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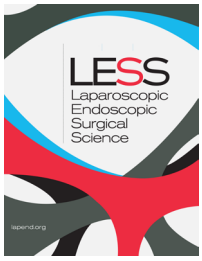

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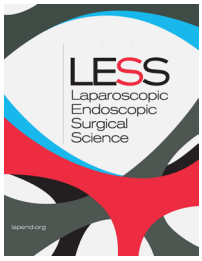

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CASE REPORTS

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Original Article

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Short-term results of laparoscopic surgeries in rectal cancer: Single center experience

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ABSTRACT

Introduction: The laparoscopy technique is widely recognized for its numerous benefits in rectal surgery. This study assesses the short-term outcomes of 81 patients who underwent laparoscopic rectal resection.

Materials and Methods: The study included 81 patients who underwent laparoscopic rectal surgery at the General Surgery Clinic of Tokat Gaziosmanpaşa University Faculty of Medicine Hospital from January 2019 to January 2022. The evaluation focused on demographic data, surgical details, tumor TNM staging, and early postoperative complications.

Results: A total of 81 patients with malignant lesions underwent laparoscopic rectal surgery. The median age was 64.4 years (range: 35-86), with 54 patients (66.6%) being male and 27 (33.3%) female. The average BMI was 27.8±3.1 kg/m^2. Surgical procedures included abdominoperineal resection (APR) in 16 cases, anterior resection in 13, low anterior resection in 45, and intersphincteric resection in 7 cases. The average surgery duration was 264 minutes (range: 189-435). Stage T3 tumors were present in 47 patients (58%). Neoadjuvant chemoradiotherapy was administered to 68 patients (83.9%). The median number of lymph nodes retrieved was 12 (range: 4-43), with all patients achieving negative surgical margins. The postoperative hospital stay averaged 8.5 days (range: 4-48). Early postoperative complications occurred in 15 patients (18.5%), including wound infection in 9, anastomotic fistula in 3, anastomotic site bleeding in 1, parastomal hernia in 1, and perianal abscess in 1. Intraoperative complications occurred in 3 patients, involving ureter injury, iliac artery injury, and diaphragm injury in one patient each. There were no mortalities in this series of patients.

Conclusion: This study demonstrates that laparoscopic rectal surgery is a safe procedure, characterized by a low complication rate, short hospital stays, and effective surgical resection and lymph node dissection.

Keywords: Complications, Laparoscopy, Rectal Surgery

Introduction

Colorectal cancer ranks as the third most common malignant tumor worldwide.[1] Approximately one-third of all colorectal cancers are rectal cancers.[2] The treatment of curable, locally advanced rectal cancer (stage II-III) primarily involves surgical resection.[1] This method remains paramount in rectal cancer treatment for curative resection, staging, prognosis, and subsequent therapeutic decisions.[3]

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Recently, the use of minimally invasive surgery in oncological procedures has increased, attributed to benefits such as quicker recovery, earlier bowel function resumption, and shorter hospital stays, as evidenced in prior meta-analyses.[4] Minimally invasive surgery for colorectal cancer has now gained widespread acceptance globally and is extensively utilized in numerous centers.[5]

In 1986, Professor RJ Heald introduced Total Mesorectal Excision (TME) in a publication in The Lancet. This technique, which involved the excision of the posterior elements of the rectum and endopelvic fascia, resulted in an exceptionally low regional recurrence rate in 115 patients. TME is now considered the gold standard in rectal cancer treatment.[6] Over the past 20 years, surgical resection, primarily due to the introduction of TME, has seen significant improvements in outcomes. This technique reduces tumor recurrence by ensuring the complete removal of mesorectal tissues and preventing the radial spread of cancer cells.[7] A critical aspect of mesorectal excision is the initial stage, particularly the identification of the "sacred plane." In the era of TME, the precision and safety of mesorectal dissection and achieving clear resection margins are key pathological indicators of surgical quality. Indeed, a negative circumferential resection margin and complete TME correlate with lower rates of local and distal recurrence and improved long-term survival.[8]

Large randomized clinical trials have demonstrated that laparoscopic TME is associated with reduced blood loss, quicker bowel movement recovery, and shorter hospital stays compared to open surgery.[9] Although the routine application of laparoscopy remains a subject of debate and study, the COLOR II and COREAN studies, which compared laparoscopic and open approaches for rectal cancer resection, found that laparoscopic resection offered more favorable short-term outcomes than open resection, without significant differences in oncological results.[10]

In this study, we aim to evaluate the short-term outcomes of 81 patients who underwent laparoscopic rectal resection in our clinic.

Materials and Methods

This study included eighty-one patients who underwent laparoscopic rectal surgery at the General Surgery Clinic of Tokat Gaziosmanpaşa University Faculty of Medicine Hospital between January 2019 and January 2022. Patient files were retrospectively reviewed. Recorded data included demographic characteristics, diagnoses, tumor localization, diameters, stages, surgery duration, number of dissected lymph nodes, hospitalization duration, intensive care unit stay, time to initiation of liquid and normal food intake, comorbidities, stoma status, need for blood transfusion, and any developed complications.

Cases that began laparoscopically but were converted to open surgery for reasons other than complications (such as adhesions) were excluded from the study. Prior to surgery, all patients were discussed in the multidisciplinary tumor council. Informed consent, detailing the surgery and potential complications, was obtained from all patients. Preoperative preparations included administering liquid food one day before surgery, appropriate bowel preparation, and prophylaxis for deep vein thrombosis and antibiotics.

Pneumoperitoneum was established using carbon dioxide gas to maintain a pressure of approximately 12-14 mmHg. The number and placement of trocars varied based on the surgical procedure. In abdominoperineal resection (APR) cases, the specimen was removed anally. For patients with rectal tumors below the peritoneal reflection and those who received neoadjuvant radiotherapy, a protective loop ileostomy was created in the right lower quadrant of the abdomen. Depending on the patient's general condition and the safety of the anastomosis, liquid food was introduced on the 1st or 2nd postoperative day. Subsequently, the diet was gradually escalated based on the patient's gas and stool output. Patients were discharged upon full recovery, and any early complications were recorded.

Statistical Analyses

For the analysis of data in this study, the SPSS 20 software package was utilized. Descriptive statistics were presented as mean ± standard deviation. The Chi-square test was employed for the analysis of categorical variables.

Results

In this study, laparoscopic rectal surgery was performed on 81 patients with malignant lesions. The median age of the patients was 64.4 years, ranging from 35 to 86 years. Of these patients, 54 (66.6%) were male, and 27 (33.3%) were female. The average Body Mass Index (BMI) was 27.8±3.1 kg/m^2. The surgical procedures included abdominoperineal resection (APR) in 16 cases, anterior resection in 13 cases, low anterior resection in 45 cases, and intersphincteric resection in 7 cases. T3 stage was noted in 47 patients (58%). A majority of the patients, 68 (83.9%), received

neoadjuvant chemoradiotherapy. Early postoperative complications were observed in 15 patients (18.5%), including wound infection in 9 patients, anastomotic fistula in 3, anastomosis site bleeding in 1, parastomal hernia in 1, and perianal abscess in 1 patient. Intraoperative complications occurred in 3 patients, consisting of ureter injury in 1, iliac artery injury in 1, and diaphragm injury in 1. There were no mortalities reported in this series of patients (Table 1).

Table 1. Demographic data, surgery types, stage and complications

Age (mean, range)	64.4 (42-86)
	n (%)
Gender	
Famale	27 (33.3)
Male	54 (66.6)
Tumor stage	
1	6 (7.4)
2	25 (30.8)
3	47 (58)
4	3 (3.7)
Intraoperative complications	3 (3.7)
Ureter injury	1 (1.2)
Iliac artery injury	1 (1.2)
Diaphragmatic injury	1 (1.2)
Postoperative complications	15 (18.5)
Wound infection	9 (11.1)
Anastomotic leak	3 (3.7)
Bleeding	1 (1.2)
Parastomal hernia	1 (1.2)
Perianal abscess	1 (1.2)

The average surgery duration was 264 minutes, with a range of 189 to 435 minutes. Neoadjuvant chemoradiotherapy was administered to 68 (83.9%) patients. The median number of lymph nodes retrieved was 12, ranging from 4 to 43. All patients achieved negative surgical margins. The postoperative hospital stay averaged 8.5 days, with a range of 4 to 48 days (Table 2).

For patients who developed anastomotic fistula, complications were managed non-surgically due to the presence of protective loop ileostomy. In the patient who experienced anastomosis line bleeding on the first postoperative day, bleeding control was achieved through colonoscopy-guided intervention. The patient who developed an early parastomal hernia underwent hernia repair surgery. Regarding intraoperative complications, ureteral injury was primarily repaired with the involvement of the urology team. The patient with iliac artery injury underwent primary repair in collaboration with cardiovascular surgery. The diaphragm injury was laparoscopically repaired during the operation. Wound infections were managed with oral antibiotics and local treatments.

In our clinic, the protocol for closing protective ileostomies following rectal tumor surgery involves a waiting period of approximately six months after the completion of adjuvant treatment. Consistent with this practice, the protective loop ileostomies in our current patient series were closed on average six months post-treatment.

Discussion

Despite being a peripheral university hospital in a region with a low population rate, our clinic has successfully performed rectal cancer surgeries using minimally invasive laparoscopic techniques for approximately 15 years.

Table 2. Tumor and patient data

	n	Minimum	Maksimum	Mean
Tumor diameter (cm)	81	1	8	3.41
Tumor localization-anal verge distance (cm)	81	1	19	8.7
Surgery time (min)	81	210	420	264
Intensive care stay (days)	81	0	6	1.41
Hospital stay (days)	81	4	48	8.39
Lymph node	81	8	40	12
Pathological lymph node	81	0	34	5
Start eating liquid food	81	1	5	1.5
Start eating normal food	81	2	7	3.6

The outcomes of our laparoscopic rectal cancer surgeries align with findings reported in the literature.

The laparoscopic approach for colorectal cancer has gained increasing acceptance worldwide.[11] Since its introduction in 1991, a growing body of high-quality evidence indicates that laparoscopic treatment of colon carcinoma is on par with open techniques. Furthermore, evidence strongly suggests that both short- and long-term safety and quality outcomes in patients treated laparoscopically surpass those in patients undergoing open surgery.[12]

In our study, laparoscopic minimally invasive surgery was performed on all 81 patients, 77 of whom had T1-T3 stage rectal tumors. The ALaCarT Randomized Clinical Trial, a multicenter study involving 475 patients with T1-T3 rectal adenocarcinoma located less than 15 cm from the anal verge, compared laparoscopic (237 patients) and open (238 patients) rectal resection. This study found similar survival and complication rates between laparoscopic and open surgeries, with a higher risk of successful resection in patients with T1-T3 rectal tumors.[13] Various studies in the literature have reported that the complication rate of laparoscopic colorectal surgery ranges from 1.5% to 36%.[14] Among these complications, anastomotic leakage is the most significant. It is a dreaded postoperative complication in colorectal cancer surgery, with an incidence ranging from 2% to 4% in large series, and it adversely affects the patient's postoperative recovery, quality of life, and survival.[13] In our study, the rate of anastomotic leakage was 3.7%, which is consistent with the figures reported in the literature.

In laparoscopic low anterior resection, the use of prophylactic ileostomy is considered beneficial for preventing anastomotic leakage, especially in patients with a low level of anastomosis, those undergoing concurrent neoadjuvant radiotherapy, or those at high risk of anastomotic leakage due to vascular insufficiency.[15] However, the optimal timing for this procedure remains a subject of debate. Given the higher complication rate associated with surgeries performed during chemotherapy, most surgeons prefer to wait until the completion of adjuvant treatment.[16] In line with this approach, we performed protective loop ileostomies on all rectal cancer patients undergoing low resection and receiving neoadjuvant therapy. These stomas were closed approximately six months later, following the end of adjuvant treatment.

While laparoscopic colorectal surgery facilitates earlier recovery and hospital discharge, literature reports vary regarding the length of hospital stay. Stottmeier et al.[17] reported an average hospital stay of 5 days among 102 consecutive patients undergoing laparoscopic rectal cancer surgery. In a larger study, Rossive et al.[18] observed that in their series of 882 patients, the average hospital stay was 3 days, with 10% of patients being discharged within the first 48 hours. In contrast, the average hospital stay for our patients was 8.39 days. We believe that one of the factors contributing to this extended duration was the presence of major complications in five of our patients.

Surgical quality indicators such as Total Mesorectal Excision (TME) quality, negative circumferential resection margins (CRM), negative distal resection margins, and the number of lymph nodes (LNs) removed are crucial surrogate markers for local recurrence in rectal cancer.[19] The tumor-node-metastasis (TNM) classification system, widely used for staging colorectal cancer, categorizes patients into different prognostic groups based on primary tumor thickness, lymph node (LN) invasion, and distant metastasis.[20] A higher number of positive LNs and advanced stage are associated with a poorer prognosis. Consequently, the number of dissected LNs is vital in determining the pN category and the need for adjuvant chemotherapy.[21]

The American Joint Committee on Cancer (AJCC) guidelines recommend that at least 12 LNs should be collected and examined from the resected specimen for accurate staging.[22] However, achieving this benchmark can be challenging, as the number of LNs removed is influenced by various factors, including the patient's age, gender, comorbid diseases, tumor size and location, degree of differentiation, lymphoid reaction, and preoperative chemoradiotherapy (CRT).[23] Preoperative CRT, in particular, can impact LN retrieval in resected specimens. Studies have shown that the total number of LNs removed in patients undergoing preoperative CRT is often fewer than 12. This reduction is attributed to LN atrophy, fibrosis, and lymphocyte depletion caused by radiotherapy and/or chemotherapy. In a cohort study, more than 12 LNs were obtained in only 40.5% (107/264) of the patients.[24] In our study, the median number of lymph nodes obtained was 12.

Conclusion

This study demonstrates that laparoscopic rectal surgery can be considered a safe option, as evidenced by its low complication rate, short hospital stay, and the adequacy

of surgical resection and lymph node dissection. Laparoscopic colorectal surgery offers satisfactory outcomes compared to open surgery, fulfilling oncological principles while providing better cosmetic results, earlier recovery, and higher patient satisfaction.

As a result, we aimed to show that laparoscopic surgery for rectal cancer can be safely performed in a peripheral university hospital.

Considering our short-term results, we have obtained results comperable to the literature in terms of complication rates and parameters.

Disclosures

Ethichs Committee Approval: This study included eighty-one patients who underwent laparoscopic rectal surgery at the General Surgery Clinic of Tokat Gaziosmanpaşa University Faculty of Medicine Hospital between January 2019 and January 2022. Patient files were retrospectively reviewed.

