği belirtilmelidir. Aksi takdirde, bir açıklama temin edilmelidir. Üst yazı; adres, telefon, faks ve ilgili yazarın e-posta adresini içermelidir.

**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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## Yazarlara Bilgi

- 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.

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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;

- Her yazarın kurumu;

- Yazarın adı ve e-posta adresi;

- 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.

**DÜZELTME SONRASI GÖNDERİLMESİ**

Revize edilmiş bir versiyonu gönderirken yazar, yorumcular tarafından ele alınan her konuyu ayrıntılı olarak açıklamalı ve nokta nokta ayrıntılı olarak "yorumlara yanıt" sunmalıdır ve ardından belgenin açıklamalı kopyası bulunmalıdır (her yorumcunun yorumu nerede bulunabilir, yazarın cevap ve satır numaraları gibi yapılan değişiklikler).

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.

**İNGİLİZCE YAZIM**

Tüm yazılar yayımlanmadan önce profesyonel olarak "English Language Editor" tarafından değerlendirilmektedir.

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Tüm kabul edilen makaleler editörlerden biri tarafından teknik açıdan değerlendirilecektir. Teknik inceleme tamamlandıktan sonra, makale ilgili birime gönderilerek yaklaşık bir hafta içerisinde tamamen atıf yapılabilir "Kabul Edilmiş Makale" şeklinde online olarak yayınlanacaktır.

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Basım Öncesi Son Kontrol (Proof Reading)

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Online olarak yayımlandıktan sonra yapılacak değişikliklerde, Erratum üzerinden form oluşturulup makaleye erişim sağlayacak bağlantı oluşturulması gerekmektedir.

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Kabul edilmiş yazının baskı için tümü hazırlanırken online olarak özet hali yayımlanır. Kabul edilen yazı kontrolden geçtikten sonra, yazarlar son düzeltmeleri yaptıktan sonra ve tüm değişiklikler yapıldıktan sonra yazı online olarak yayımlanacaktır. Bu aşamada yazıya DOI (Digital Object Identifier) numarası verilecektir. Her iki forma da www.journalagent.com/krhd adresinden ulaşılabilecektir. Kabul edilen yazının yazarları elektronik ortamdaki sayfaları çıktı olarak aldıktan sonra proofreading yapmak, tüm yazıyı, tabloları, şekilleri ve kaynakları kontrol etmekle sorumludur. Baskıda gecikme olmaması için 48 saat içinde sayfa kontrolleri yapılmış olmalıdır.

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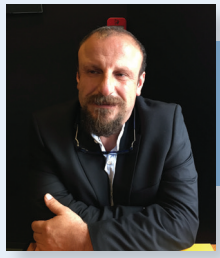

## Editorial/Editöryal

*Değerli Meslektaşlarım,*

*Yaklaşık altı yıldır sürdürdüğüm TKRHD baş editörlüğü görevim bu sayı ile birlikte sona eriyor. 2022 yılında yeni seçilecek Türk Kolon ve Rektum Hastalıkları Derneği Yönetim Kurulu, doğal olarak yeni editörler kurulunu belirleyerek taşıdığımız bu bayrağı bir sonraki ekibe devretmemize vesile olacaklar.*

*2015 yılında Dergiyi devraldığımızdan bu yana, dergide radikal hatta devrim sayılabilecek birçok değişiklikler yaptığımıza şahit oldunuz. Bütün değişiklikleri her sayının başında, bu kısa editöryal yazımda sizler ile paylaşmaya gayret ettim.*

*2015'te dergiyi devraldığımızda, maalesef dergi çıkmakta zorlanıyordu, yazarlar tarafından tercih edilemiyordu ve üzülerek belirtmek isterim ki, dergi Türk indeksleri dahil olmak üzere hiçbir indeks tarafından taranmıyordu. Doğal olarak yayınlayacak materyal azlığı oluyordu ve bu da derginin düzenli olarak neşredilmesini engelliyordu. Bu haliyle devraldığımız dergi, şimdi 15'in üzerinde ulusal ve uluslararası en prestijli indeksler tarafından taranmakta ve hem ulusal hem de uluslararası birçok enstitüden yayın almaktadır.*

*Bildiğiniz gibi dergi 3 ayda bir basılmaktadır. Ancak 2022 yılından itibaren iki ayda bir basılacak duruma hazırdır. Prestiji, dizaynı, çıkan yazıların kalitesiyle, tam bir bilimsel uluslararası nitelikte bir dergi bırakmanın huzuru içindeyiz. Bundan sonra gelecek editöryal takımın bayrağı daha yukarıya taşıyacağından eminiz.*

*Bu vesile ile yeni gelecek olan editöryal kurula şimdiden başarılar dilerken, sizler ile yeni görevlerde buluşmayı dilerim.*

*Sonsuz saygı ile…*

***Prof. Dr.Tahsin ÇOLAK***

***Baş-Editör***

*Dear Colleagues,*

*My duty as editor-in-chief of TJCD, which I have been continuing for about six years, ends with this issue. The Turkish Society of Colon and Rectal Surgery Board of Directors, which will be newly elected in 2022, will naturally determine the new editorial board and will enable us to hand over this flag to the next team.*

*Since we took over the journal in 2015, you have witnessed that we have made many radical and even revolutionary changes in the journal. I have tried to share all the changes with you in this short editorial at the beginning of each issue.*

*When we took over the journal in 2015, unfortunately, the journal had difficulties in publishing, it was not preferred by the authors and I regret to state that the journal was not scanned by any index, including Turkish indexes. Naturally, there was a shortage of material to be published, which prevented the regular publication of the journal. The journal, which we took over as such, is now scanned by more than 15 national and international most prestigious indexes and accepts studies from many national and international institutes.*

*As you know, the journal is published quarterly. However, it is ready to be published bimonthly from 2022. We are in the peace of delivering a fully scientific international journal with its prestige, design and quality of the published articles. We are sure that the next editorial team will carry the flag higher.*

*On this occasion, I wish success to the new editorial board and I hope to meet you in new duties.*

*With endless respect…*

***Prof. Dr. Tahsin ÇOLAK***

***Editor-in-Chief***

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REVIEW

# The Turkish Society of Colon and Rectal Surgery (TKRCD) Terminology Commission Study Report

## Türk Kolon ve Rektum Cerrahisi Derneği (TKRCD) Terminoloji Komisyonu Çalışma Raporu

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## ABSTRACT

This study aimed to explain the working order of the Terminology Commission, which was established at the workshop of the Turkish Society of Colon and Rectal Surgery (TKRCD) on February 22, 2020, the criteria and results in the preparation of the terminology report. The commission prepared a work plan to complete in three main steps. The working process continued in a way that the members expressed their opinions with equal rights and the decisions were taken by consensus or by majority vote. The main purpose of the commission study was determined as "determining the terms that need to be explained and agreed in colorectal surgery, and to define them in a way that is compatible with the literature and contributes to daily practice". The first meeting of the commission was held on February 22, 2020, and the report was accepted by the TKRCD Board of Directors on May 25, 2021. A total of 20 meetings were held during this period. In the first step, five headings were determined for writing the terms: Anatomy, symptoms and diagnostic tools, diseases, treatments and complications. There was a consensus that the terms met the following three conditions: 1) the need for explanation and consensus in colorectal surgery, 2) literature support, and 3) use in daily practice. The terms were written in the following format: Terms and synonyms, English equivalents, definition, explanation and bibliography. In the second step, each commissioner wrote an average of 10.8±4.3 terms. The distribution of 89 terms in the final report was as follows: Anatomy (n=26, 29.2%), symptoms and diagnostic tools (n=8, 8.9%), diseases (n=20, 22.4%), treatments (n=28, 31.4%), and complications (n=7, 7.8%). Figures (n=7), all from the archives of the commission members, and figures drawn by a new commission member (n=53) were also added to the report. In the third step, the report was submitted to the TKRCD Management with the approval of the TKRCD President. The preparation process of the Terminology Commission report of TKRCD was presented. The final report is open to changes and expansions with future studies.

**Keywords:** Workshop report, colorectal surgery, terminology

**Terminology Commission Study Report**

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## ÖZ

Bu çalışma Türk Kolon ve Rektum Cerrahisi Derneği'nin (TKRCD) 22 Şubat 2020 tarihinde yaptığı çalıştayda kurulan Terminoloji Komisyonu'nun çalışma düzenini, terminoloji raporunun hazırlanmasındaki kriterleri ve sonuçlarını açıklamayı amaçlamaktadır. Komisyon üç ana basamakta tamamlayacak iş planı hazırlamıştır. Çalışma süreci üyelerin eşit haklarla görüş belirttiği ve kararların uzlaşı veya oy çokluğuyla alındığı bir şekilde sürdürülmüştür. Komisyon çalışmasının temel amacı "kolorektal cerrahide açıklanması ve uzlaşı sağlanması gerekli terimlerin belirlenmesi, literatüre uygun ve günlük pratiğe katkı sağlayacak bir şekilde tanımlanması" olarak saptanmıştır. Komisyon ilk toplantısı 22 Şubat 2020'de yapılmış, rapor ise TKRCD Yönetim Kurulu'nda 25 Mayıs 2021'de kabul edilmiştir. Bu dönemde toplam 20 toplantı yapılmıştır. İlk basamakta terimlerin yazılması için beş adet üst başlık belirlenmiştir: anatomi, semptomlar ve tanı gereçleri, hastalıklar, tedaviler ve komplikasyonlar. Terimlerin şu üç şartı sağlaması konusunda karar birliği oluşmuştur: 1) kolorektal cerrahide açıklanması ve uzlaşı sağlanması gerekliliği, 2) literatür desteği ve 3) günlük pratikte kullanılması. Terimler şu formatta yazılmıştır: terim ve eş anlamlıları, İngilizce karşılıkları, tanım, açıklama ve kaynakça. İkinci basamakta her bir komisyon üyesi ortalama 10,8±4,3 terim yazmıştır. Sonuç raporunda yer alan 89 terimin üst başlıklara dağılımı şu şekildedir: anatomi (n=26, %29,2), semptomlar ve tanı gereçleri (n=8, %8,9), hastalıklar (n=20, %22,4), tedaviler (n=28, %31,4) ve komplikasyonlar (n=7, %7,8). Tamamı komisyon üyelerinin arşivlerinden gelen resimler (n=7) ve yeni bir komisyon üyesi tarafından çizilen şekiller de (n=53) rapora eklenmiştir. Üçüncü basamakta rapor TKRCD Başkanının onayıyla TKRCD Yönetimi'ne sunulmuştur. TKRCD'nin Terminoloji Komisyonu raporunun hazırlık süreci sunulmuştur. Sonuç raporu ileride yapılacak çalışmalarla değişiklik ve genişletmelere açıktır.
**Anahtar Kelimeler:** Çalıştay raporu, kolorektal cerrahi, terminoloji

## Introduction

Naming and defining are the first step for human beings to embody the concept of learning. On the other hand, learning the human body and creating a common language in medical terminology have become an integral part of health education, research, scientific publications, and perhaps most importantly clinical practice.[1,2,3] However, in practice, besides the anatomical structures, the presence of different definitions of patients' presentation symptoms, diseases and treatments, and even complications are noteworthy. It is also striking that the use of standardized definitions and agreed terms in the literature is not as much foregrounded as other elements, for example statistical significance, during the writing of the studies.[1]

The importance of making the definitions and terms used in daily medical practice in a way that is understood and agreed by everyone is very obvious. However, even in some frequently used terms, such a common language is sometimes not established. For example, it remains unclear how to name the examination of the anal canal and rectum, which is the simplest application of colorectal practice in many surgical clinics. Whether the use of the term "rectal touch" for digital rectal examination is a correct practice is still a matter of debate.[4] Although the lack of a common language is seen as insignificant because it does not affect the treatment process of the patient in particular, some other disagreements and uncertainties have the potential to cause significant clinical problems. For example, in an international consensus meeting with specialists specialized in colorectal surgery, a consensus could not be reached even on how far the rectum extends from the anal canal. Moreover, although 10 different definitions of the rectum were presented in this consensus study, 12% of the experts did not find any of them appropriate and made their own unique definitions.[5] The definition of where the rectum is, is the first step in the management of many diseases in this region. Preoperative neoadjuvant radiotherapy is recommended for locally advanced cancers, if the disease is located in the middle or lower rectum.

For this reason, The Turkish Society of Colon and Rectal Surgery (TKRCD) decided to make a terminology study to be a reference for its members and the Turkish colorectal community, and shared it with the members of the association in the workshop held on February 22, 2020. At this meeting, such a need was underlined and the study was supported. On the other hand, it may be a very well-intentioned guess that the terms prepared by the commission are accepted by everyone. The main reason for this is that various teams in our country have developed a common language among themselves for many years. The consensus report of the Commission and the proposed terms will likely be criticized in this respect. For this reason, it is a necessity to share the technical details of the process from the election of the commission to the submission of the report to the TKRCD management and the methodology of writing the terms in detail. This study aims to share the progress stages of this process in detail.

## Materials and Methods

In the workshop held by TKRCD on February 22, 2020, a consensus was reached on the establishment of a commission to work on terminology. Eight surgeons who would also take part in the first plan were announced. The surgeons in the commission were determined before the workshop by the board of directors of the society among the surgeons who were members of TKRCD and who were involved in scientific studies organized within the society for many years. Other participants in the workshop were also free to join the commission and take part in the next process. The

works were carried out under the chairmanship of a member of the board of directors in order to ensure coordination with the board of directors. Members' participation in the commission was on a voluntary basis, but the members of the commission were obliged to attend all meetings except for force majeure. The working process continued in a way that the members expressed their opinions with equal rights and the decisions were taken by consensus or by majority vote. The prepared report was presented to the head of TKRCD at various stages and his suggestions were received.

The main purpose of the commission study was determined as "determining the terms that need to be explained and agreed in colorectal surgery and defined in a way that is appropriate to the literature and contributes to daily practice". The commission held its first meeting on the day of the workshop and determined its secretary. He laid out his work plan at the first meetings (Table 1). The meetings were planned to be held face to face. Before each meeting, it was foreseen that the members should study the determined topics and convey their suggestions to the secretary, that the suggestions were combined by the secretary and delivered to all members for preparation before the meeting. Members who were assigned the task of writing the terms during the preparation phase were released to exchange views with each other or with other surgeons outside the commission during the preparation phase. In addition, it was stipulated that the existing literature should be searched and a bibliography should be found in the prepared texts. Before the preparation report of the commission was given its final form, it was planned to receive suggestions by conveying it to the head of TKRCD.

**Table 1.** The work plan of the terminology commission

| | |
|---|---|
| Step 1. Preliminary study | Determining the categories (headings) of the terms |
| | Determining criteria for inclusion of terms in the report |
| | Determining the spelling format of terms |
| | Determination of terms |
| | Determining who will write the terms |
| | Writing the determined terms by the members |
| Step 2. Writing the terms and developing the report | Revision of writings: review or cancellation (if needed) of term explanations by the commission and opening new titles by the commission |
| | Completion of explanations and references of written terms |
| Step 3. Consensus and finalization of the report | Presentation of the preliminary report to the President of Turkish Society of Colon and Rectal Surgery and development of the report in line with the recommendations |
| | Finalizing of writing of the terms and preparing the final report |

## Results

The commission was determined by the TKRCD Board of Directors among physicians who were members of TKRCD and experienced in colorectal surgery. The first meeting was held on February 22, 2020, the day of the workshop, and the report was accepted by the TKRCD Board of Directors on May 25, 2021. The working period of the commission lasted approximately 15 months. Although the commission meetings to be held in line with the work program were planned face-to-face, the meetings were mostly held over the internet, as the process overlapped with the COVID-19 pandemic period. Despite the pandemic process, face-to-face meetings were also held intermittently due to necessity. During this period, a total of 20 meetings were held, 18 of which were online and 2 of them face-to-face, with a duration varying between 1.5 and 6 hours. The preparation process of the report was progressed in accordance with the work plan prepared in the first meetings.

### Step 1: Preliminary work

In order to determine the terms planned to be written, the topics were categorized and five headings were determined: Anatomy, symptoms and diagnostic tools, diseases, treatments and complications.

For the terms to be written, in accordance with the purpose of the commission's establishment, a consensus was reached on the following three conditions for the terms to be included in the study: 1) the need for explanation and consensus in colorectal surgery, 2) the ability to provide literature support, and 3) the use in daily practice.

The following format was followed in the writing of the terms: The term (in the first place the term deemed appropriate by the commission) and its synonyms (or other terms deemed appropriate to be explained under the same title), the English equivalent or equivalents, definition, explanation and bibliography. During the writing of the terms, it was decided not to pursue a persistent Turkish translation purpose and to accept foreign words as they were if they were generally known.

In the next meetings, the recommendations of the commission members were combined and discussed, with a total of 87 terms under the headings of anatomy (n=27), symptoms and diagnostic tools (n=8), diseases (n=24), treatments (n=20) and complications (n=8) were deemed worthy of inclusion in the report.

### Step 2: Writing the terms and developing the report

At this stage, it was decided by whom which terms would be written with the voluntary participation of the commission members. Each commission member wrote an average of (standard deviation) 10.8 (±4.3) terms, but the members also received opinions from other TKRCD members who were not members of the commission, if they deemed necessary. During the writing, literature support was deemed absolutely necessary and the publications frequently cited in the meetings were re-checked.

The control of the writing format and content of the terms written in their meetings was discussed by the members of the commission, and a consensus was tried to be reached, and in cases where this could not be achieved, a decision was made by voting. The meanings of the previously determined terms were written by determining their synonyms. Also, similar terms were grouped together. With these regulations, it was aimed that the researcher, who would question a term in the final report in the future, could reach similar terms and have an idea about their differences. Again in the commission meetings, 9 (10.3%) terms were deemed unnecessary and canceled, and 8 (9.2%) terms were combined with similar titles or among themselves. In addition, sub-terms were determined for some terms under the same category and these terms were defined separately. In the interim evaluations, it was decided to add new terms (n=7) upon the recommendation of the President of TKRCD. As a result, their definitions were completed and the distribution of the 89 terms in the final report was as follows: Anatomy (n=26, 29.2%), symptoms and diagnostic tools (n=8, 8.9%), diseases (n=20, 22%, 4), treatments (n=28, 31.4%), and complications (n=7, 7.8%).

Again, in this stage, it was decided to add pictures and figures to the texts with the suggestion of the President of TKRCD. For this purpose, a TKRCD member, a general surgery specialist (BG), who had experience in medical drawing and had been involved in similar studies before, was unanimously added to the commission. In this direction, pictures (n=7) from the archives of the commission members and the figures drawn by the new commission member (n=53) were also studied and added to the report in the subsequent meetings. An example drawing is presented in Figure 1. Many corrections were made for each picture and figure with the suggestions of the commission members.

### Step 3: Consensus and finalization of the report

In the last step, text explanations, pictures and figures were combined, and the typo and spelling were checked once again. Following this, the report was made into a file by the secretary of the commission and presented to the management of TKRCD through the approval of the President of TKRCD. These terms are planned to be included in the official website of TKRCD.

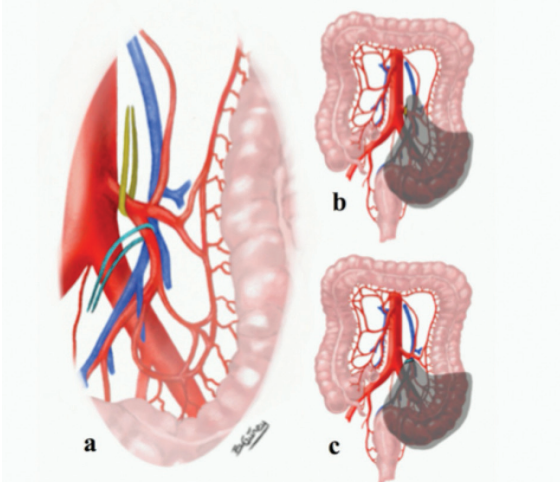


**Figure 1.** A sample drawing prepared by the terminology commission. This drawing shows high and low ligation and resection margins with threads of different colors

## Discussion

In order for the human brain to embody a concept, it is necessary to give it a name in the first step. Differences in definition in medicine, especially in surgery, pose an important problem for researchers, clinicians, and patients.[5] For this purpose, TKRCD decided to prepare a terminology report for the use of physicians practicing in the field of colorectal surgery. This study aimed to explain the working order of the commission established for this purpose, the criteria and results it set forth to prepare the terminology report.

The process of preparing terminology reports involves some difficulties. Among these, it is to choose the people who will take part in the commission who will make the definition. At this stage, the initiative of societies to form working groups is a solution that is both fast and suitable for the flow of life. In the literature, it is frequently seen that various gynecology and anatomy societies have formed commissions or working groups to define anatomical structures.[1,6,7] In this study, the members of the commission were selected from among its own members by the TKRCD Board of Directors, who were dealing with colorectal surgery for many years. In addition, it was underlined that all members who wanted to take part in the work of the commission during and after the workshop held on February 22, 2020 could take part in the work of the commission. Similarly, the commission was expanded in case of need. For example, the commission decided to expand on the decision to include pictures in the report and invited new members. In addition, the commission did not hesitate to get suggestions by contacting the opinions of people outside the commission (for example, the President of TKRCD). Some descriptive studies achieved consensus on terminology through questionnaires.[1] However, such an application may not have literature support. Moreover, there

is a potential for criticism from those who disagree with the survey's final decision or those who have not participated. Commissions are more often accepted as they conduct literature searches and create environments for discussion on each term.

Which terms to include in the report is another difficult topic. Regardless of the number of items in the final report, it can be predicted that why some terms are included in the scope of this study or, on the contrary, why some terms are excluded from the report will be an important point of criticism. This issue is most likely one of the serious difficulties in preparing such reports, as this point is very subjective and individual differences are commonplace. For example, a surgeon who has a lot of practice in cancer may hope that even more detailed terms on this subject will be included in the report, while another surgeon who practices less on this subject may want simpler terms to be included in the report. For this reason, the commission found it appropriate to stay within reasonable limits on this issue and determined that it should be used more frequently in "daily practice" at the beginning as the main criterion for inclusion in the report.

Also it is impossible that the items written and the terms suggested are accepted, liked and approved by everyone. This is especially true when a concept is expressed in many terms. In such a case, the terms are understood or named differently by various teams and centers. For this reason, this is the area where consensus commissions have the most difficulty. In a multicenter study aiming to explain where the rectum was anatomically, only 36% of all participants agreed on the concept of "rectum" in the final report, while the others did not accept the result. However, 92.4% of those who voted in the same study emphasized that it was important to make this definition.[5] It is possible to see similar differences in other terms. For example, there is still no consensus on the definition of anastomotic leak.[8] One systematic review states that there are 29 different definitions for lower gastrointestinal tract anastomotic leaks.[9] In a situation where even consensus texts find it difficult to come up with a single definition for terms, it would be too optimistic to predict universal acceptance of the definitions presented in the report.[5] The commission mentioned in this study consisted of physicians who were dealing with colorectal surgery for years. The final report, which included the terms studied, was prepared as a result of many meetings held over a long period of 15 months. Literature support was sought in the writing of all terms. Despite all these well-intentioned efforts, the written terms are not unchangeable texts. In line with future criticisms, it is possible to change and improve the final report by reviewing it in the future. Especially since the language has a living, changing and dynamic structure, it can be predicted that this report will be a step towards a better definition of these terms in the future and new definitions will be made that are less affected by the limitations listed. The important point is to assume that the presented text is a well-intentioned final report prepared by TKRCD and to take part in the effort to advance it.

As a result, this study explains the working order of the TKRCD terminology commission, the criteria it has set for preparing the terminology report, and its results. It may be appropriate to evaluate the report on the official website of TKRCD with this information. It is possible to develop the report in the future.

**Peer-review:** Internally peer reviewed.

### Authorship Contributions

Concept: G.Ç., S.I., B.G., Ö.K., M.A.K., N.O., M.Ö., V.Ö., N.Ş., L.V.T., Design: G.Ç., S.I., B.G., Ö.K., M.A.K., N.O., M.Ö., V.Ö., N.Ş., L.V.T., Data Collection or Processing: M.Ö., V.Ö., Analysis or Interpretation: G.Ç., S.I., B.G., Ö.K., M.A.K., N.O., M.Ö., V.Ö., N.Ş., M.Ö., V.Ö., Literature Search: S.I., B.G., Ö.K., M.Ö., V.Ö., L.V.T., Writing: M.Ö., V.Ö.

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

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RESEARCH ARTICLE

# Recurrence is not the Only Problem with Sacrococcygeal Pilonidal Sinus Disease: A Comparison between Microsinusectomy and Limberg Flap Technique

## Sakrokoksigeal Pilonidal Sinüs Hastalığında Tek Sorun Nüks Değil; Mikrosinüsektomi ve Limberg Flep Tekniklerinin Karşılaştırılması

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## ABSTRACT

**Aim:** The aim of this study was to compare Limberg flap technique (LF) with microsinusectomy technique (MS) for the treatment of sacrococcygeal pilonidal sinus disease (SPS), in terms of early postoperative outcomes.

**Method:** Ninety-six patients who underwent LF or MS for SPS at two different centers between October 2017 and October 2018 were included. The patients were evaluated retrospectively. The primary endpoints comprised of the duration of incapacity for work and postoperative patient's comfort and capabilities, while the secondary endpoints included postoperative complications, first-year satisfaction, and recurrence rates.

**Results:** The demographic data were similar in both LF and MS groups. The median operating times (60 vs. 18 minutes; p<0.01) and median length of stay (26 vs. 2 hours; p<0.01) were significantly shorter in the MS group. Postoperative pain scores were comparable in both groups. Postoperative complications were significantly higher in the LF group (61.1% vs. 6.7%, p<0.01). Pain-free walking (11.4 vs. 2.15; p <0.01) and return to work (26.2 vs. 5.15; p <0, 01) were significantly lower in the MS group. Postoperative first-year satisfaction and recurrence rates were comparable.

**Conclusion:** Despite similar satisfaction and recurrence rates to LF, MS might be preferred due to its shorter hospital stay, lower risk of complication and more rapid return to work and normal activities.

**Keywords:** Microsinusectomy, complication, comfort, return to work

## ÖZ

**Amaç:** Bu çalışmada, sakrokoksigeal pilonidal sinüs hastalığının (SPS) tedavisinde Limberg flep (LF) tekniği ile mikrosinüsektomi (MS) tekniğinin erken dönem postoperatif sonuçlarının karşılaştırması amaçlandı.

**Yöntem:** Ekim 2017 ile Ekim 2018 arasında farklı iki merkezde SPS için LF ve MS uygulanan 96 hasta dahil edildi. Hastalar geriye dönük olarak değerlendirildi. Çalışmada birincil sonlanım; iş göremezlik zamanı, ameliyat sonrası hasta konforu ve rahatlığı; ikincil sonlanım noktaları ise postoperatif komplikasyonlar, birinci yıl hasta memnuniyeti ve nüks oranlarıydı.

**Bulgular:** Demografik veriler her iki grupta da benzerdi. Ortanca ameliyat süresi (60 dakika vs 18 dakika; p<0,01) ve ortanca hastanede kalış süresi (26 saat vs 2 saat; p<0,01) Postoperatif ağrı skorları her iki grupta benzerdi. Postoperatif komplikasyonlar LF grubunda anlamlı olarak daha yüksekti (%61,1 vs %6,7; p<0,01). Ağrısız yürüme (11,4 gün vs 2,15 gün; p<0,01) ve işe dönüş (26,2 gün vs 5,15 gün; p<0, 01) MS grubunda anlamlı olarak daha düşüktü. Postoperatif birinci yıl hasta memnuniyeti ve nüks oranları benzerdi.

**Sonuç:** MS tekniği, LF tekniği ile benzer memnuniyet ve nüks oranlarına sahip olmasının yanında, hastanede kalış süresinin kısa, komplikasyon oranlarının düşük, işe ve günlük aktivitelere hızlı dönüş olması nedeniyle öncelikli olarak tercih edilebilir.

**Anahtar Kelimeler:** Mikrosinüsektomi, komplikasyon, konfor, işe dönüş

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## Introduction

Pilonidal sinus is a cystic disease that most often affects the sacrococcygeal region. It disrupts daily activities and life comfort and its surgical treatment causes long-term labor loss. The prevalence of sacrococcygeal pilonidal sinus (SPS) disease has increased in recent years, and the currently estimated incidence is 26 per 100,000 per year in the general population.[1] Although SPS treatment appears simple, the socioeconomic burden is quite high as young people between 20 and 30 years of age are at risk. The treatment takes weeks to months and the reported overall recurrence rates at 20 years follow-up reach 34%.[2]

The ideal treatment for pilonidal sinus should include a short hospitalization period, low risk of complications, rapid return to normal activities, low cost and should be associated with a low recurrence rate.[3,4] The Limberg flap technique is frequently used for the treatments of SPS. However, it does not fulfill the criteria to be an "ideal" surgical treatment for SPS.

Therefore, the aim of the present study was to compare LF and the microsinusectomy techniques (MS) in terms of clinical outcomes and patient acceptability.

## Materials and Methods

Patients who underwent surgery for SPS with LF and MS in Bayburt State Hospital and Bursa Private Aritmi Osmangazi Hospital, from October 2017 to October 2018, were evaluated retrospectively. This study was approved by the institutional review board.

