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RESEARCH ARTICLE

Partial Versus Total Mesorectal Excision for the Surgical Treatment of Mid-Rectal Cancer: An Assessment from the Turkish Society of Colon and Rectal Surgery's Colorectal Cancer Database

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ABSTRACT

Aim: Although total mesorectal excision (TME) is standard, partial mesorectal excision (PME) is increasingly performed in upper rectal cancer to preserve a longer rectal stump, potentially improving outcomes. However, data on the role of PME in mid-rectal cancer are limited. This study aims to assess the short-term clinicopathological outcomes of PME in mid-rectal cancer.

Method: The Turkish Society of Colon and Rectal Surgery's colorectal cancer database was searched for patients undergoing surgery for mid-rectal cancer between July 2018 and December 2022. The patients were divided into PME and TME groups and histopathological and 30-day clinical outcomes were compared.

Results: The study included 158 patients: 24 (15%) in the PME group and 134 (85%) in the TME group. There were no significant differences in perioperative data, except for tumor stage, neoadjuvant treatment, and stoma creation (58.3% in PME vs. 85.8% in TME, p=0.004). No differences were observed in nodal harvest (18.6±8.5 in PME vs. 15.6±9.2 in TME), quality of mesorectal excision, or positivity of radial and distal margins (8.3% in PME vs. 5.2% in TME). Multivariate analysis showed that PME was associated with a similar likelihood of distal margin positivity [odds ratio (OR): 0.77, 95% confidence interval (CI): 0.02-19.08, p=0.88], radial margin positivity (OR: 9.95, 95% CI: 0.22-522.17, p=0.22), nodal harvest (1.28, 95% CI: -1.62-7.70, p=0.20), anastomotic leak (OR: 0.30, 95% CI: 0.01-2.60, p=0.33), and stoma formation (OR: 0.67, 95% CI: 0.19-2.44, p=0.53).

Conclusion: PME does not compromise surgical resection margins or short-term outcomes in patients with mid-rectal cancer. These findings need confirmation with larger cohorts, and additional studies are necessary to evaluate functional outcomes.

Keywords: Mid-rectal cancer, partial mesorectal excision, pathological outcomes, morbidity

Introduction

Since Heald first introduced total mesorectal excision (TME),[1] it has been widely adopted as the standard surgical technique for all rectal cancers, including those in the upper and mid-rectum. The rationale for completely excising the mesorectum stemmed from addressing local recurrences, which were thought to occur due to distal extramural cancer spread, such as lymph node metastasis and mesorectal tumor deposits not removed with conventional surgery. To date, most research has focused on low rectal cancer and assessing the oncological adequacy of sphincter-saving surgery. With the increasing use of neoadjuvant chemoradiotherapy, which provides improved oncological outcomes and better local disease control,[2,3] the required length for a clear distal surgical margin has been successfully reduced from 5 to 1 cm.[4-6]

The standards for the distal resection margin for upper- and mid-rectal cancers are still based on older studies conducted before the introduction of neoadjuvant chemoradiation and the widespread use of modern magnetic resonance imaging.[5-8] Current guidelines continue to recommend partial mesorectal excision (PME) for upper rectal cancer, involving division of the mesorectum 5 cm below the tumor level. For mid-rectal

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cancers, TME with dissection down to the pelvic floor is recommended in most studies, regardless of the specific tumor location.[9]

Recent research by Guedj et al.[10] on mid-rectal tumors post-chemoradiotherapy indicated that mesorectal tumor invasion below the tumor's lower edge, including lymph node metastasis, is fairly rare. In light of these findings, several studies have suggested that PME, with a shorter distal resection margin, could also be a viable option for mid-rectal cancer to preserve a longer rectal stump and thereby ensure better rectal function. Nonetheless, the data supporting this approach remain limited.

Therefore, this study aims to investigate the impact of PME versus TME on surgical margins and short-term perioperative outcomes in patients with mid-rectal cancer, utilizing the national colorectal cancer database.