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Original Article

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Comparison of short-term results: Laparoscopic sleeve gastrectomy (LSG) vs laparoscopic roux-en-y gastric bypass (LRYGB)

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ABSTRACT

Introduction: In this study, it was aimed to compare the short-term results of the effects of LSG and LRYGB procedures on weight loss, laboratory parameters and comorbidities.

Materials and Methods: This retrospective study (February 2021-August 2022) includes the prospectively collected data of the 1-year postoperative follow-up of patients who underwent LSG and LRYGB for morbid obesity. EWL%, the percentage of patients who were successful, laboratory parameters of patients and effects on comorbidities were compared between the groups.

Results: When the two surgical techniques were compared in terms of the changes in fasting glucose, liver function tests, kidney function tests, lipid profile (HDL, LDL, cholesterol, triglyceride) and EWL% in both 6th months and 12th months after surgery, no significant difference was found. In the 1-year results, we detected a significant decrease weight, fasting glucose, creatinine, cholesterol, trigliseride values as well as a significant increase in HDL value in LRYGB group (p=0.001, p=0.004, p=0.023, p=0.039, p=0.004, p=0.002 respectively). No significant decrease in the need for medication in DM, HT and HL. In the 1-year results, we detected significant weight loss, decreased fasting glucose, AST, ALT, Trigliseride, TSH, as well as an increase in HDL in LSG group (p<0.001, p<0.001, p<0.001, p<0.001, p<0.001, p=0.006, and p<0.001 respectively). It is found that LSG significantly reduced the need for medication in DM, HT and HL.

Conclusion: Both LSG and LRYGB have effective results on weight loss at the sixth month and first year follow-up. Without superiority between them, both procedures revealed improvements in liver enzymes, lipid profile and thyroid function tests.

Keywords: Laparoscopic Roux-en-Y Gastric Bypass, Laparoscopic Sleeve Gastrectomy, short-term outcomes

Introduction

It is widely believed that obesity is a chronic disease which leads to excessive fat accumulation in the body, induces a condition of systemic inflammation, and adversely affects a number of organs and systems.[1] Obesity is basically caused by the fact that the calories consumed are more than the calories expended.[2] In addition, insufficient physical activity, unhealthy diet and genetic causes are also factors in the etiology of obesity.[3]

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Since obesity is a complex metabolic disease, a multidisciplinary approach is required in treatment planning. Dietary regulations and medical treatments are the first step of this multidisciplinary approach. In recent years, glucagon-like peptide-1 (GLP-1) analogues like semagulitide and liragulitide have become more popular in medical treatment than other medications. Despite this, medical treatment has yet to achieve the expected effects, and surgery is still the most successful option for treatment of obesity.[3,4]

Indications for surgical treatment of obesity in international guidelines are defined as having a Body Mass Index (BMI) of either 40 kg/m^2 or above or having a BMI between 35 and 40 kg/m^2 and having weight–related comorbidity. These patients must have tried non-surgical methods for at least a year and have not been able to lose weight. This situation was updated by ASMBS and IFSO in 2022 and it was updated as having a BMI of 35 kg/m^2 and above or having a BMI between 30 and 34.9 kg/m^2 and having comorbidity related to weight.[5,6] Laparoscopic Sleeve Gastrectomy (LSG) and Laparoscopic Round-en-Y Gastric Bypass (LRYGB) are the surgical procedures commonly applied for obesity surgery worldwide. While investigations have shown that LSG has similar effects on weight loss and the improvement of comorbidities as LRYGB, which has been the most frequently used bariatric surgery method in the past, the frequency of its application has significantly increased despite the fact that the long-term results are not yet sufficient.[7,8] LRYGB is both restrictive and malabsorptive procedure, whereas LSG is a restrictive surgical procedure. It has been demonstrated that both surgical techniques have positive effects on weight loss and weight-related comorbidities.[9]

In this study, it was aimed to compare the short-term results of the effects of LSG and LRYGB procedures, which are the two most applied procedures of bariatric surgery, on weight loss, laboratory parameters and comorbidities.

Materials and Methods

Study Design and Data Set

This retrospective study (February 2021- August 2022) includes the prospectively collected data of the 1-year postoperative follow-up of patients who underwent LSG and LRYGB for morbid obesity in the Department of General Surgery, Umraniye Education and Research Hospital, University of Health Sciences. The study included obese people between the ages of 18 and 60 years-old who had a BMI of 35 kg/m^2 or above and had received approval from the bariatric surgery council for surgery. People who underwent other bariatric procedures and had insufficient data were not included in the study.

In addition to demographic data such as age and gender, patients' preoperative and postoperative (postoperative 6th month and 1st year) Body Mass Index (BMI), Excess Weight Loss percentage (EWL%), comorbidities, and laboratory results (fasting glucose, thyroid stimulating hormone (TSH), high-density lipoprotein (HDL), low-density lipoprotein (LDL), Cholesterol, Triglyceride, BUN, creatinine, AST and ALT levels) were recorded.

The patients were divided into two groups: the LRYGB Group and the LSG Group. EWL%, the percentage of patients who were successful, laboratory parameters of patients and effects on comorbidities (success in stopping medicinal medication after surgery) were compared between the groups. Only diabetes mellitus (DM), hypertension (HT) and hyperlipidemia (HL) have been recorded as comorbidities and the effects on these comorbidities have been evaluated.

EWL% was taken as the basis to evaluate the patients' postoperative weight loss success, and surgery was considered successful for patients whose EWL was 60% and above at the end of the first year after surgery. The ideal BMI was accepted as 25 kg/m^2 and the ideal weight was calculated with the formula 25 x height (m^2). EWL%= initial weight (kg) – first year weight (kg) / initial weight (kg)-ideal weight x 100 was calculated with the formula.[10]

Surgical Technique

LSG

The operation started with the classical 5 trochar method in the reverse trendelenburg position. The stomach was mobilized along great curvature up to the left crus in cranial and 2-3 cm to the pylorus in caudal. Vertical sleeve gastrectomy was performed using staple with the help of a 38-French oro-gastric bougie, starting 4-6 cm from the pylorus and ending 1-2 cm away from the left hiatal crus. The staple line was reinforced with omentopexy. All patients were operated by the same surgeon and with the same technique.

LRYGB

The operation was performed by standard 5 trocar technique. Stomach was divided horizontally with a staple from the lesser curvature part 5-6 cm distal of the gastroesophageal junction. A gastric pouch was created by dividing the stomach vertically towards the angle of his with staple accompanied by a 38 French oro-gastric bougie. An alimenter limb with the length of 100 cm and a biliopancreatic limb with the length of 80 cm were created. Mesenteric defects were closed. All patients were operated by the same surgeon and with the same technique.

Statical Analysis

We analyzed the collected data using the SPSS program (IBM Corp., Released 2019, IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp). To assess normality, the Shapiro-Wilk test was employed. As none of the continuous variables exhibited a normal distribution, we presented them as medians with interquartile ranges (25% to 75% quartiles). For comparing non-normally distributed independent continuous data, we employed the Mann-Whitney U test, and for non-normally distributed related continuous data, we used Wilcoxon's test. Categorical data were expressed as frequencies (%) and independent variables were analyzed using the Chi-Square test. Fisher Exact test was utilized when necessary. For the comparison of related cathegorical variables, McNemar's test was used. The level of statistical significance was set at $p<0.05$.

Results

After applying the inclusion and exclusion criteria, a total of 62 patients were enrolled to the final analysis. Fifty-three (85.5%) of the patients were female and the median age of the study population was 38 (31-46). Forty-nine (79%) of the patients underwent LSG and 13 (21%) LRYGB. Thirty-three (53.2) of the patients had DM, 20 (32.3%) had HT, 18 (29%) had HL. After six months, 48 (77.4%) of the patients had an EWL% greater than 60%, and after 1 year, 56 (90.3%) of the patients had an EWL% greater than 60%. Basic characteristics of the study population was summarized in Table 1.

Table 1. Basic characteristics of the study population

Age, Median (25% to 75% quartiles)	38 (31-46)
Sex (Female), n (%)	53 (85.5)
LSG, n (%)	49 (79)
LRYGB, n (%)	13 (21)
DM, n (%)	33 (53.2)
HT, n (%)	20 (32.3)
HL, n (%)	18 (29)
Preoperative Weight (kg), Median (25% to 75% quartiles)	120 (106-133)
Preoperative BMI, Median (25% to 75% quartiles)	44 (42-48)
Preoperative fasting glucose, Median (25% to 75% quartiles)	96 (87-109)
Preoperative AST, Median (25% to 75% quartiles)	19 (16-23)
Preoperative ALT, Median (25% to 75% quartiles)	19 (16-27)
Preoperative BUN, Median (25% to 75% quartiles)	24.8 (18.5-30)
Preoperative Creatinine, Median (25% to 75% quartiles)	0.68 (0.61–0.79)
Preoperative HDL, Median (25% to 75% quartiles)	44 (38-53)
Preoperative LDL, Median (25% to 75% quartiles)	112 (94-133)
Preoperative cholesterol, Median (25% to 75% quartiles)	187 (166-210)
Preoperative trigliseride, Median (25% to 75% quartiles)	139 (97-195)
Preoperative TSH, Median (25% to 75% quartiles)	2.09 (1.4–2.65)
6-months EWL>60%, n (%)	48 (77.4)
1-year EWL>60%, n (%)	56 (90.3)

LSG: Laparoscopic Sleeve Gastrectomy; LRYGB: Laparoscopic Roux-en-Y Gastric Bypass; ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; HDL: High-density lipoprotein; LDL: low-density lipoprotein; BMI: Body Mass Index; DM: diabetes mellitus; HT: hypertension; HL: hyperlipidemia; EWL: Excess Weight Loss; TSH: thyroid stimulating hormone.

When we assessed the 6-month results of patients who underwent LSG, we observed significant associations with various positive outcomes. These included significant decrease in weight, fasting glucose, AST, ALT, triglycerides, and TSH levels, as well as an increase in HDL level ($p<0.001$, $p=0.014$, $p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$, and $p<0.001$ respectively). Similarly in the 1-year results, we detected significant decrease in weight, fasting glucose, AST, ALT, Trigliseride, TSH levels, as well as asignificant increase in HDL level ($p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$, $p<0.001$, $p=0.006$, and $p<0.001$ respectively). It is found that LSG significantly reduced the requirement for medication in DM, HT and HL ($p<0.001$) (Table 2).

When we assessed the 6-month results of patients who underwent LRYGB, we observed significant associations with various positive outcomes. These included significant decrease in weight, fasting glucose, ALT, TSH, triglycerides levels, and as well as an significant increase in HDL level ($p=0.001$, $p=0.021$, $p=0.009$, $p=0.033$, $p=0.006$, $p=0.0023$ respectively). In the 1-year results, we detected a significant decrease weight, fasting glucose, creatinine, cholesterol, trigliseride levels as well as a significant increase in HDL level ($p=0.001$, $p=0.004$, $p=0.023$, $p=0.039$, $p=0.004$, $p=0.002$ respectively). No significant reduction in requirement for DM, HT, and HL medication was found (Table 3).

When the two surgical techniques were compared in terms of the changes in fasting glucose, liver function tests, kidney function tests, lipid profile (HDL, LDL, cholesterol, triglyceride) and EWL% in 6 months, no significant difference was found. Upon reviewing the one-year results, a significantly higher decrease in creatinine levels was observed among patients who underwent LRYGB compared to LSG ($p=0.042$). However, no significant differences were detected between the two surgical techniques with respect to other variables, including EWL% (Table 4).

Discussion

The majority of bariatric surgery procedures carried out on morbidly obese people are known to be LSG and LRYGB.[11] The short-term effects of these two procedures on weight loss, laboratory findings, and comorbidities (DM, HT, HL) were assessed and compared. In terms of weight loss and laboratory data, it was found that both the LSG and LRYGB procedures improved statistically. Patients underwent LSG and LRYGB procedures discovered significant weight reduction in terms of EWL% of almost 90% and there was no significant difference between the two procedures. In terms of effects on comorbidities (elimination of the need for medical treatment), a significant decrease was detected in LSG group, while no significant difference was detected in LRYGB group. The small number of samples within the LRYGB group patients may be the cause

Table 2. Six months and 1-year results of LSG Group

	Preoperative	6 months	p	1-year	p
Weight, Median (25% to 75% quartiles)	120 (109-136)	85 (75-94)	<0.001	72 (65-85)	<0.001
Glucose, Median (25% to 75% quartiles)	95 (87-107)	89 (85-99)	0.014	84 (78-91)	<0.001
AST, Median (25% to 75% quartiles)	19 (16-23)	15 (13-18)	<0.001	14 (12-18)	<0.001
ALT, Median (25% to 75% quartiles)	21 (16-31)	13 (11-18)	<0.001	13 (10-17)	<0.001
BUN, Median (25% to 75% quartiles)	24.7 (18.5–29.8)	22 (17.7-29.4)	0.066	24.9 (19.3-32.2)	0.342
Creatinine, Median (25% to 75% quartiles)	0.68 (0.59–0.77)	0.65 (0.58-0.73)	0.227	0.67 (0.61-0.74)	0.415
HDL, Median (25% to 75% quartiles)	44 (38-52)	51 (44-59)	<0.001	58 (48-65)	<0.001
LDL, Median (25% to 75% quartiles)	116 (93-134)	113 (99-133)	0.204	100 (92-122)	0.179
Cholesterol, Median (25% to 75% quartiles)	188 (160-212)	178 (157-213)	0.774	177 (151-203)	0.181
Trigliceride, Median (25% to 75% quartiles)	133 (96-188)	95 (70-124)	<0.001	81 (66-97)	<0.001
TSH, Median (25% to 75% quartiles)	2.08 (1.48-2.69)	1.45 (1.17-2.13)	<0.001	1.73 (1.23–2.2)	0.006
DM, n (%)	27 (55.1)	NA	NA	1 (2)	<0.001
HT, n (%)	15 (30.6)	NA	NA	2 (4.1)	<0.001
HL, n (%)	16 (32.7)	NA	NA	1 (2)	<0.001

ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: Body Mass Index; DM: diabetes mellitus; HT: hypertension; HL: hyperlipidemia; EWL: Excess Weight Loss; TSH: thyroid stimulating hormone.