The demographics of the patients, presence of initial abscess, length of stay, postoperative complications, duration of wound healing, postoperative pain scores as assessed using a visual analogue scale (VAS) with 0 = no pain and 10 = most intolerable pain, pain-free walking time without the use of painkiller, time to return to work, satisfaction in the first year and recurrence rates in the first year were compared between the two groups.

The SPS was divided into five types, as classified by Irkörücü et al.[5] These are: Type I - pit(s) on the natal cleft; Type II - pit(s) on either side of the natal cleft; Type III - pits on both sides of the natal cleft; Type IV- complex SPS with multiple pits on and beside the natal cleft; and Type V - recurrent SPS.

Inclusion criteria comprised: patients older than 16 years of age; American Society of Anaesthesiologists (ASA) type 1 and 2 patients; and SPS type 1, 2 and 3 patients. Exclusion criteria comprised: ASA type 3, 4, 5 and 6 patients; SPS type 4 and 5 patients; patients with penicillin allergy; and patients who were not available for follow-up.

After the patients were evaluated at the outpatient clinic and informed about both the methods, they were asked to choose which surgical technique they would prefer to undergo. All surgical operations were performed by one of two different surgeons, with the patient in prone position, using standard methods. LF was performed by a standard method as defined by Käser et al.[1] without the use of methylene blue, under spinal anesthesia. For MS, the patient was brought into a supine position and the shaved and buttocks were separated by bands. The orifice of the pilonidal sinus was probed in each case. The orifices and sinus were then closely excised under local anesthesia with a scalpel or scissors over a 2 cm elliptical, mini-incision, which also included the pilonidal cyst. After hemostasis was achieved, the wounds were left open to heal. All patients were instructed to clean the wound in the shower at least once a day until complete healing was achieved (Figure 1). Second-generation cephalosporin was administered in a single intravenous dose before either technique was performed. No postoperative antibiotic treatment was given. If an abscess was present, it was first drained by a small incision under local anesthesia followed by oral amoxicillin and clavulanic acid for 7-10 days at a dose of 2x1 g per day. After two weeks, either of the two surgeries was performed.

Postoperatively, patients were assessed on the first, third, seventh and fourteenth days and on the first, third, and sixth months and at one year. At the end of the first year, recurrence was assessed and a satisfaction score questionnaire was completed by each patient. Satisfaction scores ranged from 0 to 10 (0 = not at all satisfied, 10 = completely satisfied).

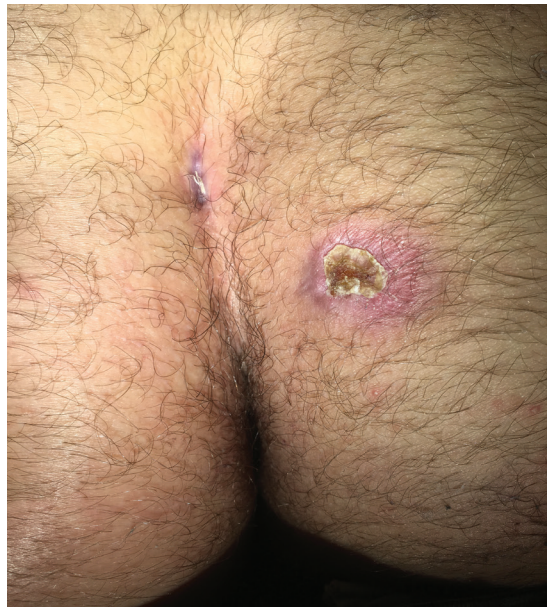

**Figure 1:** The appearance of the healing wound after microsinusectomy

The primary endpoints included the duration of incapacity for work and postoperative patient's comfort and patient acceptability, while the secondary endpoints included postoperative complications, first-year satisfaction, and recurrence rates.

The results were expressed as median and range. For statistical analyses, two-sided Fisher's exact test was used for categorical data and the Mann-Whitney U test was used for numerical data. A p value of less than 0.05 was considered to be significant.

## Results

Out of 147 patients treated at the two centers for one year, 96 patients who met the inclusion criteria were included in the study. Demographics and perioperative data of the patients were evaluated and are presented in Table 1. The operative time (p<0.01) and length of stay (p<0.01) were significantly shorter in the MS group.

Wound healing time, postoperative VAS pain scores, postoperative complications, pain-free walking and time to return to work were assessed and are given in Table 2. In the LF group, postoperative complications were worse (p<0.01), pain-free walking was worse (p<0.01) and return to work was longer (p<0.01) than in the MS group. Postoperative complications in LF were: wound dehiscence in 14 (38.8%), skin necrosis in four (11.1%), wound infection in two (5.6%), and hematoma in two (5.6%). In the MS group the only complication encountered was bleeding in four (6.7%) patients.

The satisfaction scores and recurrence rates at the end of the first year were compared and the results were found to be similar for both the groups (p=0.57 and p=1.0, respectively) (Table 3).

## Discussion

The optimal surgical treatment for SPS has not yet been identified and the optimal therapy for SPS is also still under debate, so different surgical techniques are used. This study investigated clinical outcomes and patient comfort and acceptability. In patients undergoing MS the duration of surgery and length of stay and time to pain free walking were shorter, postoperative complication rates were lower, and return to work was earlier. Clinical outcomes appeared to be generally better in the MS group compared to the LF group and thus MS could be safely chosen with clinical results in SPS treatment.

Surgery is the central treatment option for SPS. Although minimally invasive procedures, such as lay-open, removal

**Table 1.** Patients' demographics and perioperative details

| | LF (n=36 ) | MS (n=60) | p value |
|---|---|---|---|
| Age | 23.5 (16-45) | 23 (16-44) | 0.92 |
| Male gender (%) | 83.3% (n=30) | 81.7% (n=49) | 0.78 |
| Presence of initial abscess (%) | 23.3% (n=14) | 22.2% (n=8) | 0.96 |
| Median interval between incision and definitive surgical treatment (days) | 13 (12-15) | 13 (12-14) | 1 |
| Median operating time (minutes) | 60 (35-80) | 18 (12-25) | <0.01 |
| Median length of stay (hours) | 26 (18-112) | 2 (1-3) | <0.01 |

LF: Limberg flap technique MS: Microsinusectomy technique

**Table 2.** Postoperative outcomes

| | LF (n=36 ) | MS (n=60) | p value |
|---|---|---|---|
| Wound healing (days) | 16 (14-19) | 22 (18-30) | 0.18 |
| Postoperative first day VAS | 3 (1-6) | 3 (2-7) | 0.46 |
| Postoperative fourteenth day VAS | 2 (0-4) | 2 (0-3) | 0.52 |
| Postoperative complications (%) | 61.1% (n=22) | 6.7%(n=4) | <0.01 |
| Pain-free walking (days) | 11.5 (6-17) | 2 (1-5) | <0.01 |
| Return to work (days) | 25 (20-40) | 5 (2-9) | <0.01 |

LF: Limberg flap technique MS: Microsinusectomy technique VAS: Visual analog scale

of hair only, curettage and phenol treatment are performed, the recurrence rates are higher when these techniques are used.[4,6] More invasive procedures, such as flap techniques including LF and V-Y advancement, Z-plasty, and Karydakis flap, have been described by some as overtreatment for SPS because large tissue displacements are involved.[6] Another significant factor is that wound healing along the midline is faster than that away from the midline while the complications and recurrence rates for flaps are reported to be lower.[7] Therefore, flap techniques are preferred for off-midline healing.[8] However, because comparative studies for MS using novel and less invasive techniques are limited in number, it is usually not the first choice. The biggest problem with a flap technique is the long period before return to normal daily activity together with poor post-operative patient comfort and patient acceptability. Therefore, the present study was performed not only to compare the rates of recurrence and postoperative complication, but also the time to return to daily activity and postoperative patient comfort and acceptability.

To prepare patients for the SPS surgery, any technique of anesthesia including local, spinal, and general anesthesia may be used. Almost all of the MS techniques can be performed with local anesthesia. LF is usually performed under spinal anesthesia or general anesthesia. This difference in anesthesia directly affects the discharge time and postoperative early period. General anesthesia is not preferred due to positional respiratory problems other than the side effects of general anesthesia itself.[9] Patients undergoing spinal anesthesia are admitted to the hospital for an average of 24 hours, taking into consideration the duration of the spinal blockade and possible side effects.[1,10] In contrast, patients undergoing local anesthesia can be discharged immediately after the procedure.[9] However, patients administered local anesthesia may rarely experience allergic dermatitis and toxicity at high doses. When the MS technique is performed under local anesthesia, the duration of surgery and the length of stay in the hospital are remarkably shortened compared to flap techniques. Therefore, the cost of MS surgery is lower because of a reduction on health care resource usage, including less medical equipment, shorter operating time and shorter length of stay. In addition, emotional effects may be less due to the short time spent in the operating room and because hospitalization is not required. Indeed, in the present study, all of the MS techniques were performed under local anesthesia. However, if spinal anesthesia was administered for MS techniques, the duration of hospitalization would be prolonged due to the effect of the anesthetic technique. The duration of operation is a major disadvantage in LF technique.[11]

In the present study, even though wound healing time was similar, return to work and return to daily life were noticeably faster in the MS group. Earlier studies have presented contradictory findings. Testini et al.[12] demonstrated that a flap method was more advantageous as compared to excision and secondary wound healing with respect to the time required to return to work. However, a study by Ersoy et al.[13] reported no difference in the time required to return to work when comparing LF and primary closure. A meta-analysis reported a range of 3-42 days for return to work in different types of procedures.[7] However, patients who undergo MS are more comfortable in the postoperative period because of the lack of extensive excision, a smaller incision, a lower rate of complication and lack of tightness, as there is no suture. Thus, the time taken to return to normal daily activity and that required to return to work are thought to be shorter. Although the open wound may seem to be a disadvantage, only a few minutes of wound care are needed and pain does not require any analgesic and does not prevent daily activities.

The complications in the LF group mainly included wound dehiscence and skin necrosis. Some surgeons ignore wound dehiscence. To avoid this well-known complication, some surgeons prefer a modified LF technique, placing the lower pole 1-2 cm lateral to the midline.[1,14] In this study, a modified LF technique was not applied in any of the patients and wound dehiscence was seen in almost one-third of them. The only postoperative complication detected in the MS group was bleeding. The bleeding was controlled in the outpatient room immediately after readmitting the patient. Other studies have reported bleeding after excision in 0%-2.8% of cases.[4,6,12] In this study, the rate of bleeding after MS technique was higher at 6.7%. This can be explained by the fact that in relation to the excision, MS is performed from a much smaller incision, and thus the exposed area is not as wide as the excision.

**Table 3.** First-year satisfaction, recurrence rates

| | LF (n=36 ) | MS (n=60) | p value |
|---|---|---|---|
| Postoperative first year satisfaction score (0-10) | 7 (5-10) | 8 (5-10) | 0.57 |
| Postoperative first year recurrence (%) | 2.77% (n=1) | 1.66% (n=1) | 1 |

LF: Limberg flap technique MS: Microsinusectomy technique

Studies comparing the LF with the excision technique have reported lower recurrence rates in the LF technique. However, studies comparing MS are rare.[15,16] In our study, the recurrence rates were found to be similar in both the LF and MS techniques (2.77%-1.66%). However, in a long-term study by Doll et al.[2], the 20-year recurrence rate was up to 34%, which indicates an increase and difference in recurrence rates. Furthermore, as wound complications significantly influence the long-term recurrence rate[1,17], it can be anticipated that the long-term recurrence rate in the LF group would be higher than that in the MS group.

### Stduy Limitations

Limitations of this study include the retrospective design, Type II error, possibility of bias due to lack of randomization, possibility of bias in patient selection and short follow-up. Although one-year follow-up is sufficient in terms of evaluation of the postoperative comfort and patient acceptability, it will be insufficient to get a clear picture of recurrence rates. The lack of patients in the MS group undergoing spinal anesthesia is another limitation of the study; the authors recommend local anesthesia with the MS technique.

## Conclusion

In conclusion, despite similar patient satisfaction and recurrence rates to LF at one-year follow-up, MS might initially be preferred due to shorter hospital stay, lower complication risk, and rapid return to work and normal activities. Further prospective clinical trials are required to examine the efficiency of this technique in the long term.

### Ethics

**Ethics Committee Approval:** The study was conducted according to the tenets of the Declaration of Helsinki. No Institutional Review Board approval was required for this study because in retrospective nature and there was no deviation from normal clinical practice.

**Informed Consent:** Obtained.

**Peer-review:** Externally and internally peer reviewed.

### Authorship Contributions

Surgical and Medical Practices: B.G., E.Ö., Concept: B.G., E.Ö., Design: B.G., E.Ö., Data Collection or Processing: B.G., Analysis or Interpretation: E.Ö., Literature Search: B.G., Writing: B.G.

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

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RESEARCH ARTICLE

# Does a Standardized Distance Cut-off Accurately Predict the Length of the Rectum? Using MRI to Analyze the Height of the Peritoneal Reflection

## Standartlaştırılmış Mesafe Eşiği Rektumun Uzunluğunu Doğru Bir Şekilde Öngörür mü? Peritoneal Refleksiyonun Yüksekliğini Analiz Etmede MRG Kullanımı

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## ABSTRACT

**Aim:** Standardized distance cut-offs are frequently utilized as a surrogate in determining whether neoadjuvant therapy is needed in treating upper rectal cancer. With patient-to-patient variation in rectal length this method can prove inaccurate. This article establishes the range of natural variation in the height of this structure in patients and if standardized measurement cut-offs are inappropriate in characterizing its location.

**Method:** Retrospective chart review, from 2015 to 2019, of patients in whom pre-operative rectal cancer staging magnetic resonance imaging was undertaken. Measurement from the anal verge to the anterior peritoneal reflection (APR) and sigmoid take-off (ST) was performed. Differences between genders were compared and distance measurement correlations with height, weight, age, and body mass index were investigated.

**Results:** Mean overall height of the APR was 11.9±2.0 cm from the anal verge. When genders were compared this measurement was 12.3±2.1 cm in males and 11.3±1.5 cm in females (p=0.003). Overall, the 75$^{th}$, 90$^{th}$, and 95$^{th}$ percentile of the height of the APR was 13.2 cm, 14.5 cm, and 15.5 cm, respectively. Average height of the rectum at the ST from the anal verge was 19.3±2.4 cm and 14.3±2.1 cm, for men and women, respectively. No anthropometric measurements had a strong correlation with APR height.

**Conclusion:** Males possess a higher APR and ST over females. This difference resembles the difference between genders in anal canal length. Currently utilized standardized rectal length cut-offs may inappropriately categorize patients as rectal cancer whose tumor may lie above the peritoneal reflection.

**Keywords:** Peritoneal reflection, neoadjuvant chemoradiation, sigmoid take-off, rectum length

## ÖZ

**Amaç:** Üst rektum kanserinin tedavisinde neoadjuvan tedavinin gerekli olup olmadığının belirlenmesinde standartlaştırılmış mesafe eşikleri sıklıkla kullanılır. Rektal uzunluk hastadan hastaya değişiklik gösterdiğinden bu yöntem yanlış sonuçlar verebilir. Bu makale, hastalarda bu yapının yüksekliğindeki doğal varyasyon aralığını ve konumunu karakterize etmede standart ölçüm eşiklerinin uygun olup olmadığını belirlemektedir.

**Yöntem:** Ameliyat öncesi rektum kanseri evrelemesi için manyetik rezonans görüntüleme yapılan 2015'ten 2019'a kadar ki hastaların retrospektif tablo incelemesi hazırlanmıştır. Anal sınırdan anterior peritoneal refleksiyona (APR) ve sigmoid take-off'a (ST) kadar ölçüm yapıldı. Cinsiyetler arasındaki farklılıklar karşılaştırılmış ve boy, kilo, yaş ve vücut kitle indeksi ile mesafe ölçüm korelasyonları araştırılmıştır.

**Bulgular:** APR'nin ortalama toplam yüksekliği anal sınırdan itibaren 11,9±2,0 cm idi. Cinsiyetler karşılaştırıldığında bu ölçüm erkeklerde 12,3±2,1 cm, kadınlarda 11,3±1,5 cm idi (p=0,003). Genel olarak, APR yüksekliğinin 75., 90. ve 95. yüzdelikleri sırasıyla 13,2 cm, 14,5 cm ve 15,5 cm idi. Anal sınırdan ST'ye kadar olan ortalama rektumun yüksekliği erkeklerde ve kadınlarda sırasıyla 19,3±2,4 cm ve 14,3±2,1 cm idi. Hiçbir antropometrik ölçüm APR yüksekliği ile güçlü bir korelasyona sahip değildi.

**Sonuç:** Erkekler kadınlara göre daha yüksek APR ve ST'ye sahiptir. Bu fark, anal kanal uzunluğundaki cinsiyetler arasındaki farka benzemektedir. Halihazırda kullanılan standartlaştırılmış rektal uzunluk eşikleri, peritoneal refleksiyonun üzerinde yer alan tümörleri yanlışlıkla rektal kanser olarak kategorize edebilir.

**Anahtar Kelimeler:** Peritoneal refleksiyon, neoadjuvan kemoradyoterapi, sigmoid take-off, rektum uzunluğu

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## Introduction

The delineation between high rectal cancer and distal sigmoid cancer has a profound effect on the clinical treatment course for patients with distal neoplastic colorectal adenocarcinoma. Neoadjuvant chemoradiation therapy before oncologic resection has been established to significantly improve rates of local recurrence for stage II and III rectal cancer. This improvement disappears as tumor distance from the anal verge increases, and thus, patients with distal sigmoid carcinoma are typically recommended to bypass neoadjuvant chemoradiation and typically move straight to oncologic resection.[1,2] Misclassification of these cancers can lead to unfavorable avoidance or unnecessary administration of potentially life-altering chemoradiation. Chemoradiation has a wide assortment of significant side effects and its effect on quality of life and basic daily bowel function can be evident long after cessation of therapy.[3] This makes the decision to administer this multimodal therapy challenging.

The decision whether neoadjuvant chemoradiation can provide a significant advantage hinges in part on the ability to accurately localize the disease in relation to its intra-luminal and extra-luminal anatomy, in particular the peritoneal reflection. Differences in the lymphatic distribution between regions of the rectum has been hypothesized to be a reason behind the benefit seen with neoadjuvant chemoradiation.[4] The clinical advantage of this neoadjuvant therapy disappears around 10-15 cm, suggesting that local and metastatic disease in this region behaves differently.[5]

The American Society of Colon and Rectal Surgeons (ASCRS) Clinical Practice Guidelines for rectal cancer utilizes a distance cut-off to define rectal cancer which is limited to tumors within 15 cm of the anal verge.[6] This definition poses inherent limitations, as previous literature has identified variations in the length of the rectum with body habitus and sex.[7] Utilizing standardized cut-offs for all patients for the delineation of rectal tumors from distal sigmoid tumors appears to be inappropriate. As the literature has demonstrated, there is a general acceptance in the surgical community that an anatomical landmark, specifically the peritoneal reflection, defines the transition from rectal cancer to distal sigmoid cancer. Thus, utilizing magnetic resonance imaging (MRI) to establish the boundaries of the rectum and the tumor's relation to it, is paramount in delineating rectal from distal sigmoid cancer.[8]

The aim of this study was to establish the average height and variation patterns of the peritoneal reflection, along with other extra-luminal structures, to guide practitioner management for the administration of neoadjuvant chemotherapy. This information can also be used to either guide standardized distance cut-offs for treatment decisions related to neoadjuvant therapy or to exclude this therapy in cases where it would be ineffective.

## Materials and Methods

### Study Design

This manuscript follows STROBE guidelines for a cross sectional observational study.[9]

### Setting

This study was undertaken at an academic, tertiary referral center from January 2016 to November 2019. It evaluated patients with a diagnosis of rectal cancer who underwent pre-operative staging pelvic MRI. Exclusion criteria included patients presenting for rectal cancer recurrence after oncologic resection, previous pelvic surgery obscuring anatomical planes, patients with low quality imaging possessing motion artifact that precluded accurate assessment of tumor location, previous administration of neoadjuvant chemoradiotherapy for rectal cancer, and patients with significant missing data in their electronic medical records.

Primary Outcome

The primary outcome was the average measurements from the anal verge to the anterior peritoneal reflection (APR) (Figure 1). This was measured on midline sagittal view and identified the anterior fold of the peritoneal reflection in the rectovesical fold or the recto-uterine pouch, using the freehand distance-tracing tool on Synapse (Fugifilm, Valhalla, NY, USA). All measurements were taken by a

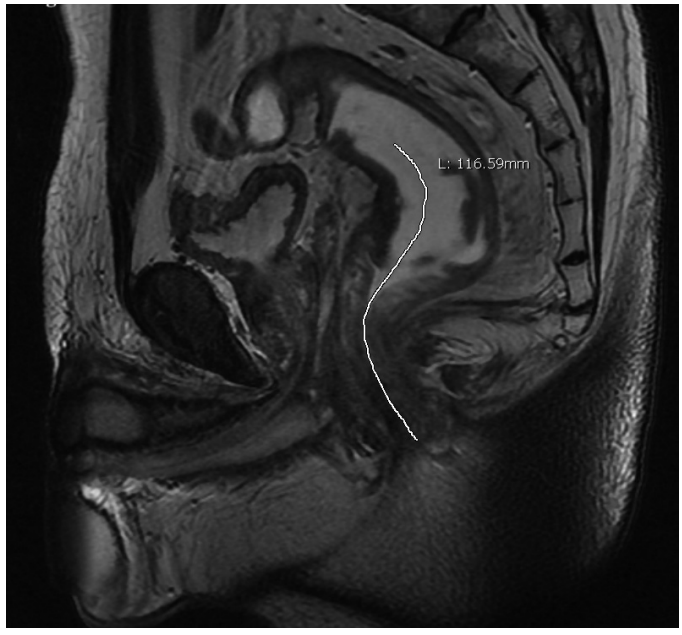


**Figure 1.** Distance measurements from anal verge to the anterior peritoneal reflection

single medical professional, trained by a senior professor of clinical radiology and medicine, as is custom for templated reporting at our institution. On pelvic MRI the mid-sagittal T2 weighted image utilized the freehand distance tracing tool to follow the posterior curve of the rectum from the anal verge to the inferior border of the tumor.[10] This curvilinear measurement was reported to be a valid method to determine tumor height compared to the gold standard rigid rectoscopy.[11] This mid-sagittal location allowed for a more accurate representation of luminal distance. The anal verge was defined by its position relative to the anoderm to stratified squamous transition point. This was represented by the transition from hypo-lucent anoderm to hyper-lucent stratified squamous epithelium, which in the radiologic literature has been demonstrated to be a reliable anatomical landmark for the anal verge.[10] Identical technique was utilized to recreate each measurement from patient to patient to decrease the risk of observation bias. These measurements were taken again two months later with the same technique and were blinded to the previous measurements to confirm their reproducibility.

## Secondary Outcome

Secondary outcomes included height of the APR correlated with height, weight, age, body mass index (BMI), and sex. Other secondary outcomes included the average distance measurement from the pelvic floor to the APR (Figure 2), average distance measurement from the pelvic floor to the sigmoid take-off (ST) (Figure 3), the average distance measurement from the anal verge to the rectal lumen at the sacral prominence (Figure 4), the average distance measurement from the anal verge to the ST (Figure 5).[12,13] This was done by measuring the APR and posterior peritoneal reflection and identifying a line between the two. The point where that line crossed the center of the rectal lumen was defined as the position of the ST. A further

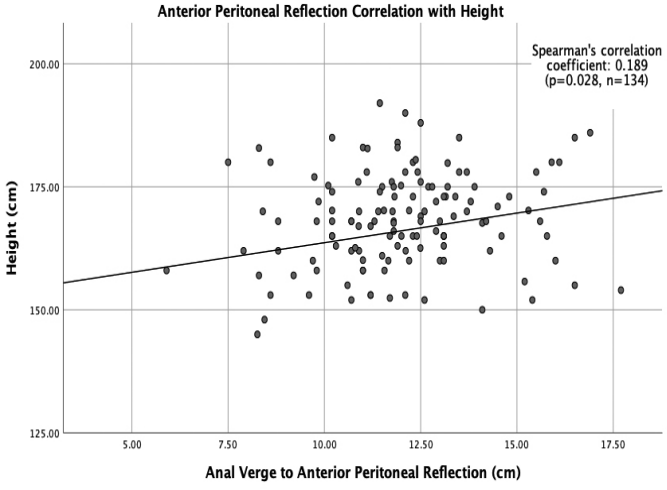


**Figure 2.** Anterior peritoneal reflection correlation with height

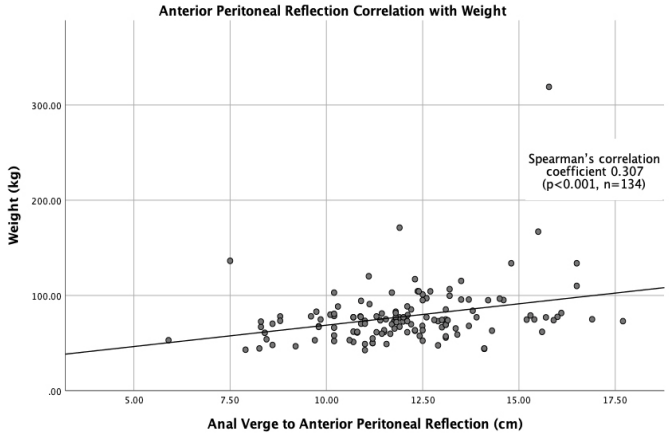


**Figure 3.** Anterior peritoneal reflection correlation with weight

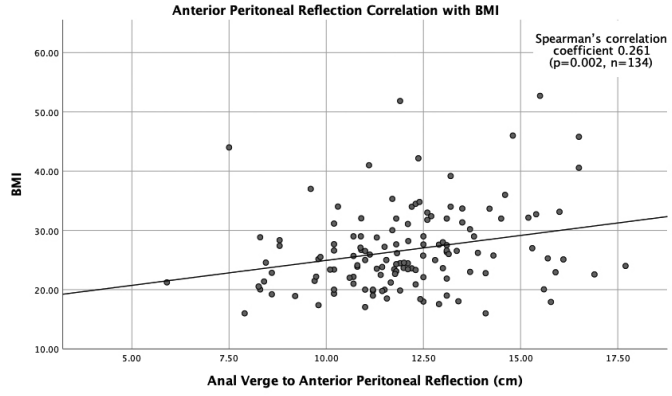


**Figure 4.** Anterior peritoneal reflection correlation with BMI
BMI: Body mass index

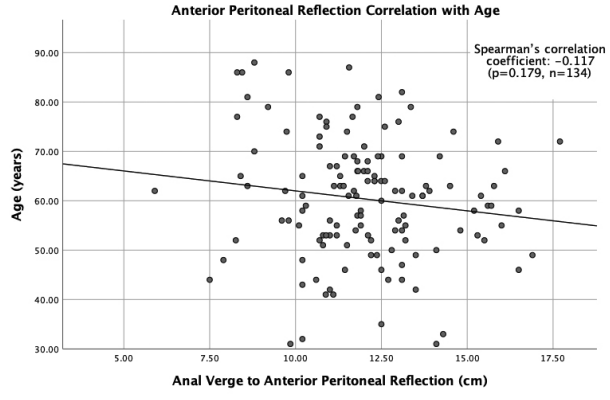


**Figure 5.** Anterior peritoneal reflection correlation with age

secondary outcome was the average distance measurement from the anal verge to the prostate and seminal vesicles in males (Figures 6, 7), and the average anal canal length (Figure 8). Anal canal length was measured on coronal MRI from the inside of the external anal sphincter at the anal verge to the top of the internal anal sphincter and pelvic floor.[14] The height of the rectum at the sacral prominence was determined by drawing a line from the top of the pubic symphysis to the sacral prominence and using the free-hand tracing tool to follow the curve of the rectum along its posterior wall (Figure 4). The free-hand distance tool was used for all measurements.

