ISSN 2536-4898
Volume 33
Issue 2
June 2023

Turkish Journal of COLORECTAL DISEASE

Official Journal of the Turkish Society of Colon and Rectal Surgery

www.turkishjcrd.com

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Printing Date: June 2023 **ISSN:** 2536-4898 **E-ISSN:** 2536-4901

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AIMS AND SCOPE

Turkish Journal of Colorectal Disease is an open access, scientific and peer-reviewed journal in accordance with independent, unbiased, and double-blinded peer-review principles of the Turkish Society of Colon and Rectal Surgery.

The journal is published quarterly in March, June, September, and December in print and electronically. The publication language of the journal is English.

This journal aims to contribute to science by publishing high-quality, peer-reviewed publications of scientific and clinical importance that address current issues at both national and international levels.

Furthermore, review articles, case reports, technical notes, letters to the editor, editorial comments, educational contributions, and congress/meeting announcements are released.

The journal scopes epidemiologic, pathologic, diagnostic, and therapeutic studies relevant to managing small intestine, colon, rectum, anus, and pelvic floor diseases.

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

Turkish Journal of Colorectal Disease is currently indexed in **TÜBİTAK/ULAKBİM, British Library, ProQuest, CINAHL, IdealOnline, EBSCO, Embase, Gale/Cengage Learning, Turkish Citation Index, Hinari, GOALI, ARDI, OARE, AGORA J-GATE** and **TürkMedline**.

The editorial and publication processes of the journal are shaped in accordance with the guidelines of the International Committee of Medical Journal Editors (ICMJE), World Association of Medical Editors (WAME), Council of Science Editors (CSE), Committee on Publication Ethics (COPE), European Association of Science Editors (EASE), and National Information Standards Organization (NISO). The journal is in conformity with the Principles of Transparency and Best Practice in Scholarly Publishing.

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Turkish Journal of Colorectal Disease is an international, open access, scientific, peer-reviewed journal in accordance with independent, unbiased, and double-blinded peer-review principles of Turkish Society of Colon and Rectal Surgery. The journal is published quarterly in in March, June, September and December in print and electronically. The publication language of the journal is English.

This journal aims to contribute to science by publishing high quality, peer-reviewed publications of scientific and clinical importance address current issues at both national and international levels. Furthermore, review articles, case reports, technical notes, letters to the editor, editorial comments, educational contributions and congress/meeting announcements are released.

The journal scopes epidemiologic, pathologic, diagnostic and therapeutic studies relevant to the management of small intestine, colon, rectum, anus and pelvic floor diseases.

Reviewed and accepted manuscripts are translated from Turkish to English by the Journal through a professional translation service. Before printing, the translations are submitted to the authors for approval or correction requests, to be returned within 7 days. The editorial board checks and approves the translation if any response is received from the corresponding author within this period.

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As a peer-reviewed journal that is independent, impartial and in compliance with the principles of double-blinded peer review, after checking the compliance of the submitted manuscript with the writing rules and plagiarism control, all articles are reviewed by the editor-in-chief, section editor, at least two reviewers, and statistic editor. All evaluation process except Editor-in-Chief is done double-blinded. After all these processes are completed, the Editor-in-Chief decides whether to publish or reject the article. In the final stage, the plagiarism review is repeated once more

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

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

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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);

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.);

STARD checklist for reporting 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.);

STROBE statement, a checklist of items that should be included in reports of observational studies;

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 standard, 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 e-mail 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;

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

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 by any authors, should be clearly cited and referenced.

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All clinical trials must be registered in a public trials registry acceptable to the International Committee of Medical Journals Editors (ICMJE). Authors of randomized controlled trials must adhere to the CONSORT guidelines, 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 keywords or short phrases. Do not use abbreviations as keywords.

Introduction: State the purpose and rationale for the study concisely 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 essential observations; do not compare your observations with those of others. Such comparisons and comments are reserved for the discussion section.

Discussion:

1. State the importance and significance of your findings but do not repeat the details given in the Results section.

2. Limit your opinions to those strictly indicated by the facts in your report.

3. Compare your finding with those of others.

No new data are to be presented in this section.

Acknowledgements: 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 acknowledgement 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 the 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.

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"

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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.

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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 of 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 a description of a new surgical technique and its application in 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.

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, MPEG-PS, 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 info@galenos.com.tr. All videos must include 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 comments on articles published in the 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.

The Editor exclusively solicits editorials. 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.

Peer review of study protocols :

TJCD will consider publishing without peer review protocols with formal ethical approval and funding from a recognized, open Access, supporting research-funding boy (such as those listed by the JULIET Project). Please provide proof that these criteria are met when uploading your protocol. Any

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protocols that do not meet both these criteria will be sent for open external peer review, with reviewer comments published online upon acceptance, as with research articles. Reviewers will be instructed to review for clarity and sufficient detail. The intention of peer review is not to alter the study design. Reviewers will be required to check that the study is scientifically credible and ethically sound in its scope and methods. There is sufficient detail to instil confidence that the study will be managed and analyzed correctly.

Publishing study protocols enables researchers and funding bodies to stay up to date in their fields by providing exposure to research activity that may not otherwise be widely publicized. This can help prevent unnecessary duplication of work and will hopefully enable collaboration. Publishing protocols in full also makes available more information than is currently by trial registries and increases transparency, making it easier for others (editors, reviewers and readers) to see and understand any variations from the protocol that occur during the conduct of the study)

The SPIRIT (Standart Protocol Items for Randomized Trials) statement has now been published. It is an evidence-based tool developed through a systematic review of a wide range of resources and consensus. It closely mirrors the CONSORT statement and also reflects essential ethical considerations.

PRISMA is an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses. PRISMA focuses on reporting reviews evaluating randomized trials but can also be used as a basis for writing systematic reviews of other types of research, particularly evaluations of interventions.

General TJCD policies apply to manuscript formatting, editorial guidelines, licence forms and patient consent.

- Protocol papers should report planned or ongoing studies: Manuscripts that report work already carried out will not be deemed protocols. The dates of the study must be included in the manuscript and cover letter.

Protocol for studies that will require ethical approval, such as trials, is unlikely to be considered without receiving that approval.

- **Title:** This should include the specific study type, randomized controlled trial

- **Abstract:** This should be structured with the following sections—introduction; Methods and analysis; Ethics, and dissemination. Registration details should be included as a final section, if appropriate.

- **Introduction:** describe the rationale for the research and what evidence gay it may fill.

- **Methods and analysis:**

- **Ethics and dissemination:** Ethical and safety considerations and any dissemination plan should be covered here

- Full references

- Authors contributions

- Funding Statement

- Competing Interests Statement

- **Word Count:** Not to exceed 4000 words.

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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.

Suppose doubt exists whether the research was conducted in accordance with the 1964 Helsinki Declaration or comparable standards. In that case, the authors must explain the reasons for their approach and demonstrate that the independent ethics committee or institutional review board explicitly approved the doubtful aspects of the study.

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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 essential that all participants gave their informed consent in writing before inclusion in the study. They are identifying details (names, dates of birth, identity numbers and other information) of the participants that were

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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 assure that alterations do not distort scientific meaning.

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EDITORIAL

Editor-in-Chief
Prof. Fatma Ayca Gultekin, M.D. Zonguldak-Turkey

Get Better Together...

"II. International Colorectal Surgery Congress and XIX. National Colon and Rectal Surgery Congress" was held on May 16-20, 2023, at Susesi Convention Center in Antalya. More than 1200 of surgeons participated in the congress, which had an extremely rich scientific program, where current issues in colorectal surgery were discussed, 18 surgeons from different countries who are internationally renowned in their field and have great contribution to the literature. As Turkish Journal of Colorectal Disease (TJCD), we would like to thank Prof. Feza Yarbug Karakayalı, the chairperson; Prof. Dr. Feza Yarbuğ Karakayalı, the secretary; Prof. Aras Emre Canda, the members of organizing committee of the congress, and the President of the Turkish Society of Colon and Rectum Surgery (TSCRS), Prof. Dr. Mehmet Ayhan Kuzu and the members of executive committee of TSCRS, who organized this wonderful congress.

In this congress, TJCD achieved several important firsts with the support of TSCRS and organizing committee of the congress. We brought together our reviewers in the TJCD reviewer pool with the editors-in-chief of the most respected journals in the fields of colorectal surgery and surgery in the "Editors Meet Reviewers" session. The editors-in-chief, Prof. Susan Galandiuk (Disease of the Colon and Rectum), Prof Neil Smart (Colorectal Disease) and Prof. Wim Ceelen (Acta Chirurgica Belgica), who participated in the session, explained what to pay attention to from the editor's point of view when reviewing an article as a reviewer on various topics. As TJCD, our goal is to turn the referee-editor meeting, which we organized as a session in this congress, into a workshop in future congresses to include authors as well.

In this congress, the editorial board of TJCD selected the articles published in the journal between 2021-2022 as "Anal Fissure Patients: Before Treatment, First Consider Irritable Bowel Syndrome, Defecation Disorder and Psychopathology. Neriman Şengül, Özden Arısoy, Direnç Yiğit, Ufuk Arslan. Turk J Colorectal Dis 2022;32: 238-244" and awarded the "TJCD Best Article Award" (Figure 1). Another award was the "Best Article Award in Colorectal Surgery Published from Centers in Turkey".

According to the criteria determined by the editorial board of TJCD, among the articles published between 2021-2022, "Unroofing Curettage Versus Modified Limberg Flap in Pilonidal Disease: A Retrospective Cohort Study. Alpaslan Sahin, Gurcan Simsek, Kemal Arslan. Dis Colon Rectum. 2022;65(10):1241-1250." was found eligible for the award (Figure 2).

TJCD will continue to give the awards, the first of which they were given this year, at the International Colorectal Surgery Congress and National Colon and Rectal Surgery Congress, which are held every two years from now on. "TJCD Best Article Award" and "Best Article Award in Colorectal Surgery Published from Centers in Turkey" will be awarded according to the following criteria.

Criteria for the "TJCD Best Article Award"

1. Original research articles will be included in the evaluation. Articles in the categories of case report, case series, review, technical note, short note, letter to the editor or video presentation will be not evaluated.
2. For an article to be included in the evaluation, it is not sufficient to have a "doi number", but it must have been published in the year of the evaluation and must have a volume and page number.
3. The order of priority will be randomized controlled trial, cohort study, case-control study.
4. The originality of the researched topic will be taken into consideration and multicenter studies will be prioritized.
5. Authors will be considered to have no conflict of interest with TJCD and TSCRS.

Criteria for the "Best Published Article Award in Colorectal Surgery from Centers in Turkey"

1. Original research articles will be included in the evaluation. Articles in the categories of case report, case series, review, technical note, short note, letter to the editor or video presentation will be evaluated.

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2. For an article to be included in the evaluation, it is not sufficient to have a "doi number", but it must have been published in the year of the evaluation and must have a volume and page number.

3. The "Quartile" categories of the journals in which the articles were published were based on Web of Science data. For journals listed in more than one field category (for example, listed in both "Gastroenterology & Hepatology" and "Surgery" categories), the "Quartile" value in the "Surgery" category will be taken as the basis.

4. Among the journals in the same quartile category, priority will be given to the article in the journal with the higher "impact factor."