Table 3. Six months and 1-year results of LRYGB Group

	Preoperative	6 months	p	1-year	p
Weight, Median (25% to 75% quartiles)	120 (109-136)	78 (70-98)	0.001	68 (40-78)	0.001
Glucose, Median (25% to 75% quartiles)	95 (87-107)	93 (85-121)	0.021	81 (76-89)	0.004
AST, Median (25% to 75% quartiles)	19 (16-23)	16 (15-18)	0.183	16 (15-20)	0.599
ALT, Median (25% to 75% quartiles)	21 (16-31)	13 (12-16)	0.009	12 (11-17)	0.071
BUN, mean (min-max)	24.7 (18.5-29.8)	24.7 (21.4-27.4)	0.272	24.8 (23.1-30.1)	0.875
Creatinine, Median (25% to 75% quartiles)	0.68 (0.59-0.77)	0.63 (0.56-0.76)	0.124	0.64 (0.54-0.69)	0.023
HDL, Median (25% to 75% quartiles)	44 (38-52)	50 (40-62)	0.0023	55 (45-59)	0.002
LDL, Median (25% to 75% quartiles)	116 (93-134)	101 (77-135)	0.347	93 (77-117)	0.064
Cholesterol, Median (25% to 75% quartiles)	188 (160-212)	167 (145-220)	0.173	165 (144-188)	0.039
Trigliceride, Median (25% to 75% quartiles)	133 (96-188)	106 (74-150)	0.006	82 (69-112)	0.004
TSH, Median (25% to 75% quartiles)	2.08 (1.48-2.69)	1.08 (0.69-1.44)	0.033	1.28 (0.94-2.08)	0.507
DM, n (%)	6 (46.2)	NA	NA	3 (23.1)	0.999
HT, n (%)	5 (38.5)	NA	NA	1 (7.7)	0.125
HL, n (%)	2 (15.4)	NA	NA	1 (7.7)	0.999

ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: Body Mass Index; DM: diabetes mellitus; HT: hypertension; HL: hyperlipidemia; EWL: Excess Weight Loss; TSH; thyroid stimulating hormone.

of this outcome. The small sample size of LRYGB patients was the main limitation of the present study. LRYGB group showed improvements in their comorbidities without significance. In 6 months results of our study, in terms of laboratory parameters, significant improvement in only AST value was found in LSG group, unlike LRYGB group, while no significant improvement in any value was found in LRYGB group, unlike LSG group. In first year results of our study, in terms of laboratory parameters, significant improvement in AST, ALT, and TSH values was found in LSG group, unlike LRYGB group, while significant improvement in Creatine and cholesterol values was found in LRYGB group, unlike LSG group.

In their analysis of patients who underwent LRYGB or LSG surgery at the end of a 5-year follow-up period, Toolabi et al.[12] examined the amount of weight loss as well as the remission rate of obesity-related comorbidities such DM, HT, and dyslipidemia. They didn't find a significant difference in the EWL% in the LSG and LRYGB groups in the first year following surgery. In addition, when the results of the surgery were evaluated both after 1 year and after 5 years, no significant difference was found between the two procedures in terms of remission of comorbidities. After 5 years, however, %EWL in LRYGB were higher than LSG. In meta-analysis, Hu et al.[13] compared LRYGB with LSG in terms of their early and late complications, postoperative weight loss, effects on comorbidities, and amount of weight loss. In this study, no significant difference was found between LSG and LRYGB in short-term results in terms of EWL%, but a significant difference was found in favor of LRYGB in terms of EWL% in mid-term results. When they evaluated the improvements of comorbidities, a significant superiority of LRYGB was found in all three comorbidities in early results, no significant difference was found between the two procedures in mid-term results, and a significant difference was found in favor of LRYGB in HT in long-term results. We did not detect a significant difference between the groups in terms of both EWL% and improvements of comorbidities in our study.

In morbidly obese individuals, Woelnerhanssen et al.[14] examined the relationship between weight, circulating adipokines, lipid profiles, and insulin sensitivity after LRYGB and LSG acccording to 1-year follow-up results. In this study, while no significant difference was found in total cholesterol values, a significant improvement in triglyceride, HDL, LDL values was detected in in both procedures. However, no significant difference was detected between the procedures. Benaiges et al.[15] evaluated the effects of two bariatric procedures (LSG and LRYGB) on lipid profiles at the end of the first year of follow-up. A significant increase in HDL value and a significant decrease in triglyceride value were found in both procedures,

Table 4. Comparison of LSG and LRYGB Groups: 6-month and 1-year results

	LSG	LRYGB	p
Delta fasting glucose (6 months)	4 (-6 - 16)	15 (-3 - 19)	0.226
Delta AST (6 months)	3 (-1 - 7)	3 (-1.5 - 5.5)	0.521
Delta ALT (6 months)	7 (1 - 16)	4 (1.5 - 9)	0.354
Delta BUN (6 months)	1.5 (-1.7 - 5)	1.7 (-1.9 – 4.8)	0.931
Delta Creatinine (6 months)	0.02 (-0.07 – 0.09)	0.09 (-0.03 – 0.15)	0.151
Delta HDL (6 months)	-9 (-15 - -1)	-7 (-12 - 1)	0.616
Delta LDL (6 months)	-6 (-25 - 14)	12 (6 - 30)	0.124
Delta cholesterole (6 months)	0 (-21 - 25)	18 (-11 - 33)	0.307
Delta trigliseride (6 months)	33 (11 - 81)	39 (5 - 92)	0.979
Delta TSH (6 months)	0.5 (0.1 – 0.94)	0.73 (0.06 – 1.76)	0.303
Excess weight loss (%)	68 (62 - 79)	61 (55 - 83)	0.346
EWL Success	40 (81.6%)	8 (61.5%)	0.146
Delta fasting glucose (1 year)	11 (3 – 23)	25 (5 - 83)	0.115
Delta AST (1 year)	3 (0 – 10)	1 (-2 – 5)	0.132
Delta ALT (1 year)	7 (0 – 19)	5 (1 - 12)	0.350
Delta BUN (1 year)	-2 (-7.8 – 5.3)	0 (-5.5 – 6.5)	0.697
Delta Creatinine (1 year)	0.02 (-0.06 – 0.11)	0.11 (0.03 – 0.24)	0.042
Delta HDL (1 year)	-12 (-19 - -6)	8 (22 - -6)	0.684
Delta LDL (1 year)	5 (-14 - 25)	17 (12 - 35)	0.078
Delta cholesterole (1 year)	2 (-16 - 34)	22 (8.5 - 37)	0.177
Delta trigliseride (1 year)	45 (18 - 100)	56 (14 - 117)	0.634
Delta TSH (1 year)	0.23 (-0.11 – 0.81)	0.55 (-0.95 – 1.29)	0.849
Excess weight loss (%)	92.2% (77 – 105.9)	94.3% (81.1 – 108.8)	0.659
EWL Success	44 (89.8%)	12 (92.3%)	0.999
Quitting DM medication (1 year)	21 (42.9%)	8 (61.5%)	0.230
Quitting HT medication (1 year)	13 (26.5%)	4 (30.8%)	0.739
Quitting HL medication (1 year)	15 (30.6%)	1 (7.7%)	0.154

"Delta" defines the change of the variable in 6 monts and 1 year period.
ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; HDL: high-density lipoprotein; LDL: low-density lipoprotein; BMI: Body Mass Index; DM: diabetes mellitus; HT: hypertension; HL: hyperlipidemia; EWL: Excess Weight Loss; TSH: thyroid stimulating hormone.

but a significant decrease in LDL and total cholesterol was found in the LRYGB procedure, while no significant change was found in the LSG procedure. In our study, no significant difference was found in terms of LDL value in both procedures, but significant improvement was found in both procedures in terms of HDL and triglyceride values. In terms of cholesterol values, the LRYGB procedure demonstrated a significant decrease in end of the first year, whereas the LSG procedure showed no significant change.

Rudnick et al.[16] evaluated the effect of LSG and LRYGB procedures on thyroid function in hypothyroid obese patients and found a significant decrease in TSH value in both procedures, without any difference between procedures. In 6 months results of our study there was a significant decrease in TSH values in both procedures while there was a significant decrease in only LSG group at 1st year follow-up. However, no significant difference was found when the procedures were compared in terms of TSH change.

In their study, Yang et al.[17] analyzed the effects of LRYGB and LSG on fasting levels of ghrelin, glucose, GLP-1, GLP-2, PYY, GIP, insulin, and glucagon in obese individuals and detected a significant decrease in fasting glucose in both procedures, but no significant difference between the procedures. We found a similar result in our study.

Retrospective design of the study, small patient population in LRYGB group, and comparison of just short-term outcomes might all be considered as limitations of this study.

Conclusion

Both LSG and LRYGB have effective results on weight loss at the sixth month and first year follow-up. Without superiority between them, both procedures revealed improvements in liver enzymes, lipid profile and thyroid function tests. Studies including larger patient groups and longer follow-up times are required.

Disclosures

Ethichs Committee Approval: Approval for the study was received from the ethics committee of University of Health Science Umraniye Traning and Research Hospital (15.05.2023/215591172).

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Conflict of Interest: None declared.

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Factors affecting the healing of arthroscopic microfracture and the role of MRI in follow-up: Talus osteochondral lesions

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ABSTRACT

Introduction: The aim of this study is to compare preoperative and postoperative clinical and radiological findings of patients with talus osteochondral lesion who underwent arthroscopic microfracture surgery.

Materials and Methods: Thirty-two patients who underwent arthroscopic treatment for talus osteochondral lesion between 2014-2017 at the Department of Orthopedics and Traumatology of a tertiary hospital were evaluated retrospectively. Preoperative and postoperative AOFAS and VAS scores were recorded, and the results were compared with demographic data. Twenty-four patients with magnetic resonance imaging were evaluated with the MOCART system. Results were compared with AOFAS, VAS scores, and demographic data.

Results: Of the 32 patients included in the study, 13 (40.6%) were male, and 19 (59.4%) were female. The mean body mass index (BMI) of the patients was 26.1 kg/m². In 14 (43.8%) patients, there was a history of trauma. The number of smokers was 12 (37.5%). Twelve (37.5%) patients had a BMI≤25 kg/m², and 20 (62.5%) patients had a BMI>25 kg/m². The mean age of the patients was 42.62 years. The mean follow-up period was 20.9 months. The mean MOCART value of the patients with MRI after surgery was 56.11.

Conclusion: It was found that there was no correlation between cartilage healing detected with MRI and clinical improvement, function, and patient satisfaction. The body mass indexes of the patients and smoking did not have a significant effect on the results.

Keywords: Arthroscopy, Microfracture, Osteochondral lesion, Talus

Introduction

Osteochondral lesions of the talus; these are the lesions of the talus on the joint surface of the ankle including the cartilage and subchondral bone. Talus osteochondral lesions are a common problem affecting many people every year, and many studies have been done for this problem.[1] Although its etiology has not been fully clarified, the most prominent etiological factor is trauma.[2]

Although direct radiography, computed tomography and magnetic resonance imaging can be used as imaging

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methods, magnetic resonance imaging is the most commonly used imaging method that provides the clearest information about the condition of the cartilage, the location, size and depth of the lesion.[3] In this study, in our patients with talus osteochondral lesions that we treated with arthroscopic microfracture between 2014-2017; it was aimed to evaluate the arthroscopic microfracture application, which is a bone marrow stimulation method, with many different parameters; if there is a post-operative correlation between the clinical conditions of the patients and MRI or not, and to determine the progression, pain, satisfaction, range of motion of the patients with functional and clinical scores.

Materials and Methods

In this study, patients who were operated on with the diagnosis of talus osteochondral lesion and received microfracture treatment in the Orthopedics and Traumatology Clinic of a tertiary hospital between 2014-2017 were evaluated retrospectively. The preoperative and postoperative Visual Analogue Scale (VAS), American Orthopedic Foot and Ankle Society Ankle-Hindfoot score (AOFAS) values of the patients were recorded, and Magnetic Resonance Observation of Cartilage Tissue (MOCART) scores were examined to evaluate the cartilage healing following the microfracture procedure. Thirty-two patients were included in the study. Patients with a previous operation history in the ankle joint, revision cases, and patients with advanced stage osteoarthritis were excluded from the study.

Arthroscopic microfractures were performed on all 32 patients (Fig. 1). The patients were followed up postoperatively at the 3rd, 6th, 12th month and annually after 12 months. The time elapsed between the last control of the patients and the date of surgery was considered the follow-up period. VAS and AOFAS values in the final postoperative evaluations of the patients were used in the study. MRI and the MOCART scoring system were used for clinical correlation and monitoring the healing of cartilage tissue.

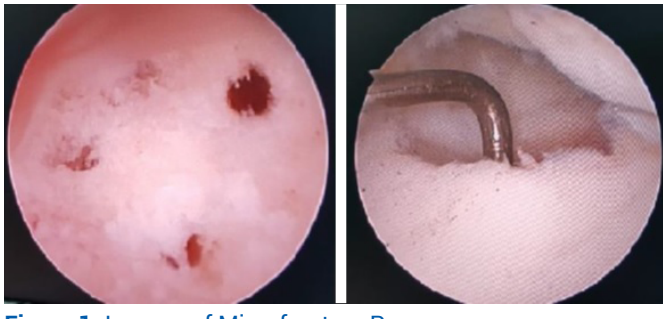

Figure 1. Images of Microfracture Process.

In our study, the IBM Statistical Package for the Social Sciences (SPSS) program was used to evaluate the statistical data. Descriptive statistical methods (frequency, mean, median), as well as the Mann-Whitney U test, were used to compare quantitative data between two groups. The Wilcoxon Signed Ranks Test was used to compare parameters within groups. Relationship analysis between parameters was performed using Spearman's Rho and Student's T correlation analysis. Results were evaluated at a 95% confidence interval and a $p<0.05$ was considered significant.

Results

Considering the inclusion and exclusion criteria, a total of 32 patients were included in our study. Of these, 13 were male (40.6%), and 19 were female (59.4%). The mean age of our patients was 42.62±12.87 years (range, 16-65). The mean body mass index of the patients was 26.1±3.88 kg/m² (range, 18-33.30). Fourteen patients (43.8%) had a history of previous trauma. Regarding the smoking habits of the patients; 12 patients (37.5%) were smokers, and 20 (62.5%) were non-smokers.

In 30 patients (93.8%), the lesion was medial, while in 2 (6.2%) the lesion was lateral. When the lesion locations are divided into 9 parts by numbering the talus from anteromedial to posterolaterally; 3 patients (9.4%) were in zone 1, 2 patients (6.3%) in zone 3, 20 patients (62.5%) in zone 4, 1 patient (3.1%) in zone 5, and 6 patients (18.8%) were in zone 7.