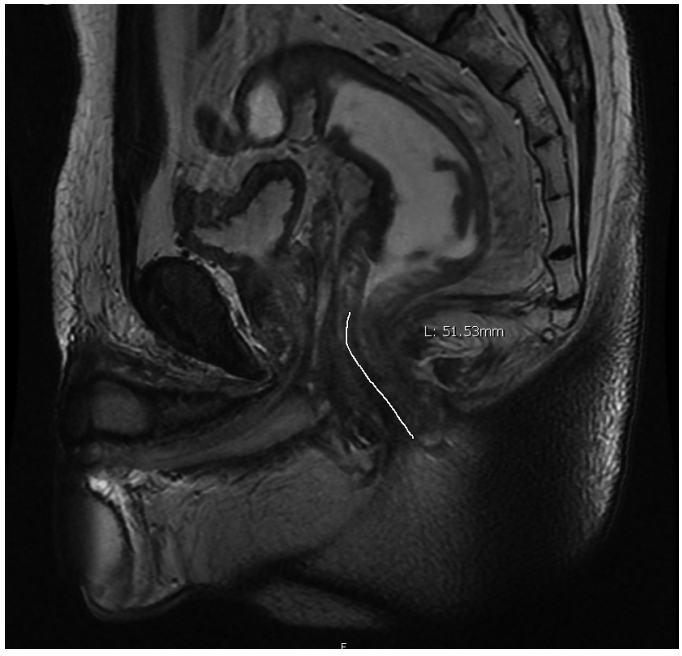


**Figure 6.** Distance measurements from anal verge to the prostate

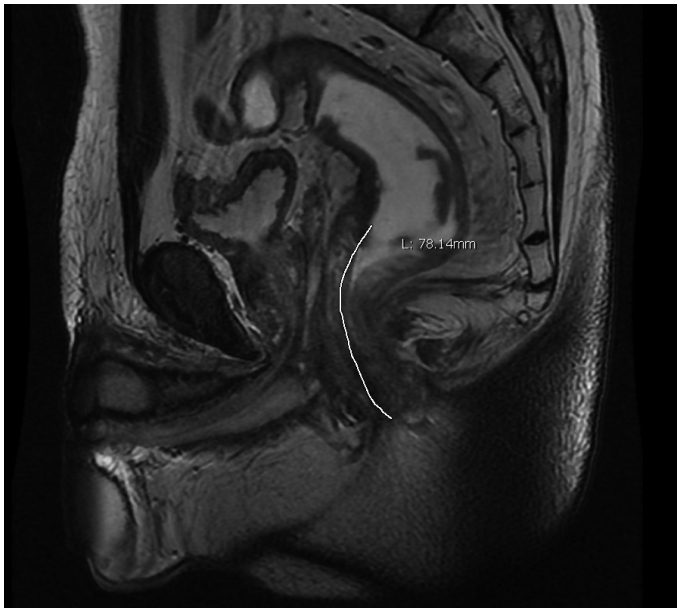


**Figure 7.** Distance measurements from anal verge to the seminal vesicles

### Statistical Analysis

All data and figures were prepared and compiled using the Statistical Package for the Social Sciences, version 26.0 for Macintosh (SPSS Inc, Chicago, IL, USA). Correlations between scale variables were calculated with Spearman correlation coefficients. A Spearman's correlation coefficient of >0.7, 0.69-0.5, 0.49-0.3, and <0.3 along with a p value of <0.05 was considered a strong correlation, moderate correlation, weak correlation, and no correlation, respectively. Independent t-tests and Mann-Whitney U tests were used to compare all anatomical and anthropometric measurements between sex. A p value of <0.05 demonstrated statistical significance. Intra-class correlation coefficient

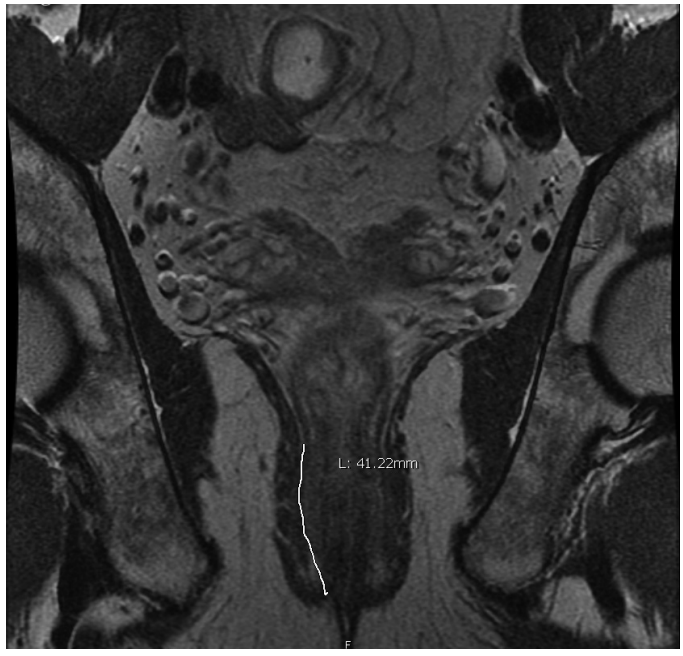


**Figure 8.** Anal canal distance

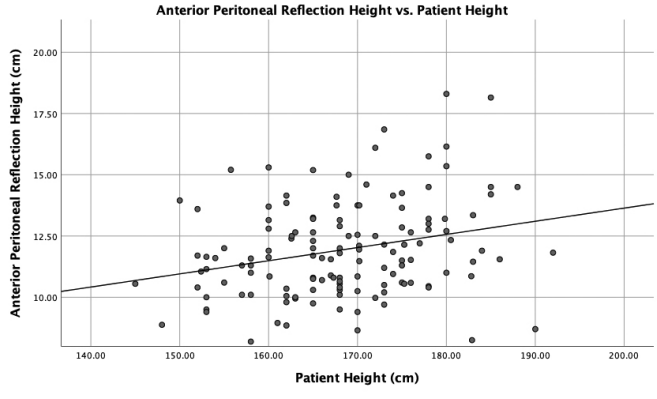


**Figure 9.** Anterior peritoneal reflection correlation with height

(ICC) were calculated between measurement time points to confirm reproducibility of the measurements. An ICC >0.800 was considered strong correlation between the two measurements.

## Results

Between January 2016 and November 2019, 278 patients were identified with a diagnosis of rectal cancer. Of these 278 patients, 7.2% (n=20) were excluded either because of previous pelvic surgery obscuring anatomical pelvic anatomy, or they had recurrent rectal cancer after oncologic resection. Of the remaining 258 patients, 60.1% (n=152) had MRI imaging available for imaging review. Of these 152 patients, 18 had poor quality imaging, preventing identification of the location of the APR or tumor. This left 134 patients with adequate quality preoperative staging MRI available for study.

Patients were 60.7% (n=85) male with a mean age of 60.4±12.2 years. The height and weight was 168.4±9.6 cm and 77.9±30.5 kg, while the median BMI was 25.2 (interquartile range 8.0). The mean distance from the APR to anal verge was 12.0±2.0 cm. When 75$^{th}$ percentile, 90$^{th}$ percentile, and 95$^{th}$ percentile heights of the APR were assessed they corresponded with rectal heights of 13.2 cm, 14.5 cm, and 15.5 cm, respectively The mean distance from the APR to apex of the pelvic floor was 8.5±1.7 cm while the average distance from the ST to apex of the pelvic floor was 10.8±1.9 cm. The average anal canal length was 3.5±1.0 cm. The average height of the rectum at the sacral prominence and ST was 19.3±2.4 cm and 14.3±2.1 cm, respectively, from the anal verge. The average distances from the anal verge to the distal and proximal tumor edge for the cohort were 7.9±3.6 cm and 12.4±3.9 cm, respectively.

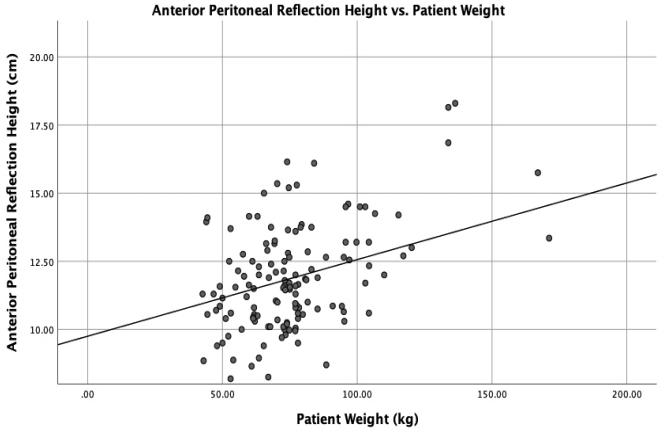


**Figure 10**. Anterior peritoneal reflection correlation with weight

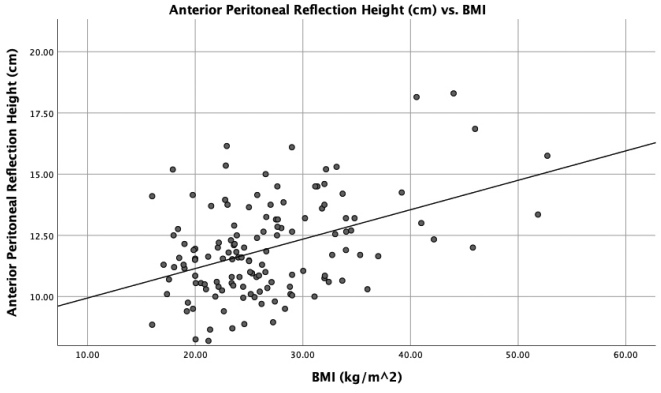


**Figure 11**. Anterior peritoneal reflection correlation with BMI
BMI: Body mass index

### Male vs. Female Comparison

The mean age was 61.1±11.6 years for males and 59.1±13.1 years for females (p=0.358). Males demonstrated a greater average patient height when compared to females (172.5±8.1 cm vs. 161.2±7.6 cm, p<0.001). Males also demonstrated a greater average weight (84.5±34.5 kg vs. 66.3±16.7 kg, p<0.001). The BMI was also statistically higher in the male cohort with a male median BMI of 26.0 (IQR: 8.15) and female median BMI of 23.9 (IQR: 8.50) (p=0.031).

The average height of the APR differed between men (12.3±2.1 cm) and women (11.3±1.5 cm) (p=0.003). The mean APR to pelvic floor distance was 8.5±1.7 cm in the male cohort which was similar to the mean value of 8.6±2.2 cm in the female cohort (p=0.703). When the mean APR to ST distance was compared between men and women there was again no difference at 10.8±1.9 cm in men and 10.8±2.0 cm in women (p=0.848). There was a significant gender difference in mean anal canal length, which was 3.8±0.8 cm in men and 3.0±1.0 cm in women (p<0.001). The average height of the rectum at the sacral prominence from the anal verge was 19.3±2.4 cm in men and 19.5±2.3 cm in women (p=0.516). The average height of the rectum at the ST from

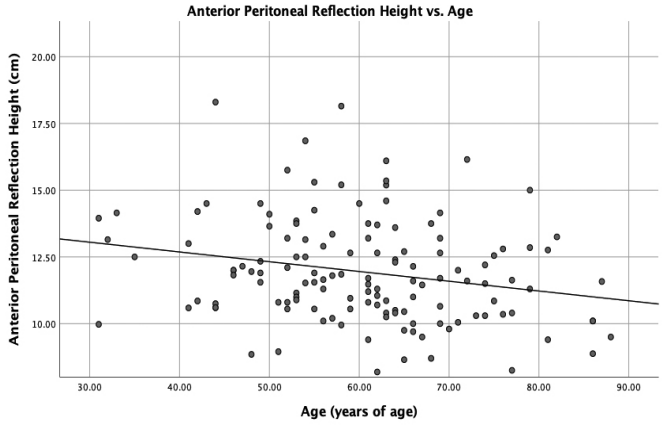


**Figure 12**. Anterior peritoneal reflection correlation with age

the anal verge was 14.7±2.1 cm and 13.8±2.0 cm in men and women, respectively (p=0.019). In the male cohort the height of the prostate and seminal vesicles were 5.1±1.1 cm and 7.8±1.2 cm, respectively (Table 1).

### Correlative Factors for Extraluminal Landmarks

When the height of the APR was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.255 (p=0.003, n=134), 0.377 (p<0.001, n=134), 0.338 (p<0.001, n=134) and -0.238 (p=0.006, n=134) (Figures 9, 10, 11, 12). When the height of the rectum at the sacral promontory was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.194 (p=0.030, n=126) for height, 0.259 (p=0.003, n=126) for weight, 0.176 (p=0.048, n=126) for BMI, and -0.186 (p=0.037, n=126) for age. When the height of the rectum at the ST was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.285 (p<0.001, n=134) for height, 0.365 (p<0.001, n=134) for weight, 0.365 (p<0.001, n=134) for BMI, and -0.204 (p=0.018, n=134) for age. When anal canal was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.400 (p<0.001, n=134) for height, 0.452 (p<0.001, n=134) for weight, 0.407 (p<0.001, n=134) for BMI, and -0.033 (p=0.708, n=134) for age. When the distance between the pelvic floor and the peritoneal reflection was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.019 (p=0.824, n=134) for height, 0.176 (p=0.042, n=134) for weight, 0.208 (p=0.016, n=134) for BMI, and -0.185 (p=0.032, n=134) for age. When the distance between the pelvic floor and the ST was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.159 (p=0.066, n=134) for height, 0.225 (p<0.001, n=134) for weight, 0.232 (p=0.007, n=134) for BMI, and -0.227 (p=0.008, n=134) for age.

In the male cohort, when the height of the prostate was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.173 (p=0.119, n=82) for height, 0.504 (p<0.001, n=82) for weight, 0.520 (p<0.001, n=82) for BMI, and -0.091 (p=0.416, n=82) for age. Lastly, in the male cohort, when the height of the seminal vesicles was correlated with height, weight, BMI, and age, the Spearman's correlation coefficients were 0.176 (p=0.115, n=82) for height, 0.515 (p<0.001, n=82) for weight, 0.527 (p<0.001, n=82) for BMI, and -0.152 (p=0.171, n=82) for age.

### Reliability Analysis

All measurements between time points possessed an ICC of >0.800 signifying strong reproducibility and reliability (Table 2).

## Discussion

This study, which sought to bestow a more comprehensive understanding how standardized distance cut-offs compare with variations in rectal length, succeeded in establishing the presence of a normally distributed APR (skewness 0.720, kurtosis 0.634) and ST height, (skewness 0.307, kurtosis -0.385). This study also demonstrated in both males and females that the men distance of the anatomical boundary of the rectum falls below the commonly used standardized distance cut-off of 15cm in the study cohort. Utilizing this distance cut-off, established by the ASCRS, may predispose rectal cancer patients to receiving neoadjuvant chemoradiation when no clinical benefit may exist. MRI may be important establishing a more personalized treatment protocol for each patient based on individual anatomy rather than generalized standards.

When the total cohort was stratified by sex, women had significantly lower height for the APR and the ST. Of note,

**Table 1.** Male vs. female cohort

| | Male | Female | p value |
|---|---|---|---|
| AV to APR | 12.3±2.1 cm | 11.3±1.5 cm | **0.003** |
| SC to APR | 8.5±1.7 cm | 8.6±2.2 cm | 0.703 |
| SC to ST | 10.8±1.9 cm | 10.8±2.0 cm | 0.848 |
| SC length | 3.8±0.8 cm | 3.0±1.0 cm | **≤0.001** |
| AV to SP | 19.3±2.4 cm | 19.5±2.3 cm | 0.516 |
| AV to ST | 14.7±2.1 cm | 13.8±2.0 cm | **0.019** |
| AV to prostate | 5.1±1.1 cm | | |
| AV to SV | 7.8±1.2 cm | | |

AV: Anal verge, APR: Anterior peritoneal reflection, SC: Sphincter complex, SP: Sacral prominence, ST: Sigmoid takeoff, SV: Seminal vesicles

**Table 2.** Intraclass correlation coefficient calculated between measurement timepoints

| | Measurement 1 | Measurement 2 | ICC |
|---|---|---|---|
| AV to ant PR | 11.9±1.9 | 12.0±2.1 | 0.920 |
| SC to ant PR | 8.5±1.7 | | 0.923 |
| SC to ST | 10.8±2.0 | 10.9±1.8 | 0.957 |
| SC length | 3.4±0.8 | 3.5±0.8 | 0.872 |
| AV to SP | 19.0±2.4 | 19.6±2.5 | 0.887 |
| AV to ST | 14.4±2.1 | 14.4±2.1 | 0.961 |
| AV to SV | 7.7±1.2 | 7.9±1.2 | 0.901 |
| AV to prostate | 5.1±1.1 | 5.2±1.1 | 0.920 |

ICC: Intraclass correlation coefficient, AV: Anal verge, Ant PR: Anterior peritoneal reflection, SC: Sphincter complex, SP: Sacral prominence, ST: Sigmoid takeoff, SV: Seminal vesicles

the distance from the pelvic floor to the APR and ST were located closer to the anal verge, the average distance of the peritoneal reflection and ST was similar between males and females. This in combination with the statistically significant difference in the anal canal length between males and females suggested that the rectum contained within the pelvis was not significantly longer in either gender. Rather, difference in the length of the anal canal could be responsible for the differences seen between the sex cohorts. Our study mirrored previous literature on variation in the length of the surgical anal canal between sexes. On average, the surgical anal canal is longer in males than in females. Intraoperative measurements of the posterior anal canal have estimated the surgical anal canal to be 4.4 cm in men compared with 4.0 cm in women.[15] With our study demonstrating similar differences in anal canal length (3.8 cm in males and 3.0 cm in females), there was an average difference of 0.8 cm between genders. With the average distance difference of 1.0 cm between male and female APR in our study, almost the entire difference can be accounted for by the shorter anal canal and not by the more concave pelvis and thus longer intra-pelvic rectum.

Another important observation is the contradiction of the current literature surrounding rectal length variation with changes in body habitus. Our study observed no strong or even moderate correlations between the APR height, ST, or the height of the rectum at the sacral prominence and any anthropometric characteristics. This demonstrated that there is no accurate way to preoperatively predict variations in the patient's APR height with patient habitus, suggesting that MRI may allow for more accurate guidance of treatment. It also suggests that changes in body metrics or habitus have limited effect on the distance to the peritoneal reflection, contradicting previous literature.[7] It may, however, make obtaining these measurements in the clinical setting more difficult, as patients with greater BMI values are difficult to examine accurately with ERUS and with physical examination.

### Study Limitations

Our study suffered from several limitations. Often the imaging utilized for assessment of the APR height was from an outside hospital MRI. In previous studies, outside hospital MRI imaging protocols vary drastically between institutions, with community imaging centers especially having wide variance in imaging and reporting standards. It is very difficult to obtain the resolution required to identify the peritoneal reflection on imaging qualities less than 1.5 Tesla or without use of surface coils. With inadequate protocols, accuracy of disease staging and involvement of extra-luminal structures can be greatly impacted.[16] Universal standardization of rectal cancer MRI protocols and MRI reporting would greatly benefit the surgical community by facilitating a more effective exchange of knowledge between specialties.[17,18] Another limitation of our study included difficulty defining the true anal verge on MRI. Even amongs radiologic societies, identification of the anal verge on MRI is a controversial topic.[10] Our study utilized guidance provided by the radiologic literature to guide our assessment of the proximal and distal landmarks of our study.[10,19] Previously there have been many tools utilized for measuring distance of a lesion/structure from the anal verge. These included multiple straight lines, a single straight line, and a singular curvilinear line on mid-sagittal MRI. Between the different measurement tools there is no clear consensus as to the superior tool.[18,20,21,22,23,24] Our study utilized a single curvilinear line which demonstrated acceptable accuracy but

is more difficult to recreate between observers.[10] However, with the recreation of these measurements there was strong agreement between observers with all ICC >0.870. When assessing for the average heights, care must be taken to standardize the distal and proximal measurement endpoints. Another weakness of our study was that the prognostic implication of utilizing the APR to guide neoadjuvant chemoradiation therapy was not assessed by this study. Our study simply compared the location of the APR and ST on pelvic MRI to previously established standardized distance cut-offs.

## Conclusion

While endoscopy is an important tool in the diagnosis and preoperative planning for rectal cancer resection, variance in the peritoneal reflection height between patients suggest that endoscopic measurement alone or standardized rectal length cut-offs may provide misleading or inadequate information. In addition, when the height of the peritoneal reflection in males and females was assessed, it was found that the variation in height between genders was almost entirely made up by the difference in the anal canal length. This suggests that the intrapelvic rectum is nearly the same in males and females. MRI and endoscopy, when used in conjunction have the capability to contribute complimentary data and evaluate patent specific anatomy to facilitate a more efficacious treatment plan and the avoidance of inappropriate neoadjuvant chemoradiation administration.

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### Ethics

**Ethics Committee Approval:** IRB approval was granted for the completion of this study with the ID number HS-17-00058.

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### Authorship Contributions

Concept: J.W., G.T., N.S., J.M., M.P.D., K.G.C., S.W.L.

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RESEARCH ARTICLE

# Comparison Between Primary Resection Anastomosis and Hartmann Procedure for the Treatment of Hinchey III and IV Acute Diverticulitis in the Emergency Setting

## Acil Durumda Hinchey III ve IV Akut Divertikülit Tedavisi için Primer Rezeksiyon Anastomozu ve Hartmann Prosedürü Arasında Karşılaştırma

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## ABSTRACT

**Aim:** The surgical management of perforated sigmoid diverticulitis and generalised peritonitis is challenging. We aimed to evaluate the safety and efficacy of primary anastomosis reducing end-stoma rate and to identify the appropriate surgical timing in the emergency setting for Hinchey III and IV acute diverticulitis.

**Method:** Pertinent data of all patients who underwent Hartmann or primary resection anastomosis (PRA) for Hinchey III and IV diverticulitis, performed between January 2014 and April 2019, were entered in a prospectively maintained database. A retrospective analysis was conducted.

**Results:** During the study period 365 patients underwent emergency surgery for colorectal diseases, 84 for acute left-sided colonic diverticulitis. Patients with Hinchey Stage IIb, stenosis and diverticular hemorrhage were excluded. After selection, a total of 36 Hinchey III and Hinchey IV patients, comparing 19 primary resections anastomosis and 17 Hartmann procedures, were finally enrolled in this study. Patient characteristics were equivalent between groups. The primary anastomosis group showed a reduction in reoperation rate for postoperative complications (5.3%, 1/19 vs 23.55%, 4/17; p=0.335) compared with the Hartmann group. Mortality was 10.5% (2/19) vs 29.4% (5/17) for the primary anastomosis versus Hartmann resection groups (p=0.256). Among patients, there was a statistically significant increase in reversal rate for the primary anastomosis group (42.1% vs 0%; p=0.002).

**Conclusion:** PRA and protective ileostomy approaches for Hinchey III and IV acute diverticulitis may be safe and feasible, resulting in satisfactory perioperative outcomes, postoperative complications and reversal rate. The study is ongoing to confirm these results with increased sample size and confidence.

**Keywords:** Acute diverticulitis, Hinchey III and IV, generalized peritonitis, primary anastomosis, Hartmann procedure

## ÖZ

**Amaç:** Perfore sigmoid divertikülit ve jeneralize peritonitin cerrahi tedavisi zordur. Bu çalışmada; Hinchey III ve IV akut divertikülitin acil koşullardaki tedavisinde primer anastomozun end-stoma oranını azaltmada güvenlik ve etkinliğini değerlendirmeyi ve cerrahi için uygun zamanlamayı belirlemeyi amaçladık.

**Yöntem:** Ocak 2014 ile Nisan 2019 arasında Hinchey III ve IV divertiküliti için Hartmann prosedürü veya primer rezeksiyon anastomozu (PRA) uygulanan tüm hastaların ilgili verileri prospektif bir veri tabanına girildi. Retrospektif bir analiz yapıldı.

**Bulgular:** Çalışma süresince 365 hasta kolorektal hastalıklar için acil ameliyata alındı. Bunların 84'ü akut sol kolon divertiküliti için opere edildi. Hinchey Evre IIb hastalığı, darlığı ve divertiküler kanaması olan hastalar çalışma dışı bırakıldı. Geriye kalan ve 19'una PRA, 17'sine Hartmann prosedürü uygulanan toplam 36 Hinchey evre III ve Hinchey evre IV hasta bu çalışmaya dahil edildi. Hasta özellikleri gruplar arasında benzer dağılmaktaydı. PRA grubunun, Hartmann grubuna kıyasla postoperatif komplikasyonlar için tekrar ameliyat edilme oranı daha düşüktü (%5,3 ve 1/19'a karşı %23,55 ve 4/17; p=0,335). Mortalite, PRA grubunda %10,5 (2/19) iken Hartmann rezeksiyon grubunda %29,4 (5/17) idi (p=0,256). PRA grubundaki hastalarda geri dönüş oranı istatistiksel olarak anlamlı derecede yüksekti (%42,1'e karşı %0; p=0,002).

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**Sonuç:** Hinchey III ve IV akut divertikülit tedavisinde PRA ve koruyucu ileostomi yaklaşımları; tatmin edici perioperatif sonuç, postoperatif komplikasyon ve geri dönüş oranları ile güvenli ve uygulanabilir gibi görünmektedir. Bu sonuçları daha fazla hasta ile daha tatmin edici şekilde doğrulamak için çalışma devam etmektedir.
**Anahtar Kelimeler:** Akut divertikülit, Hinchey III ve IV, jeneralize peritonit, primer anastomoz, Hartmann prosedürü

## Introduction

The most recent consensus conferences on acute diverticulitis updated clinicians on the current evidence that can guide surgery management practice in an emergency setting.[1,2,3] Perforated diverticulitis with peritonitis is a life-threatening complication that has been reported to account for more than half of emergency operations, with an increasing prevalence in developed countries from 2.4/100,000 in 1986 to 3.8/100,000 in 2000.[4] Surgical management of Hinchey III and IV diverticulitis utilizes either Hartmann's procedure (HP) or primary resection anastomosis (PRA) with or without fecal diversion, for patients with and without comorbidities.[5] The HP was the most commonly performed emergency operation, accounting for 72% of resections.[3] In recent years, some authors have reported the role of PRA with or without a diverting stoma, in the treatment of acute diverticulitis, even in the presence of diffuse peritonitis.[3] Studies comparing mortality and morbidity of the HP versus primary anastomosis did not show any significant differences and, despite what is reported in the literature, Hartmann currently remains the choice of surgeons in the emergency setting.[6,7] The optimal procedure is still a matter of debate. We aim to evaluate the safety and efficacy of primary anastomosis versus HP in reducing the end-stoma rate and to identify the appropriate surgical timing in the emergency setting for the treatment of Hinchey III and IV acute diverticulitis.

## Materials and Methods

The present study was conducted at the Emergency Department of Policlinico Umberto I of Rome. A retrospective analysis of our database of prospectively collected data was conducted. A total of 365 patients underwent emergency surgery from January 2014 to April 2019 for colorectal diseases, 84 for acute left-sided colonic diverticulitis. Surgical procedures performed include: 49 surgical resection and anastomosis with or without stoma (24 with diverting stoma and 25 without stoma) and 22 HR. Patients with Hinchey Stage IIb, stenosis and diverticular hemorrhage were excluded. Finally, a total of 36 Hinchey III and Hinchey IV patients, comparing 19 PRA and 17 HP, were enrolled in this study (Figure 1).

### Surgical Characteristics

Choice of surgical approach was based on the decision of the individual operator experienced in emergency surgery. Hartmann resection was performed in all cases using open technique. The left colectomy with primary anastomosis was performed, in relation to the specific case, by means of a minimally invasive laparoscopic or open technique. Routinely, in benign colon and rectal diseases we preserve the left colic artery, in order to avoid the need of a central ligation of inferior mesenteric vessels, resulting in increased blood supply for anastomosis, especially in the most severe cases of sepsis. Knight-Griffen was preferred, although manual anastomoses have also been performed in end-to-end or end-to-side fashion. Intraoperative colonic irrigation was routinely performed, primarily in high-risk patients (Figures 2, 3, 4).