5. Authors should not have any conflict of interest with TJCD and TKRCD.

6. Only studies conducted in centers in Turkey are included in the evaluation. Joint studies with foreign centers, studies where the corresponding author is from a foreign center, or joint center studies conducted during the period when the corresponding author is temporarily abroad will not be evaluated.

TJCD is also pleased to announce that the corresponding authors of the awarded articles will have their congress registration and accommodation fees covered by the TSCRS.

The goal of TJCD is to contribute valuable publications to the colorectal surgery literature of Turkey and the world. To this end, TJCD will continue to give awards and organize courses to improve the quality of articles published in the journal.

Figure 1: "TJCD Best Article Award" winners, Neriman Sengul and Direnc Yigit, receiving their award certificates from the editor-in-chief, Fatma Ayca Gultekin

Figure 2: ""BestArticle Award in Colorectal Surgery Published from Centers in Turkey"." winners, Alpaslan Sahin, Gurcan Simsek, Kemal Arslan, receiving their award certificates from the co editor; İlknur Erenler Bayraktar.

DOI: 10.4274/tjcd.galenos.2023.2023-1-5
Turk J Colorectal Dis 2023;33:31-35

RESEARCH ARTICLE

Emergency Surgery of Obstructed Carcinoma of the Left Colon with Perforation of the Cecum: Colectomy and Anastomosis Series

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ABSTRACT

Aim: The operation of choice for obstructed carcinoma of the left-side colon with perforation on the cecum is controversial. This study evaluated the timing of subtotal/total colectomy in acutely obstructed carcinoma of the left-side colon with perforation on the cecum.

Method: Twelve patients with cecal perforation due to obstructed left-side colon tumor were included in this study. The patients were evaluated for age, gender, application time, presence of systemic diseases, Acute Physiology and Chronic Health Evaluation II scores, primary tumor localization, tumor stage, type of surgical operation, Mannheim Peritonitis Index, morbidity, and mortality.

Results: Seven adenocarcinomas were localized on the left colon, three were localized on the midsigmoid, and two were localized on the rectosigmoid junction. All patients had a massively distended colon with perforation on the cecum. Seven patients underwent subtotal colectomy, while five patients underwent total colectomy. After the resection, anastomosis was performed using a circular stapler. After anastomosis, loop ileostomy was performed on the right side of the abdomen for all patients for anastomosis safety.

Conclusion: This study suggests that resection, anastomosis, and protective loop ileostomy are viable surgical alternatives, even in emergency conditions, if they can be performed together with decompression and peritoneal lavage in the surgical treatment of cecum perforation due to obstructed left colon tumors.

Keywords: Cecum perforation, colectomy, left colon, tumor obstruction

Introduction

The operation of choice for acutely obstructed carcinoma of the left colon with a massively distended and fecal-loaded colon with ischemic lesions and serosal tears or perforation on the cecum is controversial. Mechanical large bowel obstruction causes bowel dilation, mucosal edema, and impaired venous and arterial blood flow to the bowel. If the ileocecal valve is competent, colonic distention is greater, which increases the risk of ischemia and perforation. In patients with a competent ileocecal valve, the areas at risk for perforation are the cecum and the primary tumor. Left-side colonic carcinomas cause colonic obstruction much earlier in their development because the colon is narrower and the stool is harder in that area. According to the law of Laplace, in a long pliable tube, the site of the largest diameter requires the least pressure to distend. Therefore, the cecum is the most common site of perforation in patients with distal large bowel obstruction in the setting of a competent ileocecal valve. Subtotal or total colectomy with anastomosis is indicated in patients with right-sided concomitant tumors or ischemic lesions or serosal tears on the cecum. Performing subtotal or total colectomy for left bowel obstruction without these indications is seen as controversial.[1-4]

The incidence of colorectal cancer was estimated to be 84/100,000 people per year during 2012-2016. Acute colorectal obstruction is associated with tumors in the left flexure and descending colon. Between 8% and 29% of patients with colon cancer present with large bowel

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Received: 26.01.2023 **Accepted:** 01.03.2023

obstruction, and 3-8% of patients have perforation and peritonitis, while bleeding is less common.[5,6]

This study aims to explore acute obstructive carcinoma of the left colon with perforation of the cecum.

Materials and Methods

Between 2008 and 2020, 178 patients with tumor-related colonic obstruction presented to the surgical department. The patients had distended abdomens without passing gasses, and there were signs of peritonitis with clinical signs of rebound test positive. In 12 patients, cecal perforation was noticed during abdominal exploration. The patients were evaluated for age, gender, hospital application time, presence of systemic diseases, Acute Physiology and Chronic Health Evaluation (APACHE) II scores,[7] primary tumor localization, tumor stage (TNM staging systems),[8] operative findings, type of surgical operation, Mannheim Peritonitis Index (MPI),[9] and causes and rates of morbidity and mortality. The APACHE II and MPI scores were calculated on the day of laparotomy, and consent was provided by all patients. Furthermore, permission was obtained by the Memorial Diyarbakır Hospital Ethics Committee for this retrospective study (approval number: 2022/103, date: 01.12.2022).

After the patients were evaluated through physical examination, they underwent routine blood tests, erect abdominal X-rays, whole abdomen ultrasonography, and contrast-enhanced whole abdomen computed tomography (CT).

Operative mortality was defined as death that occurred within one month or operation-related death during hospitalization.

After the preoperative preparations were completed, all patients were operated on under emergency conditions using a median incision. Furthermore, all patients were operated on under general anesthesia, and decompression was applied to empty the contents of the colon. Isotonic sodium chloride solution was used for peritoneal lavage and drains were placed in the peritoneal cavity. All patients were moved to the intensive care unit after the operation. The intraoperative damage control method and the surgical technique to be applied for the tumors were left to the decision and clinical approach of the operating surgeon. When subtotal colectomy was performed, the colon, after mobilization, was resected from the terminal ileum distal to the tumor (minimum distance to the tumor was 5 cm). In total colectomy, the colon was resected from the terminal ileum distal to the upper rectum. Moreover, after resection, anastomosis was performed using a circular stapler. After anastomosis, a loop ileostomy was performed on the right side of the abdomen for all patients for anastomosis safety. Total or subtotal colectomy was preferred according to the location of the tumor.

All patients received standard life-supporting resuscitation protocols, and postoperative patients were moved to the intensive care unit. The patients received a combination of third-generation cephalosporin and anti-anaerobic antibiotics preoperatively. In patients with septic complications, antibiotic therapy was continued based on the culture antibiogram result. Sequential compression devices were placed in all patients for deep venous thrombosis prophylaxis, and they were started on low-molecular-weight heparin.

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation, except where otherwise stated.

Results

Table 1 shows demographic and clinical data on age, gender, hospital application time, APACHE II score, MPI, TNM staging systems, tumor location, morbidity, and mortality.

The mean age of the 12 patients was 62±9.21 (41-72) years, and there were 7 male and 5 female patients. The average hospital application time was 3.14±1.34 (1-5) days. In six patients, systemic diseases were also present, and diabetes mellitus was the most common among them. The mean score of APACHE II was 27.2±8.26 (17-41), and the mean score of MPI was 30±5.68 (22-38).

Seven adenocarcinomas were localized on the left colon, three were localized on the midsigmoid, and two were localized on the rectosigmoid junction. All patients had a massively distended colon with perforation on the cecum. Seven patients underwent subtotal colectomy, while five patients underwent total colectomy. No macroscopic peritoneal or liver metastases were observed in any of the patients.

Pathological examination of the specimens confirmed colonic carcinoma in all patients (stage 2: three cases, stage 3: seven cases, and stage 4: two cases). The mean number of examined lymph nodes was 21±4.3, with a 17-28 range. One of the sigmoid carcinoma patients died due to intra-abdominal sepsis and multiple organ failure on postoperative day four. No postoperative anastomotic leakage or fistula was accounted for, and intra-abdominal abscess developed in three patients within the first month. Additionally, CT-guided percutaneous drainage was performed, and wound infections developed in five patients, but they healed without any problems. The average hospital stay was 10±1.32 days, with an 8-14 days range.

Table 1. Characteristics of the patients

Patient	Age	Operation interval (day)	APACHE II	MPI	TNM stage	Tumor location	Mortality	Morbidity
1	65	3	25	29	II	Left	-	WI
2	58	2	17	24	III	Sigmoid	-	IAA + WI
3	44	4	21	22	III	Left	-	-
4	76	4	35	38	III	Rectosigmoid	-	IAA + WI
5	73	3	24	32	III	Left	-	WI
6	62	1	28	30	IV	Sigmoid	-	-
7	70	5	41	35	III	Left	IA sepsis	-
8	68	3	32	32	III	Left	-	IAA + WI
9	70	2	35	36	III	Left	-	-
10	69	1	28	30	IV	Sigmoid	-	-
11	66	2	30	32	II	Left	-	-
12	72	2	32	30	II	Rectosigmoid	-	-

MPI: Mannheim Peritonitis Index, IA: Intra-abdominal, WI: Wound Infection, IAA: Intra-abdominal abscess, APACHE II: Acute Physiology and Chronic Health Evaluation II

Discussion

Distal obstructions of the colon, in the presence of a competent ileocecal valve, may result in colonic perforation. The law of Laplace dictates that the tension required to distend a hollow tube is lowest at the widest point. Clinically, this explains why the cecum is the most common site of perforation in distal large bowel obstruction.[2]

Increased wall tension in the cecum due to closed loop large bowel obstruction causes ischemia to the bowel wall and longitudinal splitting of the serosa with a herniation of the mucosa through the diastasis of muscle. Cecal perforation is typically present on the anterior longitudinal axis, with sharp uninflamed margins,[2,4] and its risk increases with a diameter of more than 12 cm and intraluminal pressure greater than 80 mmHg.[10] Primary tumor localization in the left flexure had the highest obstruction rate (34%). Studies have found that almost half of the tumors with this localization result in obstruction.[11,12]

Albers et al.[13] printed a study on the perforation of the cecum in 1956. They said that the causes of perforation of the cecum are trauma, obstruction of the colon, inflammatory disease, and malignant tumors of the cecum. Among 72 patients, cecal perforation due to large bowel obstruction was observed in 18 patients, and the mortality rate was 72%. The researchers showed the typical clinical picture as an elderly patient who complained of abdominal pain for 6-10 days and presented marked distention and right lower quadrant tenderness. Free intraperitoneal air was noted using a roentgenogram in 31% of the patients. In the operative management of obstructive perforations of the cecum, exteriorization of the cecum with adequate, early decompression was the procedure of choice. Decompression at the time of surgery not only improved the patients' survival rate but also made the cecum easier to exteriorize. Exteriorized cecostomy was used in 10 patients: 6 patients died, and tube cecostomy was not exteriorized in three patients, who also died. This study performed subtotal or total colectomy under emergency conditions for the surgical treatment of cecum perforation due to left colon tumors with the presence of obstruction. The American Society of Colon and Rectal Surgeons recently established guidelines for colon cancer surgery as follows: 1) the extent of bowel resection and margins (5-10 cm of the normal bowel on either side of the primary tumor); 2) en-bloc resection of adherent tumors for clinically T4 lesions; and 3) lymphadenectomy (at least a minimum of 15 nodes must be examined).[5] In this study, the number of lymph nodes was consistent with the literature. Moreover, one patient died due to multiple organ failure.