The mean follow-up period for the patients was 20.90±10.38 months (range, 12-56). The mean preoperative AOFAS score was 55.68±9.96 (range, 40-78) and the postoperative mean was 90.46±7.66 (range, 70-100), with a statistically significant difference ($p<0.05$).

The mean preoperative VAS score was 8.4±1.13 (range, 5-10) and the postoperative mean was 2.03±1.46 (range, 0-7), also showing a statistically significant difference ($p<0.05$).

Patients were divided into two groups based on their smoking status. The mean postoperative AOFAS score for the smoking group was 89.45±4.56 (range, 80-100), compared to 91.83±7.98 (range, 70-100) for the non-smoking group, with no significant difference ($p=0.424$). The mean postoperative VAS score was 1.72±1.09 (range, 0-3) in the smoking group, compared to 2±1.57 (range, 0-7) in the non-smoking group, again with no significant difference ($p=0.716$) (Table 1).

Table 1. Data by Demographic Groups

		Smoking		BMI				Trauma	
	All	+	-	≤25	>25	<30	≥30	+	-
PreOp VAS	8.4	8.1	8.5	8.75	8.2	8.4	8.1		
PostOp VAS	2.0	1.72	2.1	1.66	2.05	1.79	2.4	2.2	1.6
PreOp AOFAS	55.6	58	54.3	58	54.3	56.8	52.1	54.1	56.4
PostOp AOFAS	90.4	89.5	91.8	92.5	89.8	90.4	93.2	90.5	91.2

Twenty-four of the 32 patients (75%) followed up had an MRI examination at least 12 months after the operation date, and these patients were evaluated with MOCART. The mean MOCART values for these patients were 56.11±7.77 (range, 45-75).

The correlation between the patients' MOCART values, age, BMI, lesion size, AOFAS score, VAS score, and follow-up time was investigated using Spearman's Rho test. No significant correlation was detected with MOCART value and age (p=0.123), lesion diameter (p=0.97), follow-up time (p=0.173), BMI (p=0.238), AOFAS score (p=0.615), or VAS score (p=0.920).

Arthrosis development was detected in 2 of our patients (6.25%) in the postoperative period, and superficial soft tissue infection was detected in 1 patient (3.1%), who recovered with antibiotic treatment without the need for surgical intervention. One of the 2 patients who developed arthrosis in the ankle had mild symptoms and was managed with conservative treatment. Although surgical treatment was recommended for the other patient due to more severe symptoms, it was not performed as the patient refused the operation. Secondary arthroscopy was performed in 1 patient, where fibrous cartilage formation was observed (Fig. 2).

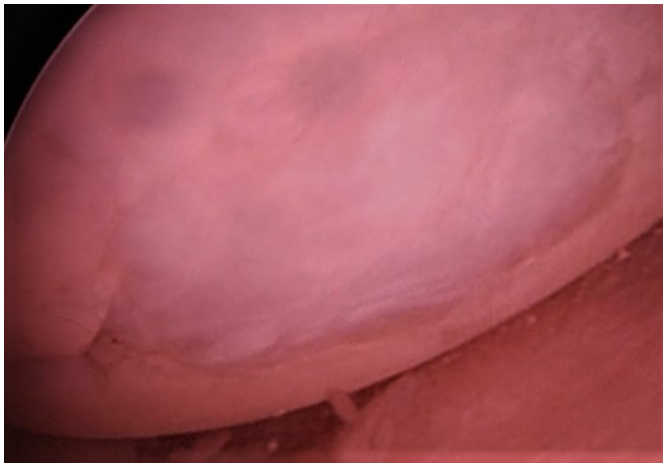

Figure 2. Arthroscopic View of Fibrous Cartilage Formation.

Discussion

Many studies have demonstrated significant increases in AOFAS values in patients with osteochondral lesions of the talus treated with microfractures.[4-8] Similarly, improvements in VAS scores have been reported with the microfracture method.[9,10] In our study, a significant increase in AOFAS values and a decrease in VAS values were observed.

Although there are studies indicating that body mass index does not affect the outcomes of microfracture,[4,7,11] Domayer et al.[12] reported worse outcomes in patients with a BMI>25 kg/m² and a significant correlation between BMI and clinical outcomes. In our study, patients were divided into groups based on a BMI of 25 kg/m², the upper limit of a healthy BMI, and a BMI of 30 kg/m², the threshold for obesity. In both divisions, no significant correlation was found between BMI and clinical outcomes. Based on our study and literature, limiting BMI in patient selection was not considered necessary.

The literature search revealed no studies on the relationship between smoking and the outcomes of microfracture treatment for talus osteochondral lesions. However, Balain et al.[13] investigated the impact of smoking on patient satisfaction and functional outcomes after knee microfracture and found that despite lower satisfaction levels in smokers, no significant difference was noted compared to non-smokers. Furthermore, no significant relationship was found between smoking and functional outcomes. Our study also found no significant difference between smoking and clinical outcomes. While direct comparisons with the literature are not possible, the detrimental effects of smoking on microcirculation and regeneration are known. To fully understand the relationship between smoking and outcomes, it would be necessary to isolate other variables that could affect results.

Canata et al.,[14] in their study, reported that the presence of trauma is one of the factors affecting outcomes in the microfracture method. Chuckpaiwong et al.,[15] investigating the results of the microfracture method applied to osteochondral lesions of the talus and the factors affecting these outcomes, found that past trauma negatively and significantly impacts results. Conversely, Choi et al.[11] reported that previous trauma does not significantly affect clinical outcomes. We divided our patients into two groups based on the presence of trauma and compared their AOFAS and VAS scores, finding that previous trauma did not significantly impact results. The literature presents conflicting views regarding the relationship between trauma and clinical outcomes, with the majority suggesting a negative effect of trauma on clinical results. Our study's limited patient number and the strong association between lateral lesions and trauma, considering only two patients had lateral lesions, could have influenced our findings. A more comprehensive study on this topic would be beneficial.

Aurich et al.[16] monitored patients with talus osteochondral lesions postoperatively using VAS, AOFAS, and MOCART and reported no correlation between MOCART and clinical outcomes. D'Ambrosi et al.,[17] comparing VAS, AOFAS values with radiography, CT, and MRI findings, also noted no significant relationship between MRI results and clinical outcomes. Our observations regarding MOCART are in line with the literature, indicating no correlation between postoperative MOCART values and clinical improvement or functional outcomes.

Conclusion

After the microfracture procedure for talus osteochondral lesions, no correlation was found between MRI-detected cartilage healing and clinical improvement, function, or patient satisfaction. The body mass indexes of patients did not significantly affect the outcomes. Smoking was shown to have no significant impact on the healing of microfracture in osteochondral lesions of the talus in terms of patient satisfaction and function.

Disclosures

Ethichs Committee Approval: This study was approved by Health Sciences University Izmir Bozyaka Training and Research Hospital Clinical Research Ethics Committee (Date: 18.04.2018, Number: 3).

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LESS

Original Article

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Colonoscopic perforation treatment results: Experience of 16.385 patients in a single center

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ABSTRACT

Introduction: Colonoscopy is the most frequently used procedure in the early diagnosis and treatment of many colon diseases, especially colon malignancies. With the increase in the use of colonoscopy, an increase in the number of colonoscopy-related perforations has been observed. This study aimed to determine the frequency of perforation and the management of colonoscopic perforation.

Materials and Methods: Patients who underwent colonoscopy between January 2012 and December 2022 and were determined to have iatrogenic colon perforation were included in the study. The dermographic characteristics of the patients, length of hospital stay, comorbidity status (defined using the guidelines of the American Society of Anesthesiologists), colonoscopy indications, diagnostic tool of perforation, treatment and follow-up methods were examined and collected.

Results: 16,385 patients were examined in the study cohort. Perforation was detected in a total of 12 (0.07%) patients, 8 women and 4 men. The average age of perforated patients was 62 (23-87) years. Eleven patients were treated with surgical intervention and 1 patient was treated with the endoscopic clip method. One patient died on the 20th day after surgery.

Conclusion: Although colonoscopic examination is important for the diagnosis and treatment of colon and rectal diseases, the possibility of procedure-related perforation should not be ignored. Early diagnosis enables minimal surgical procedures such as laparoscopic repair and endoscopic clip application. Immediate surgical management, preferably primary repair and sometimes resection, appears to be a good strategy for most patients.

Keywords: Colonoscopy, Endoscopic clip, Perforation

Introduction

A colonoscope is a flexible endoscope used to visualize the lumen of colon segments and, to some extent, the ileum. Dr. William Wolff and Dr. Hiromi Shinya developed the colonoscope in 1969, making it an important option for combating colon diseases.[1] Colonoscopy is the most frequently used procedure today for the diagnosis and treatment of colon diseases. It is the most critical step in the early identification and treatment of colon malignancies. With the widespread use of screening programs, along with colonoscopy, the recognition and treatment of colon pathologies have gained momentum. This has significantly affected the morbidity and mortality of patients.

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Perforation rates have also increased as a result of the widespread use of colonoscopy. This situation has made management equally important. A large population study showed that the incidence of colonoscopic perforation (CP) was 0.016%-0.095%.[2] Emergency surgery is the primary treatment method for patients with perforations due to colonoscopy. Considering the mortality and morbidity rates due to emergency surgery, non-surgical methods (endoluminal clip application and conservative treatment with intravenous antibiotics) have been tried in treatment protocols for these patients, but there is no standardized treatment method yet.[3-5] In this study, we aimed to retrospectively examine iatrogenic colon perforations due to colonoscopy.

Materials and Methods

Patients with colon perforation due to colonoscopy performed at Tokat Gaziosmanpaşa University Hospital between January 2012 and December 2022 were examined, and a prospective database was created. Patients with missing data and those under the age of 18 were not included in the study.

An average of 2000 colonoscopy patients are seen annually at our department. Appointments are made during outpatient examinations. The endoscopy nurse verbally and in writing informed the patients about how bowel preparation would be performed. Colonoscopic examinations are performed in the surgical endoscopy unit of our hospital by general surgeons and at least three-year senior residents under the supervision of faculty members. All patients underwent colonoscopy using the same Olympus device (serial number: CF-H170L). A low-fiber diet was recommended 72 hours before the procedure for bowel cleansing. A sample written form for the recommended diet was provided. As in our routine practice, 2 solutions (150 ml, 300 mg each) containing sennoside A+B calcium were prescribed, along with written instructions for using the medication. All patients signed a detailed informed consent form before the procedure.

The demographic characteristics of the patients, length of hospital stay, comorbidity status (defined using the guidelines of the American Society of Anesthesiologists), colonoscopy indications, diagnostic tools of perforation, treatment, and follow-up methods were examined and recorded.

Statistical Analysis

Statistical analyses of the data obtained in our study were performed using the SPSS package program (Version 22.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were presented as numbers (n) and percentages (%) for categorical variables.

Results

A total of 16.385 patients who underwent colonoscopy were included in the study. Of these cases, 49.8% were female, and 50.2% were male. The average age was 54 years (range 18-95 years). Perforation was detected in a total of 12 (0.07%) patients, 8 women and 4 men. The average age of the patients with perforations was 62 years (range 23-87 years). The indications for colonoscopy in patients diagnosed with perforation were anemia in 4 patients, positive fecal occult blood in 3 patients, and constipation, bloating, and difficulty in defecation in 5 patients. Colon perforation was diagnosed in the early period (within 6 hours) after the colonoscopy procedure in 11 patients, and 48 hours after the procedure in 1 patient. Perforation occurred during polypectomy in 1 patient. Two of these patients were diagnosed with colon cancer during colonoscopy. Three patients used corticosteroids due to different diseases (Table 1).

In 5 (41%) cases, the diagnosis was made by the endoscopist when extra-intestinal intra-abdominal structures were seen during the colonoscopy procedure, and these patients were operated on the same day. Most perforations (n=5, 41%) occurred in the sigmoid colon, with 3 (25%) occurring in the descending colon, 2 (16%) in the transverse colon, and 1 each (8%) in the cecum and rectum. Eleven patients underwent surgery, while 1 patient was treated by placing an endoscopic clip in the perforation area.

Primary repair was the most common surgical procedure, performed in 6 of the perforations (54%). In 5 of these patients, the surgery began laparoscopically, and in 1 patient, the perforation was repaired by converting to the open method due to widespread adhesions. Resection-anastomosis was performed in a total of 3 patients, including 2 in whom a mass was detected in the colon. Two patients underwent the Hartmann procedure. A total of 2 patients had peritoneal contamination.

Complications developed in the postoperative period in 4 of the 11 operated patients (36.3%). One patient underwent reoperation due to anastomotic leakage and the

Table 1. Demographic and clinical characteristics of the patients, preoperative evaluation

Patient	Age	Gender	Comorbid Disease	ASA Score	Colonoscopy Indications	History of Colon Malignancy
1	87	F	CVD, HT, Cirrhosis	ASA 4	FOBT Positivity, Rectal Bleeding	No
2	65	F	Rheumatoid Arthritis, HT, DM	ASA 3	Constipation	No
3	71	M	Parkinson's Disease	ASA 3	Constipation	No
4	68	M	HT, Hyperthyroidism	ASA 3	Anemia	No
5	64	M	HT, OSAS	ASA 3	Constipation Anemia	No
6	62	F	Asthma, Arthritis	ASA 2	Constipation	No
7	61	F	Asthma, Ankylosing Spondylitis	ASA 3	FOBT Positivity Anemia	No
8	55	F	Cervical Cancer, Asthma, HT	ASA 4	Constipation	No
9	23	F	No	ASA 1	Swelling	No
10	72	M	HT, CRF	ASA 2	FOBT Positivity Rectal Bleeding	No
11	58	F	DM, HT, Bipolar Disorder	ASA 2	Abdominal Pain	No
12	59	F	Raynaud's Phenomenon, CHF	ASA 3	Anemia	No

ASA: American Society of Anaesthesiologists; CVD: Cerebral Vascular Disease; HT: Hypertension; FOBT: Fecal Occult Blood Test; DM: Diabetes Mellitus; OSAS: Obstructive Sleep Apnoea Syndrome; CRF: Chronic Renal Failure; CHF: Chronic Heart Failure.

Hartmann procedure was performed. A pelvic abscess developed in 1 patient and was drained with percutaneous abscess drainage. A superficial wound infection developed in the incision area in 1 patient, and relaparotomy was performed in 1 patient due to evisceration. Death occurred on the 20th postoperative day in 1 patient (8.3%) who was diagnosed with cirrhosis and underwent laparoscopic primary repair. The average hospital stay for patients with perforation was 8 days (median 5 days, range 6-20 days) (Table 2).