### Measurements

Patients demographics included age, sex, American Society of Anesthesiology (ASA) score, comorbidity and history of prior abdominal surgery. Perioperative outcomes included

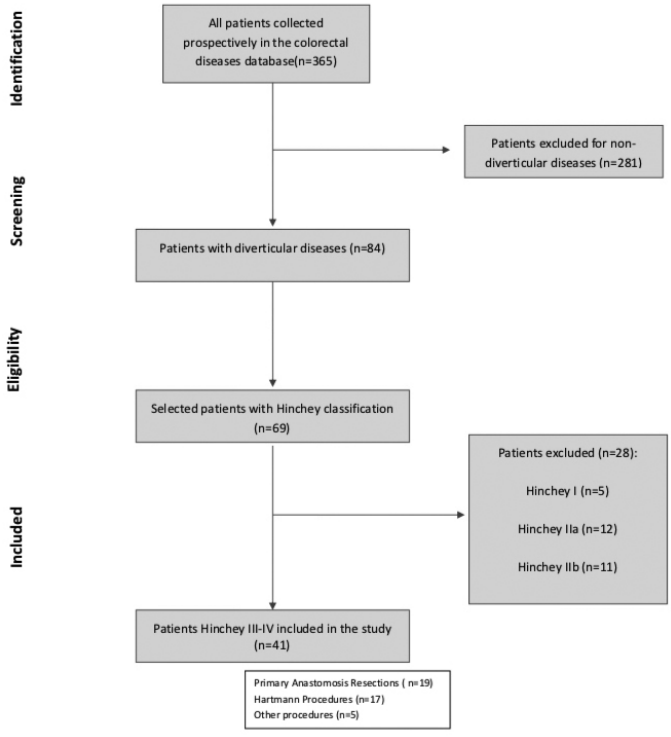


**Figure 1.** Patient selection flow-chart

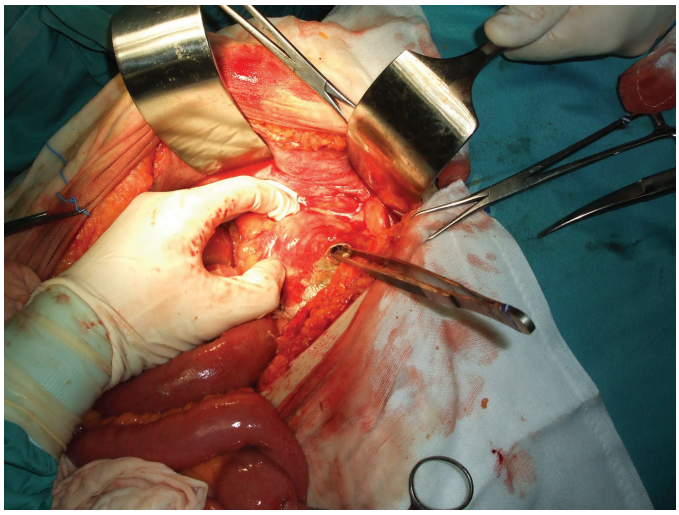

**Figure 2.** Sigmoid diverticular perforation

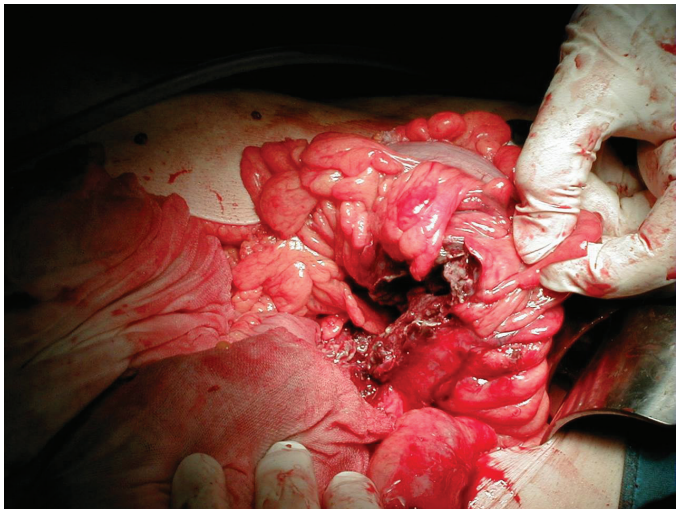

**Figure 3.** View before PRA in a Hinchey IV patient with acute diverticulitis
PRA: Primary resection anastomosis

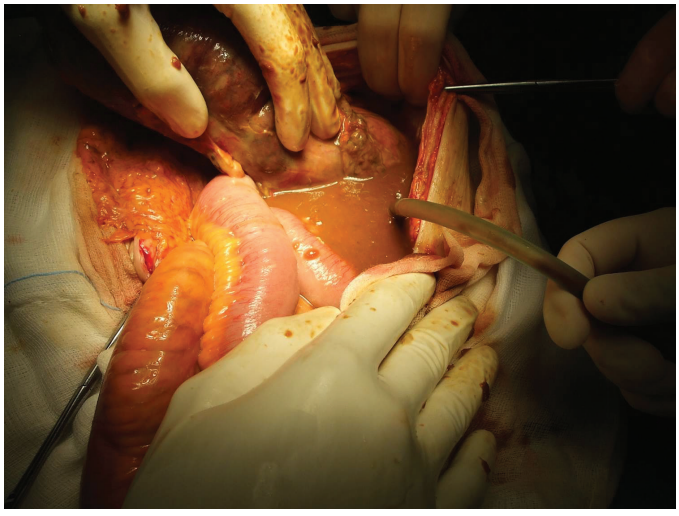

**Figure 4.** View of generalized fecal peritonitis following emergency laparotomy in a Hinchey IV patient

preoperative waiting time (minutes), operating room time (skin-incision to skin-closure, minutes), length of stay (days), postoperative complications (according to Clavien-Dindo classification scale), and re-operation and reversal rate.

### Statistical Analysis

The patient data were collected using Microsoft Excel 2019 from an internal database. A comparative analysis was performed. Descriptive statistics are presented as mean ± standard deviation and ranges for numeric variables and as proportions for categorical variables. Pearson's chi-squared and Fisher's exact tests were employed for categorical variables. Student's t-test was used for continuous variables. Mean difference (MD) and risk difference with confidence intervals of 95% were calculated for numeric variables and categorical variables, respectively, if a statistically significant p value was observed. A level of $p<0.05$ was set as the criterion for statistical significance. The statistical analyses were performed using IBM SPSS (IBM Inc., Armonk, NY, USA).

## Results

The demographic data are compiled in Table 1, and perioperative outcomes are listed in Table 2. In the PRA group, mean age was 63.9±13.4 years and 57.9% were male. In the HP group, mean age was 70.8±13.8 years and 58.8% were female. No statistically significant differences were found in age and sex but a slight difference was found in ASA score between the two groups (PRA group 10/19, 52.6% ASA 2 vs. HP group 8/17, 47% ASA 3; p=0.065). Therefore, although not significant, the difference in ASA score is evident, probably influenced by the small sample of patients, and this could justify Hartmann's resection in critical settings. However, a non-significant difference was found in Hinchey staging between the two procedures (PRA group 14/19, 73.7% vs HP group 9/17, 53% in Hinchey III pts; PRA group 5/19, 26.3% vs HP group 8/17, 47% in Hinchey IV pts; p=0.172). No statistically significant differences were found in operating room time (p=0.850) and length of stay (p=0.990) between the groups. The mean operating room time was the same in the PRA and HP group (211.7 vs 207.2 minimum; p=0.850) and a MD of 4.5 min was observed. According to these preliminary data, there does not appear to be a major difference in terms of surgical time when performing an HP or a PRA in an emergency setting in our center. There was no significant correlation between preoperative waiting time (p=0.739) and operating room time (p=0.946) with postoperative complications in both groups. However, a statistically significant correlation was found between length of stay and postoperative complications (p=0.005).

**Table 1.** Patient characteristics

| | PRA (19 pts) | HP (17 pts) | p value |
|---|---|---|---|
| **Age (yr)** | | | |
| Mean (SD) | 63.9 (13.4) | 70.8 (13.8) | 0.135 |
| **Sex n (%)** | | | |
| Female | 8 (42.1) | 10 (58.8) | 0.317 |
| Male | 11 (57.9) | 7 (41.2) | |
| **ASA score n (%)** | | | 0.065 |
| 1 | 3 (15.8) | 2 (11.8) | |
| 2 | 10 (52.6) | 2 (11.8) | |
| 3 | 3 (15.8) | 8 (47) | |
| 4 | 3 (15.8) | 4 (23.5) | |
| 5 | 0 (0) | 1 (5.9) | |
| Total | 19 | 17 | |

Value are expressed as mean (SD: Standard deviation) or n (%)

PRA: Primary resection anastomosis, HP: Hartmann procedure, ASA: American Society of Anesthesiologists, pts: Patients

**Table 2.** Perioperative outcomes

| | PRA (19 pts) | HP (17 pts) | p value |
|---|---|---|---|
| **Preoperative waiting time (minutes)** Mean (SD) | 2360.3 (4887) | 2649.2 (3996.5) | 0.853 |
| **Operating room time (min)** | | | |
| Mean (SD) | 211.7 (65.5) | 207.2 (71.5) | 0.850 |
| **Length of stay** | | | |
| Mean (SD) | 17.5 (17.9) | 17.4 (21.7) | 0.990 |
| Reversal rate n (%) | 8 (42.1) | 0 (0) | 0.002 |
| **Hinchey staging n (%)** | | | 0.172 |
| III | 14 (73.7) | 9 (53) | |
| IV | 5 (26.3) | 8 (47) | |
| Total | 19 | 17 | |

Value are expressed as mean (SD: Standard deviation) or n (%)

PRA: Primary resection anastomosis, HP: Hartmann procedure, pts: Patients

No intraoperative complications occurred in the PRA or the HP series. Medical complications (Clavien Dindo grade I-II) represented the most frequent cause of overall postoperative complications (19.4%; p=0.256). No abscess (Clavien Dindo grade I-II) was observed in either group. Surgical site infection occurred in one patient (1/19) in the PRA group and in two patients (2/17) in the HP group. No prolonged postoperative ileus or bowel occlusion was observed in either group. Two patients in the PRA group required intervention not under general anesthesia (Clavien Dindo grade IIIa) for anastomotic leak (n=1) and abscess (n=1). Postoperative complications are reported in Table 3 and Figure 5. Symptomatic anastomotic leakage (Clavien Dindo grade IIIb) occurred in one patient (1/19) in the PRA group, requiring open revision with an end-colostomy. This event occurred in a patient who underwent PRA without diverting ileostomy. In the HP group, one patient suffered from massive hemoperitoneum from a rectal stump vessel and so required open surgery on postoperative day 12, and three patients required reoperation for a stoma complication (n=1), an abscess collection (n=1) and a wound dehiscence (n=1). Therefore, the overall re-operation rate was 5.3% (1/19) in the PRA group and 23.5% (4/17) in the HP group. Mortality was 29.4% (5/17 patients) in the HP group while

**Table 3.** Postoperative complications

| | PRA (19 pts) | HP (17 pts) | p value |
|---|---|---|---|
| No complications (Dindo grade 0) n (%) | 8 (42.1) | 5 (29.4) | 0.256 |
| Complications (Dindo grade I-II) n (%) | 4 (21) | 3 (17.6) | 0.256 |
| Medical complications | 3 | 1 | |
| Surgical Site infection | 1 | 2 | |
| Abscess | 0 | 0 | |
| Complications (Dindo grade III-IV) n (%) | 4 (21) | 4 (23.5) | 0.256 |
| Anastomotic leak | 2 | - | |
| Massive bleeding | 0 | 1 | |
| Stoma complication | 0 | 1 | |
| Bowel occlusion | 0 | 0 | |
| Abscess | 1 | 1 | |
| Wound dehiscence | 0 | 1 | |
| Acute kidney failure | 1 | 0 | |
| Acute respiratory failure | 0 | 0 | |
| Acute myocardial infarction | 0 | 0 | |
| Ischaemic stroke | 0 | 0 | |
| Mortality (Dindo grade V) n (%) | 2 (10.5) | 5 (29.4) | 0.256 |
| Total | 19 | 17 | |

Value are expressed as n (%), PRA: Primary resection anastomosis, HP: Hartmann procedure, pts: Patients

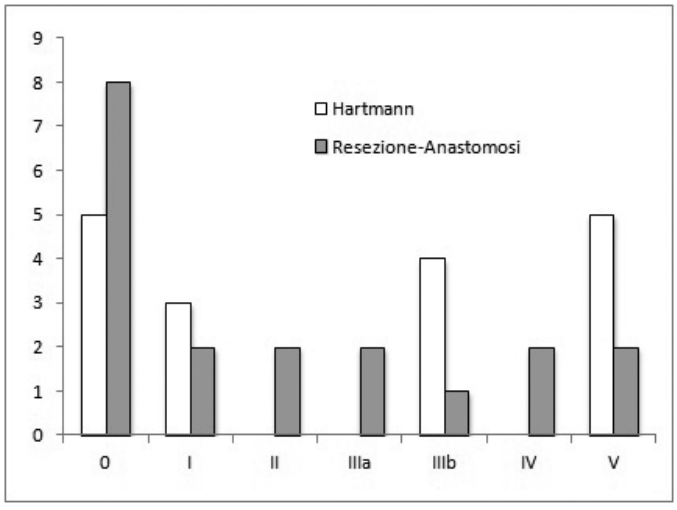


**Figure 5.** Relationship between treatment and postoperative complications (according to Clavien Dindo classification scale)

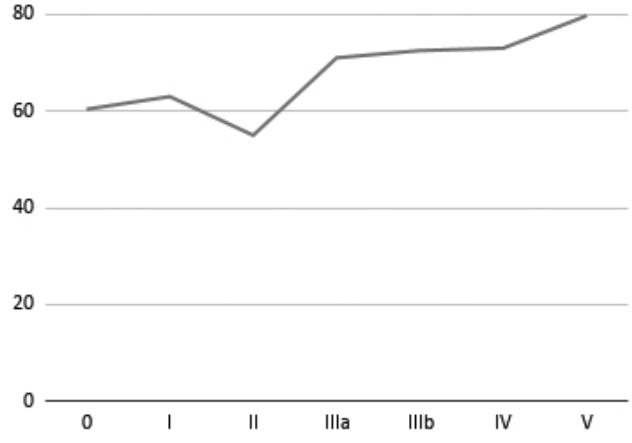


**Figure 6.** Postoperative complications increase with the age of patients

there were two deaths (10.5%, 2/19) in the PRA group. No statistically significant differences in postoperative complications were found in ASA (p=0.675) and sex (p=0.314) but a statistically significant correlation was found between age and postoperative complications in the two groups (p=0.039) (Figure 6).

Furthermore, a slight difference was found by analyzing patient comorbidities and possible pre-operative predictors of the risk of postoperative complications. Among the four patients with cardiovascular disease, three underwent reoperation and one died; among the seven patients with no comorbidity, three had no complications (Clavien Dindo grade 0) and three had minor complications (Clavien Dindo grade I-II). An almost significant correlation was

found between the increase in pre-operative lactates (Lac) and postoperative complications (p=0.077). Finally, among Hinchey stage III-IV patients, there was a significant difference in reversal rate for the PRA group (42.1%, 8/19 vs 0%, 0/17); p=0.002).

## Discussion

In this study, we reported our emergency surgery department experience on the feasibility and efficacy of PRA with protective ileostomy in Hinchey III and IV diverticulitis in a selected cohort of patients (Table 4). Perforated left-sided diverticulitis with generalized peritonitis, Hinchey III and IV is a well defined, life-threatening, clinical situation, which occurs frequently in every surgical emergency department.[8] We reported reasonable operating room time, low morbidity, and an increase in reversal rate. By performing the protective ileostomy, we did not see any cases of AL or other major complications. The PRA-approach resulted in no difference in operative times, which also decreased with surgical experience. The primary anastomosis provided a technical advantage, as evidenced by the lower re-operation rate. We reported an equivalent length of stay for HP compared with primary anastomosis. In our experience, performing a technically correct and safe colorectal anastomosis did not increase length of stay of patients compared to those undergoing to end-colostomy. Although not statistically significant in this analysis, post-operative major complication rates in the HP series appeared to be higher than in the PRA series. We did observe significant differences in reversal rate, probably because an end-colostomy was performed in high-risk patients or unfit for surgery. We suggest that ileostomy closure is not a surgical procedure that is comparable to Hartmann reversal, in which there is a high risk of postoperative morbidity and mortality. Hartmann reversal represents a major complex procedure for surgeons at the time of second-stage. The pitfalls can be multiple, from adhesions formed by previous surgery, to problems in preparing the rectum for the anastomosis, which is sometimes difficult to manipulate, adhering to loco-regional structures, such as the sacrum, and with the risk of performing unsafe anastomoses and consequently undergoing further postoperative pitfalls. In contrast, the ileostomy closure procedure requires a mini peri-stomal surgical access, a simple preparation of the loops of the small bowel, and therefore often a rapid postoperative recovery of the patient.

**Table 4.** Our experience

| | PRA | HP |
|---|---|---|
| Preoperative timing | ? | ? |
| Operating room time | = | = |
| Length of stay | = | = |
| Morbidity | - | + |
| Reversal rate | + | - |

PRA: Primary resection anastomosis, HP: Hartmann procedure

Consistent with literature reports[2], we had no significant data on timing of surgery. EAES and SAGES collaborative consensus conference aimed to summarize recent evidence and draw up guidelines for comprehensive acute diverticulitis management. Patients with perforated diverticulitis and peritonitis should be evaluated early for operative intervention to control infection. There is little data to inform the timing of operative intervention, but the clinical status of the patient should guide urgency of surgical intervention.[2] Patient comorbidities can represent possible pre-operative predictors of postoperative complications, as described by Richter et al.[9], reporting that patients with previous transplantation or complex cardiovascular procedures have a significantly increased risk of dying after sigmoid resection for perforated diverticulitis. Four studies reported on C-reactive protein level as a risk factor for complicated diverticulitis[10,11,12,13], and four studies reported on white blood cell count as risk factor.[10,12,14,15]

Fears of inadequate control of the source of sepsis prompted the implementation of the resection of the affected segment of colon with formation of a colostomy (HP) in the 1970's. Future development of treatment strategies was driven by the recognition of high morbidity and mortality associated with HP and the low Hartmann's reversal rates and this led to the wider use of resection with PRA during the 1990's.[16] In a Nationwide Analysis of 2,729 Emergency Surgery Patients[17] it was reported that primary anastomosis with a diverting loop ileostomy appears to be at least as safe an alternative to HP. Nevertheless, several studies[6,7] that compare the numbers of HP and PRA performed show how Hartmann currently remains the choice of surgeons in the emergency setting. The first multicenter randomized clinical trial (RCT)[18] to promote primary anastomosis with ileostomy compared to HP in patients with perforated diverticulitis was published in 2012. In the DIVERTI trial[19], although mortality was similar in both procedures, the reversal rate of the stoma is significantly higher after primary anastomosis (p=0.0001). The international, multicentre, randomised controlled LADIES trial[20] aimed to compare HP with primary anastomosis (with or without defunctioning ileostomy) to determine the optimal strategy for perforated diverticulitis with purulent or faecal peritonitis. Results of this trial showed significantly better 12-month stoma-free survival for patients in the primary anastomosis group, a significantly lower short-term overall morbidity after stoma reversal for primary anastomosis and a significantly

shorter median time to reversal and post-operative stay after reversal. This is the first trial to report on 12-month stoma-free survival and this is the largest randomised trial that prefers primary anastomosis to HP for the treatment of perforated diverticulitis. Moreover, the role of laparoscopy in the treatment of complicated diverticulitis is an important area of research.[21] Recent data suggest that resection with primary anastomosis can be performed in Hinchey III in expert hands, whereas trials specifically assessing Hinchey IV diverticulitis are still lacking.[22] In the systematic review and meta-analysis on perforated diverticulitis by Shaban et al.[23], primary anastomosis had a statistically significant lower mortality (10.6%) and morbidity (41.8%) compared to the Hartmann's group (20.7% and 51.2%) (p=0.0003). In addiction, a systematic review of the existing literature was performed by Halim et al.[5], involving 3,546 patients, of whom 2,868 underwent HP and 860 underwent PRA. The overall mortality in the HP group was 10.8% across the observational studies and 9.4% in the RCTs. The mortality rates in the PRA group, at 8.2% in observational studies and 4.3% in the RCTs, were lower than those in the HP group. Many surgeons favour a Hartmann's resection where there is no risk of an anastomosis leak in the setting of peritonitis and where the reversal is done when the pelvic inflammation settles, usually around six months later.[23] A recent systematic review of literature[24] analyzed and reported risk factors for anastomosis leakage following colorectal resections, such as male sex, elevated BMI, preoperative nutritional status, postoperative hypoalbuminemia, post operative diarrhea, low level of anastomosis, diverting stoma, operative time, left colic artery ligation, and perioperative events. Prolonged operative time can be associated with leakage, with a reported threshold varying from 220 to 300 minutes.[24] In this systematic review the role of left colic artery preservation was reported, resulting in increased blood supply for anastomosis and subsequently improved anastomotic healing. The laterality may be relevant during left colectomy for acute diverticulitis. In fact, in benign disease there is no need for a central vascular ligation and lymphadenectomy with complete mesocolic excision, as there is in the setting of colorectal malignancies.[25] Furthermore, bleeding during surgery may predispose to leakage due to hemodynamic alterations at the anastomotic site. Kawada et a.[26] found that intraoperative bleeding at more than 100 mL was associated with significantly increased incidence of leakage (p=0.037). Currently, there is much research into the role of new technologies introduced in clinical practice to evaluate organ perfusion in several conditions. Indocyanine green (ICG) fluorescence angiography (FA) was introduced to provide real-time, intra-operative evaluation of the vascular supply of anastomosis.[27] The rationale behind FA is that the fluorescent dye, upon systemic injection, should reach and highlight only vascularized areas.[28] Meyer et al.[29] describe pre-operative and operative measures to reduce anastomotic leakage, encouraging the implementation of FA, which leads to significant intra-operative changes in surgical strategies. In recent years, several authors published the application of this innovative technique with safe results and with no additional time-consumption during colorectal resections in the elective setting.[30,31]

Keller et al.[32] presented the first report of ICG FA imaging in emergency surgery, showing that this was safe, feasible, and effective. Nonetheless, the ease, the low cost, and the rare side effects of the procedure make FA a promising tool whose actual role in colonic resection should be studied further.[30] The role of ICG-FA may already represent the beginning of a new ethos in emergency colorectal resections, challenging old dogmas, increasing primary anastomosis and drastically reducing end-stoma rate.

### Study Limitations

Overall, the present study demonstrated a (non-significant) improvement in postoperative complications and re-operations for Hinchey III and IV patients with acute diverticulitis when treated with primary anastomosis surgery in comparison to HP. Limitations of this study include its retrospective nature, although the data was collected prospectively, with its inherent risk-of-bias and the number of patients enrolled. Strengths of the study include the highly selected category of enrolled patients. We also provide detail of the types and severity of all complications using standardized classification criteria.

## Conclusion

Based on our emergency surgery department experience, PRA and protective ileostomy safely performed may be feasible, with satisfactory perioperative outcomes, postoperative complication rates and a significant reversal rate in Hinchey III and IV patients with acute diverticulitis. Hartmann's resection should be considered as a life-saving surgery, limiting end-colostomy only to elderly patients combined with an ASA score that predicts a bad prognosis. Future randomized studies will be needed to define the correct timing of surgery to improve outcomes of complicated acute diverticulitis. The present study is ongoing to confirm these results with increased sample size and greater confidence.

### Ethics

**Ethics Committee Approval:** Not applicable.
**Peer-review:** Internally and externally peer reviewed.

### Authorship Contributions

Surgical and Medical Practices: M.A., G.M., S.S., G.B., E.M., P.B., D.R., F.C., Concept: M.A., G.M., F.C., Design: M.A., G.M., F.C., Data Collection or Processing: G.M., G.B., E.M., P.B., Analysis or Interpretation: G.M., G.B., E.M., P.B., Literature Search: G.M., Writing: M.A., G.M., F.C.

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RESEARCH ARTICLE

# Is Closure of Hartmann's Colostomy a Safe Operation?

## Harttmann Kapatılması Güvenli Bir Operasyon mu?

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## ABSTRACT

**Aim:** Ostomy closure after Hartmann's procedure is a challenging decision for surgeons due to the frequency of postoperative early complications in these patients. The aim of this study was to evaluate whether this operation is safe and to identify the factors associated with complications, based on analysis of a population that underwent Hartmann's procedure.

**Method:** Ostomy closure patients, operated between January 2016 and December 2020, were included in the study retrospectively. Post-operative complications of the patients were classified by Modified Clavien Dindo (MCD) score.

**Results:** During the study period 52 patients were eligible for inclusion. Seven (13.5%) had MCD high grade complication. Univariate analysis indicated a significant association between complication and first operation indication and between intensive care unit admission and first operation reason and also the MCD score. In regression analysis, it was found that an increase in age increased the need for intensive care (odds ratio: 1.046, 95% confidence interval: 1.004-1.089, p=0.032). Moreover, the reason for performing the Hartmann's procedure in the first operation was determined as an independent risk factor for complication development and for intensive care (p=0.001 and p=0.028, respectively).

**Conclusion:** Operation of Hartmann's closure is a safe procedure in selected and experienced centres.

**Keywords:** Complication, Harttmann, ostomy

## ÖZ

**Amaç:** Bu hastalarda postoperatif erken komplikasyon sıklığı nedeniyle Harttmann prosedüründen sonra ostominin kapatılması cerrahlar için iddialı bir karardır. Bu çalışmanın amacı, Hartmann operasyonu uygulanan hastalarda bu operasyonun güvenli olup olmadığını değerlendirmek ve komplikasyonlarla ilişkili faktörleri ortaya koymaktır.

**Yöntem:** Ocak 2016-Aralık 2020 tarihleri arasında opere edilen 52 ostomi kapatılma hastası geriye dönük olarak çalışmaya dahil edildi. Tüm hastalardan yazılı olarak onam alındı. Hastaların ameliyat sonrası komplikasyonları Modifiye Clavien Dindo (MCD) skoruna göre sınıflandırıldı.

**Sonuç:** Elli iki hastanın 7'sinde MCD yüksek dereceli komplikasyon vardı. Tek değişkenli analizde komplikasyon ile ilk operasyon endikasyonu arasında anlamlı bir ilişki vardı, ayrıca yoğun bakıma yatış ile ilk operasyon nedeni ve MCD skoru arasında da anlamlı bir ilişki vardı. Regresyon analizinde yaş artışının yoğun bakım ihtiyacını arttırdığı bulundu (odds ratio: 1,046, %95 güven aralığı: 1,004-1,089, p=0,032). Ayrıca ilk ameliyatta Hartmann işleminin yapılma nedeni komplikasyon gelişimi ve yoğun bakım için bağımsız bir risk faktörü olarak belirlendi (sırasıyla; p=0,001, p=0,028).

**Sonuç:** Hartmann kapatma operasyonu, seçilmiş ve deneyimli merkezlerde güvenli bir prosedürdür.

**Anahtar Kelimeler:** Komplikasyon, Hartmann, ostomi

## Introduction

Hartmann's procedure is an operation in which the rectosigmoid colon is resected, rectal stump is left distally and the proximal border is opened from the skin to create an end colostomy.[1] This technique is frequently preferred in urgent surgery of colorectal cancers with complications such as perforation and obstruction. The advantages of this approach include immediate resection of the diseased colon,

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safety of avoiding an anastomosis, more rapid convalescence and a shorter hospital stay. The disadvantages are the low reversal rate-in the region of 60%[2] and the complications associated with the second stage.[3] In addition, this technique is frequently preferred in cases of complicated diverticulitis, sigmoid volvulus or colon trauma.[4] Hartmann's procedure is a surgical method used not only in urgent surgery or damage control surgery, but also in patients with comorbidities to reduce operation time and to prevent complications due to anastomosis.[5] Although it is preferred to attempt primary anastomosis in colon resections as often as possible, since it will eliminate the need for surgery, the presence of panperitonitis or patient comorbidities may make it necessary to apply Hartmann's procedure, especially in emergency conditions and in cases where preoperative preparation is not sufficient. However, ostomy closure is a challenging decision for surgeons, due to the frequency of postoperative early complications in patients undergoing Hartmann's procedure. Although Hartmann's procedure or other stoma procedures are currently mostly carried out on the understanding that they will be temporary, stoma closure is still not possible in half of cases.[6], which may be due to age and the various comorbidities of individual patients. This procedure, which was first applied by Gervin and Fischer[1] in 1879, was first described in 1921 by the eponymous Hartmann as a procedure for resection of rectal cancers.[7] Nevertheless, the first practical application of Hartmann's closure method was only possible in 1950 and, with the increase in experience in laparoscopic surgery, laparoscopic Hartmann's closure was first described in 1993. The frequency of complications varies widely from 0.8% to 40% from centre to centre.[5] This suggests that greater success rates are possible when using Hartmann's procedure or closure, with lower complication rates, but the variables which may affect success should be identified. The aim of this study was to evaluate whether this operation is safe and to reveal the factors associated with complications, based on a population of patients who underwent Hartmann's procedure in our clinic or another health institution and who had the Hartmann's closure in our clinic.

## Materials and Methods

This was designed as a retrospective observational study through data collection and includes 52 patients who underwent Hartmann's closure between the dates of January 2016 and December 2020. Hospital Ethics Committee approval was obtained (Non-interventional Clinical Research Ethics Committee, date: 21.12.2020, number: 2020/233) and the study was prepared in accordance with the Declaration of Helsinki. Patient data were obtained from the hospital information management system; incomplete data were collected by contacting patients by telephone.

Inclusion criteria of the study were:

- Patients underwent Hartmann's procedure for both benign or malignant reasons;
- Patients underwent the first operation either at our clinic or another health institution;
- All patients had post-operative follow-up at our clinic after Hartmann's closure,
- All patients had Hartmann's closure performed by the same surgeon;
- All patients underwent anastomosis which was performed using a circular stapler.

Exclusion criteria were:

- Patients transferred to another centre in the postoperative period after the Hartmann closure;
- Patients whose data were not available;
- Patients who underwent laparoscopic closure of the Hartmann or who were converted into open surgery;
- Cases in which anastomosis was performed manually.

In all patients operated because of malignancy, the condition of the rectal stump was evaluated by colonoscopic evaluation before closure of Hartmann. After the Hartmann's procedure in patients first operated under emergency conditions, the presence of synchronous tumours was evaluated by colonoscopy. Also, bowel preparation was carried out in all patients before the closure of the Hartmann.

Patients' ender, age, indication for Hartmann's procedure, duration between the two operations, length of hospital stay after closure of the Hartmann operation, requirement for intensive care unit (ICU) care and duration of ICU stay, ASA scores of the patients, complication type in patients who develop complications, Modified Clavien Dindo (MCD) complication score, and instances of mortality were evaluated. While calculating the hospitalization and ICU periods of the patients, the day of operation was accepted as the first day of hospitalization. For ASA scores, the score in preoperative anaesthesia consultation was accepted. MCD score was calculated retrospectively, based on patient progress and epicrisis information. Deaths in patients up to 30 days postoperatively or deaths associated with surgery were considered as operation-related mortality. All cases with prolonged hospitalisation, or that required additional medical or surgical intervention were considered as complication. Intestinal content coming from the abdominal drain or incision site and/or contrast agent extravasation into the abdomen in contrast-enhanced computed tomography using either oral or rectal contrast or detecting abscess content were defined as anastomotic leak. Eventration occurred in one patient during postoperative hospitalization and this was also considered as a complication of incisional hernia.