Materials and Methods

Ethical approval was granted by the Acıbadem University Ethic Committee (approval number: ATADEK 2023-05/150, date: 24.03.2023), and a comprehensive review of the Turkish Society of Colon and Rectal Surgery (TSCRS) colorectal cancer database was conducted. This review covered all individuals who underwent rectal cancer surgery between July 2018 and December 2022. The TSCRS database provides extensive data on patients requiring colorectal surgery, encompassing preoperative and intraoperative information and postoperative 30-day clinicopathological outcomes across 20 centers in Turkey. The retrospective nature of the study negated the need for informed consent.

The study included patients with (y)pTNM stage I-IV mid-rectal adenocarcinoma who had undergone sphincter-saving procedures. Mid-rectal cancer was specifically identified as cancer located between 5 and 10 cm from the anal verge. Exclusion criteria encompassed emergency surgeries, an American Society of Anesthesiologists (ASA) score exceeding 3, abdominoperineal resection, indeterminate tumor distance from the anal verge, and either synchronous colorectal lesions or recurrent tumors that necessitated additional or reoperative interventions.

Patients were categorized into two cohorts based on the surgical method employed: The PME group and the TME group, with the choice of the procedure largely influenced by the attending surgeon's preference. Collected data included patient demographics, comorbidities, tumor distance from the anal verge, tumor staging, use of neoadjuvant chemoradiotherapy, surgical approach, anastomotic techniques, tumor proximity to resection margins, formation of diverting stomas, number of lymph nodes harvested, mesorectal excision quality, and outcomes 30-days post-surgery.

Primary outcomes were assessed based on the positivity of the distal and radial resection margins. Secondary outcomes focused on the harvest of lymph nodes, the incidence of anastomotic leaks, and the creation of diverting stomas. Clinical and pathological outcomes were systematically compared between the PME and TME groups to evaluate any potential associations with preoperative and intraoperative factors.

Statistical Analysis

In this study, two primary analyses were conducted. Initially, univariate analyses were utilized to explore the perioperative and postoperative variables between the PME and TME groups. Following this, similar univariate analyses were performed to discern statistically significant factors associated with the study outcomes. Subsequently, both statistically significant and clinically important but statistically non-significant preoperative and intraoperative risk factors were included in a multivariate analysis to determine independent predictors of the study outcomes.

Categorical variables were expressed as frequencies and percentages, whereas continuous variables were reported as means and standard deviations. Univariate comparisons between the groups were conducted. For categorical data, a chi-square test or Fisher's exact test was employed, depending on the expected frequencies in each cell. Continuous variables were analyzed using the Student's t-test for normally distributed data or the Wilcoxon rank-sum test for data not following a normal distribution.

Logistic regression analysis was performed to evaluate the multivariable relationships between the risk factors and the outcomes. All potential risk factors were entered into the logistic regression model simultaneously. Odds ratios (OR) and their 95% confidence intervals (CI) were calculated to estimate the association strength between each risk factor and the outcome. Statistical analyses were carried out using the R programming language, with a significance level set at 0.05 for all tests to determine statistical significance.

Results

The database identified a total of 432 patients who underwent rectal cancer surgery during the study period. Among these, 158 patients (men: 99, women: 59) with mid-rectal cancer met the inclusion criteria. The distribution between the PME and TME groups was 24 (15%) and 134 (85%) patients, respectively. The mean tumor distance from the anal verge was 8.9±1.4 cm in the PME group and 7.8±1.3 cm in the TME group (p=0.0004).

The preoperative characteristics are detailed in Table 1. No substantial differences were observed between the groups concerning age, gender, ASA scores, body mass index,

Table 1. Comparison of preoperative characteristics between the PME and TME groups