Discussion

Colonoscopic examination is very common in the diagnosis and treatment of colon and rectal diseases. In recent years, with the increase in screening programs, the number of patients having colonoscopies has significantly risen. Consequently, there is an increase in the number of complications arising from colonoscopy. Although the frequency of perforations due to colonoscopy is low, these are important complications that require surgery if they occur and have high morbidity and mortality rates.[5]

The frequency of colonoscopy-related perforations is influenced by many factors, such as the center where the procedure is performed and the experience of the person performing the procedure. Colonoscopy-related complications can occur between 0.03% and 0.8% in diagnostic colonoscopies and between 0.3% and 3% in therapeutic colonoscopies.[6-8] In our study, our perforation rate was observed at 0.07% and is comparable in the literature.

According to a retrospective study conducted by a large center, which included 165 colonoscopy-related perforations, perforations were most commonly found in the rectosigmoid region at a rate of 53%. The cecum followed this at 24%, and the ascending and descending colon at 9%.[9] Another large-scale study observed that 52% of perforations due to colonoscopy occurred most frequently in the rectosigmoid corner and sigmoid colon. This study also showed that the frequency of colonoscopy-related perforations in other colon segments was 17% in the cecum, 14% in the ascending colon, 7% in the transverse

Table 2. Colon segments where perforations occur due to colonoscopy, diagnostic methods, hospital or intensive care unit stays, postoperative complications

Patient	Perforation Area	Diagnostic Method	Surgical Procedure	Hospital Stay Duration (Days)	Intensive Care Hospitalization Duration (Days)	Complication	Mortality
1	Sigmoid Colon	Direct Examination	Laparoscopic Primary Repair	5	15	Wound Infection	Yes
2	Sigmoid Colon	Direct Examination + X-ray	Laparoscopic Primary Repair	6	-	No	No
3	Descending Colon	Direct Examination	Resection-anastomosis	5	2	Anastomotic Leak	No
4	Sigmoid Colon	Ct	Hartman	3	-	No	No
5	Transvers Colon	Direct Examination	Laparoscopic Primary Repair	7	1	Wound Infection	No
6	Cecum	Direct Examination + X-ray	Laparoscopic Primary Repair	5	3	No	No
7	Descending Colon	Direct Examination + X-ray	Laparoscopic Primary Repair	9	1	No	No
8	Rectum	X-ray	Resection-anastomosis	1	6	Evisceration	No
9	Sigmoid Colon	Direct Examination	Endoscopic Clips	8	-	No	No
10	Sigmoid Colon	Direct Examination + X-ray	Hartman	7	1	No	No
11	Descending Colon	Direct Examination	Resection-anastomosis	8	2	No	No
12	Transvers Colon	Direct Examination + X-ray	Primary Repair	9	1	No	No

colon, 8% in the descending colon, and 1% in the rectum.[10] In our series, 41.6% of the colonoscopic perforations occurred in the sigmoid colon and 25% in the descending colon. It occurred with decreasing frequency in the transverse colon, cecum, and rectum.

Perforations due to colonoscopy can be quickly detected at the time of the procedure when a full-thickness defect in the colon wall and/or intraperitoneal fat and internal organs are visualized. Most other patients present within the first 24 hours. The time of the procedure, physical examination, and the clinician's suspicion are crucial for diagnosis. Persistent abdominal pain and bloating after colonoscopy should prompt consideration of perforation. Therefore, perforation due to colonoscopy should be promptly considered, and the necessary examinations should be conducted as quickly as possible.[11]

The presence of perforations due to colonoscopy and extraluminal free air on a standing abdominal radiograph are largely diagnostic. Computerized tomography may be necessary for patients with a negative or suspicious outpatient direct abdominal radiograph. In addition to diagnosing colonoscopic perforation, computed tomography can also localize the perforation site.[12] In our study, 5 (41%) patients were diagnosed with perforation and underwent emergency surgery because intra-abdominal fat tissue and organs were seen during the procedure. Another 5 (41%) patients experienced persistent abdominal pain and bloating. Patients presenting with signs of an acute abdomen on physical examination and detection of free air on standing abdominal radiography were taken

for surgery. One patient (8%), with clinically unclear perforation findings, was taken for surgery after the perforation was confirmed on contrast-enhanced abdominal computed tomography, due to inadequate findings from direct examination and standing direct abdominal radiography.

The risk of colonoscopy-related perforation increases with factors such as advanced age, female gender, intra-abdominal adhesions from previous surgeries or other causes, and the experience of the endoscopist.[13-15] The frequency of colonoscopy-related perforations also varies by gender, partly because the colon is longer in women and the transverse colon is more mobile, making the procedure more difficult and risky for them.[16] Consistently, in our study, the number of perforations due to colonoscopy was higher in female patients.

Morbidity and mortality rates of colonoscopic perforations have been observed to be 31-48.7% for morbidity and 8.2-25.6% for mortality.[17,18] In this study, the morbidity and mortality rates were found to be 33.3% and 8.3%, respectively, aligning with previous reports.

Although surgical treatment is definitive for patients with perforation due to colonoscopy, the morbidity, mortality, and potential complications related to general anesthesia during and after surgery must not be overlooked. Laparoscopic surgery, being less invasive, allows patients a quicker return to daily life postoperatively.[19] Nevertheless, traditional open surgery remains an indispensable option. Some studies have also utilized non-surgical methods. Endoscopic clip application has gained popularity, especially for patients diagnosed at the time of the procedure, with small perforations, and without intra-abdominal contamination.[20] In our series, almost half of the surgeries were performed using the laparoscopic method, and in one patient, we successfully performed a perforation repair using the endoclip method.

Conclusion

Although colonoscopic examination is important for the diagnosis and treatment of colon and rectal diseases, the possibility of procedure-related perforation should not be overlooked. Appropriate diet programs and colon cleansing before the procedure are crucial for its success and the prevention of potential complications. Early diagnosis permits minimal surgical interventions such as laparoscopic repair and endoscopic clip application. Immediate surgical management, preferably primary repair and occasionally resection, seems to be an effective strategy for most patients.

Disclosures

Ethichs Committee Approval: Ethics committee approval was not obtained for the retrospective study. However, the study was conducted in accordance with the principles of the Declaration of Helsinki.

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Evaluation of colonoscopy indications and the association with malignancy in patients aged 75 and over

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ABSTRACT

Introduction: Colonoscopy is the gold standard for early diagnosis of colorectal cancer. Screening programs are recommended for individuals between the ages of 45-75. In this study, we aimed to evaluate the relationship between indications for colonoscopy and malignancy in patients aged 75 and above.

Materials and Methods: Between 2021 and 2023, 12,416 colonoscopic procedures performed in our endoscopy unit were retrospectively analyzed. Of these, 946 were patients aged 75 and over. After excluding those with inaccessible data, incomplete colonoscopies, or a history of colorectal cancer/polyps, 398 were included in the study. Symptoms were categorized as follows: macroscopic bleeding, anemia, changes in bowel habits, suspicion of malignancy, weight loss, and non-specific symptoms. Rates of malignancy were subsequently determined.

Results: The median age of all patients was 77 years (minimum: 75, maximum: 97), with 51.3% being male. Macroscopic bleeding was the most common symptom at 29.9%, followed by changes in bowel habits (28.6%), anemia (25.1%), non-specific symptoms (7.8%), suspicion of malignancy (6.5%), and weight loss (3.3%). Malignancy was detected in 10.8% of patients, with 55.8% of those diagnosed being female. The most prevalent symptom among these patients was macroscopic bleeding (44.2%), then anemia (25.6%), bowel habit changes (2%), suspicion of malignancy (14%), non-specific symptoms (4.7%), and weight loss (2.3%). Macroscopic bleeding (p=0.030) and suspicion of malignancy (p=0.037) were statistically significant in predicting malignancy, whereas the other symptoms were not.

Conclusion: Colonoscopy can be safely performed in patients aged 75 and over. It is particularly critical for patients presenting with macroscopic bleeding and suspicion of malignancy. However, the utility of colonoscopy for other symptoms warrants further evaluation.

Keywords: Colonoscopy, colorectal cancer, elderly patients, macroscopic bleeding, suspicion of malignancy

Introduction

Colorectal cancer (CRC) ranks as the third most common cancer globally and stands as the second leading cause of cancer-related mortality.[1] Worldwide, life expectancies are increasing with advancements in modern medical technology. As age progresses, the incidence of colorectal cancer also increases. Early diagnosis and treatment significantly improve the prognosis of patients.

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Colonoscopy stands as the gold standard for the endoscopic evaluation of the colon and rectum.[2] This procedure is utilized across a spectrum of clinical indications, from the early detection of colorectal cancer to the diagnosis and treatment of polyps. Therefore, its adoption as a screening method for specific risk groups is of paramount importance. In the latest guidelines published by the American Cancer Society, the recommended age for CRC screening has been lowered from 50 to 45. This screening program concludes at the age of 75. However, a consensus on the indications and frequency of screening for individuals aged 75 and above has not yet been fully established.[2]

The importance of regular screening in individuals over the age of 75 is being emphasized.[3] Yet, routine colonoscopy application in this demographic is critiqued due to the risks of complications, such as perforation, bleeding, and cardiopulmonary events, as well as the risks associated with general anesthesia.[4] Therefore, indications for colonoscopy in those over the age of 75 should be personalized, taking into account life expectancy, comorbid conditions, previous screening history, and patient preferences. High-risk groups, such as symptomatic patients (e.g., changes in bowel habits, rectal bleeding, or iron deficiency anemia) and those with a family history, should be carefully evaluated and given priority.[2]

This article aims to optimize our practice of colonoscopy in this critical age group by exploring the indications, applicability, and outcomes of colonoscopy in individuals aged 75 and over.

Materials and Methods

Between the years 2021 and 2023, 12,416 colonoscopic procedures performed in our hospital's endoscopy unit were retrospectively reviewed. A total of 946 patients aged 75 and above were identified.

Patients were categorized into six groups based on the presence of macroscopic bleeding, anemia, changes in bowel habits, suspicion of malignancy, weight loss, and non-specific symptoms. Data were recorded in a binary fashion as present or absent. All complaints of the patients were considered during data processing.

Radiological imaging findings, such as increased wall thickness and/or surrounding tissue inflammation, as well as elevated CEA levels, were regarded as suspicious for malignancy. Symptoms such as abdominal pain, bloating, and indigestion were classified as non-specific symptoms.

Bowel preparation in patients undergoing colonoscopy was achieved with two doses of oral laxatives the day before the procedure and two rectal enemas administered on the morning of the procedure. Standard colonoscopy equipment (Fujifilm, EC-600WM, Tokyo, Japan) was utilized. During the procedure, patients were administered 1 mg/kg of midazolam and 0.5 mg/kg of meperidine.

Patients whose data were inaccessible, who could not undergo a total colonoscopy for any reason, or whose examination was reported as insufficient due to uncleanliness, were excluded from the study. Additionally, patients with known malignancies, those who had undergone surgery for colorectal cancer, and those under surveillance due to a history of polyps, were also excluded. Of the remaining patients, 70 underwent colonoscopy due to positive fecal occult blood test (FOBT) results. Comparative analysis could not be conducted for patients with negative FOBT results due to a lack of data. The incidence rate of malignancy in patients with positive FOBT results was presented as a percentage.

All statistical analyses were performed using the SPSS software, Windows version 25.0 (SPSS Inc., Chicago, IL, USA). The normality of data distribution was assessed using the Shapiro-Wilk and Kolmogorov-Smirnov tests. For non-normally distributed data, median and min-max values were used. Data were also expressed numerically (n) and as percentages (%). Categorical variables were compared using the chi-square test. All statistical calculations were two-tailed, and a p-value of $<.05$ was considered statistically significant within a 95% confidence interval.

Results

The data of 398 patients were statistically evaluated in the study. The ages of the patients were not normally distributed. The median age of all patients was found to be 77 years (minimum: 75, maximum: 97). Of the patients, 51.3% were male (n=204), and 48.7% were female (n=194) (Table 1). Colonoscopy was performed on 29.9% (n=119) of patients due to macroscopic bleeding; 25.1% (n=100) due to anemia; 28.6% (n=114) due to changes in bowel habits; 6.5% (n=26) due to suspicion of malignancy; 7.8% (n=31) due to non-specific symptoms; and 3.3% (n=13) due to weight loss (Table 2).

Malignancy was detected in 10.8% (n=43) of the patients. The median age of patients diagnosed with malignancy was 76 years (minimum: 75, maximum: 88), while in patients without detected malignancy, it was 77 years (minimum: 75, maximum: 97) (Table 1).

Table 1. Distribution of colonoscopy findings by sex and age in patients aged 75 and over

	Benign or Non-Pathologic		Malignancy		All patients	
	n	%	n	%	n	%
Sex						
Male	185	52.1	19	44.2	204	51.3
Female	170	47.9	24	55.8	194	48.7
Age (Median/Min-Max)	77 (75-97)		76±3 (75-88)		77 (75-97)	

Table 2. Indications for colonoscopy in patients aged 75 and over

	Count	Column, n (%)
Macroscopic Bleeding	119	29.9
Anemia	100	25.1
Changes in Bowel Habits	114	28.6
Non-spesific Symptoms	31	7.8
Weight Loss	13	3.3
Suspicion of malignancy	26	6.5

Of the patients diagnosed with malignancy, 55.8% were female (n=24). Furthermore, among the 43 patients diagnosed with malignancy, the rate of macroscopic bleeding as a symptom was 44.2% (n=19); anemia was 25.6% (n=11); changes in bowel habits were 2% (n=9); suspicion of malignancy was 14% (n=6); non-specific symptoms were 4.7% (n=2); and weight loss was 2.3% (n=1) (Table 3).

The statistical analysis revealed that the presence of macroscopic bleeding (p=0.030) and suspicion of malignancy (p=0.037) were statistically significant symptoms in the detection of malignancy. On the other hand, the presence of anemia (p=0.942), changes in bowel habits (p=0.236), weight loss (p=0.713), and non-specific symptoms (p=0.416) were not found to be significant in the detection of malignancy (Table 3).

Malignancy was detected in 3 of the 70 patients with a positive FOBT, accounting for 4.2%.