### Statistical Analysis

After the data were compiled retrospectively using Microsoft Excel® (Microsoft Corporation, Santa Rosa, CA., USA), statistical analysis was performed with SPSS® software for Windows, version 22 (IBM Inc., Chicago, IL., USA). Distribution widths of the data were evaluated by Kolmogorov-Smirnov and Shapiro-Wilk tests. Mean and standard deviation values for data that conformed to normal distribution and median and interquartile ranges were calculated for non-parametric data. The evaluation of categorical data was done by chi-square and Fisher's exact test. Analysis of nonparametric quantitative data was performed using Mann-Whitney U test. Binary logistic regression was used for multivariate analysis. A p value <0.05 was assumed to indicate significance.

## Results

Of the 52 patients included in the study, 16 (25.8%) were female and 36 (58.1%) were male. The mean age of the patients was 59.08±15.92 years. When the ASA scores were evaluated, six (11.5%) patients had been operated with ASA-1, 12 (23.1%) with ASA-2, 33 (63.5%) with ASA-3, and one (1.9%) with ASA-4. Three (5.7%) patients had died during the post-operative follow up.

When the reasons for undertaking the Hartmann procedure were evaluated, benign conditions and malignancy were present in similar proportions. Diverticulitis perforation was the most common cause among benign conditions. The first operation reasons for the patients are presented in Table 1.

For all patients, the mean duration of hospitalisation after the closure of the Hartmann was 13.04±10.33 days. While 24 (46.2%) patients did not require intensive care follow-up in the post-operative period, 28 patients (53.8%) did. Median (interquartile range) duration in the ICU was 4 (2.25-7) days.

Discharge was made in 23 (44.2%) patients after normal procedures. MCD scoring was performed in the remaining 29 patients for complications after the Hartmann closure. In these Grade 1 MCD score was present in 14 (26.9%) and Grade 2 MCD score was present in eight (15.4%) patients. In addition, MCD score was Grade 3 in two (3.8%) patients, Grade 4 in two (3.8%) patients, and Grade 5 in three (5.8%) patients. Clinical characteristics of the patients with high MCD scores are shown in Table 2.

Patients with no complications or with low-grade MCD scores (Grade 1, 2) were defined as Group 1 (n=45), and patients with high-grade MCD scores (Grades 3-5) as Group 2 (n=7). When the demographic, preoperative, perioperative and postoperative data of these two groups were evaluated, complications were significantly more likely in patients operated for volvulus (p=0.002). Hospitalization and ICU duration were significantly longer in Group 2 patients (p<0.001 for both). Mortality was also significantly higher in Group 2 patients (p=0.002). Univariate analysis of the two groups are summarized in Table 3.

Just under half of the patients (n=24, 46.2%) did not need ICU care in the post-operative period, while 28 patients were admitted to ICU. Patients needing ICU were significantly older (p=0.04) and also had higher MCD scores (p=0.016). ICU requirement was higher in patients who were operated because of either colorectal cancer or volvulus. Table 4

**Table 1.** Etiology in patients undergoing Hartmann procedure (first operation)

| | n | (%) |
|---|---|---|
| **Colorectal cancer** | 27 | 51.9 |
| **Diverticulitis perforation** | 17 | 32.7 |
| **Trauma** | 4 | 7.7 |
| **Volvulus** | 4 | 7.7 |
| **Benign etiology** | 25 | 48.1 |
| **Malign etiology** | 27 | 51.9 |

n: Number of patients

**Table 2.** Follow-up and mortality results of patients with MCD high grade complications

| Complication type (n) | First operation reason | Length of stay in hospital/ ICU (days) | MCD score | Mortality |
|---|---|---|---|---|
| **Anastomotic leak (4)** | p1 sigmoid volvulus | p1: 43/13 | Grade 4 | No |
| | p2 sigmoid volvulus | p2: 57/50 | Grade 5 | Exitus |
| | p3 diverticulitis perforation | p3: 36/22 | Grade 5 | Exitus |
| | p4 sigmoid volvulus | p4: 42/13 | Grade 5 | Exitus |
| **Ileum perforation (1)** | Tumor | 33/18 | Grade 4 | No |
| **Rectovaginal fistula (1)** | Tumor | 15/4 | Grade 3 | No |
| **Incisional hernia (1)** | Trauma | 7 / 0 | Grade 3 | No |

n: Number of patients, p: Patient, ICU: Intensive care unit, MCD: Modified Clavien Dindo score

shows a comparison of characteristics of those patients who did or did not need ICU.

Regression analysis assessment of the effect of demographic and pre-operative clinicopathological characteristics for predicting the development of complications and the need for ICU showed that increased age had no effect on development of complications (p=0.077), but did increase ICU requirement [odds ratio (OR): 1.046, 95% confidence interval (CI): 1.004-1.089, p=0.032]. The reason for performing Hartmann's procedure in the first operation was an independent risk factor for complication development and for ICU requirement (p=0.001 and p=0.028, respectively). The risk of developing complications was found to be significantly higher in patients who underwent Hartmann's procedure for sigmoid volvulus compared to diverticulitis perforation (OR: 0.001, 95% CI: 0-0.077, p=0.002) and presence of tumor (OR: 0.002, 95% CI: 0-0.044, p<0.001). In addition, the risk of going to ICU was found to be significantly higher in patients who underwent Hartmann due to sigmoid volvulus compared to diverticulitis perforation (OR: 0.073, 95% CI: 0.007-0.773, p=0.030). There was a correlation between increasing ASA score and an increasing risk of complications (OR: 17.02, 95% CI: 1.155-250.871, p=0.039) but the ASA score was not able to predict the risk of going to intensive care (p=0.678). It was found that, as the duration between the two operations increased, the risk of developing complications decreased (OR: 1.163, 95% CI: 1.004-1.346, p=0.044) (Table 5).

## Discussion

This study showed that the procedure of Hartmann closure is a safe operation, especially in selected patient groups. Hartmann's procedure is currently still being performed and is likely to continue. However, acceptance of this procedure by surgeons as a last resort procedure brings a mandatory requirement for careful patient selection, in order to shorten the operation time and to avoid the risk of anastomotic leak in those with comorbidities.

The mean age of the patients in our study was 59 years and 65% of the patients had ASA ≥3 which is similar to earlier reports.[8,9,10] However, it seems self-evident that elderly

**Table 3.** Parameters associated with complication in two groups stratified by Modified Clavien Dindo score. Group 1 had no complications or MCD score 1 or 2, Group 2 had MCD score of ≥3

| | Group 1 (n=45) | Group 2 (n=7) | p value |
|---|---|---|---|
| **Median age (IQR)** | 58 (48.5-73) | 67 (35-72) | 0.703 |
| **Gender n (%)** | | | |
| **Female** | 14 (31.1) | 2 (28.6) | 0.078 |
| **Male** | 31 (68.9) | 5 (71.4) | |
| **Reason for Hartmann n (%)** | | | |
| **Tumor** | 25 (55.6) | 2 (28.6) | **0.002** |
| **Diverticulitis** | 16 (35.6) | 1 (14.3) | |
| **Trauma** | 3 (6.7) | 1 (14.3) | |
| **Volvulus** | 1 (2.2) | 3 (42.9) | |
| **Median duration between first and second procedure (IQR), months** | 9 (6-15) | 12 (8-15) | 0.268 |
| **Median duration of hospital stay (IQR), days** | 9 (8-12) | 36 (15-43) | **<0.001** |
| **Median duration of ICU stay (IQR), days** | 0 (0-3.5) | 13 (4-22) | **<0.001** |
| **ASA score n (%)** | | | |
| **1** | 5 (11.1) | 1 (14.3) | 0.078 |
| **2** | 11 (24.4) | 1 (14.3) | |
| **3** | 29 (64.4) | 4 (57.1) | |
| **4** | 0 | 1 (14.3) | |
| **Mortality n (%)** | | | |
| **No** | 45 (100) | 4 (57.1) | **0.002** |
| **Exitus** | 0 | 3 (42.9) | |

ICU: Intensive care unit, ASA: American Society of Anaesthesiologist, IQR: Interquartile range

Table 4. Parameters associated with requirement for ICU

| | No ICU (n=24) | Needed ICU (n=28) | p value |
|---|---|---|---|
| **Median age (IQR)** | 53.5 (45.25-65) | 63.25 (52-75.75) | **0.040** |
| **Gender n (%)** | | | 0.821 |
| **Female** | 7 (29.2) | 9 (32.1) | |
| **Male** | 17 (70.8) | 19 (67.9) | |
| **Reason for Hartmann n (%)** | | | **0.038** |
| **Tumor** | 10 (41.7) | 17 (60.7) | |
| **Diverticulitis** | 12 (50) | 5 (17.9) | |
| **Trauma** | 2 (8.3) | 2 (7.1) | |
| **Volvulus** | 0 (0) | 4 (14.3) | |
| **Median duration between first and second procedure (IQR), months** | 9 (6-15.75) | 9.5 (6.5-14.75) | 0.518 |
| **Median duration of hospital stay (IQR), days** | 9.5 (8-12) | 9.5 (8-15) | 0.511 |
| **Proportion in each MCD grade n (%)** | | | **0.016** |
| **MCD (-)** | 11 (45.8) | 12 (42.9) | |
| **Grade 1** | 12 (50) | 2 (7.1) | |
| **Grade 2** | 1 (4.2) | 8 (28.6) | |
| **Grade 3** | 0 (0) | 1 (3.6) | |
| **Grade 4** | 0 (0) | 2 (7.1) | |
| **Grade 5** | 0 (0) | 3 (10.7) | |
| **ASA score n (%)** | | | 0.362 |
| **1** | 4 (16.7) | 2 (7.1) | |
| **2** | 7 (29.2) | 5 (17.9) | |
| **3** | 11 (54.2) | 20 (71.4) | |
| **4** | 0 | 1 (3.6) | |
| **Mortality n (%)** | | | 0.148 |
| **No** | 24 (100) | 25 (89.3) | |
| **Exitus** | 0 (0) | 3 (10.7) | |

ICU: Intensive care unit, MCD: Modified Clavien Dindo, ASA: American Society of Anaesthesiologist, IQR: Interquartile range

Table 5. Multiple logistic regression analysis in predicting development of complications and the need for ICU

| | | Development of complication | | Need for ICU | |
|---|---|---|---|---|---|
| | | Exp (B) (95% CI) | p value | Exp (B) (95% CI) | p value |
| **Age** | | 0.923 (0.845-1.009) | 0.077 | 1.046 (1.004-1.089) | **0.032** |
| **Gender** | | 6.256 (0.696-56.273) | 0.102 | 1.703 (0.627-4.623) | 0.296 |
| **First operation reason** | | | **0.001** | | **0.028** |
| | **Tm vs SV** | 0.002 (0-0.044) | **<0.001** | 0.229 (0.022-2.379) | 0.217 |
| | **D vs SV** | 0.001 (0-0.077) | **0.002** | 0.073 (0.007-0.773) | **0.030** |
| | **Tr vs SV** | 0.326 (0.011-9.333) | 0.512 | 0.481 (0.028-8.112) | 0.612 |
| **ASA score** | | 17.02 (1.155-250.871) | 0.039 | 1.207 (0.497-2.934) | 0.678 |
| **Duration between two operations** | | 1.163 (1.004-1.346) | 0.044 | 0.921 (0.847-1.001) | 0.054 |

Tm: Tumor, D: Diverticulitis perforation, SV: Sigmoid volvulus, ASA: American Society of Anaesthesiologists

patients, who are also more likely to have comorbidities and thus are frequently operated for emergency reasons, such as pan-fecalith, perforation, and ileus, will be at a disadvantage due to the nature of the Hartmann's closure operation. This should be taken into account while evaluating whether the Hartmann's closure procedure is safe. In our cohort when indications for the Hartmann's procedure were evaluated, the proportion of benign and malignant indications were similar. This contrasts with some reports in the literature, with some studies reporting the most common reason for Hartmann's procedure to be colorectal cancers[11,12], while in others diverticulitis perforation is the most common cause.[11] However, in patients with malignancy, the addition of adjuvant chemoradiotherapy causes anxiety in surgeons for anastomotic leaks after stoma closure and this tends to discourage proposing stoma closure to these patients. However, the idea of living with a stoma for life is more difficult in patients operated for benign reasons. Thus the motivation for Hartmann's closure operation is higher in this group whose disease-free survival is expected to be longer, compared to patients operated because of malignancy. Therefore, in studies reporting cases where the first and second operations were followed in a single center, it was found that some patients did not undergo Hartmann's closure surgery.[13,14] In a meta-analysis of 35 studies, the most common reasons given for not performing Hartmann's closure were high ASA score, patient reluctance, metastatic disease, and high age.[10] In the same study, the most common first operation indication in those undergoing Hartmann's closure was diverticulitis perforation, which is similar to our study.[10]

The high-grade complication rate in our study was 13.4% which is in keeping with previously reported complication frequencies (3-50%).[10] It is noteworthy that in 3 of 7 patients with high-grade complications, the first operation indication was sigmoid volvulus. Resection in a longer segment in the sigmoid volvulus, and consequently higher anastomosis tension after closure of Hartmann may be a reason for this. Although high vascular ligation in mesocolic excision is recommended, which significantly increases mobilization in the proximal loop[15], avoiding these steps in benign operations such as sigmoid volvulus due to the concern of deterioration of the vascular structure may cause restriction of mobilization in the proximal region and the line of the anastomosis to remain tight. Structural impairment of the colonic vascular bed in patients with sigmoid volvulus due to a narrow-based mesocolon[16] may explain nourishment problems in the anastomosis line after the closure of the Hartmann. One of our cohort developed incisional hernia complication although their first operation indication was trauma. Accordingly, Hartmann's closure operation was performed by using the same incision in the second operation of the patient who had a wide laparotomy in the first operation. Incisional hernia complication due to wide laparotomy in this patient is compatible with the literature.[17] Colorectal cancer as a primary pathology may have negatively affected the healing process due to adjuvant therapies in patients with ileum perforation and rectovaginal fistula. In the literature review, these complications are considered among the complications expected to be encountered in colorectal cancer.[18,19]

In our cohort, three patients died in the postoperative period and the main complication determining mortality in all of these patients was anastomotic leak. It is remarkable that two of these patients underwent the Hartmann procedure due to sigmoid volvulus and the other because of diverticular disease; all three had benign indications for the first operation. Mortality rates in the literature were variable and often higher than our study, and varied from 0.9% to 15%.[14,20]

Univariate analysis identified patient's age, ASA risk scores in the preoperative period and first operation indications as being associated with the development of complications. ASA scores were higher in patients with MCD high-grade complications at the 10% significance level, while sigmoid volvulus as a first operation indication was significant at the 5% level. In our study patients with high-grade complications were older patients. On regression analysis older age, higher ASA risk score and first operation indication were found to be independent parameters predicting the development of complications, which is similar to previous reports.[21,22] However, the ASA score was not found to be related to the length of stay in ICU. Having sufficient capacity in ICU in our clinic may have led us to determine wider indications in terms of monitoring patients in intensive care. Although ICU beds comprise of only 2-8% of the bed capacity of hospitals, patients to be observed (20-77%) may be seen in ICU during additional examinations and treatments.[23] Hospitalization, ICU follow-up duration and mortality were significantly higher in the patient group with complications, as expected. Duration of hospitalization and the need for ICU were similar to the literature.[24] The most common cause of mortality in patients undergoing Hartmann's closure is considered to be septic complications due to anastomotic leak and postoperative abscesses.[25,26] Gender and duration between the two operations weren't related to high grade complications after closure of the Hartmann, as has previously been reported.[10]

### Study Limitations

Limitations of our study should be noted. Our clinic is a specialist colorectal surgery center where operations are

frequently performed and is a tertiary reference clinic. Therefore, our patient group consisted of more difficult patients, with more comorbidities and higher ASA scores, compared to the literature.[10] In addition, the retrospective nature of the design introduced bias in predicting complications and mortality risk. Despite this, the mortality and complication rates are similar or even lower when compared to the literature.

## Conclusion

In conclusion, we believe that operation of Hartmann's closure is a safe procedure in selected and experienced centers. ASA score and first operation indication emerged as independent risk factors for serious complication in our cohort. There is a need for larger, prospective, multi-center studies to eliminate the patient bias inherent in our retrospective analysis of a tertiary center patient population in order to accurately identify risk factors and to confirm the findings reported here.

### Ethics

**Ethics Committee Approval:** Aydın Adnan Menderes University Faculty of Medicine Non-Invasive Clinical Research Ethics Board (date: 17.02.2020/number: 53043469-050.04.04).

**Informed Consent:** Obtained.

**Peer-review:** Internally peer reviewed.

### Authorship Contributions

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

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RESEARCH ARTICLE

# The Role of Using Micronized Purified Flavonoid Fraction After Rubber Band Ligation in Hemorrhoidal Disease: A Retrospective Analysis

## Hemoroidal Hastalıkta Lastik Band Ligasyonu Sonrası Mikronize Purifiye Flavonoid Fraksiyonu Kullanımının Rolü: Retrospektif Bir Analiz

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## ABSTRACT

**Aim:** To investigate the effect of the addition of micronized purified flavonoid fraction (MPFF) on occurrence and severity of symptoms in patients who underwent rubber band ligation (RBL) for hemorrhoidal disease (HD).

**Method:** Patients who underwent RBL for HD in a single clinic in 2020 were retrospectively assessed. Patients aged ≥ eighteen years treated by a single surgeon for stage II and III internal HD with RBL and MPFF or RBL alone were included. The patients were divided into those who received combined therapy (RBL+MPFF) and those who only had RBL. The presence of bleeding, pain, and/or itching and occurrence of prolapse were recorded at the time of admission and on visit 1 (seventh post-operative day) and visit 2 (28$^{th}$ post-operative day). Complications arising from RBL were also recorded. All patients were asked to evaluate general anal area comfort with a visual analog scale at admission and each visit.

**Results:** The rate of bleeding on the first visit was significantly lower in the RBL+MPFF group compared to RBL alone ($p<0.05$). The proportion of patients with persistent pain and itching and prolapse tended to be lower in the RBL+MPFF group but the difference was not significant. Anal region comfort scores were significantly higher in the RBL+MPFF group at both visit 1 and 2 ($p<0.05$). The complication rate was lower in the RBL+MPFF group compared to the RBL only group, but this did not reach statistical significance ($p>0.05$).

**Conclusion:** Giiving MPFF to patients undergoing RBL provides earlier control of bleeding, the most common symptom. Combined therapy results in an improvement in general anal area comfort compared to RBL alone.

**Keywords:** Hemorrhoidal disease, anal bleeding, flavonoid, rubber band ligation

## ÖZ

**Amaç:** Hemoroid hastalığı (HH) nedeni ile lastik band ligasyonu (LBL) uygulanan hastalarda tedaviye mikronize purifiye flavonoid fraksiyonu (MPFF) eklenmesinin, semptomlardaki düzelme üzerine etkisini araştırmaktır.

**Yöntem:** Kliniğimizde 2020 yılında HH nedeniyle LBL uygulanan hastalar retrospektif olarak tarandı. On sekiz yaş ve üzerinde, aynı cerrah tarafından, evre II ve III internal HH nedeniyle LBL+MPFF veya sadece LBL ile tedavi edilen hastalar çalışmaya dahil edildi. Hastalarda başvuru anında, 1. vizitte (7. gün) ve 2. vizitte (28. gün) kanama, ağrı, kaşıntı ve prolapsus şikayetlerinin varlığı sorgulandı. Ayrıca LBL komplikasyonları kaydedildi. Tüm hastalardan başvuru esnasında, 1. ve 2. vizitlerde genel anal bölge konforlarını bir visual anolog skala ile değerlendirmeleri istendi. Hastalar kombine tedavi alan ve sadece LBL uygulanan hastalar olarak iki gruba ayrıldı.

**Bulgular:** Kanamanın 1. vizitte devam etme oranı MPFF verilen grupta verilmeyen gruba göre anlamlı düzeyde düşük bulundu ($p<0,05$). Ağrı, kaşıntı ve prolapsus şikayetlerinin 1. vizitte devam etme oranları MPFF kullanılan grupta kullanılmayan gruba göre daha düşük oranlarda olmasına karşın bu gerileme anlamlı değildi ($p>0,05$). Birinci ve 2. vizitlerde anal bölge konfor skoru MPFF kullanan grupta kullanmayan gruba göre anlamlı olarak yüksekti ($p<0,05$). Komplikasyon oranı MPFF kullanılan grupta, kullanılmayan gruba göre düşüktü. Ancak istatistiksel anlamlılık yoktu ($p>0,05$).

**Sonuç:** LBL uygulanan hastalara MPFF eklenmesi, en sık semptom olan kanamanın daha erken kontrol altına alınmasını sağlar. Kombine tedavi uygulanması sadece LBL uygulanmasına göre genel anal bölge konforunda iyileşmeye neden olmaktadır.

**Anahtar Kelimeler:** Hemoroidal hastalık, anal kanama, flavonoid,lastik band ligasyonu

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## Introduction

Hemorrhoidal disease (HD) is a common disease that results in 45% of the population consulting a physician at some point in their lives, with bleeding as the most important symptom.[1] The treatment of HD ranges from simple lifestyle changes to surgery. According to the guideline for the treatment of HD published by the European Society of Coloproctology (ESCP) in 2020, basic treatment is recommended first for all patients.[2] This basic treatment consists of toilet training, high fiber diet, and topical and pharmacological treatment. Pharmacological treatment includes phlebotonics that have been shown to improve symptoms in patients with HD. Phlebotonics may be natural, especially some flavonoids or synthetic such as calcium dobesilate. In the ESCP guideline, rubber band ligation (RBL) is recommended as the first choice in patients in whom basic therapy has failed, especially in the treatment of Stage II HD.

Phlebotonic therapy consisting of flavonoid preparations control the symptoms of HD.[3,4,5] Flavonoids decrease venous tone and capillary permeability and increase lymphatic drainage. They also control the symptoms of HD through anti-inflammatory effects.[6,7] Micronized purified fractionated flavonoid (MPFF) preparations are widely used.

RBL is at the forefront of non-surgical treatment methods for HD and has been shown to have the lowest recurrence rate and also to be safer than other non-surgical treatments, such as injection sclerotherapy or infrared coagulation.[8] RBL is the most commonly used non-surgical treatment method for HD by surgeons.[9] In the ESCP-2020 HD treatment guideline, RBL is the first treatment recommendation for all Stage II and selected stage III patients who do not respond to basic therapy.[2]

In the literature, studies on the combined use of RBL and MPFF preparations are very limited. The aim of this study was to investigate the effect of adding MPFF to the treatment of patients who underwent RBL for HD, on occurrence and severity of symptoms, especially bleeding.

## Materials and Methods

### Study Design

Ethical approval for this study was obtained from the local ethics committee and the Declaration of Helsinki of the World Medical Association regarding human materials and data was observed at all times. Written informed consent was obtained from all participants. All patients who underwent RBL for HD in our clinic in 2020 were retrospectively assessed. There were no criteria for adding or not adding MPFF to patients who underwent RBL. Consecutive patients in the first half of 2020 had MPFF added into their treatment protocol and constituted the RBL+MPFF group, whilst consecutive patients in the second half of 2020 only underwent RBL and were included in the RBL only group.

### Participants and Eligibility Criteria

Patients aged 18 years or over who were treated by the same surgeon for stage II and III internal HD with during 2020 were included in the study. Exclusion criteria included: patients using anticoagulants or anti-aggregants; being treated with any other phlebotonic agent; pregnant women; lactating patients; patients with chronic liver disease, inflammatory bowel disease or a diagnosis of colorectal cancer; those who did not attend follow-up; and those who lacked follow-up information.

### Treatment Protocol

RBL was performed in the proctology unit of our clinic. The procedure was performed 10 minutes after the application of a topical lidocaine preparation to the anal canal. After examination by anoscope, the stage II-III internal hemorrhoid packs were banded with a band ligation device. Up to three packs were banded in the same session. Care was taken to leave intact mucosa between the banded packs.

MPFF (Daflon 500 mg film tablet, Les Laboratoires Servier, CITY, France) was administered at a dose of 3 g/day for the first five days and then at a dose of 1 g/day for a total of 21 days after RBL application in patients attending clinic in the first half of 2020.

A non-steroidal anti-inflammatory drug (Naproxen sodium, Apranax 550 mg, Abdi İbrahim İlaç San. ve Tic. A.Ş., Istanbul, Turkey), a laxative (lactulose suspension 4 scales/day, Duphalac, Abbott Biologicals BV Veerweg 12, 8121 AA Olst/ The Netherlands) and a hot water sitz bath were suggested for all patients.

### Follow up and Evaluation

The age and gender of all patients was recorded at presentation. In addition, at visit 1 (post-operative day 7) and visit 2 (post-operative day 28) persistence of bleeding, pain and itching and any occurrence of prolapse was also recorded. All patients were asked to evaluate their general anal comfort, taking into account bleeding, pain, itching and sagging on a visual analog scale where 1 represented the worst possible symptom and 10 represented no problem at all at each attendance day. In addition, complications due to RBL were also recorded. The patients included in the study were divided into 2 groups according to the treatment applied:

**Group 1**. RBL+MPFF

**Group 2.** RBL only.

The groups were compared statistically in terms of the presence of symptoms, overall anal comfort, and occurrence of complications at each time point.

### Statistical analysis

Statistical Package for Social Sciences (SPSS), version 22.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. Shapiro-Wilk test was used to check whether continuous variables were distributed normally. Student's t-test was used for comparison between groups with continuous variables. The Mann-Whitney U test was used for the comparison between the groups with the variables in which the ordinal or normality assumption could not be achieved. For comparisons between groups with categorical variables, $\chi 2$ test or Fisher's exact test was used, as appropriate.

## Results

One hundred and five patients presented to the unit during the study period. Of these, 36 were excluded because they did not meet the inclusion criteria and thus 69 patients were assessed. The mean age of the participants was 40.25±14.5 years and 42 (60.8%) were male while 27 (39.2%) were female. All participants had bleeding complaints. The next most common complaint was anal pain in 44.9% (n=31) (see Table 1).

Thirty-seven (53.6%) of the participants were treated with MPFF after RBL (RBL+MPFF group), while the remaining 32 (46.4%) constituted the RBL only group. The distribution of symptoms at admission was similar in the groups (p>0.05). The frequency of persistent bleeding at visit 1 was found to be significantly lower in the RBL+MPFF group compared to the RBL only group (p<0.05). Although the frequency of reporting pain and/or pruritus and occurrence of prolapse at visit 1 were lower in the RBL+MPFF group than in the RBL only group, this difference was not significant. On assessment of the groups at the 2nd visit, the incidence of all symptoms was similar and no significant difference was detected (Table 2).

There was no significant difference in patient-reported anal region comfort scores at the time of admission. However, at the first and second visits, the anal region comfort score was significantly better in the RBL+MPFF group than in the RBL only group (p<0.05) (Table 3).

In this cohort, the overall complication rate due to RBL was 17.3%. The complication rate was 10.8% in the RBL+MPFF group and 25% in the RBL only group. The only post-procedural complication reported in the group receiving MPFF was pain whereas the RBL only group reported both pain and urinary retention. No serious bleeding or infection

**Table 1.** Demographic characteristics of the patients included in the study and those identified in the application

| | All patients (n=69) |
|---|---|
| **Average age (SD)** | 40.25±14.5 |
| **Male/female** | 42/27 |
| **Bleeding on application** | 69 (100%) |
| **Pain on application** | 31 (44.9%) |
| **Itching on application** | 8 (11.6%) |
| **Prolapse in application** | 20 (29%) |
| **Anal comfort in application** | 2.58±0.9 |

SD: Standard deviation

**Table 2.** Detection rates of symptoms at admission and scheduled controls. Statistical comparison of regression and regression in symptoms at follow-up

| | | RBL+MPFF (n=37) | LBL (n=32) | p |
|---|---|---|---|---|
| **Bleeding** | **Application** | 37 (100%) | 32 (100%) | 1 |
| | **1st visit** | 2 (5.4%) | 7 (21.9%) | 0.044 |
| | **2nd visit** | 1 (2.7%) | 1 (3.1%) | 0.918 |
| **Pain** | **Application** | 12 (32.4%) | 11 (34.4%) | 0.865 |
| | **1st visit** | 1 (2.7%) | 3 (9.4%) | 0.240 |
| | **2nd visit** | 1 (2.7%) | 1 (3.1%) | 0.918 |
| **Itching** | **Application** | 6 (16.2%) | 5 (15.6%) | 0.95 |
| | **1st visit** | 1 (2.7%) | 2 (6.3%) | 0.47 |
| | **2nd visit** | 0 | 1 (3.1%) | 0.28 |
| **Prolapse** | **Application** | 13 (35.1%) | 12 (37.5%) | 0.84 |
| | **1st visit** | 1 (2.7%) | 2 (6.3%) | 0.47 |
| | **2nd visit** | 0 | 1 (3.1%) | 0.28 |

RBL+MPFF: Rubber band ligation+micronized purified flavonoid fraction

was observed in any patient. Patients with prolonged severe pain were treated with analgesics and a hot water sitz bath. Urinary catheter was inserted in two patients (6.25%) in the RBL only group who developed urinary retention due to globe vesicale. Urinary catheter was *in situ* for <12 hours in both patients and no additional treatment was required. The complication rate in the RBL+MPFF group was proportionally lower than in the RBL only group but this was not significant (Table 4).

## Discussion

RBL is a widely used, non-surgical technique in the treatment of HD. MPFF is a phlebotonic agent used in the treatment of HD and is recommended by the guidelines. In daily surgical practice, some clinicians combine these two methods. However, the number of studies examining the combined use of these two methods is limited. In the present study, patients who underwent RBL were divided into two groups according to whether they were given MPFF after the procedure or not.