In the study of Perrier et al.[14], 113 colonic obstructions caused by cancer were treated initially using tube cecostomy, and second operations were performed on the 98 surviving patients. The researchers pointed out that cecostomy decreased the mortality rate of the following operations. Therefore, cecostomy was a useful and less invasive surgical procedure for patients presenting with colonic obstruction caused by cancer. Tube cecostomy was supported in the management of acute left colonic obstruction with minor or no deaths.[15-17] This study does not recommend cecostomy (tube cecostomy or exteriorization) as a routine method in the treatment of acute left-sided obstructive colon

cancer with cecal perforation. In the presence of extensive peritoneal contamination, cecostomy can be applied in emergency cases where colectomy is not possible and the general condition is poor.

One-stage emergency subtotal or total colectomy to relieve bowel obstruction and tumor resection in a massively distended and fecal-loaded colon with ischemic lesions and serosal tears on the cecum is supported in previous studies.[1-3]

Segmental resection and anastomosis can be the preferred option in patients with malignant left-sided bowel obstruction without cecal perforation.[1] If cecal perforation is not present, subtotal colectomy should not be performed. Subtotal colectomy was compared with segmental resection after intraoperative lavage in patients with malignant left-sided obstructed tumors.[18] Segmental resection following intraoperative irrigation is the preferred option, except when there is cecal perforation or synchronous neoplasms in the colon. In this case, subtotal colectomy is more appropriate. The mortality and complication rates did not differ between the groups, but in the fourth postoperative month, the number of bowel movements was significantly higher in the subtotal colectomy group. In this study, there was an increase in the number of defecations during the follow up of patients.

In the study of Ngu et al.[19], 10 (16.7%) of 60 patients presenting with acute malignant left colon obstruction underwent CT scans. The presence of cecal wall pneumatosis was evaluated as CT evidence of possible perforation.[19] This study used CT as the imaging method, and free fluid and free air were observed in the patients' reports.

Hennekinne-Mucci et al.[3] reported 27 cases of cecal serosal tears among 156 patients with acute left colonic obstruction: 2 cases presented with wall (17.3%) and significant diastatic perforation (0.13%). In the prospective study of Anwar et al.[20], it was reported that 10 (1.31%) of 762 consecutive patients with colon tumors presented with acute perforation proximal to the tumor. In a retrospective study by Lee et al.[21], 7 (0.57%) of 1,227 patients with colorectal tumors reported a proximal perforation rate of. The study of Ozogul et al.[22] reported that in 26 (11.6%) of 223 patients with colon cancer, colonic perforation proximal to the tumor was applied. This rate was the highest in the literature, and in this study, the rate was 6.74%.

Conclusion

This study suggests that resection, anastomosis, and protective loop ileostomy are viable surgical alternatives, even in emergency conditions, if they can be performed together with decompression and peritoneal lavage in the surgical treatment of cecum perforation due to obstructed left colon tumors.

Ethics

Ethics Committee Approval: This study was approved by the Memorial Hospital Ethics Committee (approval number: 2022/103, date: 01.12.2022).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: E.D., C.D., A.O., Concept: A.T., C.D., A.O., Design: E.D., A.T., Data Collection or Processing: E.D., A.T., Analysis or Interpretation: A.T., C.D., A.O., Literature Search: E.D., A.T., A.O., Writing: E.D., C.D.

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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DOI: 10.4274/tjcd.galenos.2023.2022-12-3
Turk J Colorectal Dis 2023;33:36-42

RESEARCH ARTICLE

The Impact of Body Mass Index on the Oncological Outcomes of Locally Advanced Rectal Cancer: A Comparative Study in a Country with High Obesity Rates

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ABSTRACT

Aim: To evaluate the effect of body mass index (BMI) on the short- and long-term oncological outcomes and postoperative complications of patients with rectal cancer who underwent total mesorectal excision (TME) following neoadjuvant chemoradiotherapy (NACRT). Obesity is a known risk factor for colorectal cancer. Patients classified as obese are more likely to have increased morbidity and prolonged hospitalization; this is particularly relevant in Jordan-a country ranked high in the worldwide obesity index.

Method: A retrospective cohort of 294 patients with locally advanced rectal cancer (stage 2 T3/4 node negative or stage 3 node positive) who underwent TME after NACRT between 2006 and 2018 was divided into two groups (obese: ≥30 kg/m^2 and non-obese: <30 kg/m^2) according to BMI. Clinicopathological comparisons between the groups were performed in addition to a survival analysis, which was plotted on a Kaplan-Meier curve. The main outcomes were disease-free survival (DFS) and overall survival (OS), and the secondary outcomes were complete pathological response (pCR) and post-operative complications.

Results: There were 140 and 154 patients in the non-obese and obese groups, respectively. The mean age of the entire cohort was 54.2 years, the mean BMI was 28.4 kg (+/– 6.1), and the median time interval between NACRT and surgery was 10.3 weeks (interquartile range: 8.4, 13.4). The mean follow-up period was 42 months. Both groups had similar baseline clinicopathological characteristics. Patients with obesity were more likely to achieve a pCR (p=0.034) and have a higher percentage of positive lymph nodes in their resected specimens (p=0.05). Patients with obesity also had a higher risk of developing incisional herniation but not other complications (p=0.018). OS was comparable between the groups, while DFS was higher in patients with obesity.

Conclusion: In our local cohort of patients, obesity affected incisional hernia formation. It did not have an impact on OS; however, the patients in the obese group had higher DFS and pCR rates than those in the non-obese group.

Keywords: Obesity, BMI, neoadjuvant chemoradiotherapy, total mesorectal excision, rectal cancer, rectal surgery, survival

Introduction

Colorectal cancer (CRC) is the third most common cancer worldwide and the second most common cause of cancer mortality.[1] In Jordan[2], it is the most common cancer among men and the second most common among women. Obesity has been identified as a risk factor for the development of CRC and has also been significantly associated with cardiovascular, metabolic, and respiratory morbidity.[3,5] It may lead to an increased risk of intraoperative and postoperative complications,[4] and intraoperatively, it is likely to yield a higher rate of conversion and prolonged surgical duration.[5] Jordan is ranked the 13th most obese country in the world, with a rate of 35.5% among adults.[6] With the rising number of obesity cases, the World Health Organization (WHO) declared obesity a global epidemic in 1997, with even higher projections for the next decades as the obesity rate tripled between 1975 and 2016.[7]

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Received: 11.01.2023 **Accepted:** 03.03.2023

The primary objective of this national study was to evaluate the effect of body mass index (BMI) on the oncological outcomes of patients with locally advanced rectal cancer who received neoadjuvant chemoradiotherapy (NACRT) followed by total mesorectal excision (TME). The secondary objective was to assess the impact of BMI on postoperative morbidity and pathological response.

Materials and Methods

The study utilized a retrospective design to evaluate a cohort of patient records. Cases were selected from the King Hussein Cancer Center (KHCC) Registry-a tertiary care center. Data, including the patients' characteristics, clinical and pathological findings, and clinical outcomes, were retrospectively retrieved from prospectively maintained electronic patient records. The impact of BMI on treatment outcomes encompassing operative morbidity rate, complete pathological response (pCR), disease-free survival (DFS), and overall survival (OS) was investigated.

Patients with locally advanced rectal cancer (stage 2 T3/4 node negative or stage 3 node positive) who completed NACRT followed by curative rectal surgery between 2006 and 2018 were identified. Patients who underwent rectal surgery as part of a staged or simultaneous approach for metastatic disease were excluded. Patients with incomplete records were ineligible to participate in this study.

Our patients were assessed by a consultant surgical oncologist. Staging investigations included colonoscopy and biopsy; computed tomography of the chest, abdomen, and pelvis; and magnetic resonance imaging of the pelvis. Rectal tumors were defined as those at a distance of less than 12 cm from the anal verge.

All patients with stage 2 and 3 disease were considered for NACRT according to our institution's guidelines. The radiotherapy dose was 45-50.4 Gy over 25-28 fractions spanning five to six weeks. The chemotherapy regimen was capecitabine based on the daily continuous infusion of 5-fluorouracil (200-225 mg/m^2) over 24 hours or oral capecitabine (825 mg/m^2) twice daily for five days per week for five weeks. Patients with locally resectable non-metastatic disease underwent TME at six to eight weeks after NACRT either laparoscopically or through an open approach. All patients received and completed postoperative adjuvant chemotherapy.

Ethical Considerations

This retrospective cohort received approval from the Institutional Review Board at King Hussein Cancer Center (approval number: 17KHCC42). The King Hussein Cancer Center Institutional Review Board is guided by the principles described in the World Medical Association's Declaration of Helsinki (1964) and its amendments. Due to the retrospective nature of the study and the lack of personal or clinical details of participants that could compromise anonymity, the need for consent was waived.

Definitions

For cancer recurrence, mortality indices, and BMI, the following definitions were utilized:

Disease-Free Survival

DFS was defined as the time from surgical resection to radiological evidence of disease recurrence (including loco-regional failure or metastases) or death by any cause. Loco-regional failure was defined as anastomotic site tumor recurrence in the residual rectum or intrapelvic relapse. Any form of extra-pelvic recurrence was deemed a distant failure.

Overall Survival

OS was defined as the time interval from surgical resection to either death from any cause or the final follow-up.

Body Mass Index

BMI was calculated as the patient's weight on the first day of neoadjuvant treatment (in kilograms) divided by the patient's height squared (in meters). Patients' BMI-the most widely used indicator of obesity-was used to subdivide patients with rectal cancer into two categories: BMI <30 kg/m^2 and BMI ≥30 kg/m^2, the latter of which is defined as obese according to the WHO's classification.

Statistical Analysis

Data were analyzed using the SPSS 24 (Chicago, Illinois, USA) software package. Results were expressed as medians and interquartile ranges. Comparisons between the two groups were performed using an χ^2 test for categorical variables and a t-test for continuous variables. Survival functions were compared using the non-parametric Kaplan-Meier estimator. Significance was accepted at the 5% level.

Results

A total of 294 patients were included in the study: 154 patients with BMI ≥30 kg/m^2 and 140 with BMI <30 kg/m^2. The population comprised 171 (58.2%) males and 123 (41.8%) females. The mean age at diagnosis was 54.2 years. The majority of patients (89.1%) (n=262) presented in stage 3. Both groups were similar in terms of tumor site in the rectum (p=0.900). The patients' clinicopathological characteristics are presented in Table 1. Patients with obesity and rectal cancer were at a higher risk of having diabetes mellitus and hypertension (p<0.01). There was no significant difference in the presence of other comorbidities (Figure 1).