Preoperative characteristics	PME group (n=24)	TME group (n=134)	p
Age, years, mean ± SD	62.5±14.5	61.2±11.5	0.42
Gender, M/F, n (%)	14 (58.3)/10 (41.7)	85 (63.4)/49 (36.6)	0.81
ASA score, n (%)			0.49
1	8 (33.3)	33 (24.6)	
2	11 (45.8)	79 (58.9)	
3	5 (20.8)	22 (16.4)	
BMI (kg/m^2), mean ± SD	25.4±2.7	25.9±3.6	0.46
Tobacco use, n (%)	3 (12.5)	23 (17.2)	0.79
Hypertension, n (%)	7 (29.2)	48 (35.8)	0.69
Diabetes mellitus, n (%)	1 (4.2)	26 (19.4)	0.13
Coronary heart disease, n (%)	5 (20.8)	12 (8.9)	0.17
Congestive heart disease, n (%)	1 (4.2)	0 (0)	0.33
Chronic obstructive pulmonary disease, n (%)	1 (4.2)	7 (5.2)	>0.99
Cerebrovascular disease, n (%)	1 (4.2)	3 (2.2)	>0.99
Chronic kidney disease, n (%)	0 (0)	0 (0)	NS
Other diseases, n (%)	2 (8.3)	14 (10.5)	>0.99
Previous abdominal surgery, n (%)	4 (16.7)	24 (17.9)	>0.99
Distance of tumor from the anal verge (cm), mean ± SD	8.9±1.4	7.8±1.3	0.0004
cT stage, n (%)			0.71
1 and 2	7 (29.2)	31 (23.1)	
3 and 4	17 (70.8)	103 (76.9)	
cN stage, n (%)			0.03
Negative	14 (58.3)	44 (32.8)	
Positive	10 (41.7)	90 (67.2)	
cM stage, n (%)			0.59
Negative	19 (79.2)	115 (85.8)	
Positive	5 (20.8)	19 (14.2)	
cTNM stage, n (%)			0.016
1 and 2	14 (58.3)	41 (30.6)	
3 and 4	10 (41.7)	93 (69.4)	
Hepatic metastasis, n (%)	3 (12.5)	18 (13.4)	>0.99
Lung metastasis, n (%)	0 (0)	5 (3.7)	0.74
Other organ metastasis, n (%)	2 (8.3)	1 (0.8)	0.09
Neoadjuvant treatment, n (%)	9 (37.5)	117 (87.3)	<0.001
The time between neoadjuvant treatment and surgery; weeks, mean ± SD	6.9±4.3	8.8±3.3	0.23

TME: Total mesorectal excision, PME: Partial mesorectal excision, SD: Standard deviation, M/F: Male/female, ASA: American Society of Anesthesiologists, BMI: Body mass index, NS: Not significant

preoperative comorbidities, prior abdominal surgery, cT stage, and cM stage. However, the rate of cN positivity (41.7% vs. 67.2%) and cTNM stage were significantly higher in the TME group ($p<0.05$). Neoadjuvant chemoradiotherapy usage was also more prevalent in the TME group (37.5% vs. 87.3%, $p<0.001$).

Intraoperative findings, as presented in Table 2, showed no substantial differences in terms of the operative approach (open vs. minimally invasive), anastomotic technique and configuration, additional organ resection, operative time (187.3±68.2 vs. 214±82.3 minutes), conversion to open surgery, estimated blood loss, and intraoperative complications (0% vs. 5.2%). Notably, the mean distance of the anastomosis from the anal verge was longer (5.2±1.5 cm vs. 3.7±1.1 cm, p=0.001), and the rate of diverting stoma formation was lower (58.3% vs. 85.8%, p=0.004) in the PME group.

The postoperative morbidity distributions are shown in Table 3. There were no substantial differences in the rates of anastomotic leak (4.2% vs. 8.9%), surgical site infections, prolonged ileus, mechanical bowel obstruction, bleeding, blood transfusion, cardiopulmonary and urinary complications, reoperation, readmission, and mortality (0% vs. 0.8%). The mean hospital stay was 7.3±4.9 days in the PME group and 8.1±5.0 days in the TME group (p=0.13).

Table 4 presents the pathological results. There were no substantial differences in pT stage, nodal positivity, pTNM stage, quality of mesorectal excision, or rates of distal resection margin positivity (4.2% vs. 2.2%) and radial resection margin positivity (4.2% vs. 2.9%). The mean lengths of the distal resection margins were comparable between the groups (3.3±1.4 cm vs. 3.3±1.6 cm, p=0.76). Similarly, the mean numbers of lymph nodes harvested were not significantly different (18.6±8.5 vs. 15.6±9.2, p=0.09).