Discussion

Our study examined the indications and outcomes of colonoscopy in a high-risk group aged 75 and above. It was observed that colonoscopies performed due to macroscopic bleeding and suspicion of malignancy were significant in the detection of malignancy. It was determined that other indications were not significant in the detection of malignancy. According to the recommendations of the American Cancer Society, the routine colonoscopy screening program consists of starting at age 45 and then proceeding with a high-sensitivity, guaiac-based fecal occult blood test annually; a multitarget stool DNA test every 3 years; a colonoscopy every 10 years; computed tomography colonography every 5 years; and flexible sigmoidoscopy every 5 years. The screening program concludes at age 75.[2]

While digital colon radiography and CT colonography can be used in colorectal cancer screening and polyp diagnosis, colonoscopy remains the gold standard as it provides simultaneous diagnostic and therapeutic opportunities. Complications such as perforation and bleeding related to the procedure, and morbidity associated with premedication and sedation, can be observed in colonoscopy. It is believed that in the elderly population, comorbid diseases may increase the risk associated with the procedure.[4] This situation necessitates the need for the procedure to be performed on selected patients.

In our study, no secondary complications were observed following colonoscopy. In a multicenter study, bleeding, one of the most significant complications post-colonoscopy, was seen in 0.13% of patients, and all were controlled endoscopically.[5] The same multicenter study reported no occurrences of post-colonoscopy perforation.[5] Another study found the rate of post-colonoscopy perforation to be 0.02%.[6] When considering the rate of complications in the literature, the absence of complications in our study could be attributed to the limited number of patients.

Increased age during the colonoscopy preparation phase can be associated with increased renal and cardiac dysfunction following the preparatory procedure. It has been indicated that the most challenging part of

Table 3. Association of colonoscopy indications with benign or non-pathologic and malignancy outcomes

Symptom	Benign or Non-Pathologic		Malignancy		p
	n	%	n	%	
Macroscopic Bleeding					
No	255	71.8	24	55.8	0.030[a]
Yes	100	28.2	19	44.2	
Anemia					
No	266	74.9	32	74.4	0.942
Yes	89	25.1	11	25.6	
Changes in Bowel Habits					
No	250	70.4	34	79.1	0.236
Yes	105	29.6	9	20.9	
Suspicion of Malignancy					
No	335	94.4	37	86.0	0.037[a]
Yes	20	5.6	6	14.0	
Non-spesific Symptoms					
No	326	91.8	41	95.3	0.416
Yes	29	8.2	2	4.7	
Weight Loss					
No	343	96.6	42	97.7	0.713
Yes	12	3.4	1	2.3	

[a]Statistically significant difference at the confidence level of 0.95.

the colonoscopy process for patients in this age group is the bowel preparation phase.[7] In our study, no adverse events related to the bowel preparation process were detected.

In our study, the rate of malignancy detection in patients over 75 years of age was 10.8%. This rate varies in the literature. In a study conducted with patients over the age of 80 by Bat et al.,[8] the rate was 28.7%, while Sardinha et al.[9] found it to be 4.5% in the same age group. The higher rate of malignancy detection in our study could be due to the inclusion of a younger age group. David et al.[10] reported that significant malignancy was not detected in patients over 75, concluding that screening in this demographic may not be meaningful.

In the study by Sardinha et al.,[9] the most common colonoscopy indications were changes in defecation, bleeding, and abdominal pain, with bleeding being the symptom most associated with a cancer diagnosis (11.5%). Apart from this symptom, malignancy was detected in 2 patients, and it was suggested that flexible sigmoidoscopy and double-contrast barium enema might be used for diagnosis. Similarly, in our study, the most frequent indications for colonoscopy were macroscopic bleeding, anemia, and changes in bowel habits, with macroscopic bleeding being the most related to malignancy, along with suspicion of malignancy.

Stevens and Burke included patients aged 50 to 100 in their study, but only 6% (n=53) were over 80. Their definition of "symptomatic patient" was limited to those with abdominal pain and changes in bowel habits, excluding anemia, occult blood loss, or macroscopic bleeding.[11] In contrast, our study focused solely on patients over 75, with the most common malignancy-related indications being macroscopic bleeding and suspicion of malignancy.

A multicentric study involving 1,199 patients is one of the most comprehensive on colonoscopy outcomes in the elderly. It categorized patients as symptomatic and asymptomatic, finding that the diagnostic yield was low in the asymptomatic group but beneficial in cases of macroscopic bleeding, positive occult blood, and changes in defecation. The study reported a low complication rate of

0.6% for colonoscopies in the advanced age group but did include patients with a history of polyp follow-up, which was the most frequent indication.[12] Our study excluded patients undergoing polyp follow-up to prevent skewing the results. Consistent with the literature, macroscopic bleeding was associated with malignancy detection. However, no significant findings were observed for positive occult blood, possibly due to the small number of affected patients. Notably, our study found a high rate of malignancy detection in colonoscopies prompted by suspicion of malignancy, an indication not commonly mentioned in similar studies. We defined suspicion of malignancy as increased wall thickness and/or inflammation in surrounding tissues on radiological imaging, or elevated CEA levels, which yielded significant results in malignancy detection, potentially contributing to the literature.

The limitations of our study include its retrospective nature, reliance on file review, and a limited patient sample, restricting our evaluation of outcomes related to symptoms like positive occult blood and weight loss. We also could not ascertain if patients had undergone previous colonoscopies or the timing of their last endoscopic examination.

Conclusion

Based on our review of colonoscopy outcomes in patients over the age of 75, we can conclude that colonoscopy is a safer procedure for this population than previously thought, as evidenced by the lack of complications in our study. Our findings support the use of colonoscopy for diagnosis and treatment in elderly patients who present with macroscopic bleeding and suspicion of malignancy. Furthermore, the relative absence of significant findings in individuals over 75 with non-specific symptoms suggests that the role of colonoscopy in this subset of patients may need to be reassessed.

Disclosures

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LESS

Original Article

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Results of upper gastrointestinal endoscopy conducted at a state hospital

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ABSTRACT

Introduction: This study aimed to analyze upper gastrointestinal system endoscopic examination findings from September 2021 to July 2022 at a state hospital.

Materials and Methods: Sedated endoscopic examinations were conducted in the general surgical endoscopy unit, with retrospective evaluation of findings.

Results: Among the patients, 272 (61.1%) were male and 173 (38.9%) were female. Common diagnoses included Duodenal ulcer (16.9%), Esophagitis (16.2%), Pangastritis (12.6%), Alkaline reflux (11.5%), Hiatal hernia (11.0%), Gastric polyp (7.6%), Gastric cancer (7.4%), Antral gastritis (6.5%), Gastric ulcer (6.1%), and Pyloric stenosis (2.5%).

Conclusion: Esophagogastroduodenoscopy, a well-tolerated diagnostic procedure under sedation with minimal complications, is increasingly important in smaller, resource-limited hospitals. Its widespread use by healthcare professionals in such settings is crucial for diagnosing and treating patients.

Keywords: Endoscopy, Upper gastrointestinal system, Stomach

Introduction

Endoscopy plays a crucial role in the diagnosis and treatment of complex pathologies and has emerged as a preferred method for managing many diseases.[1] The advancement of endoscopic procedures has enhanced the feasibility of diagnostic and therapeutic interventions, establishing endoscopy as the primary modality for diagnosing and treating a wide range of diseases.[2]

The introduction of fiberoptic endoscopes for upper gastrointestinal system endoscopy in the late 1950s marked a significant milestone. This innovation provided the first opportunity for direct visualization of the esophagus, stomach, and duodenum in a live setting. Initially, patients undergoing this procedure often presented with severe symptoms such as bleeding, obstruction, and pain, frequently associated with cancer.[3] Since the mid-1990s, technological advancements have significantly increased the safety and prevalence of its use.

Upper gastrointestinal system endoscopy can be performed by both gastroenterologists and general surgeons. The increasing incidence of malignancies, the rise in Helicobacter Pylori prevalence, and the evolution of more fre-

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quent and widespread screening programs in our country have led to a heightened demand for endoscopy.[4]

This study aims to evaluate the endoscopic and pathological diagnoses of cases undergoing upper gastrointestinal system endoscopy and biopsy at the surgical endoscopy unit of a state hospital in Van.

Materials and Methods

This study included cases that underwent upper gastrointestinal system endoscopy and biopsy at the surgical endoscopy unit of a state hospital from September 2021 to July 2022. We retrospectively reviewed the age, gender, complaints, endoscopic diagnoses, and results of pathological evaluations of these cases, using the hospital information system records. All upper gastrointestinal system endoscopy procedures in this unit were performed by a single surgeon with extensive endoscopic experience. These procedures were conducted after an eight-hour fasting period and under sedation analgesia.

Statistical Analysis

For the statistical analysis of the data, we used the Statistical Package for the Social Sciences (SPSS) version 25.0. Categorical measurements were summarized as numbers and percentages. Continuous measurements were presented as mean and standard deviation, and where necessary, median and minimum-maximum values were also included. The chi-square test was applied to compare categorical variables. The Shapiro-Wilk test was utilized to assess whether the parameters in the study followed a normal distribution. For parameters that did not follow a normal distribution, the Mann-Whitney U test was employed. A significance level of 0.05 was set for all tests.

Results

The study encompassed patients aged between 31 and 94 years, with an average age of 62.9±11.7 years. Among these patients, 272 (61.1%) were male, and 173 (38.9%) were female. The most common diagnostic findings were as follows: Duodenal ulcer in 75 patients (16.9%), Esophagitis in 73 patients (16.2%), Pangastritis in 56 patients (12.6%), Alkaline reflux in 51 patients (11.5%), Hiatal hernia in 49 patients (11.0%), Gastric polyp in 34 patients (7.6%), Gastric cancer in 33 patients (7.4%), Antral gastritis in 29 patients (6.5%), Gastric ulcer in 27 patients (6.1%), and Pyloric stenosis in 11 patients (2.5%).

Discussion

Endoscopic examination has become an effective method for evaluating symptoms of the upper gastrointestinal system (GIS).[5] This approach not only aids in identifying the causes of gastrointestinal symptoms[6] but also serves therapeutic purposes. These include controlling variceal and non-variceal bleeding, dilating strictures, removing foreign bodies, palliating advanced malignancies with stent placement or tumor ablation, and inserting percutaneous gastrostomy tubes.[7]

Peptic ulcer disease is a significant public health concern. In Western societies, its point prevalence ranges between 1.5-2.5%, and it is expected to be higher in low socioeconomic communities.[8] A study in the Netherlands found gastric ulcers at a rate of 1.8% and duodenal ulcers at 2.1%,[9] while a study in Cuba reported 15.8% for duodenal ulcers and 6.2% for gastric ulcers.[10] Our study showed rates of 16.9% for duodenal ulcers and 6.1% for gastric ulcers, aligning with the literature from a socioeconomic perspective.

Endoscopic esophagitis is detected in 30-70% of symptomatic cases. A survey in our country reported that 3.1% of participants experienced continuous, 22.6% frequent, and 46.3% occasional reflux symptoms.[11] Ayar Y. and colleagues, in a study conducted in Bayburt, reported esophagitis in 8% of cases undergoing upper gastrointestinal endoscopy.[12] Mungan and colleagues, in a 1999 study involving 585 participants from Istanbul, Erzurum, Diyarbakir, and Malatya, stated that 3.1% had continuous, 22.6% frequent, and 43.6% occasional pyrosis and/or regurgitation.[6] In our study, esophagitis was detected in 16.2% of cases.[7] Although our study was conducted in a similar geographic area, our finding is somewhat higher, suggesting regional variations or differences in study methodologies.

The prevalence of gastritis varies significantly across different regions and studies. In a study by Galban et al. in Cuba, gastritis prevalence was found to be 91.6%.[10] At Zonguldak Karaelmas University in our country, gastritis was detected in 78% of cases,[13] while at Osmangazi University, the rate was 23%.[14] In the Diyarbakir region, the prevalence was 13%.[15] In our study, we encountered pangastritis in 12.6% and antral gastritis in 6.5% of cases. Although these rates are lower compared to some literature, they align with expectations when considering regional dietary habits and geography.

Alkaline reflux gastritis incidence varies, with estimates ranging from 5% to 35% in patients who have undergone operations affecting pyloric sphincter functions. Other authors have estimated a 3% incidence in patients post-gastrectomy.[16] In Erzurum, alkaline reflux gastritis was found in 8.2% of 106 cases.[17] In Adapazari Akyazi, the incidence was 7% in women and 8.5% in men for alkaline antral gastritis, and 3.5% in women and 2.8% in men for alkaline pangastritis.[18] In our study, alkaline reflux gastritis was observed in 11.4% of male patients and 11.6% of female patients, totaling an 11% incidence, with none having a history of gastric surgery.

The detection of gastric and duodenal polyps has increased with the widespread use of upper endoscopy, identified in 6% and 4.6% of patient examinations, respectively.[19] These polyps can be either neoplastic or non-neoplastic. In our study, gastric polyps were detected in 7.6% of cases, and duodenal polyps in 1.1%.

Regarding esophageal and gastric cancers; in our country, the incidence was 0.33% for esophageal cancer and 1.75% for gastric cancer in endoscopy patients.[20] In Erzurum, gastric cancer was detected at a rate of 6.5% and esophageal cancer at 3.1%,[17] while in Diyarbakir, the rates were 2.1% for gastric cancer and 0.38% for esophageal cancer.[15] In our research, gastric cancer was observed at a rate of 7.4%, and esophageal cancer at 0.2%. The high incidence of stomach cancer in our region is likely linked to dietary habits, while the low incidence of esophageal cancer could be attributed to the study's short duration and the limited number of cases. A study in the Netherlands found a 1.3% incidence of esophageal cancer.[21]

In conclusion, esophagogastroduodenoscopy (EGD) is a well-tolerated diagnostic procedure when performed under sedation, presenting minimal complications. The widespread implementation of endoscopic procedures, particularly in smaller and remote hospitals with limited resources, is crucial. This approach enables healthcare professionals to play a significant role in the timely diagnosis and effective treatment of patients with various gastrointestinal conditions. The accessibility and reliability of EGD make it an invaluable tool in both urban and rural healthcare settings, contributing to improved patient outcomes and the efficient management of gastrointestinal diseases.

Disclosures

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LESS

Original Article

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Evaluation of the incidence and risk factors of early symptomatic cholelithiasis following obesity surgery in Turkish patients

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ABSTRACT

Introduction: Obesity is a serious public health issue. According to 2016 data from the Turkish Statistical Institute, 15.2% of males and 23.9% of females aged 15 years or older were detected to be obese in Türkiye. The reason obesity alone is a health problem is that it is accompanied by comorbidities such as diabetes, hypertension, and chronic obstructive pulmonary disease.

Materials and Methods: Data of 294 patients admitted to our hospital with a body mass index (BMI)>40 kg/m^2 who underwent laparoscopic sleeve gastrectomy between January 2015 and December 2020 were retrospectively examined. Demographic data, chronic disease histories, biochemical work-up data, hospitalization period, post-operative complications, and histopathological examination results were recorded.