Table 1. Patients' clinicopathological characteristics

Name	Value	Total, 294	Non-obese, (n=140) (47.6%)	Obese, (n=154) (52.4%)	p-value
Age	≤50 y	104	49	55	0.407
	50 to 65 y	128	57	71	
	≥65 y	62	34	28	
Gender	Male	171	88	83	0.120
	Female	123	52	71	
Clinical stage	2	32	17	15	0.516
	3	262	123	139	
Tumor site (AV)	0-4 cm	58	28	30	0.900
	>4-10 cm	144	69	75	
	10-12 cm	11	4	7	
	N/A	81	39	42	
Pathological stage	0	28	6	22	0.041
	I	48	22	26	
	II	98	54	44	
	III	118	57	61	
	IV	2	1	1	
Treatment response	Complete	28	6	22	0.034
	Partial	128	65	63	
	Stable disease	131	65	66	
	Disease progression	7	4	3	
Surgery type	APR	79	31	48	0.081
	LAR +/– stoma	215	109	106	
Margin	Positive	15	9	6	0.442
	Negative	279	139	140	
Lymph node harvest (mean)			17	18	0.122
Lymph node positivity (mean)			1.4	2.4	0.05

AV: Anal verge, APR: Abdominoperineal resection, LAR: Low anterior resection

There was no difference between the groups in terms of the stage of disease at presentation. The median time interval between NACRT and surgery was 10.3 weeks [interquartile range (IQR): 8.4, 13.4]. The majority of patients (n=215, 73.1%) underwent low anterior resection with or without a stoma compared with 79 (26.9%) who underwent abdominoperineal resection. Patients in the obese group were more likely to achieve a pCR (p=0.034) and have a lower pathological stage after resection (p=0.041). The median number of lymph nodes harvested was not statistically different between the groups (non-obese: 17 vs obese: 18) (p=0.122). However, the percentage of lymph node involvement was higher in the obese group (2.4 vs 1.4, p=0.05).

The short- and long-term postoperative outcomes are summarized in Table 2, which shows that the patients with obesity had a higher rate of developing an incisional hernia (11.0% vs 4.0%, p=0.008), but not other complications, than those without obesity.

At a mean follow-up of 42 months, loco-regional and distant failure occurred in 60 patients (16 local and 44 distant recurrences) (non-obese: n=36, obese: n=24, p=0.090). The DFS curve showed a statistical difference in favor of the obese group of patients (Figure 2, Table 3). At the five-year follow-up, only 56% of patients in the non-obese group had no events related to their disease compared with 78% of those in the obese group (p=0.033). The OS at five years was

similar in both groups (non-obese: 73.9% vs obese: 80%, p=0.119) (Figure 3, Table 4).

Discussion

To the best of our knowledge, this is the first study examining the effect of obesity on rectal cancer oncological outcomes in a Middle Eastern population. As our population has a high obesity rate and a younger age at cancer diagnosis, we considered that it was important to investigate a causal relationship.

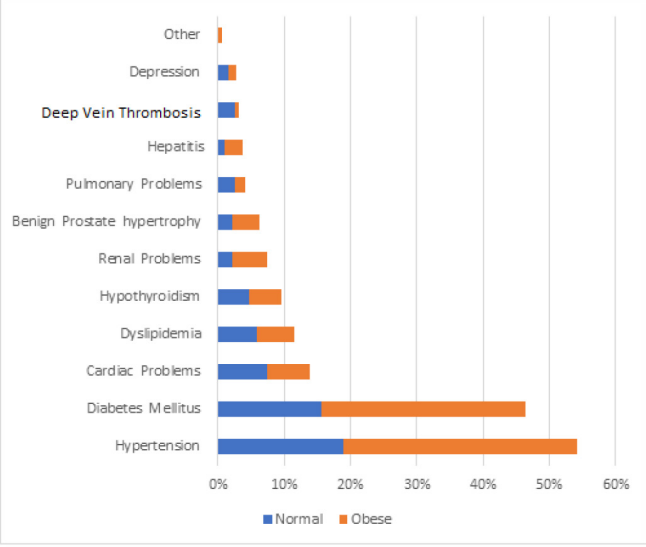

Figure 1. Comparison of co-morbidities

Obesity is well linked to increased CRC risk, which becomes more accentuated the higher the BMI.[3] It has also been shown to increase the risk of conversion to an open approach during surgery, with increased operative times and blood loss. A higher likelihood of post-operative complications has also been shown in several studies.[8,9] Additionally, obesity increases the rate of adverse events, including mortality, during chemotherapy.[10]

Despite the increased risk of developing cancer, multiple publications have failed to show negative effects on oncological outcomes. An Irish study on 414 patients with CRC showed no difference in DFS or OS between patients with and without obesity.[11] In a Japanese study on 263 patients with rectal cancer who underwent surgery, obesity (defined in the Asian population as BMI ≥25 kg/m^2) was associated with a significantly lower incidence of distant metastases (6.7% vs. 19.7%, heart rate: 0.32; 95% confidence interval: 0.11-0.94; p=0.04).[12] Another study from New York also mentioned no impact on oncological outcomes, with an obese group of patients having longer operative times.[13] This result has been further replicated in other published studies.[14-16]

Our findings suggest a positive association between obese BMI and oncological outcomes. This was previously reported by Chang et al.[17] in a systematic review of studies on rectal cancer. Our study also showed a positive correlation between obesity and pCR, a result that has also been published in a study by Lee et al.[18] from Korea.

Table 2. Post-operative events

		Total	Non-obese, (n=139) (47.6%)	Obese, (n=153) (52.4%)	p-value
SSI	Yes	42	15	27	0.095
	No	252	125	127	
Intra-op blood transfusion	Yes	2	2	0	0.137
	No	292	138	154	
Hernia	Yes	27	7	20	0.018
	No	267	133	134	
VTE	Yes	5	2	3	0.731
	No	289	138	151	
Stoma	Yes	19	8	11	0.619
	No	275	132	143	
Metastasis	Yes	44	26	18	0.098
	No	250	114	136	
Recurrence	Yes	16	10	6	0.220
	No	278	130	148	

SSI: Surgical site infection, VTE: Venous thromboembolism

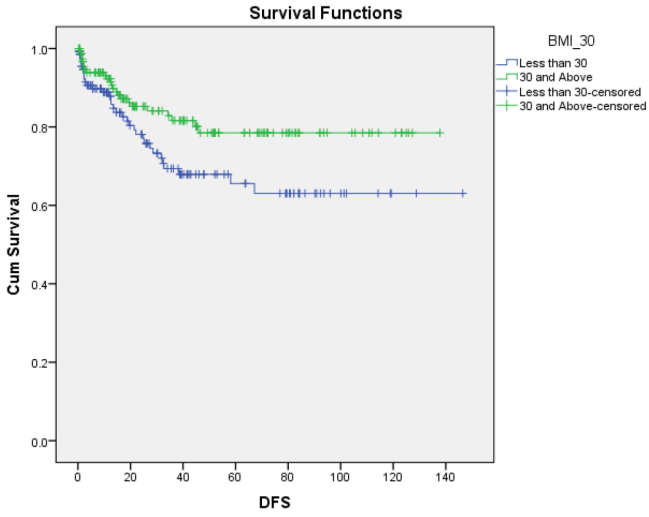

Figure 2. Disease-free survival Kaplan-Meier curve (p=0.033)
BMI: Body mass index, DFS: Disease-free survival

Table 3. Disease-free survival rate

BMI	42 months (3.5 years)	60 months (5 years)
<30	67%	56%
≥30	81%	78%

BMI: Body mass index

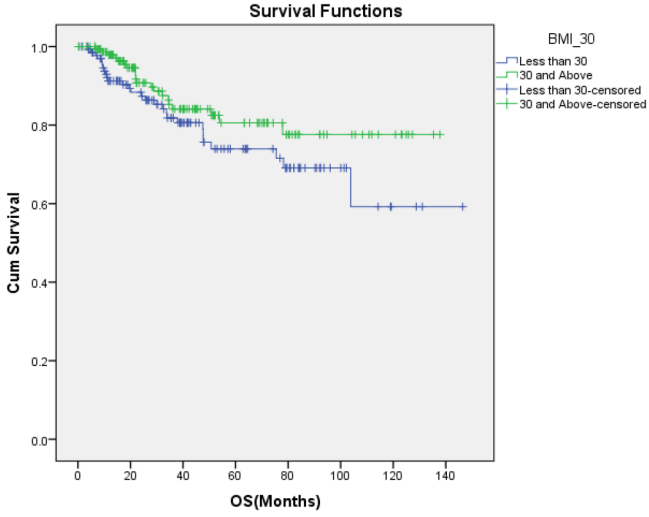

Figure 3. Overall survival Kaplan-Meier curve (p=0.119)
BMI: Body mass index, OS: Overall survival

The literature has attributed this phenomenon to the state of chronic inflammation, evident in the increased number of macrophages and cytokines as adipose tissue harbors a high number of macrophages, resulting in the subsequent increased production of inflammatory cytokines.[19] Thus, the interaction between obesity and immune response is

Table 4. Overall survival rate

BMI	42 months (3.5 years)	60 months (5 years)
<30	80%	73.9%
≥30	84%	80%

BMI: Body mass index

believed to alter a tumor's microenvironment and increase its response to radiotherapy. A protective nutritional effect in well-nourished patients with CRC translating into reduced operative complications may be implied, as patients with obesity may tolerate the weight loss associated with cancer and its treatment.[20]

The degree and pattern of obesity faced in Middle Eastern and Asian populations differ significantly from those of their Western counterparts. Ethnic differences in body composition and obesity patterns are well established in the literature.[21,22] Although our study did not consider BMI as a continuous variable when investigating the impact of obesity on oncological and post-operative complications, patients with mild obesity in Asian and Middle Eastern ethnic groups may represent a state of good nourishment or over nourishment rather than major perioperative morbidity.

Choi et al.[23] found obesity to be the only independent predictor for reduced local control. Clark et al.[24] reported visceral adiposity rather than BMI as an increased risk factor for recurrence after NACRT in rectal cancer, which was explained by limited surgical visibility in subjects with obesity. The largest European retrospective cohort (n=406 patients) evaluating the influence of visceral obesity on postoperative complications in rectal cancer surgery established a significant association between visceral obesity, intraoperative blood loss, postoperative complications, and an increased length of hospitalization.[25] Visceral fat is strongly linked to metabolic disease and insulin resistance even in patients with a normal BMI. Subcutaneous fat does not share the same risks and may be protective. Moreover, obesity induced by following a high-fat diet triggers low-grade inflammation, whereby macrophages include insulin resistance.[26]

The obesity paradox is well known in the literature, having been demonstrated in critically ill patients with chronic medical conditions and also in post-coronary procedures.[27-34] This has been also demonstrated by Mullen et al.[35], where patients with obesity had a lower risk of mortality after non-bariatric surgery.

Study Limitations

Although this study is limited by its retrospective nature, the KHCC remains the only tertiary center in Jordan

that guarantees well-documented long-term follow-ups involving a thorough clinical exam with appropriate labs and imaging modalities. We also acknowledge that we used post-diagnosis BMI, where the weight of patients was affected by their disease before presenting to our care. A pre-diagnostic BMI would have been more valid; however, it would not have been as accurate to use because of possible recall bias, as most patients asked did not have documented recent BMIs.

Conclusion

Obesity in patients with rectal cancer treated with NACRT and surgery was associated with an improved likelihood of a pCR and DFS. Our study's findings correspond with those already published in the literature and reinforce the obesity paradox in rectal cancer.

Ethics

Ethics Committee Approval: This retrospective cohort received approval from the Institutional Review Board at King Hussein Cancer Center (approval number: 17KHCC42). The King Hussein Cancer Center Institutional Review Board is guided by the principles described in the World Medical Association's Declaration of Helsinki (1964) and its amendments.