Table 2. Comparison of intraoperative characteristics between the PME and TME groups

Intraoperative characteristics	PME group (n=24)	TME group (n=134)	p
Operative procedure, n (%)			0.16
Open	16 (66.7)	65 (48.5)	
Minimally invasive	8 (33.3)	69 (51.5)	
Anastomotic technique, n (%)			>0.99
Hand-sewn	0 (0)	2 (1.5)	
Stapled	24 (100)	132 (98.5)	
Anastomotic configuration, n (%)			
End-to-end	20 (83.3)	101 (75.4)	
Side-to-end	4 (16.7)	33 (24.6)	
Distance of anastomosis from the anal verge (cm), mean ± SD	5.2±1.5	3.7±1.1	<0.001
Stoma creation, n (%)	14 (58.3)	115 (85.8)	0.004
Additional organ resection, n (%)	0 (0)	10 (7.5)	0.35
Operative time (minute), mean ± SD	187.3±68.2	214±82.3	0.12
Conversion to open surgery, n (%)	0 (0)	2 (2.9)	>0.99
Estimated blood loss (mL), mean ± SD	126.3±80.4	141.6±174.9	0.58
Intraoperative complication, n (%)	0 (0)	7 (5.2)	0.54

TME: Total mesorectal excision, PME: Partial mesorectal excision, SD: Standard deviation

Table 3. Comparison of postoperative outcomes between the PME and TME groups

Postoperative outcomes	PME group (n=24)	TME group (n=134)	p
Anastomotic leak, n (%)	1 (4.2)	12 (8.9)	0.70
Surgical site infection, n (%)			0.17
Superficial	0 (0)	12 (8.9)	
Deep	0 (0)	2 (1.5)	
Organ/space	0 (0)	10 (7.5)	
Prolonged ileus, n (%)	2 (8.3)	7 (5.2)	0.89
Mechanical bowel obstruction, n (%)	1 (4.2)	0 (0)	0.33
Bleeding, n (%)	0 (0)	2 (1.5)	>0.99

Table 3. Continued

Postoperative outcomes	PME group (n=24)	TME group (n=134)	p
Red blood cell transfusion, n (%)	7 (29.2)	25 (18.7)	0.37
Cardiac complications, n (%)	0 (0)	1 (0.8)	>0.99
Pulmonary complications, n (%)	0 (0)	2 (1.5)	>0.99
Urinary complications, n (%)	1 (4.2)	3 (2.2)	>0.99
Other complications, n (%)	0 (0)	2 (1.5)	>0.99
Reoperation, n (%)	1 (4.2)	9 (6.7)	0.98
Readmission, n (%)	1 (4.2)	11 (8.2)	0.79
Hospital stay (days), mean ± SD	7.3±4.9	8.1±5.0	0.13
Mortality, n (%)	0 (0)	1 (0.8)	>0.99

TME: Total mesorectal excision, PME: Partial mesorectal excision, SD: Standard deviation

Table 4. Comparison of pathologic characteristics between the PME and TME groups

Pathologic characteristics	PME group (n=24)	TME group (n=134)	p
pT stage, n (%)			0.76
0, 1 and 2	9 (37.5)	58 (43.3)	
3 and 4	15 (62.5)	76 (56.7)	
pN stage, n (%)			0.45
0	14 (58.3)	92 (68.7)	
Positive	10 (41.7)	42 (31.3)	
pTNM stage, n (%)			0.76
0, 1 and 2	13 (54.2)	87 (64.9)	
3 and 4	11 (45.8)	47 (35.1)	
Number of harvested lymph nodes, mean ± SD	18.6±8.5	15.6±9.2	0.09
Number of positive lymph nodes, mean ± SD	2.6±4.9	1.3±3.9	0.31
Tumor perforation, n (%)	1 (4.2)	4 (2.9)	>0.99
Quality of mesorectal excision, n (%)			
Complete	19 (86.4)	118 (88.1)	
Near complete	3 (13.6)	16 (11.9)	
Incomplete	0 (0)	0 (0)	
Not reported	2	0	
Distal resection margin positivity, n (%)	1 (4.2)	3 (2.2)	>0.99
Radial resection margin positivity, n (%)	1 (4.2)	4 (2.9)	>0.99
Length of distal resection margin (cm), mean ± SD	3.3±1.4	3.3±1.6	0.76

TME: Total mesorectal excision, PME: Partial mesorectal excision, SD: Standard deviation