Results: 235 (80%) of our patients were female and 59 (20%) were male. The mean pre-operative BMI value of the females was found to be 42.3±3.58 kg/m^2 [41-56 kg/m^2]. The mean pre-operative BMI value of the males was found to be 47.6±7.74 kg/m^2 [41-62 kg/m^2]. After bariatric surgery, within the first 6 post-operative months, cholelithiasis was accompanied in a total of 35 patients (11.9%). Following bariatric surgery, 19 patients were operated on for gallstones. Thirteen of these patients were asymptomatic.

Conclusion: We detected that the incidence of post-bariatric surgery cholelithiasis is low. Factors such as sex, age, and comorbidities were not associated with cholelithiasis development in our patients. Therefore, we believe that prophylactic cholecystectomy should be avoided.

Keywords: Bariatric surgery, Cholelithiasis, Obesity

Introduction

Obesity is a serious public health issue, rapidly increasing all over the world. The World Health Organization (WHO) reported that in 2016 globally, 13% of adults aged 18 years or older, meaning more than 650 million adults, are obese.[1] According to 2016 data from the Turkish Statistical Institute (TÜİK), 15.2% of males and 23.9% of females aged 15 years or older were detected to be obese in Türkiye.[2] The reason obesity alone is a health problem is that it is accompanied by comorbidities such as diabetes, hypertension, and chronic obstructive pulmonary disease.[3, 4] While bariatric surgery is the most effective method for

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the treatment of these comorbidities, medical therapy is also used for the treatment of morbid obesity. Surgical treatment options include multiple procedures such as Roux-en-Y gastric bypass (RYGB), laparoscopic sleeve gastrectomy (LSG), and single anastomotic gastric bypass (OAGB). LSG has become today the most frequently performed method in the world and in our country.[4] While bariatric surgery has many benefits, post-operative problems may occur. The most important one is the risk of formation of gallstones.[5] Rapid weight loss in a short period of time after obesity surgery and losing more than 25% of body weight lead to the development of post-operative gallstones.[6] The incidence of gallstone formation after laparoscopic sleeve gastrectomy is 0.9 to 7.5%.[7-9] The present study aimed to retrospectively determine the rate of cholelithiasis development within the sixth post-operative month in patients who underwent LSG. We also made efforts to determine the risk factors of symptomatic cholelithiasis after bariatric surgery.

Materials and Methods

Data of 294 patients admitted to the General Surgery Clinic of our hospital with a body mass index (BMI)>40 kg/m^2 who underwent laparoscopic sleeve gastrectomy between January 2015 and December 2020 were retrospectively examined. Demographic data, chronic disease histories, and data on biochemical work-up, hospitalization period, operation duration, post-operative complications, type of operation, operation report, pre- and post-operative ultrasonography reports, and histopathological examination results were recorded. Pre- and post-operative body mass indices of the patients were calculated. It was questioned whether the patients had undergone a second surgery or another interventional procedure and whether they followed the recommended diet. The rate of post-operative gallstone development and the treatments administered to the patients who developed gallstones were evaluated. Data obtained from the study were analyzed using SPSS (25.0, IBM Corp, Armonk, NY) software. As descriptive statistics, the number (n) and percentage (%) were given for categorical data, and mean±standard deviation for numerical data. The distribution normality of the data was tested using the Kolmogorov-Smirnov test. BMI values of the patients before and after the LSG operation were compared using the t-test (paired-samples t-test). Whether there is a significant difference between gallstone development, and pre- and post-operative BMI values was also tested using this test.

Results

235 (80%) of our patients were female and 59 (20%) were male. The patients' ages ranged from 13 to 71 years old, with the mean age of the female patients being 32.4±10.72 years and the mean age of the male patients 35.9±10.76 years. Patients who underwent post-operative Laparoscopic cholecystectomy (LC) were young, with a mean age of 38.2 years. The mean pre-operative BMI value of the females was found to be 42.3±3.58 kg/m^2 [41-56 kg/m^2]. The mean pre-operative BMI value of the males was found to be 47.6±7.74 kg/m^2 [41-62 kg/m^2] (Table 1). The mean post-operative BMI value was found to be 27.18±2.80 kg/m^2 for females and 27.92±3.79 kg/m^2 for males. The patients were called for ultrasonography (USG) control 6 months after the operation. After bariatric surgery, within the first 6 post-operative months, cholelithiasis occurred in a total of 35 patients (11.9%). None of these patients had a history of gallstones before LSG. Three patients (15.78%) had a history of hypertension (HT), 8 patients (42.1%) a history of diabetes mellitus (DM), and 8 patients (42.1%) a history of dyslipidemia. After bariatric surgery, 19 patients were operated on for gallstones. Thirteen of these patients were asymptomatic. However, patients were operated on because the gallstones were either larger than 1.5 cm or smaller than 0.5 cm and were numerous. The other six patients had complications such as biliary colic and cholangitis due to gallstones. LC was performed on all these patients. (Table 2) Patients who underwent LC were those who lost an average of 6 to 11 kg per month ($p<0.05$) and their mean pre-operative BMI was >48 ($p<0.05$). In

Table 1. Demographic characteristic

	Male	Female
Number of patients	59 (19%)	294 (81%)
Age	35.9 +10.76	32.4 +10.72
Preop BMI	47.6 +7.74	42.3 +3.58
Postop BMI	27.92 +3.79	27.18 +2.8

Table 2. Timing of cholelithiasis development

	N	Cholecystectomy
Preop cholelithiasis	11	11
Periop cholelithiasis	12	12
Postop cholelithiasis	35	19
Total	58	42

our study, only 40 patients routinely received ursodeoxycholic acid preparation for 6 months after the operation; other patients did not receive ursodeoxycholic acid. We did not observe findings that using ursodeoxycholic acid preparation would decrease gallstone formation ($p>0.05$). When USG was performed on patients who had no complaints, biliary sludge was detected in the gallbladder of seven patients, and millimetric stones were detected in the gallbladder of nine patients. The mean period in our trial was 6 months (4-8). Mortality was not observed in any of the patients.

Discussion

Cholelithiasis is seen in 5.9% to 21.6% of the general population,[10] with approximately 20% of the patients being symptomatic.[11] It is well known that the female population has a two- to three-fold higher rate of gallstones than the male population.[12] Particularly, female sex, age, and BMI were associated with an increased prevalence of gallstones.[13] Furthermore, gallstones are observed seven-fold more in female morbidly obese patients (BMI>45 kg/m^2). The possibility of female patients undergoing a cholecystectomy procedure after bariatric surgery is higher than that of male patients, both in obese and normal populations.[14] The risk of gallstone formation is 3- to 5-fold higher in the obese population compared to the normal population.[10, 15] In the literature, it was reported that gallstone or gallbladder polyp was detected in 23.8% of the morbidly obese patients before the LSG operation.[16] In our study, this rate was 7.8%; the rate of post-operative gallstone formation was 11.9%. Our results demonstrated that 6.4% of the morbidly obese patients require LC. It was reported that gallstones are formed due to increased cholesterol levels in the gallbladder and saturation of the gallbladder mucin concentration.[17] Asymptomatic gallstones may become symptomatic 6-12 months after the operation. Symptoms occur in 30% to 52% of the patients with gallstones after obesity surgery, and it was reported that the rate of serious complications like cholangitis, abdominal pain, severe vomiting is 2% to 3%.[18] These patients were detected to lose 3-6 kg per month during the first six months.[19] There are studies associating rapid weight loss with increased gallstone formation.[16] In a Saudi Arabian trial, the incidence of post-bariatric surgery cholelithiasis was found to be 6.53%.[20] Previous studies reported that the incidence of cholelithiasis is increased in patients with rapid weight loss, especially within the first post-operative year.[20, 21] In the literature, the incidence of cholelithiasis in the case of rapid weight loss was also statistically higher.[20] The rates in our study were higher than the literature, with 11.9% of our patients having post-bariatric cholelithiasis in the first 6 months of follow-up, because our patients lost a significant amount of weight (6-11kg) quickly. We think that the reason for rapid weight loss is the patients' desire to lose weight early and malnutrition. There are also studies reporting that there is no correlation between rapid weight loss after the LSG operation and early and late gallbladder or bile duct stones.[22] Recently, Chen et al.[23] reported that the risk of post-bariatric surgery gallstone disease is not increased later. One of the risk factors for gallstone formation is gender.[24] In our study, 14 of the 19 patients who underwent post-operative LC were females (73.7%). No statistical difference was detected between female and male patients in terms of gallstone formation. Since the number of female patients in the study was high, most of the patients who were operated on for gallbladder were women. In their study, Alsaif et al.[25] showed that the development of post-bariatric surgery cholelithiasis is not associated with gender. However, in their study, Haal et al.[26] demonstrated that sex is statistically important for the development of cholelithiasis and stated that it was more common in women.

Another risk factor affecting the development of post-bariatric surgery gallstone formation is age. In the literature, the mean age of patients developing cholelithiasis was observed to be higher.[27] However, data on the correlation between age and cholelithiasis development are lacking. In the present study, we observed that age was not a determinant for cholelithiasis development. Another risk factor is BMI. The risk of developing cholelithiasis was observed to be substantially increased in patients with a BMI ≥40 kg/m^2.[28] The reason for this was shown to be high cholesterol levels.[29] In our study, the mean pre-operative BMI value in patients who underwent post-operative LC was observed to be 48.6 ($p<0.05$). Consistent with the literature, the rate of cholelithiasis development was found to be higher in patients with a high BMI. The type of obesity surgery also affects the incidence of cholelithiasis. In the literature, this rate was reported to be 14.5% for Roux-en-Y gastric bypass, and substantially lower (4.1%) for LSG.[30] Laparoscopic cholecystectomy within the first 6 post-operative months was performed in 5.2% of the patients who underwent LSG and 7.4% of the patients who underwent bypass. Unfortunately, as our study mostly

included patients who underwent LSG, we could not statistically determine its rate compared to other bariatric procedures. As for the correlation between post-bariatric surgery cholelithiasis and comorbidities, hypertension was found to be a protective factor.[20] In our study, 15.8% of the patients had a history of hypertension (HT). However, there was no correlation between cholelithiasis and comorbidities in our study. Ursodeoxycholic acid administration was recommended as an alternative medical therapy to prevent gallstone formation. Routine use of ursodeoxycholic acid preparation after LSG has been reported to decrease the formation of gallbladder and bile duct stones. We recommended ursodeoxycholic acid to our patients as it was recommended in the literature.[31] In our study, ursodeoxycholic acid preparation was routinely applied to only 40 patients for 6 months after the operation. However, we did not observe any evidence that the use of ursodeoxycholic acid preparation would reduce the formation of gallstones ($p>0.05$). Therefore, we did not recommend it to our other patients.

LSG is an effective surgical technique. The highest rate of cholecystectomy within the first six months after bariatric surgery was detected to be 3.7%.[32] In our study, this rate was detected to be 6.5%. Cholecystectomy indication after bariatric surgery is generally associated with acute biliary complications like vomiting, cholangitis, and fever. Therefore, we recommend an ultrasonography follow-up every 6 months after the LSG operation. The drawbacks of our study include the retrospective design and the limited number of patients.

Conclusion

While LSG is an effective and safe method, the patients are at risk for post-bariatric surgery complications including stone formation and acute cholecystitis. We detected that the incidence of post-bariatric surgery cholelithiasis is low. Factors such as sex, age, and comorbidities were not associated with cholelithiasis development in our patients. Therefore, we believe that prophylactic cholecystectomy should be avoided.

Disclosures

Ethichs Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – M.V.Y., Z.Ş.B.; Design – M.V.Y., Z.Ş.B.; Supervision – M.V.Y., Z.Ş.B.; Materials – M.V.Y., Z.Ş.B.; Data collection and/or processing – M.V.Y., Z.Ş.B.; Analysis and/ or interpretation – M.V.Y., Z.Ş.B.; Literature search – M.V.Y., Z.Ş.B.; Writing – M.V.Y., Z.Ş.B.; Critical review – M.V.Y., Z.Ş.B.

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LESS

Case Report

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A case of pneumoperitoneum due to tube dislocation after peg insertion

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ABSTRACT

Percutaneous endoscopic gastrostomy (PEG) serves as a preferred method for providing nutrition and nutritional support to patients who require long-term enteral feeding and have a functioning gastrointestinal tract. PEG offers better access to the gastrointestinal tract than surgical alternatives and has well-documented benefits over parenteral nutrition. Given that PEG tube insertion is among the most common endoscopic procedures globally, a thorough understanding of its indications and contraindications is vital in modern medicine.

While PEG is generally seen as a safe intervention, it carries risks for both minor and major complications, which can arise from endoscopic technical challenges, issues during the PEG procedure, or from prolonged PEG tube usage and wound care.

Our case report details an unusual complication of PEG, where the catheter tube penetrated the omentum majus, leading to pneumoperitoneum due to blockage in the catheter's tract development, followed by the patient's subsequent treatment. Awareness of such potential complications and knowledge of proper catheter maintenance can enhance the standard of care for patients with PEG tubes.

Keywords: Complication, Gastrostomy tube, Enteral nutrition, Percutaneous

Introduction

Enteral nutrition is generally the preferred method over parenteral nutrition in patients with a functional gastrointestinal system (GIS) due to the risks and higher costs of intravenous feeding, as well as the failure of parenteral nutrition to provide enteral stimulation and subsequent compromise of the intestinal defense barrier.[1,2] Furthermore, enteral nutrition has been shown to reduce the risk of bacterial translocation and corresponding bacteremia.[3]

Gastric feeding is the most common type of enteral feeding. Gastrostomy tube placement can be performed using endoscopy, radiological imaging, or surgical techniques (open or laparoscopic). Percutaneous endoscopic gastrostomy (PEG) was first introduced in 1980, utilizing endoscopy to insert a feeding tube into the stomach.[4]

PEG tube placement is generally considered safe, but complications may arise at varying rates depending on the study population. Minor complications include wound infection, leakage from the tube to the abdominal cavity, obstruction of the tube, pneumoperitoneum, and gastric outlet obstruction; major complications comprise

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aspiration pneumonia, bleeding, buried bumper syndrome, intestinal perforation, necrotizing fasciitis, and tumor seeding.[5]

This report discusses pneumoperitoneum, a rare complication of PEG, often mistaken for GIS perforation when the catheter tube penetrates the omentum majus and obstructs tract formation.