Informed Consent: Consent was waived, and the study was approved by the IRB of KHCC.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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

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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DOI: 10.4274/tjcd.galenos.2023.2023-1-10
Turk J Colorectal Dis 2023;33:43-47

RESEARCH ARTICLE

Frequency and Clinical Impact of Microsatellite Instability in Colorectal Dysplasia Subgroups

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ABSTRACT

Aim: The risk of colorectal cancer development associated with low-grade dysplasia (LGD) and high-grade dysplasia (HGD) colon polyps at baseline polypectomy remains unclear. In this study, we investigated the role of microsatellite instability (MSI) in the formation and prognosis of dysplasia.

Method: In the study, 40 polyps diagnosed as HGD, and 40 polyps diagnosed as LGD were evaluated according to the revised Vienna criteria (2015) as a result of polypectomy. MSI analysis was performed by fragment analysis using five different primers.

Results: Three of the polyps diagnosed with LGD and eight of the polyps diagnosed with HGD turned into cancer during the follow-up period. The rate of MSI in sporadic colorectal dysplasia was determined as 36.3. A significant correlation was found between MSI status and polyp recurrence within the five-year follow-up period after polypectomy.

Conclusion: In our study, it was determined that LGD and HGDs with MSI can recur, but polypectomy may be effective in preventing cancer formation in cases of dysplasia with MSI.

Keywords: Colorectal polyps, low-grade dysplasia, high-grade dysplasia, microsatellite instability

Introduction

Colorectal cancers (CRCs) originate from initially benign polyps identified as high-grade dysplasia (HGD) and low-grade dysplasia (LGD).[1] Elimination of polyps by polypectomy was reported to reduce CRC incidence in the National Polyp Study cohort.[2] Although studies have examined CRC formation from HGD, CRC development from low-grade adenomas has to date not been evaluated. The reported risk of progression of HGD and CRC for LGD varies between 0.5-54%.[3]

Despite the location, size, and number of polyps being defined as risk factors for CRC, an understanding of the factors that affect the CRC risk of patients with different clinical outcomes is limited. Although the genetic basis of CRC is complex and heterogeneous, this cancer includes point mutations, abnormal gene fusion, and various somatic and germline gene mutations, such as epigenetic changes.[4] Sporadic CRC is known to result from polyps in the initial stages of CRC due to mutations in the adenomatous polyposis coli gene.[5]

The genetic basis of inherited forms of CRC is not clearly defined. The most common form of hereditary non-polyposis syndromes is hereditary non-polyposis colorectal cancer (HNPCC), accounting for approximately 2-3% of all CRCs.

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Received: 06.03.2023 **Accepted:** 21.05.2023

Among these, 30-60% of HNPCC patients have germline mutations that lead to the microsatellite instability (MSI) phenotype. However, approximately 10-25% of CRC arises via other molecular changes, such as MSI. MSI is caused by the loss of DNA mismatch repair activity found in 12% of sporadic CRCs. The prognostic impact of MSI is still controversial today. Several research groups have reported that CRC with MSI has a slightly better prognosis than colorectal tumors without MSI. Therefore, The National Comprehensive Cancer Network (NCCN) guideline does not recommend chemotherapy for MSI-positive CRC patients.[6] However, the status and prognostic significance of MSI in sporadic colon dysplasia are unclear.

An assessment of the prognosis for these patients is necessary. This study aimed to investigate the frequency and prognostic effect of MSI in LGD and HGD. This may help to define the role of these dysplasia types within the category of advanced adenoma to guide clinical management.

Materials and Methods

Patient Selection

In this retrospective study, 40 patients with LGD and 40 patients with HGD tissue who applied to the university hospital general surgery clinic between 1998 and 2016 were included. The CRC archive database at the university's department of general surgery (medical faculty) was used to collect the patients' clinical information and follow-up data.

Basic demographic, clinical, and lesion characteristics such as location, number, and size were analyzed. The polyp site was classified into three groups: right colon, left colon, and rectum. The polyp site of the proximal to mid-transverse colon was defined as the right colon, while the distal of the mid-transverse colon was defined as the left colon. Only sporadic colorectal polyps were included to create a homogenous study group. Patients who had a previous history of cancer, who had undergone surgery for cancer, and who received preoperative chemotherapy and/or radiation, were excluded from the study. Clinical follow-up after polypectomy was based on periodic clinical visits, the results of biochemical tests, imaging techniques, and surveillance colonoscopy results. Patients who had/had not experienced disease recurrence, based on at least five years of follow-up, were included. The combination of these clinical data allowed for the classification of patients as having either progressive or stable disease conditions. The time to recurrence of polyps and the disease-free interval was defined as the time from the date of polypectomy to the date of confirmed tumor relapse and the date of the last follow-up, respectively. For carcinoma formation, carcinomas arising in the same region as the polyp after polypectomy were evaluated.

Disease-free survival was defined as being alive without any evidence of recurrent disease as of the latest clinical follow-up. The median survival times and the median progression-free survival times were also calculated. The study was approved by the Bursa Uludag University Local Ethics Committee (approval number, 2012-3/12) and conformed to the ethical standards of the Helsinki Declaration.

DNA Isolation

Hematoxylin and eosin-stained slides cut from formalin-fixed paraffin-embedded (FFPE) tissue were evaluated by two expert pathologists. The normal tissue samples were most commonly an uninvolved proximal or distal resection margin. FFPE tissue sections were deparaffinized using xylene and 95% ethanol. According to the manufacturer's protocol, DNA was extracted from 40 HGD tissue samples, 40 LGD tissue samples, and 20 normal specimens using a DNA Extraction kit (Qiagen, Germantown, MD). The quality and concentration of isolated DNA in a 4 µL volume of all samples were measured using a Beckman Coulter DU-730 spectrophotometer (Beckman Coulter Inc., CA, US). The high-quality DNA samples with absorbance ratios between 1.9 and 2.1 were used for the subsequent analysis.

Microsatellite Instability Analysis

This study used 80 polyps DNA and respective 20 normal tissue DNA samples to independently study MSI status using five microsatellite markers [BAT25, BAT26, D2S123, D5S346, and D17S250 (the Bethesda panel)]. Forward primers were dye-labeled for automated high-throughput multiplex detection using capillary array electrophoresis (CEQ 8000XL; Beckman Coulter, Inc., Fullerton, CA). The differences in the polymerase chain reaction (PCR) product fragment lengths among different tissue categories were visualized using the CEQ software (Beckman Coulter, Inc.). The PCR products from the five amplified microsatellite regions in the tumor were compared with the normal epithelium reference. The patients whose polyp DNA showed alleles that were not present in the corresponding normal DNA were classified as MSI positive. If only one of the five markers showed MSI, the polyps were classified as MSI-low (MSI-L), and if two or more markers showed MSI, the polyps were classified as MSI-high (MSI-H). The results were visually evaluated by two independent reviewers.

Statistical Analysis

The significant differences among the study groups concerning the pathologic and clinical characteristics of MSI-H, MSI-L, and microsatellite stable (MSS) tumors were calculated using the chi-square test (c2) and Fisher's exact test. Progression-free survival curves were plotted using the Kaplan-Meier method. The log-rank test was used to assess the survival

differences between groups. Overall survival was defined as the intermediate time interval between sampling and the last follow-up. A chi-square (c2) and Fisher's exact tests were performed using the SPSS Statistics (v.16.00) software for Windows (IBM, Chicago, IL), and the Kaplan-Meier analysis and a log-rank test were performed using MedCalc (v.12.4.00 statistical software (Bvba, Ostend, Belgium). The 95% confidence intervals were calculated using associated estimated standard errors. A p-value <0.05 was considered significant.

Results

Patient Characteristics

This study included 43 female and 37 male patients, with ages ranging from 26-73 years (mean: 56±4.3 years); 30 polyps were within the right colon, and the remaining 50 polyps were in the left colon. Among them, 11 polyps were localized in the rectum. The mean polyp size was 2.3±0.3 cm (Table 1).

Table 1. Patients' clinicopathological features

Variables	LGD, (n=40)	HGD, (n=40)	p-value
Gender			0.102
Female	23 (57.5%)	20 (50%)	
Male	17 (42.5%)	20 (50%)	
Age	56.3	57.5	
Polyp Localizaiton			0.055
Rectum	9 (22.5%)	2 (5%)	
Sigmoid	14 (35%)	7 (17.5%)	
Descending colon	4 (10%)	14 (35%)	
Transverse colon	7 (17.5%)	2 (5%)	
Right colon and caecum	6 (15%)	15 (37.5)	
Polyp Size			0.054
<1 cm	12 (30%)	7 (17.5%)	
1-5 cm	17 (42.5%)	29 (72.5%)	
>1 cm	11 (27.5%)	4 (10%)	
Recurrence			0.081
Presence	29 (72.5%)	22 (55%)	
Absence	11 (27.5%)	18 (45%)	
Carcinogenesis			0.096
Presence	37 (92.5%)	32 (80%)	
Absence	3 (7.5%)	8 (20%)	

Bold values indicate statistical significance, p<0.05. A chi-square test and Fisher's exact test were used for statistical analysis. LGD: Low-grade dysplasia, HGD: High-grade dysplasia

Histopathologically, 40 lesions were HGD, and 40 lesions were LGD. The mean age was 56.3±3.4 years in the LGD patients and 57.5±5.6 years in the HGD patients. In 35% of the polyps diagnosed with LGD, the polyps were localized in the right colon, 42% in the left colon, and 23% in the rectum. Of the polyps diagnosed with HGD, 42% were in the right colon, 38% were in the left colon, and 20% were in the rectum. Additionally, 3 of the polyps with LGD and 8 of the polyps with HGD were diagnosed with CRC during the follow-up period. Polyp recurrence at the same site was determined in 8 of the polyps with LGD and in 21 of the polyps with HGD. There was no statistically significant difference between the HGD and LGD groups in terms of gender, age, location, or size of the adenoma (p>0.05). Furthermore, HGD was associated with a higher risk of polyp recurrence (p=0.021).

MSI Status in High- and Low-Grade Dysplasia

Of the 80 polyps, 51 (63.7%) colon polyps were MSS and the remaining 29 (36.3%) lesions were MSI. The frequency of positivity among the five markers determined by the Bethesda criteria was examined. Among the five markers, BAT25 was the most frequently observed positivity (n=29). BAT26 was positive in 10 patients, D17S256 in 9 patients, D2S123 in 8 patients, and D5S346 in 3 patients. The frequency of MSI was as follows: 17 of 80 (21.25%) polyps had MSI-H; 12 of 80 (15%) were MSI-L.

The frequencies of MSI among the two dysplasia groups were 41.4% (12/40) in patients with LGD and 58.6% (17/40) in patients with HGD. The distribution of the clinicopathological features of an MSI status, based on the different histological dysplasia groups, are shown in Table 2.

Differences between the MSS and MSI tumors were observed in terms of recurrence and the formation of carcinoma in the polyps. During the five-year follow-up period, 29 polyps (36.3%) recurred at the same site. MSI was detected in 69% of the polyps (n=20) with recurrence (p=0.001). Invasive cancer was determined in 11 (21.6%) cases, and all the cases diagnosed with cancer were MSS.