Regarding the primary study outcomes, the results from multivariable logistic regression analyses are detailed in Tables 5, 6. Compared with TME, PME did not significantly increase the risk of positivity for either distal resection margins (OR: 0.77, 95% CI: 0.02-19.08, p=0.88) or radial resection margins (OR: 9.95, 95% CI: 0.22-522.17, p=0.22). In terms of secondary outcomes, PME compared with TME showed no significant difference in the number of lymph nodes harvested (OR: 1.28, 95% CI: -1.62-7.70, p=0.20) or the likelihood of an anastomotic leak (OR: 0.3, 95% CI: 0.01-2.60, p=0.33) and diverting stoma formation (OR: 0.67, 95% CI: 0.19-2.44, p=0.53), as indicated in Tables 7-9.

Table 5. Multivariate logistic regression analysis evaluating possible risk factors associated with distal resection margin positivity

Risk factors	OR	95% CI	p
Groups (PME vs. TME)	0.77	0.02-19.08	0.88
BMI (1 kg/m^2 increase)	1.07	0.78-1.50	0.65
pT stage (0+1+2 vs. 3+4)	2.28	0.20-56.08	0.53
pN stage (positive vs. negative)	0.56	0.02-6.69	0.67
Neoadjuvant treatment (yes vs. no)	0.23	0.01-4.28	0.29
Operative approach (open vs. minimally invasive)	0.60	0.02-7.74	0.69
Anastomotic technique (hand-sewn vs. stapled)	N/A	0.0-N/A	>0.99
Quality of mesorectal excision (complete vs. near complete)	8.87	0.84-125.25	0.06
Distance of tumor from the anal verge (1 cm increase)	0.52	0.15-1.36	0.22
Distance of anastomosis from the anal verge (1 cm increase)	1.47	0.51-4.69	0.47

TME: Total mesorectal excision, PME: Partial mesorectal excision, BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, N/A: Non-applicable

Table 6. Multivariate logistic regression analysis evaluating possible risk factors associated with radial resection margin positivity

Risk factors	OR	95% CI	p
Groups (PME vs. TME)	9.95	0.22-522.17	0.22
BMI (1 kg/m^2 increase)	0.66	0.78-1.50	0.65
pT stage (0+1+2 vs. 3+4)	N/A	0.0-N/A	>0.99
pN stage (positive vs. negative)	13.31	0.46-2007.8	>0.99
Neoadjuvant treatment (yes vs. no)	N/A	0.00-N/A	>0.99
Operative approach (open vs. minimally invasive)	1.16	0.05-27.1	0.92
Anastomotic technique (hand-sewn vs. stapled)	0.0	0.0-N/A	>0.99
Quality of mesorectal excision (complete vs. near complete)	0.0	N/A	>0.99
Distance of tumor from the anal verge (1 cm increase)	0.11	0.0-0.70	0.096
Distance of anastomosis from the anal verge (1 cm increase)	6.67	1.42-84.47	0.048

TME: Total mesorectal excision, PME: Partial mesorectal excision, BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, N/A: Non-applicable

Discussion

The present study provides a risk-adjusted comparison of PME versus TME in patients with mid-rectal cancer using a national colorectal cancer database. The results suggest that PME neither increases the risk of distal resection margin positivity nor radial margin positivity. Furthermore, PME does not affect the number of lymph nodes harvested or the rates of anastomotic leak and diverting stoma creation.

The description of TME by Heald revolutionized the surgical treatment of rectal cancer, leading to a substantial reduction in the local recurrence rate-from 30% to <10%.[11] Heald proposed that since rectal cancer might spread below the tumor level, an optimal cancer dissection should include the entire mesorectum, hence the term TME, for all rectal cancers.[1] However, TME is associated with a high incidence of morbidity, including anorectal and urogenital dysfunctions, due to the extensive pelvic dissection performed.[12,13] Consequently, in the management of upper rectal cancer, improved oncological outcomes-particularly in the era of neoadjuvant chemoradiation-have prompted surgeons to prioritize functional outcomes, adopting a tailored approach known as PME. This approach preserves a longer rectal stump, ensuring better functional outcomes. Currently, PME is considered oncologically adequate for upper rectal cancers in many institutions.