Case Report

An 88-year-old female patient was referred to general surgery for PEG placement during her hospitalization in the palliative service with a history of cerebrovascular disease and diagnoses of Alzheimer's and malnutrition. After anesthesia, the PEG catheter was placed in the endoscopy unit. The patient's pulse, blood pressure, and oxygen saturation were monitored throughout the procedure. The "pull" method was used to perform the procedure endoscopically, utilizing a 20 Fr standard silicone PEG kit. Oral local anesthesia (10% lidocaine spray) was administered to the conscious patient, who was responding to painful stimuli, along with sedoanalgesia using midazolam and propofol. Local anesthesia was also applied prior to the dermal incision. The placement of the tube was guided by the site where the endoscopic light was visible on the abdominal wall. The patient had the PEG inserted using the endoscopic pulling method and commenced feeding via the PEG catheter 24 hours later. After seven days of uncomplicated feeding through PEG, a chest X-ray was taken due to the patient's complaint of food regurgitation through the nose, to rule out aspiration pneumonia. The X-ray revealed free air in the chest (Fig. 1). Consequently, computed tomography (CT) was scheduled, which also showed free air (Fig. 2), leading to surgery under the suspicion of GIS perforation. During the laparotomic procedure with a supraumbilical incision, no free or gastrointestinal fluid was found in the abdomen. Inspection of the PEG tube showed that it was correctly positioned in the stomach; however, the omentum majus was ensnared between the tube's cuff and the peritoneum, preventing tract formation between the stomach and the abdominal wall. The ensnared omentum was dissected, released, and the stomach was secured to the anterior abdominal wall at the tube's insertion point. By the second postoperative day, the patient resumed feeding through the PEG. On day four post-surgery, the patient was stable and was moved back to the palliative service.

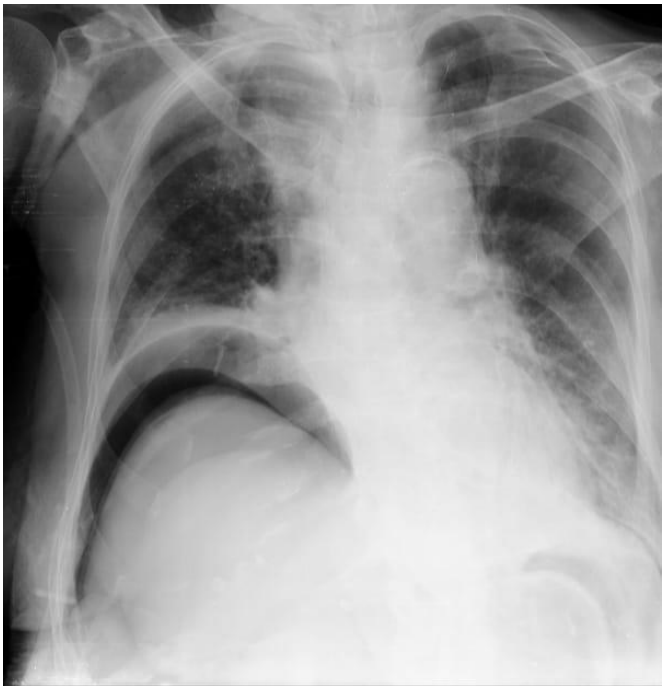

Figure 1. Subdiaphragmatic free fluid in the chest X-ray after PEG catheter placement (7th day).

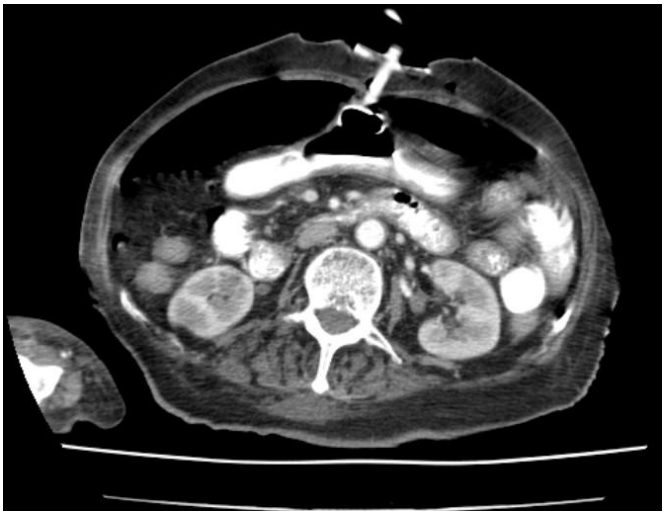

Figure 2. Tomography image after PEG catheter placement (diffuse free air in the abdomen and failure of the PEG catheter to form a tract).

Discussion

With an enhanced appreciation for the clinical importance of nutrition, gastrostomy procedures have become integral to treatment strategies. Enteral nutrition, offering substantial benefits over parenteral nutrition, is more frequently recommended for patients with an operational gastrointestinal system.[5] ESPEN (European Society of Clinical Nutrition and Metabolism) guidelines advise PEG for patients requiring nutrition beyond 2 to 3 weeks.[6] Enteral nutrition can be administered to individuals

in palliative care and intensive care using nasogastric or nasojejunal tubes for up to four weeks. PEG is commonly employed for longer-term enteral feeding due to its practicality, cost-effectiveness, and feasibility of bedside implementation under local anesthesia and sedation.[7]

Complications associated with PEG can arise during or after the procedure, with a range of complication rates cited in the literature. Fröhlich et al. reported PEG-related complication rates, including morbidity and mortality, at 4.9-50%, 3-12, and 0.5-1.2%, respectively.[8] Intra-abdominal organs, particularly the colon and small intestine, and less commonly the liver and spleen, are susceptible to injury during PEG placement. Notably, cases of complete gastric laceration post-placement have been documented.[9] The incidence of iatrogenic intestinal perforation during PEG insertion is higher in the elderly due to mesenteric laxity of the colon.[10] Contrast-enhanced CT scanning or fluoroscopy, especially in hemodynamically unstable cases, is a valuable diagnostic tool to confirm gastrointestinal integrity. The presence of peritonitis symptoms and any sign of contrast leakage into the peritoneal cavity necessitates urgent surgical intervention.

Pneumoperitoneum is frequently observed post-PEG tube insertion, with reports of occurrence rates up to 50% in some studies.[11] Typically, pneumoperitoneum post-PEG is not classified as a complication, as it often has no detrimental consequences. It is generally attributed to air introduction into the abdominal cavity during endoscopic maneuvers and abdominal wall needle insertion. In the absence of peritonitis indicators, pneumoperitoneum should not hinder the initiation or continuation of PEG feeding. However, persistence of any amount of free air beyond 72 hours post-PEG suggests the possibility of intestinal compromise.[10] Although instances of complicated pneumoperitoneum, such as those resulting from intestinal injury, are infrequent following PEG, they have been noted.[12]

The etiology of pneumoperitoneum after PEG placement is likely related to the high intragastric air pressure from the endoscope compared to the needle puncture of the stomach and gastric wall. Air may escape from the stomach during the needle puncture and while placing the PEG tube through the abdominal wall.[13] The most common complications identified in pneumoperitoneum after PEG tube placement are colocutaneous fistula or colon injury. A colocutaneous fistula often results from entrapment of the intestine between the anterior abdominal wall and the stomach wall.[11] Inadequate or excessive gastric insufflation, improper transillumination, or unnoticed focal invagination of the anterior gastric wall during palpation are linked to colon damage.[11]

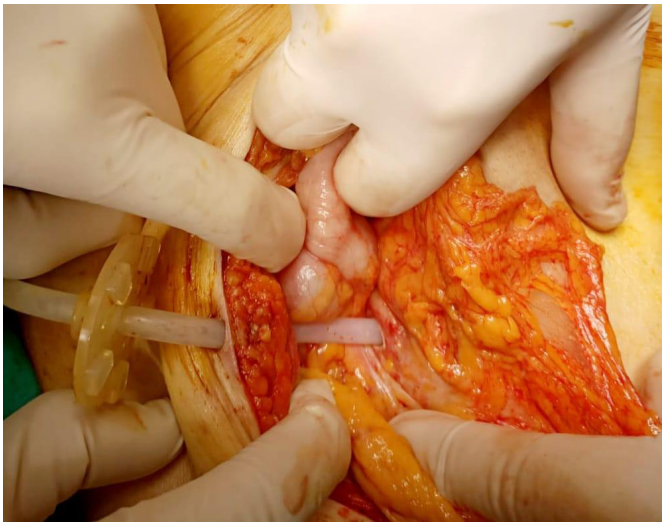

Figure 5. Operational images post-complication (PEG catheter tube intersecting the omentum majus, narrowly contacting the transverse colon).

These observations suggest that technical issues during PEG placement could be linked to complex pneumoperitoneum cases. In our specific instance, the pneumoperitoneum arose from the PEG tube piercing the omentum majus near the transverse colon during the endoscopic pulling process (Fig. 3). This obstructed the creation of a passageway between the stomach and the peritoneum, leading to pneumoperitoneum.

Conclusion

PEG is a commonly employed, effective method for enteral nutrition, but it may lead to the complications we have discussed. Careful use of endoscopy light and palpation of the anterior abdominal wall to identify the tube's entry point can prevent such complications. Additionally, our case report illustrates that pneumoperitoneum following PEG does not always follow a benign and self-limiting course.

Disclosures

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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LESS

Case Report

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Laparoscopic cholecystectomy for acute cholecystitis caused by a giant gallstone

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ABSTRACT

Gallstone-related acute cholecystitis is the most common reason for cholecystectomy, with laparoscopic cholecystectomy being the current gold standard approach. Gallstones larger than five centimeters, known as 'giant gallstones,' are quite rare. Data on the safety of laparoscopic cholecystectomy in cases with giant gallstones are limited. In this case presentation, we discuss the emergency laparoscopic cholecystectomy performed for acute cholecystitis due to a giant gallstone.

Keywords: Cholecystitis, Gallstones, Laparoscopy

Introduction

Acute cholecystitis is one of the complications of cholelithiasis and the most common indication for emergency cholecystectomy. With increasing experience, laparoscopic approaches are accepted as the gold standard for cholecystectomy, but inflammatory changes and the increasing size of gallstones often lead to more conversions to open surgery. Gallstone sizes generally do not exceed 2-3 cm; gallstones larger than 5 cm are rarely found.[1]

Case Report

A 49-year-old male patient presented with abdominal pain lasting 3 days. Physical examination showed tenderness in the right upper quadrant. Abdominal USG detected a 47 mm solitary gallstone in the gallbladder, increased gallbladder wall thickness, and pericholecystic band-style fluids. Blood tests revealed WBC: 21400/µL, CRP: 287 mg/L; liver function tests were normal, and bilirubins were minimally elevated. Computerized Tomography showed a solitary giant gallstone in the gallbladder and pericholecystic inflammation (Fig. 1).

Emergency laparoscopic cholecystectomy was performed using 4 ports. During laparoscopic exploration, it was observed that the gallbladder contained a solitary giant gallstone (Fig. 2). Although manipulating the gallbladder was difficult during the operation due to this gallstone, the operation was completed laparoscopically. The gallbladder was removed with the help of an endobag by extending the upper left quadrant port site by approximately 4 cm (total incision length was 5 cm). The solitary gallstone measured 10.5 cm longitudinally. The patient did not develop any complications in the postoperative follow-up and was discharged on the 2nd day after surgery. Written informed consent was obtained from the patient for this case report.

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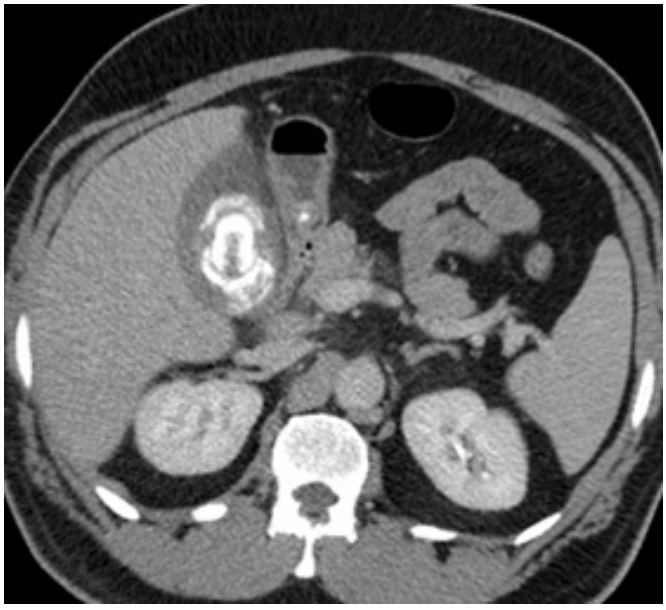

Figure 1. Solitary giant gallstone filling whole gallbladder in abdominal computerized tomography.

Discussion

With increasing experience and advancements in acute cholecystitis, laparoscopic cholecystectomy has become the standard treatment. However, large calculi in the gallbladder or severe acute cholecystitis are reasons for some centers to opt for open surgery from the beginning. In this case, we would like to point out that such cases can be completed laparoscopically in experienced centers.[2-5] If there is a need for an open approach, conversion to open surgery is always an option. In cases of giant gallstones that cannot be extracted from the port site, an appropriate area can be determined preoperatively. We extended the epigastric port incision and removed the gallbladder from the epigastric area. Therefore, in such cases, it is better to plan the gallbladder removal according to preoperative imaging results.

In cases of acute cholecystitis, the operation can be performed laparoscopically even with a giant calculus in the gallbladder. Additionally, it is beneficial to determine preoperatively the area where the gallbladder will be removed.

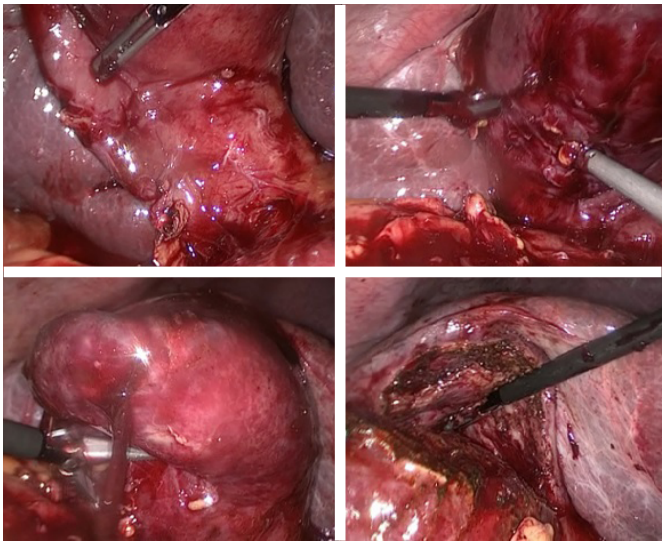

Figure 2. Operative images taken during laparoscopic cholecystectomy.

Disclosures

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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