The most common age at presentation for HD is between 45-65 years of age and there is no difference between genders.[1] The mean age of the 69 patients included in the study was 40.25±14.5, and the male/female ratio was 1.56. The most common cause of hematochezia is HD and the most common symptom in HD is hematochezia.[1,10] All participants (100%) in this study had hematochezia.

RBL is the most effective outpatient treatment for HD when compared to other methods, such as injection sclerotherapy and infrared coagulation. However, pain is more common with RBL than with other methods.[11] In the ESCP HD treatment guideline published in 2020, it was recommended as the first treatment method in stage I-II and some stage III patients who did not respond to basic therapy.[2] With the use of MPFF, there is a rapid reduction in bleeding due to internal HD.[12] In the case of MPFF combined with RBL, bleeding is stopped earlier.[13] In the RBL only group, bleeding persisted in 21.9% at the 1st visit, and 3.1% at the 2nd visit. In contrast, in the RBL+MPFF group the rate of persistent bleeding was only 5.4% at visit 1 and 2.7% at visit 2. This reduction in bleeding at first visit was significantly lower in the RBL+MPFF compared to the RBL only group while there was no difference in frwequencies of bleedin in the two groups at the second visit.

Oral flavonoids belong to the group of phlebotonics but the mechanism of action of these agents is not clear. However, they are used in the treatment of HD, especially in Asia and Europe. Oral flavonoids have been reported to change vascular permeability and reduce tissue edema.[14] In a Cochrane analysis, phlebotonics (flavonoids and calcium dobesilate) were superior to the control group with regard to bleeding, itching, and anal incontinence (or contamination) in the treatment of HD.[3] In a study comparing calcium dobesilate and flavonoids, flavonoids were found to be more effective in controlling the symptoms of HH.[15] Caetano et al.[13] showed that adding MPFF as an adjuvant therapy in patients undergoing RBL significantly reduced bleeding in the first month and itching in the first week. Although we found a significant reduction in bleeding at visit 1 in the RBL+MPFF group there was no difference in reports of itching between the groups

Caetano et al.[13] highlighted the decrease in global symptom score after RBL in patients who did and did not receive MPFF as adjuvant therapy but that this decrease was more pronounced in the MPFF group. The patient-reported anal region comfort scores at both visitis in our cohort are

**Table 3.** The distribution and statistical comparison of the mean scores and standard deviations of the patients in the study for anal area comfort according to the groups in the planned controls

| | RBL+MPFF | RBL | p |
|---|---|---|---|
| **Application** | 2.76±1.06 | 2.38±0.6 | 0.12 |
| **1st visit** | 8±1.31 | 5.97±0.82 | 0.001 |
| **2nd visit** | 8.97±0.95 | 7.44±1.54 | 0.001 |

RBL+MPFF: Rubber band ligation+micronized purified flavonoid fraction

**Table 4.** Statistical comparison of RBL-related complications detected in the study and their incidence in groups

| | RBL+MPFF | RBL | p |
|---|---|---|---|
| **Complication** | | 8 (25%) | |
| **Severe pain** | 4 (10.8%) | 6 | 0.12 |
| **Urinary retention** | 4 | 2 | |

RBL+MPFF: Rubber band ligation+micronized purified flavonoid fraction

consistent with the report of Caetano et al.[13]

The complication rate following RBL is reported to be 3-18.8%, and the most common complications are pain and bleeding.[16] In our study, the overall complication rate was at the higher end of this range at 17.3%. Post-RBL pain is the most common complication. Some studies report moderate pain in 25-50% of patients within the first 48 hours after RBL.[17,18] Pain may sometimes be associated with dizziness, nausea, chills, and urinary retention.[18] Patients who experience pain and other pain-related symptoms, such as urinary retention, syncope, dizziness, and nausea, that require the use of analgesics are less satisfied with RBL.[16] To prevent pain, it is recommended to test the tissue by holding it during RBL. If there is pain immediately after the procedure, the band should be removed.[19] To the best of our knowledge, there is no published study investigating the effect of adjunct MPFF therapy on complications after RBL treatment. In our study, the addition of MPFF to RBL treatment caused a decrease in the rate of reporting post-procedure pain. However, this reduction was not significant which may be due to the relatively small sample size, or time scale for pain assessment. Urinary retention is a known early complication after RBL. Therefore, it is unlikely that MPFF will have an effect on urinary retention. Larger, prospective studies investigating the effects of MPFF on RBL complication rates are needed.

### Study Limitations

The most important limitation of our study was that there was no group treated with MPFF alone. Thus future studies should also include an MPFF only group in their design.

## Conclusion

Adding dietary MPFF as an adjunct therapy to patients undergoing RBL provided earlier control of hematochezia, the most common symptom in HD, in this study. Similarly, patiets reported a reduction in pain associated with RBL. Use of combined RBL and post-procedure MPFF therapy after RBL had a positive effect on patient-reported anal region comfort. There is a need for larger, prospective studies investigating the effect of the use of MPFF in patients undergoing RBL for HD. These studies should include not only RBL only and RBL+MPFF groups, but also MPFF only groups in their design.

### Ethics

**Ethics Committee Approval:** Ethical approval for this study was obtained from the local ethics committee and the Declaration of Helsinki of the World Medical Association regarding human materials and data was observed at all times.

**Informed Consent:** Written informed consent was obtained from all participants.

**Peer-review:** Externally peer reviewed.

### Authorship Contributions

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

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

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RESEARCH ARTICLE

# Factors Associated with Poor Lymph Node Dissection of Colon Neoplasm

## Kolon Kanseri Cerrahisinde Yetersiz Lenf Nodu Çıkarılması ile İlişkili Risk Faktörleri

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## ABSTRACT

**Aim:** Dissection of ≥12 lymph nodes is recommended for curative surgery of colon neoplasms. The aim was to determine the clinicopathological factors associated with poor lymph node dissection.

**Method:** Patient hospital records in those undergoing surgery due to stage 1-3 colon neoplasm, between January 2009 and December 2017, were retrospectively evaluated. Univariate and multivariate analyses were performed to evaluate the clinical and pathological risk factors associated with poor lymph node dissection.

**Results:** The patient population during the study period numbered 388. Of these, <12 lymph nodes were dissected in 21.9%. Tumor location in the left colon, large tumors, deep penetrating tumors and short surgical margins were found to be independent risk factors for poor lymph node dissection by univariate analysis. Male gender, left colon location, large-sized tumors and deep penetrating tumors were confirmed as being independent markers for poor lymph node dissection by multivariate analysis.

**Conclusion:** Adequate lymph node dissection for colon neoplasm patients has prognostic significance. Male patients, advanced pT stage neoplasm, and left colon tumors had an increased risk of poor lymph node dissection. Therefore, lymph node dissection should be undertaken particularly meticulously in these patients.

**Keywords:** Colon cancer, colectomy, poor lynph node dissection

## ÖZ

**Amaç:** Kolon kanserinin küratif cerrahisinde ≥12 lenf nodunun diseke edilmesi önerilmektedir. Bu çalışmada yetersiz lenf nodu diseksiyonuna etki eden klinikopatolojik faktörleri belirlemeyi amaçladık.

**Yöntem:** Ocak 2009-Aralık 2017 tarihleri arasında evre 1-3 kolon kanseri tanısıyla opere ettiğimiz hastalar retrospektif olarak incelenmiştir. Yetersiz lenf nodu diseksiyonu için risk faktörü olan klinik ve patolojik veriler tek değişkenli ve çok değişkenli analizlerle değerlendirilmiştir.

**Bulgular:** Çalışmaya 388 evre 1-3 kolon kanseri hasta dahil edilmiştir. Hastaların %21,9'da <12 lenf nodu diseke edildiği tespit edilmiştir. Tek değişkenli analizde sol kolon lokalizasyonunun, büyük tümörlerin, derin penetrasyon gösteren tümörlerin ve kısa cerrahi sınırın yetersiz lenf nodu diseksiyonu için bağımsız risk faktörleri olduğu tespit edilmiştir. Çok değişkenli analizde ise erkek cinsiyetin, sol kolon lokalizasyonunun, büyük tümörlerin ve derin penetrasyon gösteren tümörlerin yetersiz lenf nodu diseksiyonu açısından bağımsız belirteçler olduğu tespit edilmiştir.

**Sonuç:** Hastaların büyük kısmında yeterli lenf nodu diseksiyonun sağlandığı çalışmamızda büyük, pT evresi ileri, sol kolon yerleşimli tümöre sahip erkek hastaların yetersiz lenf nodu diseksiyonu açısından artmış riske sahiptir.

**Anahtar Kelimeler:** Kolon kanseri, kolektomi, yetersiz lenf nodu disseksiyonu

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## Introduction

Colon neoplasms are the most common malignant tumor of the gastrointestinal system worldwide and the leading cause of cancer-related morbidity and mortality in Western countries. Approximately 70-80% of colon neoplasms are diagnosed at localized disease level, and surgical resection is the treatment of choice.[1] Curative surgery of colon neoplasms should include complete tumor resection with involved bowel segment and its mesentery with dissection of the draining lymph nodes.

Currently, the most important prognostic factors for colon neoplasm are the tumor node metastasis (TNM) staging system and the presence of residual tumor after resection. The presence of nodal metastasis is not only the most important prognostic factor but also the primary factor for adjuvant therapy decision making.[2]

Detection of all positive lymph nodes is essential for accurate staging, as inadequate lymph node dissection poses an absolute risk for inaccurate staging and thus deprivation of appropriate adjuvant therapy which has a significant effect on survival.[3,4,5]

There are different views on the minimum number of lymph nodes for adequate staging.[5,6,7] However, many studies suggest that at least 12 lymph nodes should be examined for nodal evaluation of colon cancer.[8,9,10]

Institutional guidelines, including the American Joint Committee on Cancer, the American Society of Clinical Oncology, the National College of Surgeons, the National Quality Forum, and the National Comprehensive Cancer Network, state that at least 12 lymph nodes are required for the correct staging of colon neoplasm patient.[11,12,13] Several factors have been shown to influence the number of lymph nodes removed. These include patient-specific and surgeon-specific factors and others related to pathological evaluation, not all of which can be optimized.[14,15]

The aim of this study was to determine the clinicopathological factors affecting inadequate lymph node dissection in patients with curative resection of colon neoplasms.

## Materials and Methods

This study was a retrospective, single-centre study, comprised of colon cancer patients who underwent emergency and elective surgery between January 2009 and December 2017. Rectal neoplasms, synchronous colon neoplasms, colon neoplasms of familial polyposis, metastatic disease, palliative surgery patients, and patients who did not have adenocarcinoma following histopathological examination were excluded from the study. Only patients with stage 1-3 colon cancer were evaluated.

Preoperative laboratory analysis, colonoscopy, and imaging procedures including chest radiography and computed tomography, were performed in all elective surgery patients. The local Ethics Committee of University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt, Training and Research Hospital approved the study (date: 25.12.2017, no: 44/24). Written patient consent was not obtained because of the retrospective nature of the study.

All surgical specimens were fixed in 10% formalin solution and then routinely placed in paraffin. Conventional methods of visual inspection and palpation were used to detect lymph nodes. Hematoxylin-eosin stained sections of all lymph nodes were examined microscopically. If mucin constituted >50% of tumor volume histopathologically, the tumor was defined as mucinous carcinoma. Vascular invasion was defined as the presence of tumor cells along the venous endothelial surface, thrombosis of the venous lumen with tumor cells or destruction of the venous wall by tumor cells. The extraneural appearance of tumor cells was defined as “perineural invasion”. In all pathology reports, tumor size and differentiation, proximal and distal surgical margins, pT staging, the total number of removed lymph nodes and the total number of involved lymph nodes were reported.

Neoplasms located in the region from the ileocecal valve to the distal of the transverse colon were defined as right colon neoplasms, and neoplasms located in the region from splenic flexure to rectosigmoid junction (15 cm proximal from the anal canal) were defined as left colon neoplasm. Central vascular ligation was performed for both side neoplasms.

Neoplasms were pathologically classified according to the 8$^{th}$ American Joint Committee on Cancer (AJCC) TNM classification. Samples with <12 removed lymph nodes constituted the inadequate dissection group.[16]

### Statistical Analysis

The Shapiro-Wilk test was used to assess normality of distribution of data sets. Numerical variables are presented as mean ± standard deviation and median (minimum to maximum range) while categorical variables are presented as number (percentage).

A univariate logistic regression model was used to calculate the effect of independent variables on the likelihood of obtaining an insufficient number of lymph nodes. As a result of univariate logistic regression analysis of clinically predicted variables that affected inadequate lymph node removal, variables with an error level below 0.25 ($p<0.25$) were identified as candidate variables for the multivariate model. A multivariate logistic regression model (Backward Wald) was established for candidate variables. In each step, the probability of entry into the logistic regression

model was 0.05, and the probability of exclusion from the model was 0.10. In addition, 95% confidence intervals were determined for the odds ratio (OR) values obtained by logistic regression.

### Statistical Analysis

Statistical analyses and calculations were performed using SPSS, version 21.0 (IBM Inc., Armonk, NY, USA) and MS-Excel 2007. Statistical significance level was accepted as $p < 0.05$.

## Results

Between January 2009 and December 2017, a total of 761 colorectal neoplasm patients were operated. After assessment of fit with the study inclusion criteria, 388 of 761 (50.98%) stage 1-3 colon cancer patients were included in the study population (Figure 1).

Demographic characteristics of patients are shown in Table 1. Two hundred and four patients (52.6%) were younger than 65 years, and 232 (59.8%) were male. Adequate lymph node dissection (≥12 nodes) was performed in 303 (78.1%) and inadequate (<12 nodes) was performed in 85 (21.9%). The statistical numerical variables are shown in Table 2.

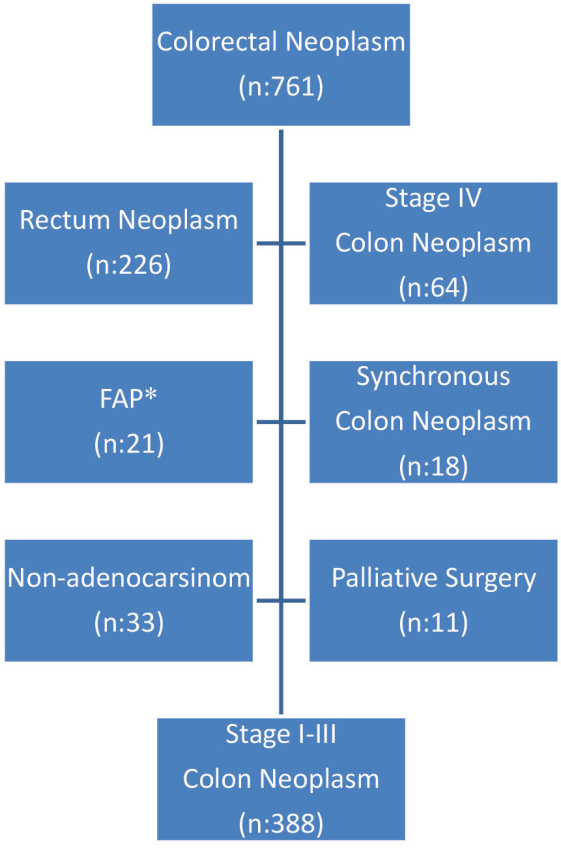


**Figure 1.** Selection of colorectal neoplasm patients' criterias
(*Familial adenomatous polyposis)

The relationship between univariate logistic regression and the number of removed lymph nodes of the indicated independent variables was examined (Table 3). The probability of inadequate lymph node dissection was found to be 1.59 times higher in male patients but this was not significant (p=0.072). The probability of inadequate lymph node dissection was 2.79 times [95% confidence interval (CI): 1.55-5.04] higher in tumors of the left colon than the right colon (p<0.001). The risk of inadequate lymph node assessment was higher in patients who did not have lymphovascular invasion (OR: 1.77) but this was not significant (p=0.053).

As a result of univariate analysis a number of variables were identified for inclusion in the multivariate logistic regression model. These variables included gender, location, tumor size, T-group, lymphovascular invasion and surgical margin. In the Enter model, there was a multiple connection problem between the T-group and the surgical margin. As a result of the stepwise model, the surgical border variable was not included in the model, whereas the T-group variable was included in the model. In the last model, the effect of gender, location, tumor size (≥5/<5 cm) and T-group (3 + 4/1 + 2) variables were significant.

## Discussion

Lymph node metastasis alone is the most important prognostic factor in colon cancer.[17] The 5-year survival rate is over 75% in patients without metastatic lymph nodes but decreases below 30% in patients with lymph node invasion.[18] Therefore, in order to perform accurate staging of colon cancer according to AJCC TNM classification, it is necessary to thoroughly examine the surgical specimen and determine the status of lymph node metastasis.

In many studies, it has been shown that total survival and disease-free survival rates are directly proportional with the number of removed lymph nodes.[19,20] However, it has been reported that regional lymph node dissection is affected by many factors.[14] Currently, the rate of adequate lymph node dissection (≥12 lymph nodes) in colon cancer was reported to be 70%.[2,19]

The proportion of patients who underwent inadequate lymph node dissection in our cohort was 21.9%, which is similar to the literature. However, in contrast to earlier studies, we could not find a correlation between lymph node dissection and patient age in colon cancer patients. Studies have reported that fewer lymph nodes are dissected in elderly patients whichmay be associated with the decrease in immunological and inflammatory reactions to cancer tissues in elderly patients.[10,21]

**Table 1.** Demographic characteristics of patients

| Variables | n (%) | Variables | n (%) |
|---|---|---|---|
| **Age (year)** | | **N** | |
| <65 | 204 (52.6) | 0 | 165 (42.5) |
| ≥65 | 184 (47.4) | 1 | 90 (23.2) |
| **Gender** | | 2 | 48 (12.4) |
| Male | 232 (59.8) | X | 85 (21.9) |
| Female | 156 (40.2) | **TNM stage** | |
| **BMI (kg/m²)** | | Stage I | 42 (10.8) |
| <25 | 74 (33.9) | Stage II | 180 (46.4) |
| ≥25 | 144 (66.1) | Stage III | 166 (42.8) |
| **Lymph node** | | Lymphovasculer invasion | |
| <12 | 85 (21.9) | No | 278 (71.6) |
| ≥12 | 303 (78.1) | Yes | 110 (28.4) |
| **Preoperative CEA** | | Extranodal involvement | |
| <5 | 108 (27.8) | No | 365 (94.1) |
| ≥5 | 42 (10.8) | Yes | 23 (5.9) |
| n/a | 238 (61.4) | Free tumor nodule | |
| **Elective/emergency** | | No | 337 (86.9) |
| Elective | 278 (71.6) | Yes | 51 (13.1) |
| Emergency | 110 (28.4) | Perineural invasion | |
| **Localisation** | | No | 327 (84.3) |
| Left | 253 (65.2) | Yes | 61 (15.7) |
| Right | 135 (34.8) | Mucinous component | |
| **Tumor size (cm)** | | No | 341 (87.9) |
| <5 | 219 (56.4) | Yes | 47 (12.1) |
| ≥5 | 169 (43.6) | | |
| **Differentiation** | | | |
| Well | 58 (14.9) | | |
| Moderate | 283 (72.9) | | |
| Poor | 24 (6.3) | | |
| Undefined | 23 (5.9) | | |
| **Histopathology** | | | |
| Adenocarsinom | 364 (93.8) | | |
| Mucinous carsinom | 21 (5.4) | | |
| Signet-ring carsinom | 3 (0.8) | | |
| **T** | | | |
| 1 | 14 (3.6) | | |
| 2 | 39 (10.1) | | |
| 3 | 253 (65.2) | | |
| 4 | 82 (21.1) | | |

BMI: Body mass index, CEA: Carcinoembryonic antigen

**Table 2.** The statistical numerical variables

| Variables | n | Median (min; max) | Mean ± SD |
|---|---|---|---|
| Age | 388 | 63.5 (24; 91) | 62.93±11.72 |
| BMI | 218 | 26.63 (16.51; 45.2) | 27.3±4.64 |
| Preoperative CEA | 150 | 2.4 (0.1; 247) | 10.06±29.35 |
| Size (cm) | 388 | 4.5 (0; 19) | 4.86±2.31 |
| LN | 388 | 17 (0; 116) | 19.56±11.79 |
| LN positive | 388 | 0.0 (0.0; 22.0) | 1.36±2.70 |
| Surgical margin (cm) | 388 | 5 (0.2; 40) | 6.21±4.86 |

SD: Standart deviation, min: Minimum, max: Maximum, BMI: Body mass index, CEA: Carcinoembryonic antigen

As previously reported, male sex was found to be associated with inadequate lymph node dissection in our study, but this relationship remains unclear. Larger and deeper-penetrating (T3-4) tumors were associated with a greater number of lymph nodes dissected by the surgeon. This may be the result of more antigenic immune and inflammatory responses increasing the number and size of regional lymph nodes.[10,22] As a result, lymph nodes were more easily identifiable for pathological examination. In our study, tumors in the left colon were associated with inadequate lymph node dissection, as many studies have reported, and this may be due to the surgeon avoiding a high anterior resection for distal sigmoid and rectosigmoid located neoplasms.[23] Additionally, the vascular anatomy of the right colon and associated neoplasms allows the removal of an extended bowel segment and wider mesentery.[15] Also, microsatellite instability, which is an essential pathway in tumor biology, is detected in 20-25% of right colon neoplasms, and this results in an increased propensity for metastatic locoregional lymph nodes.[24]

Close surgical margin is more common in sigmoid and rectosigmoid resections, and it is also associated with low numbers of lymph nodes being dissected.[25] In our study, the relationship between the close surgical margin and low lymph node number was found to be statistically significant in univariate analysis but not significant in multivariate analysis.

Tekkis et al.[21] reported that tumor differentiation was associated with the number of removed lymph nodes, so that poorly differentiated tumors had more lymph nodes removed compared with well or moderate differentiation neoplasms. We did not find any correlation between tumor differentiation and the number of lymph nodes removed.

Lymphovascular invasion, extranodal involvement, perineural involvement and free tumor nodule are indicators of tumor aggression. In a limited number of studies, their relationship with the number of removed lymph nodes could not be demonstrated. Gelos et al.[26], in a retrospective study of 341 patients, showed that the presence of lymphovascular invasion did not correlate with the number of removed lymph nodes and this is in agreement with our findings.

Although some studies have reported low numbers of lymph node being removed in patients with a high body mass index (BMI)[27], the effect of BMI on the number of removed lymph nodes is still unclear. In our cohort there was no relationship between the number of lymph nodes removed in low-weight and normal-weight patients (BMI <25 kg/m$^2$) and overweight and obese patients (BMI >25 kg/m$^2$).

The number of lymph nodes removed depends on different factors, including quality of surgical specimen, pathological examination, and characteristics of the patient and neoplasm. The limitation of our study was that more than 10 surgeons treated patients and different pathologists examined specimens. However, our hospital can be considered as a high-volume centre where approximately 100 colorectal cancer surgeries are performed annually. Moreover, some studies reported that higher hospital volume, more experienced surgeons and pathologists improve the quality of lymph node evaluation.[28] However, some other studies indicated that there was no statistical relationship between them.[29] Elferink et al.[30] reported that increased workload and, in particular that the pathologists could not perform a more detailed examination, so that there was an indirect relationship between the number of lymph nodes removed and the hospital volume.

## Conclusion

Adequate lymph node removal in colon surgery has prognostic significance for the patient, and this was achieved in most of the curative resections in this study. There is an

**Table 3.** Univariate and multiple logistic regression model results

| Variables | LNs group ≥12 n (%) | LNs group <12 n (%) | Univariate analysis Crude OR (95% CI) | Univariate analysis p | Multivariate analysis* Adjusted OR (95% CI) | Multivariate analysis* p |
|---|---|---|---|---|---|---|
| Gender | | | | 0.072 | | 0.042 |
| Female | 129 (82.7) | 27 (17.3) | 1.00 | | 1.00 | |
| Male | 174 (75.0) | 58 (25.0) | 1.59 (0.96-2.65) | | 1.74 (1.02-2.95) | |
| Age | | | | 0.678 | | |
| <65 | 161 (78.9) | 43 (21.1) | 1.00 | | | |
| ≥65 | 142 (77.2) | 42 (22.8) | 1.11 (0.68-1.79) | | | |
| BMI | | | | 0.367 | | |
| <25 kg/m$^2$ | 60 (81.1) | 14 (18.9) | 1.00 | | | |
| ≥25 kg/m$^2$ | 109 (75.7) | 35 (24.3) | 1.38 (0.69-2.76) | | | |
| Preoperative CEA | | | | 0.695 | | |
| ≥5 | 31 (73.8) | 11 (26.2) | 1.00 | | | |
| <5 | 83 (76.9) | 25 (23.1) | 0.85 (0.37-1.93) | | | |
| Elective/emergency | | | | 0.765 | | |
| Elective | 216 (77.7) | 62 (22.3) | 1.00 | | | |
| Emergency | 87 (79.1) | 23 (20.9) | 0.92 (0.54-1.58) | | | |
| Localisation | | | | <0.001 | | 0.006 |
| Right | 119 (88.1) | 16 (11.9) | 1.00 | | 1.00 | |
| Left | 184 (72.7) | 69 (27.3) | 2.79 (1.55-5.04) | | 2.34 (1.27-4.32) | |
| Tumor Size | | | | 0.001 | | 0.008 |
| ≥5 | 146 (86.4) | 23 (13.6) | 1.00 | | 1.00 | |
| <5 | 157 (71.7) | 62 (28.3) | 2.51 (1.48-4.25) | | 2.10 (1.21-3.64) | |
| Differentiation | | | | 0.388 | | |
| Poor+undefined | 39 (83.0) | 8 (17.0) | 1.00 | | | |
| Well+moderate | 264 (77.4) | 77 (22.6) | 1.42 (0.64-3.17) | | | |
| T | | | | 0.008 | | 0.024 |
| 3+4 | 269 (80.3) | 66 (19.7) | 1.00 | | 1.00 | |
| 1+2 | 34 (64.2) | 19 (35.8) | 2.28 (1.22-4.25) | | 2.10 (1.10-4.00) | |
| Lymphovasculer invasion | | | | 0.053 | | |
| Yes | 93 (84.5) | 17 (15.5) | 1.00 | | | |
| No | 210 (75.5) | 68 (24.5) | 1.77 (0.99-3.18) | | | |
| Extranodal Involvement | | | | 0.289 | | |
| Yes | 20 (87.0) | 3 (13.0) | 1.00 | | | |
| No | 283 (77.5) | 82 (22.5) | 1.93 (0.56-6.66) | | | |
| Free tumor nodule | | | | 0.764 | | |
| Yes | 39 (76.5) | 12 (23.5) | 1.00 | | | |
| No | 264 (78.3) | 73 (21.7) | 0.90 (0.45-1.80) | | | |
| Perineural invasion | | | | 0.646 | | |
| Yes | 49 (80.3) | 12 (19.7) | 1.00 | | | |
| No | 254 (77.7) | 73 (22.3) | 1.17 (0.59-2.32) | | | |
| Surgical margin | | | | 0.020 | | |
| ≥5 | 175 (82.5) | 37 (17.5) | 1.00 | | | |
| <5 | 128 (72.7) | 48 (27.3) | 1.77 (1.09-2.88) | | | |

OR: Odds ratio, CI: Confidence interval/ *Backward Wald model accurate classification rate= 78.6%, Exp (constant)= 0.060

increased risk for inadequate lymph node dissection in male patients, in patients with left colon tumors, and in patients without locally advanced tumors. Therefore, lymph node dissection should be undertaken particularly meticulously in these patients.

### Ethics

**Ethics Committee Approval:** The local Ethics Committee of University of Health Sciences Turkey, Dışkapı Yıldırım Beyazıt Training and Research Hospital approved the study (date: 25.12.2017, no: 44/24).

**Informed Consent:** Written patient consent was not obtained because of the retrospective nature of the study.

**Peer-review:** Internally and externally peer reviewed.

### Authorship Contributions

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

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RESEARCH ARTICLE

# Functional and Clinical Results of Patients Who Underwent an Ileal Pouch-anal Anastomosis

## İleal Poş-anal Anastomoz Yapılan Hastaların Fonksiyonel ve Klinik Sonuçları

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## ABSTRACT

**Aim:** To evaluate the characteristics, early and late complications, outcomes, quality of life, and procedure-related problems in patients who underwent restorative proctocolectomy performed with the ileal pouch-anal anastomosis (IPAA) approach.

**Method:** Twenty-two of the 26 patients who underwent IPAA from 2007 to 2019 were included. Data collected included demographic characteristics, surgical indications, operation types, histopathological diagnosis, early (<3 months) and late (≥3 months) postoperative complications, and functional outcomes. The Cleveland Global Quality of Life score was used to evaluate quality of life.

**Results:** Ten (45.5%) participants had ulcerative colitis (UC) and 12 (54.5%) had familial adenomatous polyposis (FAP). Nineteen (86.4%) patients underwent a two-stage surgical procedure. Early post-operative complications were: ileus n=4 (18.2%); wound infection n=4 (18.2%); pelvic abscess n=3 (13.6%); and other complications n=5 (22.7%). Late complications were: pouchitis n=2 (9.1%); anastomotic stenosis n=2 (9.1%); and pouch dysfunction n=2 (9.1%). Additionally, six (27.3%) reported experiencing fluid incontinence, of whom four (18.2%) were using pads during the day, and the mean defecation frequencies were 4.3±2.4 during the day and 1.04±0.89 during the night. Half of the patients (50%) had complaints of sexual dysfunction. It was noticed that 2 of the patients (9.1%) were using antidiarrheal drugs and 1 patient (4.5%) became pregnant 2 times after the operation. Quality of life score was significantly higher in patients with FAP (0.85±0.13) compared to patients with UC (0.71±0.11).