Discussion

This study examined the frequency and clinical relevance of MSI status in CRC polyps classified according to the Revised Vienna Criteria. The findings indicated that the frequency of MSI was 36.3% in sporadic colorectal polyps. MSI-H was detected more frequently in MSI-positive polyps (n=29) than MSI-L polyps (MSI: 58.6%, all patients: 21.25%).

There are limited published data in the literature showing the rate of MSI, particularly in sporadic colorectal polyps. Approximately 15% of all CRCs in Western countries constitute MSI-H CRCs.[7] However, according to existing

Table 2. The clinopathological features of the groups

Variables	LGD, (n=40)		HGD, (n=40)		p-value
	MSI, (n=12)	MSS, (n=28)	MSI, (n=17)	MSS, (n=23)	
Gender					0.716
Female	3 (7.5%)	10 (25%)	9 (22.5%)	15 (37.5%)	
Male	9 (22.5%)	18 (45.5%)	8 (20%)	8 (20%)	
Age	54	57	56	52	0.082
Localization					0.103
Rectum	2 (5%)	7 (17.5%)	1 (2.5%)	1 (2.5%)	
Sigmoid	5 (12.5%)	9 (22.5%)	3 (7.5%)	4 (10%)	
Descending colon	1 (2.5%)	3 (7.5%)	5 (12.5%)	9 (22.5%)	
Transverse colon	0 (0%)	7 (17.5%)	1 (2.5%)	1 (2.5%)	
Right colon and caecum	4 (10%)	2 (5%)	7 (17.5%)	8 (20%)	
Size					0.336
<1 cm	4 (10%)	8 (20%)	5 (12.5%)	2 (5%)	
1-5 cm	5 (12.5%)	12 (30%)	12 (30%)	17 (42.5%)	
>5 cm	3 (7.5%)	8 (20%)	0 (0%)	4 (10%)	
Recurrence					0.001
Presence	6 (15%)	5 (12.5%)	14 (35%)	4 (10%)	
Absence	6 (15%)	23 (57.5)	3 (7.5%)	19 (47.5%)	
Carcinogenesis					0.332
Presence	0 (0%)	3 (7.5%)	0 (0%)	8 (20%)	
Absence	12 (30%)	25 (62.5%)	17 (42.5%)	15 (37.5%)	

Bold values indicate statistical significance, $p<0.05$. A chi-square test and Fisher's exact test were used for statistical analysis. LGD: Low-grade dysplasia, HGD: High-grade dysplasia, MSI: Microsatellite instability, MSS: Microsatellite stable

studies reported by our group and others, a relatively high frequency of MSI-H has been consistently observed in Turkish patients with CRC.[8,9] We hypothesize that the high frequency of MSI-H CRCs in Turkey is mainly based on the low prevalence of genetic mutations in CRCs, and because there are ethnic differences in the major molecular alterations associated with CRCs.

Classically, the development of CRC is characterized by the adenoma-carcinoma sequence.[10] Throughout this sequence, the normal epithelium acquires sequential genetic and epigenetic mutations in specific oncogenes, or tumor suppressor genes, becomes a hyperproliferative mucosa, and subsequently gives rise to a benign adenoma that changes into a carcinoma.[11] Studies indicating the specific stage that MSI is in during this sequencing are unclear. MSI status has a pivotal role in treatment decisions for stage II CRC.[12,13] The NCCN guideline does not recommend chemotherapy for these patients, based on the good prognosis linked to patients with stage II CRC accompanied by MSI-H.[6] However, the reason for their good prognosis remains unclear.[14] Additionally, the effect of MSI status on the prognosis of polyps is unknown. Therefore, MSI has several problems that limit its use as a practical prognostic factor across all stages of CRC. Studies have reported contradicting results indicating that MSI was not statistically correlated with prognosis.[15,16] This result may be explained by the fact that MSI CRCs have distinctive clinical features and are associated with both good and poor outcomes. Many studies have reported proximal colon tumors as being MSI-H.[17,18] The relationship between the location of the polyps and MSI status is unknown. In our study, no significant difference was found between MSI positivity and polyp localization. However, this situation should be re-examined by increasing the number of polyps with tumor formation. Our results show that MSI status is associated with polyp recurrence. However, all polyps that turned into cancer were MSS.

Conclusion

In our study, we examined 40 LGD and 40 HGD colorectal polyps classified according to the Revised Vienna Criteria. The results indicated that 7.5% of polyps diagnosed with LGD and 20% of polyps diagnosed with HGD turned into cancer. Cancer rates after polypectomy for colon polyps with HGD are approximately 30% in the literature. However, the conversion rate of LGD polyps to cancer is unknown. Similar to recent studies, age, gender, polyp size, morphology, pathology, and polyp site did not differ between patients with formation of cancer. In a meta-analysis study conducted by Saini, patients with HGD in polyps experienced a 1.84-fold risk of developing advanced adenoma compared to those without HGD. Two meta-analyses have shown that the presence of HGD was slightly associated with future advanced adenoma. Upon multivariate analysis, the presence of HGD was not found to confer the recurrence of metachronous adenoma. The natural history of colonic adenoma thus remains elusive.

Adenoma-carcinoma sequencing is a widely accepted technique for investigating CRC development. Our study confirmed that 13.75% of patients with colorectal polyps developed cancer during the five-year follow-up period. However, the MSI status of the polyps appears to have an impact on recurrence rather than the development of invasive cancer. Particularly in MSI polyps diagnosed with HGD, recurrence after polypectomy was observed. Further clinical studies are warranted for determining the relationship between polyp recurrence, cancer development, and the MSI status of polyps.

Acknowledgments: This study was supported by a grant from the Scientific Research Projects Foundation of the University, Bursa, Turkey [project no: OUAP(T)-2015/2].

Ethics

Ethics Committee Approval: The study was approved by the Bursa Uludag University Local Ethics Committee (approval number, 2012-3/12) and conformed to the ethical standards of the Helsinki Declaration.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.A.A., M.E., Ç.T., Design: S.A.A., M.E., Ç.T., Data Collection or Processing: S.G., Analysis or Interpretation: N.U., Ö.Y., E.Ö., Literature Search: T.Y., E.Ö., S.G., Ö.I., Writing: S.A.A., Ö.I.

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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DOI: 10.4274/tjcd.galenos.2023.2023-1-11
Turk J Colorectal Dis 2023;33:48-54

RESEARCH ARTICLE

Evaluation of Outcomes in Patients with Emergency Diverting or Decompressive Stoma

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ABSTRACT

Aim: The creation of permanent and temporary stomas holds a prominent place in emergency gastrointestinal surgical practice. This study aimed to evaluate the complications that developed after stomas were created in emergency cases for diversion or decompression and the factors that could be associated with these complications.

Method: Patients above the age of 18 for whom emergency stoma-creation surgery was indicated and who were operated on consecutively in a single tertiary hospital were included in this retrospective cohort study. Preoperative, perioperative, and early-period postoperative results and outcomes were analyzed accordingly.

Results: This study involved a total of 112 patients, and the findings showed a complication rate of 27.7%. The mean age of the patients was 62.8±15.2. The male/female ratio was 2.2:1. Patients with complications were found to be older (p=0.003), and a significant difference was observed in the American Society of Anesthesiologists scores (p=0.011). The complication rate was higher in open surgeries (p=0.035). The length of hospital stay was observed to be longer in patients with complications (p<0.001), and perioperative hemodynamic instability was more frequent in patients with complications (p=0.001).

Conclusion: Stoma creation in emergency gastrointestinal surgical cases can be lifesaving but can also lead to complications. This risk increases significantly in patients with advanced age, major comorbidities, and hemodynamic instability. This can lead to prolonged hospitalization and the need for intensive care unit admissions in this population, which may impose heavy burdens on patients and the healthcare system.

Keywords: Ileostomy, colostomy, intestinal obstruction, intestinal perforation, complications

Introduction

The process of creating a temporary or permanent opening in the abdominal wall for the small intestine and colon is frequently used in emergency gastrointestinal surgical practice. The first known ileostomy was conducted in 1879 by Dr. Wilhelm Baum for an obstructive colon tumor. Despite a century-long historical process and developing surgical techniques, stoma-related complications have continued at a considerable rate.[1]

The most common indications for stoma creation are known to be colorectal cancers, diverticulosis coli, and inflammatory bowel diseases. Complications that develop within the first month after stoma creation, such as mucocutaneous separation, retraction, ischemia, and necrosis, are classified as early-period complications, while complications that develop after the first month, such as parastomal hernia, prolapse, and stenosis, are classified as late-period complications.[2]

The incidence of stoma-related complications reported in the literature varies between 21% and 70%.[3] In different studies, the most common early-period complications observed have been mucocutaneous separation and peristomal skin complications.[4,5] Understanding the potential risk factors associated with complications is of great interest to both surgeons and stoma therapists for the management of the postoperative process, and a considerable number of studies have been conducted on the outcomes of individuals with a stoma. In several studies, systemic diseases, such as malignancy, obesity, and diabetes mellitus, are identified as increasing complication rates.[5,6] However, it is widely agreed in the literature that preoperative stoma site marking can lead to a significant reduction in postoperative complications.[7,8] In

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Received: 27.02.2023 **Accepted:** 24.05.2023

emergency surgery, the lack of stoma site marking and the inability to determine the optimal location for a stoma can result in permanent negative psychological and social effects on individuals, prolonged hospital stays, and increased costs for the healthcare system.[8]

In this study, we aimed to evaluate the complications that developed after stomas were created in emergency cases for diversion or decompression and the factors that could be associated with these complications.

Materials and Methods

Patient Recruitment

Patients with stomas were recruited from the department of general surgery. The study protocol was approved by the Local Ethics Committee of University of Health Sciences Turkey, Gülhane Training and Research Hospital (approval number: 2022/98, date: 01/07/2022). Informed consent was obtained from all patients for inclusion in the research.

Patients above the age of 18 with an indication for emergency stoma creation surgery, who were operated on consecutively between December 2018-2021 in a single tertiary hospital, were included in this retrospective cohort study after receiving ethical approval from the local committee. Elective cases, patients with missing hospital records and postoperative follow-up, and patients below the age of 18 were excluded from the study.

The demographic and clinical data of the patients were analyzed retrospectively, including age, gender, comorbidities, body mass index, the American Society of Anesthesiologists (ASA) scores, and preoperative history of chemotherapy and radiotherapy in malignant patients. Furthermore, data concerning emergency stoma creation diagnosis, stoma locations and types according to the intestinal segment, surgical procedures and durations, perioperative characteristics, lengths of hospital stay, and postoperative intensive care unit (ICU) admissions were analyzed. Patients were followed up for specific stomal complications, such as mucocutaneous separation, ischemia and necrosis, peristomal dermatitis, retraction, and parastomal infection, along with the stages of the complications, based on the Clavien-Dindo classification system. Preoperative laboratory results, such as white blood cell count ($x10^3/\mu L$), C-reactive protein level (mg/dL), neutrophil count ($x10^3/\mu L$), platelet count ($x10^6/\mu L$), and albumin level (g/dL), were also evaluated accordingly.

In this study, five different types of stomas (loop ileostomy, end ileostomy, double-barrel ileostomy, loop colostomy, and end colostomy) were created, and their localization was chosen as the left or right lower quadrant. Additionally, in cases of loop ileostomy and loop colostomy, the use of a stoma rod was based on the surgeon's preference.