**Conclusion:** This procedure can be applied safely with low comorbidity and good functional outcomes in centers with high caseloads and thus sufficient experience.

**Keywords:** Restorative proctocolectomy, ileal pouch-anal anastomosis, ulcerative colitis, familial adenomatous polyposis

## ÖZ

**Amaç:** Amacımız kliniğimizde ileal poş-anal anastomoz (İPAA) yapılan hastaların özelliklerini, erken ve geç komplikasyonlarını, hastaların hayat kalitesi gibi İPAA sonrası gelişebilecek problemler ve sonuçları değerlendirmektir.

**Yöntem:** Kliniğinimizde 2007 ile 2019 yılları arasında İPAA yapılan 26 hastanın 22'si çalışmaya dahil edildi. Hastalara ait demografik özellikler, cerrahi endikasyonlar, operasyon tipi, patolojik tanı gibi sonuçları, erken (<3 ay) ve geç (≥3 ay) postoperatif komplikasyonları, fonksiyonel sonuçları değerlendirildi. Hayat kalitesinin değerlendirilmesi için Cleveland Global Quality of Life skorlaması uygulandı.

**Bulgular:** Hastaların 10'u ülseratif kolit (ÜK), 12'si ailesel adenomatöz polipozis (FAP) idi. On dokuz hastaya (%86,4) 2 aşamalı cerrahi prosedür uygulandı. Postoperatif erken dönemde hastalarda; ileus n=4 (%18,2), yara yeri enfeksiyonu n=4 (%18,2), pelvik apse n=3 (%13,6) ve diğer komplikasyonlar n=5 (%22,7) idi. Geç komplikasyonlar: poşit n=2 (%9,1), anastomoz darlığı n=2 (%9,1), poş disfonksiyonu n=2 (%9,1) idi. Hastaların 6'sında (%27,3) sıvı şekilde inkontinans mevcuttu bunların 4'ünün (%18,2) gün içinde ped kullandığı, ortalama 4,3±2,4 kez gündüz, 1,04±0,89 kez gece defekasyon ihtiyacı olduğu, yarısında (%50) cinsel disfonksiyon şikayeti görüldü. Hastalardan 2'si (%9,1) antidiaretik ilaç kullanmaktaydı ve 1 hastanın (%4,5) operasyon sonrası 2 kez gebe kaldığı öğrenildi. FAP hastalarının (0,85±0,13) ÜK hastalarına (0,71±0,11) göre hayat kalitesi skorunun anlamlı şekilde iyi olduğu görüldü.

**Sonuç:** Bu prosedür, yüksek vaka yükü ve yeterli deneyime sahip merkezlerde düşük komorbidite ve iyi fonksiyonel sonuçlarla güvenle uygulanabilir.

**Anahtar Kelimeler:** Restoratif proktokolektomi, ileal poş-anal anastomoz, ülseratif kolit, familial adenomatozis polipozis

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## Introduction

Restorative proctocolectomy (RP) with ileal pouch-anal anastomosis (IPAA) is a procedure used to perform ileo-anal anastomosis, with proven effectiveness in the surgical treatment of ulcerative colitis (UC) and familial adenomatous polyposis (FAP).[1] It is well-established that this procedure can be performed with acceptable functional outcomes and high success rates in experienced hands.

UC is an inflammatory bowel disease affecting the colorectal mucosa that often develops in the third or eighth decades of life. Indications for surgery include unresponsiveness to medical treatment, severe bleeding, cancer risk, obstruction, perforation, and toxic megacolon.[2] In contrast, FAP is an inherited, autosomal dominant disease caused by a germline mutation of the adenomatous polyposis coli gene.[3] If FAP is left untreated, colorectal cancer is inevitable, and it has been demonstrated that the complete removal of the colorectal mucosa prevents development of colorectal cancer.[4] Patients with UC and FAP may require RP, although the procedure may be applied in patients suffering from some other conditions.

The aim of this study was to describe our experience with IPAA by evaluating the characteristics, early and late complications, outcomes, quality of life and procedure-related problems of patients who underwent IPAA in our center.

## Materials and Methods

Following approval from the institutional Clinical Research Ethics Committee (24074710-06), a total of 26 patients who underwent IPAA at the General Surgery Department, between November 2007 and November 2019, were evaluated for inclusion in the study. The preoperative assessments of all patients had been performed routinely and included upper GI endoscopy, colonoscopy, histopathological analyses, upper abdominal tomography, pelvic magnetic resonance imaging, gynecological examination, and genetic studies, when and where necessary. The sociodemographic characteristics of the patients, surgical indications, the type of operation (one, two, or three stages), and histopathological diagnoses were obtained from medical records. Additionally, the early (<3 months) and late (≥3 months) post-operative complications, including anastomotic stenosis, obstruction, pelvic sepsis, pouchitis, post-operative bleeding, wound infection, pouch failure, anastomotic leakage and fistula formation, were examined. The Cleveland Global Quality of Life (CGQL) score, used to evaluate quality of life, was completed by all patients, either by telephone interview or by e-mail.[5]

### Measures

Sociodemographic Data Form was prepared by the authors to obtain demographic characteristics of interest including age, gender, body mass index (BMI), and so on. In addition, information about functional outcomes, such as the number of daily defecations, fecal incontinence, use of pads, presence of urinary and sexual dysfunction, anti-diarrheal drug use and postoperative pregnancy history was collected using this form.

The CGQL questionnaire is comprised of three dimensions: current quality of life; health status; and energy status. Each parameter is scored on a scale of 0 (worst outcome) to 10 (best outcome). The cumulative score obtained by the sum of the scores from all three parameters is divided by 30 to obtain the final CGQL score.[5]

### Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM Inc., Armonk, NY, USA). For descriptive analyses, categorical variables were reported as numbers (n) and percentages, and continuous variables are presented as mean ± standard deviation or median (minimum-maximum) values depending on normality of distribution. The independent samples t-test was used for the comparison of variables demonstrating normal distribution, and the Mann-Whitney U test was used for the comparison of non-normally distributed variables. Chi-square tests were used to compare the distributions of categorical variables. Significance level was set at $p<0.05$.

## Results

Among the 26 individuals who had undergone IPAA during the study period, 22 patients (14 females and 8 males) were included in the analyses. Four patients were excluded for the following reasons. Two patients, one with FAP and the other operated because of UC but who actually had a colon tumor, died during their follow-up due to the reasons not related to the operation. In one other patient operated for UC, abdominoperineal resection was performed due to anastomotic recurrence. In the remaining patient operated for FAP, ileostomy closure was not performed due to the development of pouch fistula.

In the remaining 22 patients included in the analysis, all procedures were performed as open surgeries. At the time of their respective surgeries, median (range) age was 39 (20-71) years and the median BMI was 26.5 (19.22-29.3) kg/m$^2$. Ten of the patients had UC and 12 had FAP (Table 1). Postoperative histopathological results indicated adenocarcinoma in two patients with UC and in four patients

with FAP. A two-stage surgical procedure (ileostomy closure after IPAA) was performed in 19 (86.4%) patients, and a three-stage surgical procedure (complete colectomy + RP complementary to ileostomy, followed by ileostomy closure) was performed on three (13.6%) patients. All three-stage surgeries were performed on patients with a diagnosis of UC. After proctocolectomy with total mesorectal excision in all patients, a J-pouch of 12-13 cm was formed with a stapler, and IPAA was performed with a 25 mm circular stapler. The median duration of ileostomy closure after the procedure was 3.5 (2-15) months. While the mean duration of ileostomy closure in patients with UC was 4.5 (3-15) months, it was 3 (2-5) months in patients with FAP. The mean postoperative follow-up period of the patients was 44 (12-120) months. Before ileostomy closure, the pouch was evaluated using endoscopic and imaging methods.

In the early postoperative period, four (18.2%) had ileus, five (22.7%) had wound infections, three (13.6%) had pelvic abscess, and other complications, such as deep vein thrombosis, urinary tract infection and pneumonia, developed in five (22.7%). In the late postoperative period, two (9.1%) developed pouchitis, two (9.1%) developed anastomotic stenosis, and two (9.1%) had pouch dysfunction.

### The Effect of the Final Diagnosis on the Complications (Table 2, 3)

One of the patients with pouchitis had been diagnosed with UC and the other with FAP (10% versus 8.3%, p=0.892). Anastomotic stenosis was observed in one patient (10% versus 8.3%). Crohn's disease developed in one patient during follow-up. The patient was excluded from the study since the ileostomy closure had not yet been performed due to the development of pelvic abscess and pouch-vaginal fistula. Three patients with UC and one patient with FAP had ileus (30% versus 8.3%). A pelvic abscess was observed in three patients with UC; however, this was not observed in patients with FAP (30% versus 0%). Pouch dysfunction was observed in one patient in each diagnostic group (10% versus 8.3%). Wound infection was observed in three patients with UC and two patients with FAP (30% versus 16.6%). In four patients with UC, complications such as DVT, urinary infection, and pneumonia were observed,

**Table 1.** Demographic characteristics according to diagnoses

| | n=22 | UC n=10 | FAP n=12 | P |
|---|---|---|---|---|
| Median (range) age, (years) | 39 (20-71) | 37.5 (28-71) | 39.5 (20-59) | 0.229[1] |
| Gender (F/M) | 14/8 | 6/4 | 8/4 | 0.746[2] |
| Median (range) BMI, (kg/m$^2$) | 26.5 (19.22-29.3) | 27.9 (19.4-29.3) | 25.4 (19.2-33.3) | 0.611[1] |
| Median (range) ileostomy closure time, (months) | 3.5 (2-15) | 4.5 (3-15) | 3 (2-5) | 0.052[1] |
| Surgery type (two-/three-stage) | 19/3 | 7/3 | 12/0 | 0.043[1] |
| Median (range) follow-up time (months) | 44 (12-120) | 39 (15-120) | 48.5 (12-105) | 0.878[1] |

UC: Ulcerative colitis, FAP: Familial adenomatous polyposis, [1]: Student t-test, [2]: Pearson chi-square test, F: Female, M: Male

**Table 2.** Distribution of complications by diagnosis

| Complications | n (%) | UC n=10 | FAP n=12 |
|---|---|---|---|
| Pouchitis | 2 (9.1) | 1 (10) | 1 (8.3) |
| Anastomotic stricture | 2 (9.1) | 1 (10) | 1 (8.3) |
| Pouch fistula | - | - | - |
| Anastomotic leak | - | - | - |
| Ileus | 4 (18.2) | 3 (30) | 1 (8.3) |
| Pelvic abscess | 3 (13.6) | 3 (30) | - |
| Pouch dysfunction | 2 (9.1) | 1 (10) | 1 (8.3) |
| Wound infection | 5 (22.7) | 3 (30) | 2 (16.6) |
| Others | 5 (22.7) | 4 (40) | 1 (8.3) |

UC: Ulcerative colitis, FAP: Familial adenomatous polyposis

whereas only one patient with FAP had a urinary infection (40% versus 8.3%).

### Functional Outcomes and Quality of Life

Fecal incontinence was present in six (27.3%) of the patients and four (18.2%) of these used pads during the day. The mean frequency of defecation was 4.31±2.37 times during the day and 1.04±0.89 times during the night. Half of the patients (50%) had complaints of sexual dysfunction. Two patients (9.1%) were using anti-diarrheal drugs. One patient (7.14%) conceived twice after the operation and gave birth by cesarean section in both cases.

### The Effects of Final Diagnosis on Functional Outcomes and Quality of Life

Quality of life, as measured by the CGQL, was found to be significantly better in patients with FAP (0.85±0.13) compared to those with UC (0.71±0.11). There was no significant difference between the two groups in terms of other results.

## Discussion

The colon and rectum are completely resected with RP and IPAA, ensuring the intestinal continuity of the patients and defecation via the anus.[1] Utsunomiya et al.[6] first described this procedure in 1978 as the manual anastomosis of an S-shaped pouch to the dentate line level after mucosectomy was performed in the remaining rectum. Over the years, J-, W-, and K-shaped pouch designs were also defined. Since the 1980s, the J-pouch and stapler anastomosis have become the most common techniques with the development and advances in surgical stapler technology. It has a simple design, the construction with the linear stapler is easier compared to the other techniques, and the application time is shorter.[7] The IPAA procedure has various complications, including postoperative anastomotic leak, stricture, fistula, pelvic abscess, obstruction and pouchitis. Additionally, there are various postoperative consequences that negatively affect daily life activities and quality of life, such as an increase in the number of defecations during the day and at night, the urgent need to urinate, excessive weight loss, and fecal and gas incontinence.

In the present study, we evaluated the postoperative functional outcomes, complications, approaches to complications, and quality of life in patients who underwent IPAA in our clinic. The results of this procedure have been discussed since Utsunomiya et al.[6] presented their initial IPAA results in 1978. According to previous studies, morbidity rates after IPAA vary between 30-60%.[8,9,10,11] However, surgical techniques are constantly changing and improving to reduce these morbidity rates. We used total mesorectal excision and J pouch stapler anastomosis technique in all our patients. In many studies, the J pouch has been reported as the most commonly preferred pouch type due to ease of application and good long-term functional outcomes.[12,13,14] Studies comparing stapled anastomosis with hand-sewn anastomosis concluded that the functional outcomes were observed to be better with stapling.[12,15] Considering the functional outcomes of the patients, we avoided mucosectomy in patients with no suspicion of dysplasia and neoplasia in the anal canal.[16]

The most common complications we encountered in our study were wound infection, pouchitis, anastomotic stenosis, pelvic abscess and pouch dysfunction. Fazio et al.[5] demonstrated that such complications affected functional outcomes and the quality of life of patients.[17] Tiainen and Matikainen[18] reported that pouchitis was the most common

**Table 3.** Quality of life and functional results of patients according to diagnosis

| | n=22 | UC n=10 | FAP n=12 | P |
|---|---|---|---|---|
| Mean ± SD CGQL score | 0.78±0.13 | 0.71±0.11 | 0.85±0.13 | 0.015[1] |
| Mean ± SD defecation episodes daytime | 4.31±2.37 | 3.6±1.26 | 4.91±2.93 | 0.203[1] |
| Mean ± SD defecation episodes at night | 1.04±0,89 | 1.2±0.78 | 0.91±0.99 | 0.475[1] |
| Incontinence, n (%) | 6 (27.3) | 4 (40) | 2 (16.7) | 0.221[2] |
| Pad usage, n (%) | 4 (18.2) | 3 (30) | 1 (8.3) | 0.190[2] |
| Urinary dysfunction, n (%) | 1 (4.5) | - | 1 (8.3) | 0.350[2] |
| Sexual dysfunction, n (%) | 11(50) | 6 (60) | 5 (41.7) | 0.392[2] |
| Anti-diarretic drug use, n (%) | 2 (9.1) | 1 (10) | 1 (8.3) | 0.892[2] |
| Pregnancy, n (%) | 1 (4.5) | 1 (10) | - | 0.262[2] |

UC: Ulcerative colitis, FAP: Familial adenomatous polyposis, CGQL= Cleveland global quality of life; SD: Standard deviation; $p<0.05$ as determined by [1]: Student t-test, [2]: Pearson chi-square test, All data represented as n, % or mean ± standard deviation

complication after IPAA. Similar to our study, certain studies reported that small bowel obstruction was one of the most common complications of RP and is encountered in 12-17% of all patients.[19,20,21] When we compared patients with UC and FAP, the development of ileus and pelvic abscess in patients with UC was significantly more frequent compared to the patients with FAP. This finding is supported by a study by Fazio et al.[22] that reported increased frequency of many complications in patients with UC.

Despite previous studies concluding that protective ileostomy would not prevent pelvic sepsis[23] or anastomotic leaks[24,25] after IPAA, we performed protective ileostomy in all of our patients and closed the ileostomies, after controlling via endoscopy and pouch radiography, at an average of 4.2 months. When we identified problems such as pouch fistula and pouchitis on endoscopy and pouch radiography, we postponed the ileostomy closure procedure and initiated treatment when necessary.

We performed two-stage RP surgery in all patients diagnosed with FAP and those with UC, while three-stage surgery was performed in patients with acute, severe colitis who had received an extended period of steroid therapy or anti-tumor necrosis factor (TNF) therapy.[12,26]

Patients who undergo IPAA are expected to have defecations 4-6 times during the day and 0-1 times at night, with complete continence.[27,28] The number of day and night defecations were compatible with the literature in our patients. However, six patients had fecal incontinence, two of whom needed to use pads. These outcomes were found to be acceptable and in agreement with prior studies.[29]

Gklavas et al.[30] reported that proctocolectomy in patients with inflammatory bowel disease caused no adverse effects on sexual function. These authors highlighted that all surgery in their report had been performed by an experienced colorectal surgeon. They also highlighted the importance of the surgical technique and the fact that it was crucial to spare the nerve plexi within the pre-sacral region.[30] In contrast, Harnoy et al.[31] observed worsening of sexual function in up to 50% of women, while erectile dysfunction was identified in 25% of men after RP with IPAA. In our study, half of the patients stated that they suffered from sexual dysfunction. Of note, one of our patients conceived twice after the operation.

With respect to quality of life evaluation, our patients were satisfied with the IPAA operation and the CGQL scores indicated similar quality of life to that reported by Ozdemir et al.[1] When the UC and FAP groups were compared, it was seen that the results of patients with FAP were better in terms of complications, functional outcomes, and quality of life score. The worse functional outcomes for UC compared with FAP may be because UC patients required emergency surgery for fulminant colitis, underwent preoperative medical treatments and suffered from malnutrition during the preoperative period.

The IPAA procedure was associated with a certain complication rate, as well as functional outcomes and results affecting the quality of life. However, these were at an acceptable level when compared to the preoperative period. In a study by Lichtenstein et al.[32], which examined 10 clinical studies assessing quality of life after IPAA, quality of life was found to have increased in 80% of the studies, remained the same in one of the studies, and was worse compared to the general population included in the remaining study.

### Study Limitations

The insufficient number of patients and the retrospective nature of the study are the most important limitations. However, postoperative complication rates, functional outcomes and quality of life of the patients were similar when compared to the literature.

## Conclusion

In conclusion, our experience with the IPAA procedure demonstrates that this procedure can be applied safely with low comorbidity and good functional outcomes. We believe that this is partly dependent on sufficient caseload, producing experienced clinicians, which will tend to minimize the post-operative complication rate and improve quality of life.

### Ethic

**Ethics Committee Approval:** Gazi University Faculty of Medicine, 24074710-06, 10.02.2020

**Informed Consent:** Informed consent was obtained from all individual participants included in the study.

### Author Contributions

Concept: A.Y., O.Y., Design: A.Y., Data Collection and/or Processing: H.G., O.K., S.A., Analysis and/or Interpretation: K.D., H.B., Literature Search: A.Y., Writing: A.Y. Critical Review: K.D., O.Y.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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CASE REPORT

# Epiploic Appendicitis at the Hepatic Flexure with Incidentally Detected Acute Appendicitis

## Tesadüfen Tespit Edilen Akut Apandisit ile Hepatik Köşe Yerleşimli Epiploik Apandisit

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**ABSTRACT**

Epiploic appendicitis (EA) is a rare cause of abdominal pain that is mostly treated with medical treatment. However, in some cases, surgery is required for recovery. In this case report, a case of EA and acute appendicitis, detected simultaneously, is presented. A 32-year-old-man who had tenderness and rebound at right upper quadrant was admitted to emergency department. In computed tomography scan, there was an inflamed area around the hepatic flexure, and the appendix was normal. Diagnostic laparoscopy was planned because the patient was not relieved by medical treatment. Resection of necrotic tissues was performed together with appendectomy. The patient was discharged on the seventh day of his admission because his oral intake was normal, his abdominal examination was comfortable, and his inflammatory parameters decreased to normal levels. In the pathological evaluation of the operation specimen, acute appendicitis, localized peritonitis and necrotic EA were observed.
**Keywords:** Appendicitis, diagnostic laparoscopy, epiploic appendicitis, medical treatment

**ÖZ**

Epiploik apandisit (EA), çoğunlukla medikal tedavi ile tedavi edilen nadir bir karın ağrısı nedenidir. Bununla birlikte, bazı durumlarda iyileşme için ameliyat gerekir. Bu olgu sunumunda eş zamanlı olarak saptanan EA ve akut apandisit olgusu sunulmaktadır. Sağ üst kadranda hassasiyet ve rebound olan 32 yaşında erkek hasta acil servise başvurdu. Bilgisayarlı tomografi taramasında hepatik fleksura çevresinde iltihaplı bir alan vardı ve apendiks normaldi. Hasta medikal tedavi ile rahatlamadığı için tanısal laparoskopi planlandı. Apendektomi ile birlikte nekrotik dokularının rezeksiyonu yapıldı. Hasta yatışının yedinci gününde oral alımının normal olması, karın muayenesinin rahat olması ve inflamatuar parametrelerinin normale dönmesi nedeniyle taburcu edildi. Ameliyat piyesinin patolojik değerlendirmesinde akut apandisit, lokalize peritonit ve nekrotik EA gözlendi.
**Anahtar Kelimeler:** Apandisit, tanısal laparoskopi, epiploik apandisit, medikal tedavi

## Introduction

Epiploic appendicitis (EA), is the inflammation of small peritoneal sacs (epiploic appendices) filled with fat and capillaries, which extend outward from the serosal surface of the colon.[1] It is a rare condition of abdominal pain caused by occlusion of the vessels draining the epiploic appendix due to thrombus or torsion.[2] Clinical findings of EA are abdominal pain and tenderness detected on physical examination. Diagnosis of EA may be confirmed by imaging methods. While most cases of EA are treated medically, in rare cases surgical intervention is required.[3]

Here we present a case of EA with concurrent acute appendicitis. Acute appendicitis was not detected pre-operatively by imaging, but was discovered during intraoperative evaluation.

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## Case Report

A 32-year-old-man was admitted to the emergency department of Igdir City Hospital with abdominal pain and nausea which had persisted for two days before admission. There was no history of additional disease or surgery. On evaluation, vital signs were: blood pressure 134/72 mmHg; pulse rate 108 beats per minute; oxygen saturation on room air 96%; and body temperature 37.7 °C. On abdominal physical examination, there was tenderness and rebound at the right upper quadrant.

Blood test results were normal except for high C-reactive protein (CRP) (65 mg/L) and high leukocyte count ($14x10^3/mm^3$). On computed tomography (CT) scan, there was an inflamed area around the hepatic flexure (Figure 1), and the appendix was normal (Figure 2). The patient was hospitalized with a pre-diagnosis of epiploic appendicitis. Oral intake was stopped, and intravenous hydration was started. A third-generation cephalosporin, Ceftriaxone 2x1 gr/day and Metronidazole 3x500 mg/100 mL/day were given. Daily abdominal examination was performed. On the third day of admission, the patient reported increased abdominal pain and inflammatory parameters were further elevated with leukocyte count $16x10^3/mm^3$ and CRP concentration 110 mg/L. Abdominal ultrasonography (USG) was performed and were consistent with CT findings. Diagnostic laparoscopy was performed. On exploration, a long, inflamed appendix tissue with increased vascularity was observed and was compatible with acute appendicitis (Figure 3). Approximately 200 cc of seropurulent fluid had accumulated in the pelvis. In addition, the epiploic appendix in the region of the hepatic flexure was seen to be adherent to the abdominal wall, and was severely inflamed and necrotic (Figure 4 and 5). All necrotic tissues were removed, appendectomy was performed, and seropurulent fluid accumulated in the pelvis was aspirated. One drain was placed in the subhepatic area in order to give an early indication of any colonic leak. A further drain was placed in the Douglas's pouch to drain seropurulent fluid accumulated in the pelvis.

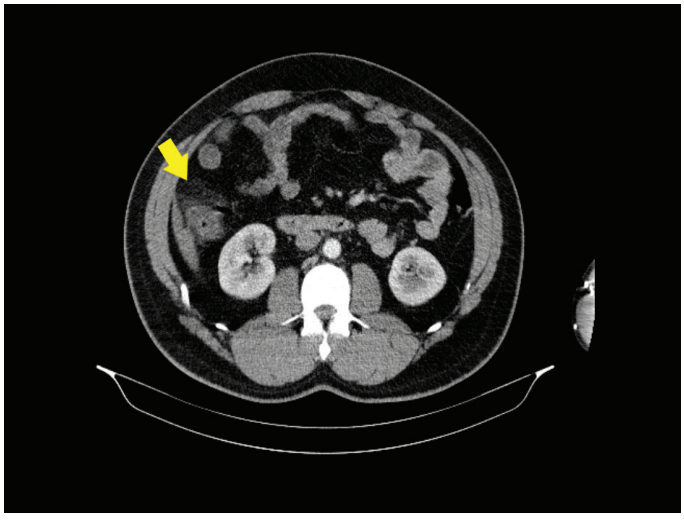

**Figure 1.** A 32-year-old-man with abdominal pain was admitted to the emergency department. CT scan showed an inflamed area around the hepatic flexure at the liver border

CT: Computed tomography

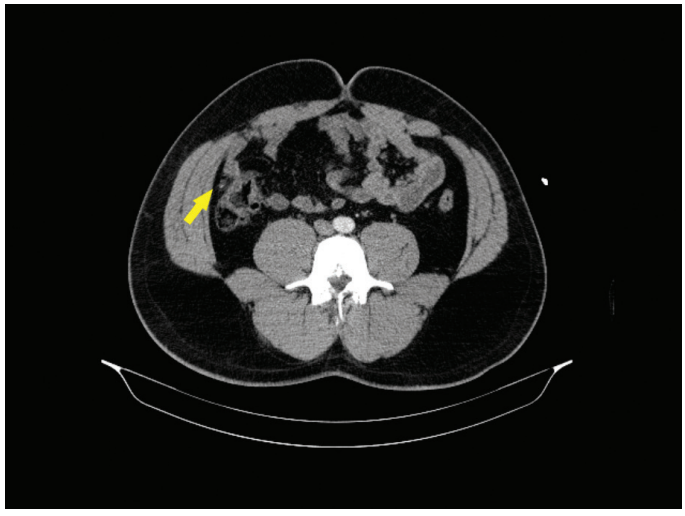

**Figure 2.** Normal appendix tissue on CT scan

CT: Computed tomography

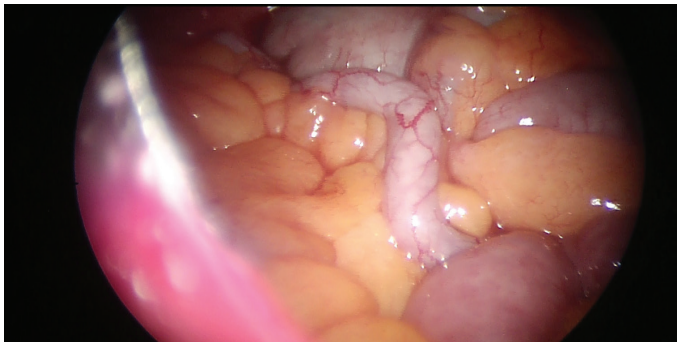

**Figure 3.** Intra-operative image of appendix vermiformis showing inflamed appendix tissue with increased vascularity

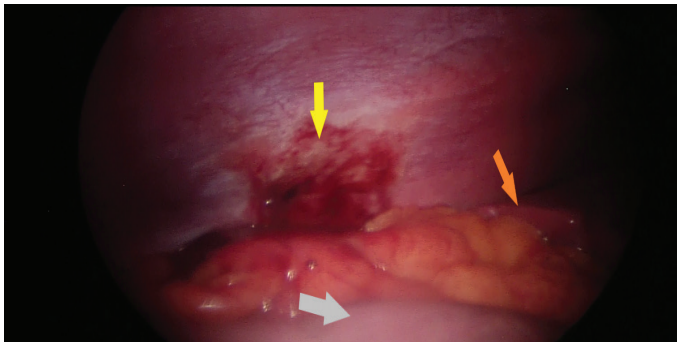

**Figure 4.** Inflamed abdominal lateral wall (yellow arrow shows inflamed abdominal lateral wall, orange arrow shows inferior border of the liver, and grey arrow shows right colonic segment)

After the operation, the patient was followed in the ward. Preoperative antibiotic therapy was continued postoperatively. Oral feeding was reinstated six hours after the operation. Drains were removed on the third postoperative day. The patient was discharged on the seventh day of his admission because his oral intake was normal, his abdominal examination was comfortable, and his inflammatory parameters decreased to normal levels. Histopathological evaluation of the operation specimen reported acute appendicitis, localized peritonitis and necrotic EA (Figure 6 and 7).