Statistical Analysis

Statistical analyses were performed using SPSS Statistics (v.22.0) software. Descriptive statistics were expressed as a number, percentage, mean, standard deviation, and median (minimum-maximum). The conformity of the variables to the normal distribution was examined using visual (histogram and probability graphs) and analytical methods (the Kolmogorov-Smirnov and Shapiro-Wilk tests). Numerical variables showing normal distribution were analyzed using the independent samples t-test between the two groups, while those that did not show normal distribution were analyzed using the Mann-Whitney U test. Chi-square analysis and Fisher's exact test were used for the comparison of nominal data. In the statistical analyses of the study, comparisons with a p-value below 0.05 were considered statistically significant.

Results

The mean age of 112 patients who underwent surgery was 62.8±15.2 (22-95 years). The male/female ratio was 2.2:1. Among the patients, 61 (54.5%) had comorbidities, and the most observed comorbidities were hypertension (n=38, 33.9%) and diabetes mellitus (n=29, 25.9%; Table 1).

The most common causes of stoma creation were colorectal carcinoma (n=56, 50%), volvulus (n=12, 10.7%), and acute

Table 1. Descriptive characteristics of the patients included in the study

Characteristic	Result
Age*	62.8±15.2
Gender	
Female	35 (31.3)
Male	77 (68.8)
Body mass index (kg/m^2)*	25.6±3.7
American Society of Anesthesiologists score	
I	1 (0.9)
II	45 (40.2)
III	64 (57.1)
IV	2 (1.8)
Presence of comorbidity	61 (54.5)
Hypertension	38 (33.9)
Diabetes mellitus	29 (25.9)
Coronary artery disease	15 (13.4)
Chronic obstructive pulmonary disease	8 (7.1)
Preoperative CT/RT history	20 (17.9)

*: Mean ± standard deviation. CT: Chemotherapy, RT: Radiotherapy

Table 2. Reasons for stoma and stoma-related characteristics of the patients

Reason for stoma	Percentage (%)
Colorectal carcinoma	56 (50.0)
Volvulus	12 (10.7)
Acute diverticulitis	10 (8.9)
Inflammatory bowel disease	7 (6.3)
Ileus (other reasons)	5 (4.5)
Fournier's gangrene	5 (4.5)
Colorectal perforation	5 (4.5)
Anastomotic leak	4 (3.6)
Gunshot injury	3 (2.7)
Acute mesenteric ischemia	2 (1.8)
Lower gastrointestinal bleeding	1 (0.9)
Penetrating tool injury	1 (0.9)
Ischemic colitis	1 (0.9)
Stoma type	
Ileostomy	31 (27.7)
End ileostomy	15 (13.4)
Loop ileostomy	11 (9.8)
Double-barrel ileostomy	5 (4.5)
Colostomy	81 (72.3)
End colostomy	65 (58.0)
Loop colostomy	16 (14.3)
Stoma localization	
Left lower quadrant	80 (71.4)
Right lower quadrant	32 (28.6)

diverticulitis (n=10, 10.7%). Colostomy was performed on 81 (72.3%) patients, with end colostomy (n=58, 58.0%) and loop colostomy (n=16, 14.3%) being the most common types, while 31 (27.7%) patients underwent ileostomy, with end ileostomy (n=15, 13.4%), loop ileostomy (n=11, 9.8%), and double-barrel ileostomy (n=5, 4.5%) being the preferred types. Localization analysis showed that 71.4% (n=80) of the stomas were in the lower left quadrant, and 28.6% (n=32) were in the lower right quadrant (Table 2).

On evaluating the surgical procedures, it was found that 100 (89.3%) patients underwent open surgery. Complications were observed in 31 (27.7%) patients. The most common complications were mucocutaneous separation (n=16, 14.3%), ischemia and necrosis (n=5, 4.5%), and peristomal dermatitis (n=5, 4.5%; Table 3).

When the descriptive characteristics of the patients were analyzed according to the presence of complications, patients

Table 3. Preoperative, intraoperative, and early postoperative characteristics of the patients included in this study

Characteristic	Percentage (%)
Type of surgery	
Open	100 (89.3)
Laparoscopic	12 (10.7)
Surgical duration (minutes)*	140 (50-220)
Length of hospital stay (days)*	11 (4-33)
Perioperative characteristics	
Use of blood and blood products	36 (32.1)
Hemodynamic instability	17 (15.2)
Use of stoma rod	15 (13.4)
Intensive care unit admission	92 (82.1)
Preoperative laboratory tests	
White blood cell count**	13.4±5.1
Neutrophil count**	11.2±4.9
Platelet count*	286 (87-815)
Hemoglobin**	12.0±2.2
Albumin**	3.0±0.5
C-reactive protein*	88 (3.5-531)
Stomal complication	31 (27.7)
Mucocutaneous separation	16 (14.3)
Ischemia and necrosis	5 (4.5)
Peristomal dermatitis	5 (4.5)
Retraction	2 (1.8)
Parastomal infection	1 (0.9)
Hemorrhage	1 (0.9)
Metabolic (high-output stoma)	1 (0.9)
Surgical complications severity (The Clavien-Dindo Classification System)	
I	21 (67.7)
III	10 (32.3)

*Median (minimum-maximum), **: Mean ± standard deviation

with complications were found to be older (p=0.003), and a significant difference was observed in their ASA scores (p=0.011; Table 4).

When the stoma-related characteristics were analyzed according to the presence of complications, the complication rate was found to be significantly higher in patients who underwent end ileostomy compared to those who underwent loop ileostomy (p=0.036), but no significant difference was observed in terms of other stoma-related characteristics (Table 5).

Table 4. Analysis of descriptive characteristics according to the presence of complications

Characteristic	Complication (+), (n=31) n (%)	Complication (-), (n=81) n (%)	p-value
Age*	69.7±14.3	60.2±14.8	0.003†
Gender			0.292††
Female	12 (38.7)	23 (28.4)	
Male	19 (61.3)	58 (71.6)	
Body mass index (kg/m²)*	25.9±4.0	25.5±3.6	0.563††
American Society of Anesthesiologists score			0.011††
I	1 (3.2)	0	
II	6 (19.4)	39 (48.1)	
III	24 (77.4)	40 (49.4)	
IV	0	2 (2.5)	
Presence of comorbidity	17 (54.8)	44 (54.3)	0.961††
Hypertension	11 (35.5)	27 (33.3)	0.830††
Diabetes mellitus	8 (25.8)	21 (25.9)	0.990††
Coronary artery disease	3 (9.7)	12 (14.8)	0.554‡
Chronic obstructive pulmonary disease	3 (9.7)	5 (6.2)	0.683‡
Preoperative CT/RT history	5 (16.1)	15 (18.5)	0.768††

CT: Chemotherapy, RT: Radiotherapy, *Mean ± standard deviation, †: Independent samples t-test, ††: Chi-square test, ‡: Fisher's exact test

Table 5. Analysis of stoma-related characteristics according to the presence of complications

Characteristic	Complication (+), (n=31) n (%)	Complication (-), (n=81) n (%)	p-value
Stoma cause			
Colorectal carcinoma	13 (41.9)	42 (51.9)	0.348†
Volvulus	4 (12.9)	8 (9.9)	0.734††
Acute diverticulitis	2 (6.5)	8 (9.9)	0.724††
Stoma type			0.253†
Ileostomy	11 (35.5)	20 (24.7)	
Colostomy	20 (64.5)	61 (75.3)	
Comparison of stoma types			
Loop ileostomy	1 (11.1)	10 (58.8)	0.036††
End ileostomy	8 (88.9)	7 (41.2)	
Loop ileostomy	1 (50.0)	10 (40.0)	0.658††
Loop colostomy	1 (50.0)	15 (60.0)	
Loop colostomy	1 (5.0)	15 (24.6)	0.102††
End colostomy	19 (95.0)	46 (75.4)	
Stoma site			0.316†
Left lower quadrant	20 (64.5)	60 (74.1)	
Right lower quadrant	11 (35.5)	21 (25.9)	

†: Chi-square test, ††Fisher's exact test

When the surgery-related characteristics were analyzed according to the presence of complications, the complication rate was higher in open surgeries (p=0.035). Moreover, in patients with complications, hospital stays were observed to be longer (p<0.001), and perioperative hemodynamic instability was more frequent (p=0.001) (Table 6).

When complications were analyzed, superficial mucocutaneous separation (n=12, 10.7%), peristomal dermatitis (n=5, 4.5%), and peristomal infection (n=1, 0.9%) were found to be treated with regular stoma care, whereas deep mucocutaneous separation (n=4, 4.6%) and retraction (n=2, 1.8%) were treated with stoma revision. Hemorrhage and metabolic complications related to high-output stoma were treated with hemodynamic and systemic follow-up and regular stoma care.

Discussion

The creation of permanent and temporary stomas holds an important place in emergency gastrointestinal surgical practice. Temporary stoma creation can also be performed as a bridge to primary surgery, as in the case of intraluminal stenting.[9] Stomas are particularly preferred in cases of advanced age, male gender, high ASA score, and the presence of comorbidities, depending on the surgical pathology encountered. In most cases, stomas can be lifesaving. In clinical practice, stomas are most commonly

Table 6. Analysis of preoperative, intraoperative, and early postoperative characteristics according to the presence of complications

Characteristic	Complication (+), (n=31) n (%)	Complication (-), (n=81) n (%)	p-value
Type of surgery			0.035†
Open	31 (100)	69 (85.2)	
Laparoscopic	0	12 (14.8)	
Surgical duration (minutes)*	150 (90-220)	140 (50-220)	0.100††
Length of hospital stay (days)*	15 (7-33)	10 (4-29)	<0.001††
Perioperative characteristics			
Use of blood and blood products	13 (41.9)	23 (28.4)	0.170‡
Hemodynamic instability	11 (35.5)	6 (7.4)	0.001†
Rod usage	2 (6.5)	13 (16.0)	0.229†
Intensive care unit admission	30 (96.8)	62 (76.5)	0.012‡
Preoperative laboratory tests			
White blood cell count**	14.1±5.6	13.1±4.9	0.381‡‡
Neutrophil count**	12.0±5.4	10.9±4.7	0.306‡‡
Platelet count*	338 (109-685)	282 (87-815)	0.189††
Hemoglobin**	12.0±2.2	12.1±2.2	0.891‡‡
Albumin**	2.9±0.5	3.0±0.4	0.384‡‡
C-Reactive protein*	88 (14-489)	89 (3-531)	0.256††

*: Median (minimum-maximum), **: Mean ± standard deviation, †: Fisher's exact test, ††: Mann-Whitney U test, ‡: Chi-square test, ‡‡: Independent samples t-test

created in emergencies due to obstructive malignant lesions. In addition, considering the intestinal segments where the pathological conditions are observed, an end colostomy is reported as being performed more frequently in the lower left abdominal quadrant.[9,10] Similar demographic and clinical characteristics were found in this study.

Advanced age, the presence of major comorbidities, and a high ASA score are parameters that can increase the risk of complications, not only in surgical cases but also in stoma complications.[11] Hospitalization may be prolonged and ICU stay may be required in the presence of complications.[4] In this study, the risk of complications was observed to be higher as age and ASA score increased. In addition, the length of hospitalization was prolonged, and ICU stay was more frequent in the group with complications.