## Discussion

Epiploic appendix was first described by Vesalius in 1543 as fat bags covered with serosa around colon segments.[1] EA was described by Dockerty et al.[4] as an ischemic inflammatory condition without inflammation of adjacent organs. Blood supply to the epiploic appendix is from branches of the colic artery and is weak. EA usually arises due to torsion of draining veins of epiploic appendices. It is frequently seen in the sigmoid colon, descending colon and cecum due to the longer epiploic extensions. There are 50-100 epiploic appendices around all the colonic segments and 57% of them are located in the rectosigmoid region.[5]

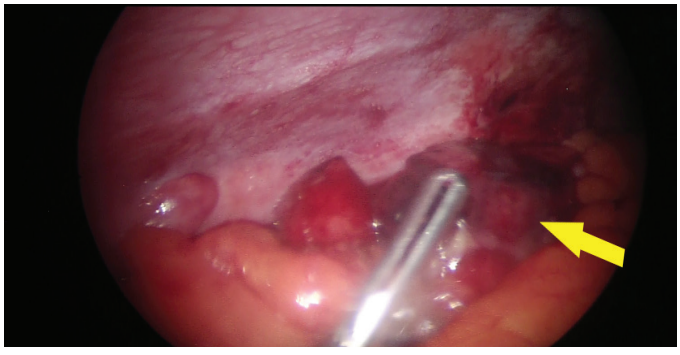

**Figure 5.** Yellow arrow shows necrotic and severely inflamed epiploic appendix

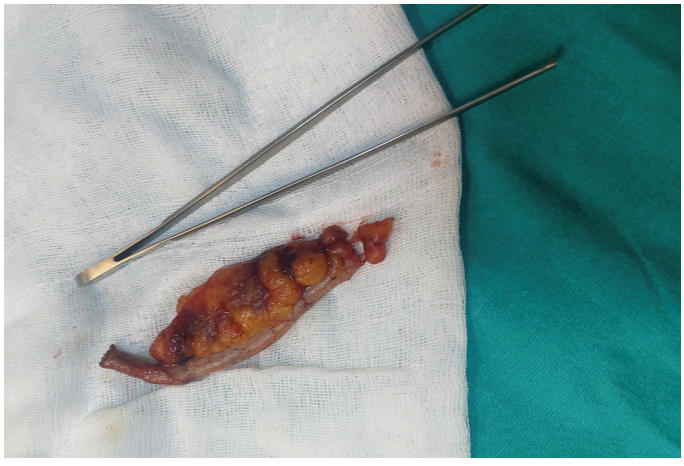

**Figure 6.** Appendix specimen: A long, inflamed tissue with increased vascularity

In this case, a patient with EA and incidentally detected acute appendicitis is presented. The appendix was normal on initial CT scan. During hospital admission acute appendicitis was added to the clinical picture, due to the progression of inflammation in the epiploic appendices across the paracolic distance or through bacterial translocation. However, the definitive etiology of acute appendicitis was not primarily known.

EA is more common in men aged 40-50, but it can be seen at all ages.[1,6] The incidence of EA is reported to be 8.8 per 1,000,000.[7] Patients normally present with a sudden onset of abdominal pain that mimics acute diverticulitis. On physical examination, tenderness is the most common finding, while defense and rebound are not usually observed. A palpable mass may be detected in 10-30% of patients.[8] EA does not have any pathognomonic diagnostic laboratory findings. However, leukocytosis and increased CRP can be seen.[9] In the past most cases of EA were incidentally diagnosed during laparotomy. However, with advances in imaging techniques it is now possible to diagnose EA through imaging. It can be difficult to diagnose EA using USG alone and CT is the most important imaging tool for diagnosing EA. Characteristic CT findings are an oval fatty lesion surrounded by a ring with inflammatory changes.[10]

EA is a benign condition that can heal spontaneously in less than 10 days with the use of antibiotics. Surgical intervention may be required in cases where complications, such as intestinal obstruction, adhesion, abscess, and peritonitis, develop. Also, in cases of persistent symptoms and failure of conservative treatment, the patient will still need laparoscopic resection of the inflamed tissue. In cases of surgical treatment, diagnostic laparoscopy was used to find

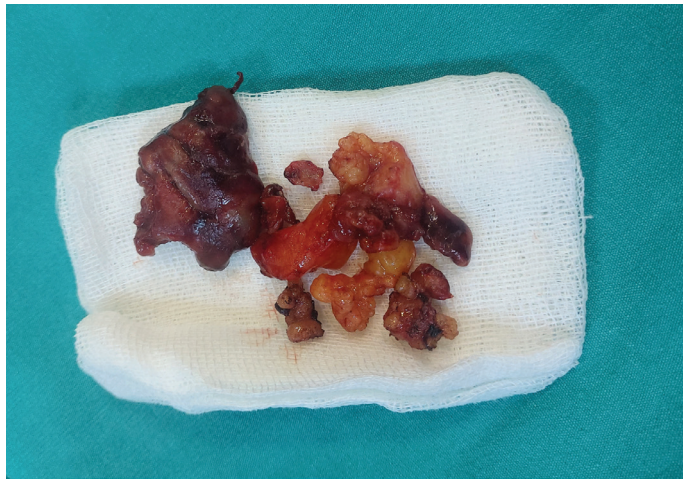

**Figure 7.** Inflamed epiploic appendix with necrosis

and identify the main pathology as diagnostic laparoscopy allows evaluation of the whole abdominal cavity and helps to find additional pathologies. During laparoscopy, the surgeon's experience and technical facilities are important factors. Due to the lack of experience of the surgeon in laparoscopy and technical difficulties, open surgery should be applied at first step. During the operation, all necrotic and inflamed tissues should be removed and existing additional pathologies should be corrected.

Recurrence is an important issue in EA. Sand et al.[2] reported a 40% recurrence rate after conservative treatment. It should be kept in mind that recurrence may develop after conservative treatment and surgical intervention may be required later.

In conclusion, EA is a rare condition that can cause acute abdomen. CT is helpful in diagnosis and most EA cases are treated conservatively. However, in some cases, surgery is required for recovery. We recommend laparoscopy in first-line surgery to ensure a general abdominal exploration, and the diagnostic laparoscopy option should be considered in patients whose abdominal examination is not relieved and in whom inflammatory markers remain elevated.

### Ethics

**Informed Consent:** The patient provided an informed consent.

**Peer-review:** Externally peer reviewed.

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

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CASE REPORT

# A Case of Laparoscopic Left Partial Nephrectomy with Concurrent Laparoscopic Sigmoidectomy

## Eş Zamanlı Yapılan Laparoskopik Sigmoidektomi ile Birlikte Laparoskopik Sol Parsiyel Nefrektomi Olgusu

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**ABSTRACT**

Simultaneous laparoscopic procedures are now becoming more common, because of advances in laparoscopic surgery and greater laparoscopy experience for some clinicians. In this article, we present simultaneous laparoscopic sigmoidectomy and laparoscopic left partial nephrectomy in a 64-year-old female patient with sigmoid colon tumor and left renal angiomyolipoma.

**Keywords:** Laparoscopic surgery, sigmoid colon tumor, concurrent laparoscopy, angiomyolipoma

**ÖZ**

Eş zamanlı laparoskopik prosedürlerin uygulanması laparoskopik cerrahideki gelişmeler ve laparoskopi deneyiminin artmasına bağlı olarak günümüzde sıklıkla uygulanmaya başlanmıştır. Biz bu çalışmamızda sigmoid kolon tümörü ve solrenalanjiyomiyolipomu bulunan 64 yaşındaki kadın hastada eş zamanlı uyguladığımız laparoskopiksigmoidektomi ve laparoskopik sol parsiyelnefrektomi olgusunu sunmayı amaçladık.

**Anahtar Kelimeler:** Laparoskopik cerrahi, sigmoid kolon tümörü, eş zamanlı laparoskopi, anjiyomiyolipom

## Introduction

Simultaneous laparoscopic procedures are now becoming more common, because of advances in laparoscopic surgery and greater laparoscopy experience for some clinicians.[1,2] Although simultaneous procedures have been reported to prolong the operation time and anesthesia time and cause excessive blood loss, they also have the advantages of effective use of limited healthcare resources, reduced hospital stay, reduced postoperative pain, early return to work and good cosmetic results.[3,4]

Renal angiomyolipoma (AML) is a benign neoplasm arising from mesenchymal elements. AML was first reported in 1951. AML is also called a "hamartoma" because of its varying composition, including adipose tissue, smooth muscle, and blood vessels.[5] Most AMLs are detected incidentally. Hemorrhage (50-60%) is most common in AML larger than 4 cm. Hemorrhagic shock can be seen in approximately 30% of patients who develop hemorrhage. In addition, although most AMLs are benign, a small proportion of them can show aggressive character.[5] Symptomatic lesions smaller than 4 cm are followed up, while those that are symptomatic are treated with embolization or conservative surgery after angiography. While asymptomatic AMLs larger than 4 cm are followed up radiologically, angiography and selective arterial embolization, enucleation or partial nephrectomy treatments can be applied in symptomatic patients.

Jacobs et al.[6] reported the first laparoscopic colectomy in the early 1990s. Compared to open surgery, laparoscopic colorectal surgery has some potential advantages.[6]

The aim of this case report is to describe a patient with sigmoid colon carcinoma and concurrent left kidney AML, in whom

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successful simultaneous laparoscopic left hemicolectomy and left partial nephrectomy was performed.

## Case Report

A sixty-four-year-old female patient was admitted to our hospital after a positive fecal occult blood (FOB) test during routine screening at the family health center. The patient's anamnesis, personal history and family history were unremarkable. The physical examination of the patient was normal, and there was no pathology evident on rectal examination. Informed consent was obtained and colonoscopy was performed because of the positive FOB test. Colonoscopy revealed a vegetative mass 20 cm away from the anal canal, with a length of 5-6 cm causing narrowing of the colon lumen, and biopsy was taken from the suspicious lesion. The biopsy result was reported as moderately differentiated adenocarcinoma. Except for a moderate low hemoglobin level (12.0 g/dL; normal range, 14-16 g/dL), the results of the complete blood count and blood biochemistry were normal. Carcinoembryonic antigen (CEA) level was 1.2 ng/mL (normal range 0-2.5 ng/dL). Computed tomography imaging of the patient, performed for staging, revealed irregular mucosa-wall thickening and lumen narrowing in the sigmoid colon and an AML with diameter 8.5 cm, originating from the upper pole of the left kidney. Magnetic resonance imaging (MRI) was performed for the mass in the upper pole of the kidney (Figure 1). Simultaneous laparoscopic sigmoidectomy and laparoscopic left partial nephrectomy were planned in the same session with the involvement of the Urology team (YA, SNG). Ports were placed for classical laparoscopic sigmoidectomy. The medial dissection was completed by ligating the inferior mesenteric artery and vein. After the lateral dissection was completed, the splenic corner was cut. Thus, the left kidney lodge was also reached. Left partial nephrectomy was performed without inserting an

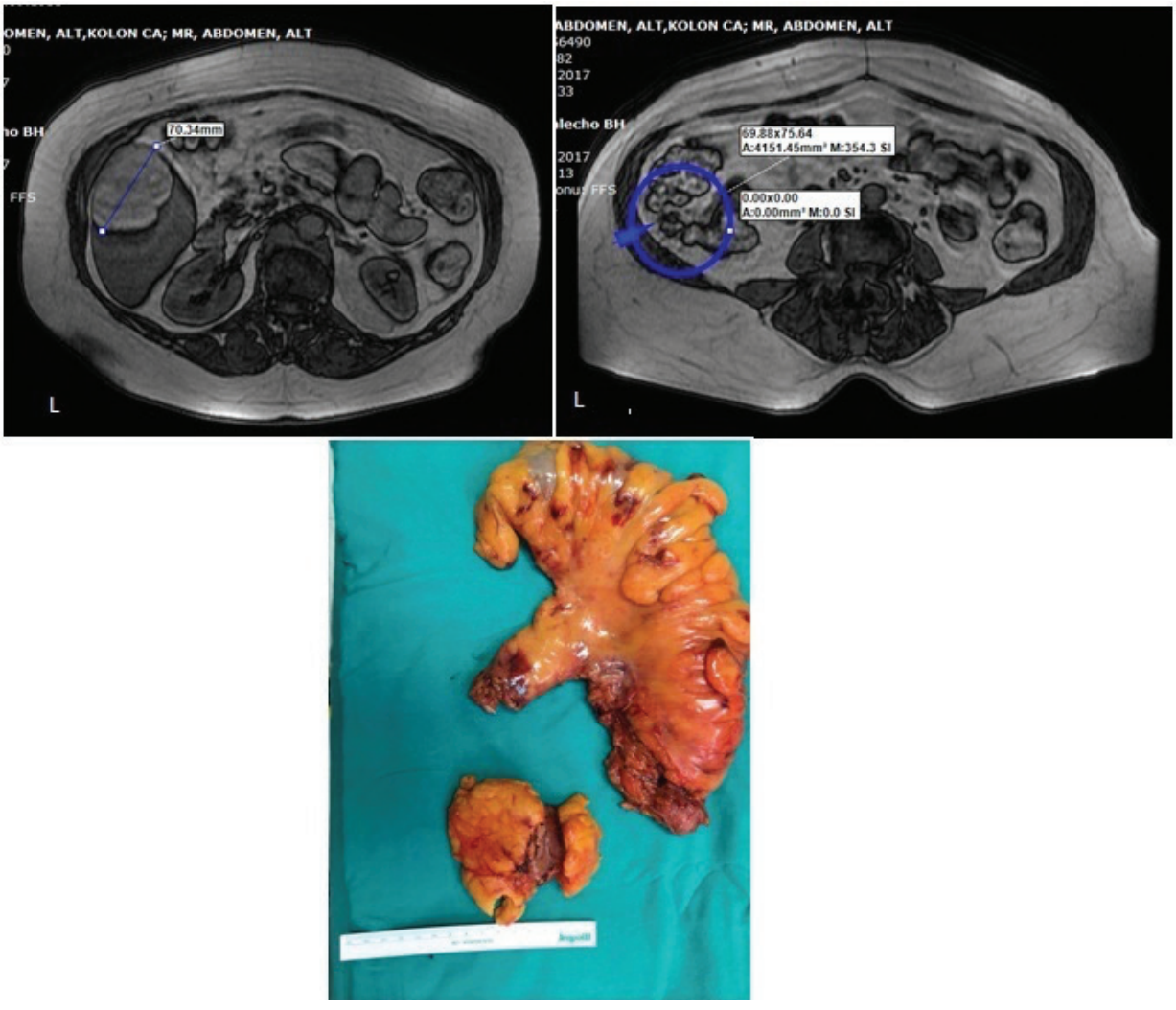


**Figure 1.** Left angiomyolipoma + sigmoid colon tumor image on MRI. Left sigmoidectomy + partial nephrectomy material in surgical specimen
MRI: Magnetic resonance imaging

additional port. Then, laparoscopic sigmoidectomy was completed (Figure 1). The patient's pathology was reported as moderately differentiated adenocarcinoma (T3N0T0) and AML. The patient was discharged on the fifth postoperative day without complications. No problem was encountered at the first and third month follow-ups. Postoperative adjuvant therapy was not considered.

## Discussion

Colorectal cancer is one of the most common cancers in the world, and laparoscopic colectomy has been performed since 1991.[2] Advances in minimally invasive surgery have now made it possible to safely perform several simultaneous surgical procedures. The benefits of minimally invasive surgery have also been extended to performing combined procedures for two different pathologies, concurrently simultaneously. This not only provides the benefits of minimally invasive surgery, but also provides benefits such as allowing the surgeon to perform simultaneous surgical procedures on two different accompanying pathologies, a single hospital stay, exposure to a single pre-anaesthetic evaluation, and a single anesthesia procedure for the patient.[1,2] There are numerous reports of simultaneous operations, such as laparoscopic splenectomy, bariatric surgery, and hernia surgery performed during laparoscopic cholecystectomy, and urological operations such as laparoscopic simultaneous nephrectomy bilateral adrenalectomy, ureteropelvic stenosis and hernia repair being performed during laparoscopic cholecystectomy.[3,7]

Although the increasing use of cross-sectional imaging has increased the incidence of incidentally encountered AMLs, renal AMLs may cause spontaneous bleeding in 15% and hemorrhagic shock in up to 10% of patients. Preservation of kidney function is important in patients with renal AML. Therefore, nephron-sparing surgery should be considered. A multidisciplinary meeting was held with general surgery, urology, radiology and medical oncology to plan the operation in the preoperative period, since our patient would have to undergo mandatory surgery due to a sigmoid colon tumor and the risk of bleeding was increased due to the fact that the patient would be operated in the left retroperitoneum. As a result of the council, simultaneous surgery was decided.

In conclusion, this report has shown that simultaneous laparoscopic left hemicolectomy and left partial nephrectomy is a feasible procedure in selected patients with sigmoid colon carcinoma and concurrent left kidney AML in centers with appropriate laparoscopic surgery experience.

### Ethics

**Informed Consent:** Informed consent was obtained and colonoscopy was performed because of the positive FOB test.

**Peer-review:** Externally and internally peer reviewed.

### Authorship Contributions

Surgical and Medical Practices: E.K., Concept: E.K., S.N.G., Design: E.K., Data Collection or Processing: E.K., Analysis or Interpretation: E.K., Y.A., F.C., Literature Search: E.K., Y.A., F.C., Writing: E.K.

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

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

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VIDEO ARTICLE

# Detection of Perianal Horseshoe Fistula with Endoanal Ultrasound: Video Presentation

## Endoanal Ultrasonografi ile Perianal Atnalı Fistül Tespiti: Video Sunum

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## ABSTRACT

Today, the horseshoe fistulas are counted among the most difficultly managed perianal fistula types. This entity, which is regarded as one of a complex fistula type, affects the ischioanal fossa. Its treatment is more costly and the optimal surgical intervention required is more complex. Since it can affect more than one anatomical structure, chance of treatment failure, perioperative and postoperative complication rates and recurrence rates increase. Especially insufficient preoperative assessment leads in most cases to devastating outcomes for both the physician and the patient. Horseshoe fistulas can be diagnosed easily with magnetic resonance imaging, which is a common modality used in evaluating perianal fistulas. However, due to the high cost and dependance on an experienced radiologist for interpretation in common practice, endoanal ultrasonography (USG) has started to gain popularity. Ability of assessing the perianal anatomy and especially the sphincter complex properly just prior to surgery in operating theatre comprise the most prominent advantages of endoanal USG. In this video presentation, we aimed to show the endoanal USG images of a horseshoe fistula tract following the injection of hydrogen peroxid solution with a branule in the perianal fistula tract of a patient with a history of Crohn's disease.
**Keywords:** Complex perianal fistula, endoanal USG, horseshoe fistula

## ÖZ

Günümüzde yönetimi en zor olan perianal fistül çeşitlerinden biri de atnalı fistüllerdir. Kompleks fistüller kategorisinde değerlendirilen bu hastalık işioanal fossayı etkilemekte olup tedavisi daha maliyetli ve gereken optimal cerrahi girişimi daha komplekstir. Birden fazla anatomik yapıyı etkileyebilmesi nedeni ile tedavi başarısızlığı, peroperatif ve postoperatif komplikasyon oranlarının artması, rekürrens oranının yüksek olması ve özellikle yetersiz preoperatif değerlendirme sonucu hem hekim hem de hasta yönünden ciddi negatif sonuçlar doğabilmektedir. Perianal fistüllerde sık kullanılan bir modalite olan MR ile atnalı fistüllerin tanısı rahatlıkla konabilmektedir. Ancak maliyetin yüksek olması ve çoğunlukla yorum için bir radyoloğa ihtiyaç duyulması nedeni ile endoanal ultrasonografi (USG) son zamanlarda klinik uygulamaya daha çok girmeye başlamıştır. Endoanal USG'nin en önemli avantajları arasında ameliyat masasında eş zamanlı perianal bölge anatomisinin ve özellikle sfinkterlerin optimal şekilde değerlendirilebilmesi söylenebilir. Bu video prezentasyonda crohn hastalığı öyküsü olan bir hastada atnalı fistül traktının intraket ile oksijenli su enjeksiyonunu takiben endoanal USG görüntüsünün paylaşılması amaçlanmıştır.
**Anahtar Kelimeler:** Kompleks perianal fistül, endoanal USG, atnalı fistül

## Introduction

One of the most important diseases affecting the perianal region is perianal fistula. The incidence of this disease in the population is 2%, and it is three times more common in men than in women. The typical features are that it has a chronic course, the rate of spontaneous remission is very low, recurrence is common, and it usually requires at least one surgical intervention.[1] It should not be forgotten that apart from the emotional and physical distress caused, perianal fistula also leads to severe loss working capability and the diagnosis and treatment may be costly. Perianal fistula may be divided into two groups; complex and non-complex

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fistulas with complex fistula being more challenging for clinical management. The delay in the diagnosis of a complex fistula, which includes horseshoe fistula, or the inability to perform optimal surgery as a result of inadequate preoperative evaluation, may result in the development of sepsis, incontinence secondary to progressive destruction, and eventually permanent stoma. In the classical approach, preoperative magnetic resonance imaging (MRI) evaluation is considered superior to other methods because MRI can provide optimal quality images and sufficient information for the evaluation of pelvic floor anatomy in the diagnosis of perianal fistula. However, MRI is not available everywhere, it can be costly and interpretation is dependent of the experience of the radiologist. Especially in high-volume centers, the delay between the MRI scan and the operation date may causs the patient to be operated without adequate evaluation of disease progression or inadequate identification and assessment of any newly developed complication. In modern practice, physical examination is recommended for the diagnosis of noncomplex fistulas and no other method is necessary.[2] In complex, recurrent or Crohn-related fistulas, endoanal ultrasonography (USG) is currently preferred because of the low cost and ease of application before surgery. In this video presentation, the aim was to share the endoanal USG image of a horseshoe fistula tract following the injection of oxygenated water with an intraket in a 34-year-old male patient with a nine-year history of Crohn disease who was actively using azathioprine and infliximab.

Written informed consent was obtained from the patient. After sedoanalgesia, the patient was placed in the lithotomy position. The external mouth of the fistula at the 7 o'clock position was visualized from 3 cm distal to the ancutaneous line. Since the inner mouth could not be visualized clearly during anal exploration, it was decided to perform endoanal USG. The patient was placed in the left lateral decubitus position. An endoanal USG probe (Anorectal 3D 2052, BK Medical) with a frequency of 16-6 MHz was placed in the anal canal. Oxygenated water was introduced into the tract through an intraket. The fistula tract was detected by USG and the procedure was terminated.

In conclusion, this presentation has demonstrated that an endoanal USG examination may be performed before surgery on the operating table and is a cheap, easily applicable and effective method. This can be used to ensure provision optimal treatment for patients with complex or recurrent perianal fistula.

*This video presentation was recorded at the proctology course held at University of Health Sciences Turkey Ümraniye Training and Research Hospital on 17.10.2020.

### Ethics

**Informed Consent:** Obtained.

**Peer-review:** Externally peer reviewed.

### Authorship Contributions

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

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

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

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**Video 1.**

https://www.doi.org/10.4274/tjcd.galenos.2021.2021-1-13.video1

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VIDEO ARTICLE

# How We Approached Locally Advanced (Stomach and Gall Bladder Invasion) Right Colon Tumor with Full Laparoscopic Total Mesocolic Dissection?

## Mide ve Safra Kesesi İnvazyonu Olan Lokal İleri Sağ Kolon Tümörüne Komplet Mezokolik Diseksiyonla Yaklaşımımız

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## ABSTRACT

Colorectal cancer is the third most common cancer diagnosed in the word. While the incidence and the mortality rate of colorectal cancer has decreased due to effective cancer screening measures, gastric or duodenal invasion by locally advanced right colon cancer is an unusual event, the management of which represents a surgical challenge. We aim to share our experience of treating patients with locally advanced, right-sided colon cancer that directly invaded the duodenum, gastric body and gallbladder. The lesions were safely resected laparoscopically for mesocolic dissection. The treatment was curative (R0) with minimum morbidity and mortality. High ligation of blood vessels at the D3 level and complete mesocoloic excision (CME) are both critical when operating right colon cancer. This laparoscopic approach, which normally requires extreme care, became even more challenging in locally advanced tumors. This video presentation illustrates total laparoscopic right hemicolectomy with D3 lymph node dissection and CME, cholecystectomy, and gastric and duodenum wedge resection. Reconstruction was performed with a Roux-en-Y gastroenterostomy and ileotransversostomy from the region of the resection, with tissue preservation. We wanted to show how the difficulties encountered during the operation are managed, as it is not possible to predict local advanced tumor preoperatively by physical examination. In conclusion, in selected patients, advanced laparoscopic surgery with appropriately trained and experienced staff in appropriate centers may be a solution for locally advanced tumors without compromising oncological principles.

**Keywords:** Right hemicolectomy, complete mesocolon excision, laparoscopic, localy invasion

## ÖZ

Kolorektal kanser, tüm dünyada tanı koyulan en yaygın üçüncü kanserdir. Etkili kanser tarama önlemleri sayesinde kolorektal kanserin insidansı ve mortalite oranı azalmakta iken; ancak bu süreçte tanı koyulan lokal ileri kolon kanserlerinden; sağ kolon kanseri zemininde mide veya duodenal invazyon, yönetimi cerrahi bir zorluk teşkil eden nadir bir durumdur. Bu olgu takdiminde doğrudan duodenumu, mide korpusunu ve safra kesesini invaze eden, lokal ileri sağ kolon kanseri olan hastamızı tedavi etme deneyimimizi paylaşmayı amaçladık. Lezyonlar mezokolik diseksiyon için güvenle laparoskopik olarak rezeke edildi ve tedavi, minimum morbidite ve mortalite ile küratif (R0) olarak tamamlandı. D3 seviyesinde vasküler yapıların yüksek ligasyonu ve tam mezokolik eksizyon (CME), sağ kolon kanserini ameliyat ederken kritik öneme sahiptir. Normalde hali hazırda aşırı dikkat gerektiren bu laparoskopik yaklaşım, lokal olarak ilerlemiş tümörlerde daha da zorlayıcı hale gelmektedir. Bu video sunumu, D3 lenf nodu diseksiyonu ve CME, kolesistektomi ve mide ve duodenum wedge rezeksiyonu ile total laparoskopik sağ hemikolektomiyi göstermektedir. Temiz cerrahi sınırla, rezeksiyon bölgesinden Roux-en-Y gastroenterostomi ve ileotransversostomi ile rekonstrüksiyon yapıldı. Ameliyat öncesi fizik muayene ile tahmin etmek mümkün olmadığı için ameliyat sırasında lokal ileri olduğu tespit edilen hastada karşılaşılan zorlukların nasıl yönetildiğini göstermek istedik. Sonuç olarak, seçilmiş hastalarda, uygun merkezlerde, uygun eğitimli ve deneyimli personel ile ileri laparoskopik cerrahi, lokal ileri tümörlere onkolojik prensiplerden ödün vermeden çözüm olabilir.

**Anahtar Kelimeler:** Sağ hemikolektomi, komplet mezokolik eksizyon, laparoskopi, lokal invazyon

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## Description

Colorectal cancers continue to be an important global cause of morbidity and mortality, despite all the advances in treatment approaches. Currently, radical surgery is the only known curative treatment option. The positive effects of the Complete Mesocolic Excision (CME) with right hemicolectomy technique on survival and local recurrence rates are indisputable.[1,2] Hohenberger et al.[1] showed the effect of CME on 5-year survival increased from 82.1% to 89.1%. Thus, high ligation of blood vessels at the D3 level and CME are two critical features of the treatment of ascendant colon cancer.[1] This laparoscopic approach, which normally requires extreme care, becomes even more challenging in locally advanced tumors.[3]

Surgical resection of tumors without local advancement is known to result in a lower morbidity and mortality than locally advanced colon tumors. However, the benefit of extensive surgery cannot be underestimated in the case of locally advanced tumors. Extensive surgery with careful lymph node dissection (LND) based on a no-touch isolation technique remains the gold standard.[4] Here, we present a 68-year-old man with a locally advanced hepatic flexure tumor. Physical examination was uninformative. Colonoscopy revealed near total obstruction at the hepatic flexure. Computed tomography showed an irregular wall at the hepatic flexure. Radiology did not suggest invasion of adjacent organs. Postoperative pathological result was pT4b pN0 (0/21) M0 (phaseII C, AJCC). This video presentation illustrates total laparoscopic right hemicolectomy with D3 LND and CME, cholecystectomy and gastric and duodenum wedge resection. Reconstruction was performed with a Roux-en-Y gastro-enterostomy and ileotransversostomy from the region of the resection, with tissue preservation. In this video we wanted to show how the difficulties encountered during the operation are managed, as it is not possible to predict local advanced tumor preoperatively by physical examination.

The benefit of extensive surgery is greater in the case of stage II tumors. In other word, the overall survival time of patients with these tumors is significantly higher than patients with more conservative surgery. In conclusion, in selected patients, advanced laparoscopic surgery performed by appropriately trained (e.g Lap Co training) and experienced staff in a center with sufficient patient numbers may be successful in the treatment of locally advanced tumors without compromising oncological principles.

### Ethics

**Informed Consent:** Obtained.

**Peer-review:** Internally peer reviewed.

### Authorship Contributions

Surgical and Medical Practices: M.U., G.M., Ö.Ö. Concept: M.U., C.D., Ö.D. Design: Ö.Ö., Ö.D., O.N. Data Collection or Processing: M.U., C.D., O.N., S.Ş. Video adition: M.U., C.D., Literature Search: Ö.D., G.M., Ö.Ö., Writing: M.U., Ö.D., Ö.Ö.

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

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**Video 2.**

https://www.doi.org/10.4274/tjcd.galenos.2021.2021-5-1.video2

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