When patients with stomas were diagnosed separately, complications were more frequently observed in patients with malignancies. Additionally, it is reported in the literature that patients with colostomy are more prone to complications than those with ileostomy, and patients with a stoma on the left lower quadrant are more prone to complications than those with a stoma on the right lower quadrant.[12] In this study, when complications were analyzed according to the cause and location of the stoma, no significant difference was observed. However, statistically fewer complications were encountered in patients with a loop ileostomy.

When complications were examined, the observations were made that mucocutaneous separation was the most common early-period complication, and the risk increased particularly in emergency surgical cases. It is known that in later stages, mucocutaneous separation becomes deeper, does not respond to medical or conventional methods of treatment, and can lead to stoma revision.[13] In the current study, mucocutaneous separation was also found to be the most common stoma complication.

In the literature, perioperative factors may cause complications, such as stoma necrosis or peristomal hemorrhage, especially in hemodynamically unstable cases. It is also known that prolonged surgical duration and the increased use of blood products can increase stoma complications, such as systemic complications.[14] In this study, it was statistically determined that, among the preoperative factors, only hemodynamic instability was a significant predictor of complications. In addition, prolonged surgical duration and increased use of blood products did not have a statistically significant effect on stoma-related complications.

Mohan et al.[15] stated that the traditional use of a stoma rod had no significant effect on reducing the risk of retraction; however, it may increase the risk of dermatitis and necrosis. In this study, it was determined that the use of a rod in stoma maturation did not create a significant difference between the groups.

In emergency surgical cases, it has been reported that preoperatively increased acute-phase reactants or changes in laboratory parameters, such as low hemoglobin and albumin levels, may be predictive of the development of complications. These laboratory parameters are also used in the monitoring and management of complications, should they arise.[16,17] In this study, however, no preoperative laboratory parameters were found to be significant.

In their study of 50 patients with stomas, Hayashi et al.[18] found that fewer complications were encountered in laparoscopic cases, and patients in this group were switched

to early oral intake. However, in the present study, the surgical duration was longer in the laparoscopic group. In a study conducted by Zhang et al.[19], it is stated that the Hartmann procedure resulted in fewer complications in laparoscopic cases. However, the rate of conversion to open surgery remained high. In this study, it was also determined that laparoscopic cases had a statistically significantly lower rate of complications.

In a systematic review and meta-analysis study conducted by Ambe et al.[20], it was found that preoperative stoma site marking was associated with a significant decrease in complications in 3,458 patients whose results were evaluated; however, the study also included long-term complications, such as parastomal hernia and stenosis, as outcome criteria. In this study, only emergency stomas were included in the evaluation scope, no preoperative marking was performed in any case, and only early-period results were evaluated.

Study Limitations

This study has some limitations, including its retrospective design, the small number of laparoscopic cases, the diversity of the surgeons, and the lack of stoma site marking. However, the population consisted of only emergency cases, and the study was designed in a center with a high patient volume; these are considered major reasons for these limitations. Another limitation was the heterogeneity of the patient population, which included individuals with both malignant and non-malignant conditions, potentially introducing bias when comparing patients for stoma-related complications.

Conclusion

Stoma creation in emergency gastrointestinal surgical cases can be lifesaving, but it can also lead to complications. This risk increases significantly in patients with advanced age, major comorbidities, and hemodynamic instability. Complications can lead to prolonged hospitalization and the need for ICU admissions in this population, which may impose heavy burdens on them and the healthcare system. Moreover, loop ileostomy was found to have fewer complications than end ileostomy. Therefore, randomized prospective studies with large patient populations, comprehensive systematic reviews, and meta-analyses are needed to determine the factors that can reduce stoma-related complications in emergency cases.

Ethics

Ethics Committee Approval: The study protocol was approved by the Local Ethics Committee of University of Health Sciences Turkey, Gülhane Training and Research Hospital (approval number: 2022/98, date: 01/07/2022).

Informed Consent: Informed consent was obtained from all patients for inclusion in the research.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.Z.B., O.H., Concept: M.S.Ç., Design: M.Z.B., Data Collection or Processing: M.S.Ç., Analysis or Interpretation: B.U., Literature Search: M.Z.B., M.S.Ç., O.H., Writing: M.Z.B.

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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DOI: 10.4274/tjcd.galenos.2023.2023-1-3
Turk J Colorectal Dis 2023;33:55-57

LETTER TO THE EDITOR

Complete Lymph Node Dissection as a Vascular-Sparing Alternative to Complete Mesocolic Excision for Colon Cancer

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Keywords: Colon cancer, complete lymph node dissection, complete mesocolic excision, CRC, D3-lymph node dissection, oncology, surgery

Dear Editor,

It was a great pleasure to read an invited review, "The Concept of Complete Mesocolic Excision," by the undisputed expert Hohenberger.[1] Complete mesocolic excision became a standard of surgical care, significantly improving the survival outcomes in colon cancer surgery.[2] Central vascular ligation (CVL) and lymph node dissection (LND) at the origin of the main feeding colic arteries with mesocolon excision within the undisrupted fascial envelope have a lot in common with the principles of total mesorectal excision for rectal cancer, suggested by Heald et al.[3], and D3 LND,[4] described in the Japanese Society for Cancer of the Colon and Rectum (JSCCR) guidelines. However, partial mesorectal excision (PME), widely adopted in the treatment of the upper rectum, was shown to be an oncologically safe procedure and recommended by the European Society for Medical Oncology and the JSCCR guidelines.[4,5]

CVL and inclusion of the arterial arcade demand extensive resection of the colon outside the 10 cm borderlines,[2] even though 10 cm margins were shown to be oncologically adequate regarding the tumor lymphatic spread.[4] With this perspective, the term "tumor-specific mesocolic excision" might be more accurate in describing the resection of the bowel 10 cm proximally and distally with the associated mesocolon and preserved fascial envelope analogous to PME.

Yet, the bowel-sparing approach demands selective arterial ligation to preserve the blood supply of the colon. Kobayashi et al.[6,7] were some of the first surgeons to describe the technical aspects of the left colic artery and superior rectal artery preservation with D3 LND at the origin of the inferior mesenteric artery (IMA). It was shown that D3 LND at the origin of the IMA and vascular preservation was associated with comparable survival rates.[8,9]

Considering that CVL for right colon cancer is at the origin of the colic branches of the superior mesenteric artery (SMA), the level of CVL for left colon cancer should be at the level of the colic branches of the IMA as well (Figure 1A).

It is crucial to ligate the colic vessels at their origin and perform LND along the arterial and venous trunks. Thus, it is important to follow standard anatomical landmarks to fully excise the lymph nodes from the apical regions and avoid the ligation of the vessels at their origin, if clinically acceptable.

- For the right colon (Figure 1B, C), the medial borders of the LND are the anterior and latero-posterior surfaces of the SMA, the lower edge of the pancreas cranially, and 2 cm from the ileocolic artery caudally.[10]

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Received: 04.03.2023 **Accepted:** 25.04.2023

- For tumors in the transverse colon, the surface of the SMA should be exposed 1-2 cm both proximally and distally to the middle colic artery (Figure 1D).

- For splenic flexure, the LND at the root of the IMA with ligation of the left colic artery is performed. Also, LND at the root of the middle colic artery with the preservation of the latter should be carried out. The left branch of the middle colic artery should be ligated. (Figure 1E).

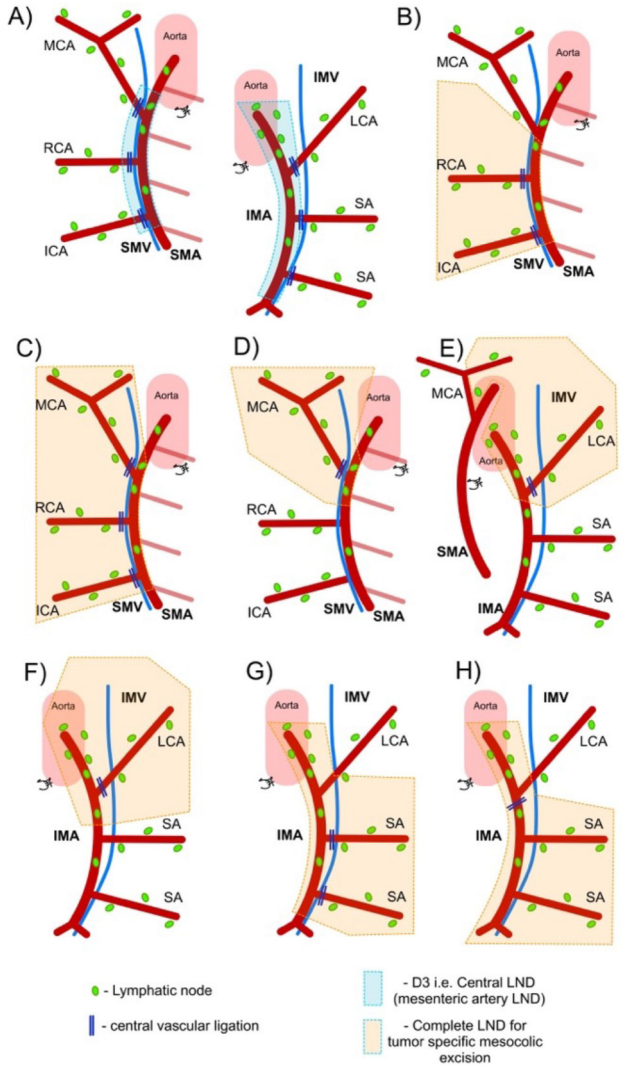

Figure 1. The schematic borders of central lymph node dissection, CLND, and CVL for colon cancer: (A) The area of central LND for the SMA and IMA (within the blue area) and the level of CVL for the colic branches. (B) CLND for cecal colon cancer. (C) CLND for ascending colon cancer and hepatic flexure cancer. (D) CLND for transverse colon cancer. (E) CLND for splenic flexure colon cancer. (F) CLND for descending colon cancer. (G) CLND for proximal sigmoid colon cancer. (H) CLND for distal sigmoid colon cancer.
MCA: Middle colic artery, RCA: Right colic artery, ICA: Ileocolic artery, SMV: Superior mesenteric vein, SMA: Superior mesenteric artery, IMV: Inferior mesenteric vein, IMA: Inferior mesenteric artery, LCA: Left colic artery, SA: Sigmoid artery, LND: Lymph node dissection, CLND: Complete lymph node dissection, CVL: Central vascular ligation

- For the left colon, the central LND area is embordered within the horizontal part of the duodenum, IMA root, medial surfaces of the splanchnic nerves, and caudally at the point of the mesentery fixation to the pre-hypogastric fascia (Figure 1F, G, H).

These landmarks ensure not only CVL but the completeness of central LND (Figure 1A).

The presented approach allows for the removal of all regional mesenteric lymph nodes while preserving blood flow with the help of the skeletonization of the non-tumor feeding arteries, i.e., to perform mesocolic complete lymph node dissection (CLND). Tumor-specific mesocolic excision with CLND results in individualized surgery based on the tumor location and arterial anatomy, ensuring oncological radicality. At the same time, vascular preservation is not associated with higher rates of short-term complications or poorer survival outcomes according to recent studies and, therefore, can be considered in clinical practice and future studies.[8,9]

Ethics

Peer-review: Externally peer-reviewed.

Authorship Contributions

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