This paradigm shift in the management of upper rectal cancer prompted us to question the rationale of continuing TME surgery for all mid-rectal cancers. A recent pathological and radiological study reported by Guedj et al.[10] showed that in 49 consecutive patients undergoing neoadjuvant chemoradiotherapy followed by PME for mid-rectal cancer, none of the 98 examined nodes were positive (N$^+$), and only one mesorectal tumor deposit was noted 2 cm below the tumor

Table 7. Multivariate logistic regression analysis evaluating possible risk factors associated with the number of lymph nodes harvested

Risk factors	OR	95% CI	p
Groups (PME vs. TME)	1.28	-1.62-7.72	0.20
pT stage (0+1+2 vs. 3+4)	2.04	0.94-5.03	0.18
pTNM stage (0+1+2 vs. 3+4)	4.92	1.87-7.96	0.002
Neoadjuvant treatment (yes vs. no)	-1.37	-5.27-2.52	0.49
Distance of tumor from the anal verge (1 cm increase)	0.02	-1.07-1.10	0.98
Operative approach (open vs. minimally invasive)	3.11	0.34-5.88	0.03
Quality of mesorectal excision (complete vs. near complete)	-1.06	-5.34-3.23	0.63

TME: Total mesorectal excision, PME: Partial mesorectal excision, OR: Odds ratio, CI: Confidence interval

Table 8. Multivariate logistic regression analysis evaluating possible risk factors associated with anastomotic leak

Risk factors	OR	95% CI	p
Groups (PME vs. TME)	0.30	0.01-2.60	0.33
ASA score (1+2 vs. 3)	1.69	0.30-8.13	0.53
BMI (1 kg/m^2 increase)	1.11	0.93-1.34	0.25
pT stage (0+1+2 vs. 3+4)	1.29	0.26-6.88	0.75
pTNM stage (0+1+2 vs. 3+4)	1.28	0.26-6.21	0.76
Neoadjuvant treatment (yes vs. no)	0.86	0.17-5.14	0.86
Distance of tumor from the anal verge (1 cm increase)	0.70	0.36-1.30	0.27
Operative time (1-minute increase)	1.00	0.99-1.01	0.14
Operative approach (open vs. minimally invasive)	0.33	0.07-1.40	0.92
Anastomotic technique (hand-sewn vs. stapled)	N/A	0.0-N/A	>0.99
Anastomotic configuration (end-to-end vs. side-to-end)	0.39	0.05-1.92	0.29
Distance of anastomosis from the anal verge (1 cm increase)	0.93	0.46-1.79	0.83
Diverting stoma (yes vs. no)	0.19	0.03-1.00	0.047
Estimated blood loss (1 mL increase)	1.00	0.99-1.00	0.73
Blood transfusion (yes vs. no)	4.73	1.04-22.96	0.045

TME: Total mesorectal excision, PME: Partial mesorectal excision, ASA: American Society of Anesthesiologists, BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, N/A: Non-applicable

Table 9. Multivariate logistic regression analysis evaluating possible risk factors associated with diverting stoma formation

Risk factors	OR	95% CI	p
Groups (PME vs. TME)	0.67	0.19-2.44	0.53
ASA score (1+2 vs. 3)	0.94	0.28-3.60	0.93
BMI (1 kg/m^2 increase)	1.00	0.87-1.15	>0.99
pTNM stage (0+1+2 vs. 3+4)	0.95	0.35-2.71	0.93
Neoadjuvant treatment (yes vs. no)	2.83	0.94-8.48	0.06
Operative approach (open vs. minimally invasive)	0.65	0.22-1.85	0.42
Distance of tumor from the anal verge (1 cm increase)	0.64	0.42-0.94	0.03
Distance of anastomosis from the anal verge (1 cm increase)	0.92	0.62-1.38	0.67
Anastomotic technique (hand-sewn vs. stapled)	0.00	N/A-1.04	>0.99
Anastomotic configuration (end-to-end vs. side-to-end)	2.13	0.62-8.87	0.26
Estimated blood loss (1 mL increase)	1.00	1.00-1.01	0.54
Operative time (1-minute increase)	1.00	1.00-1.01	0.19

TME: Total mesorectal excision, PME: Partial mesorectal excision, ASA: American Society of Anesthesiologists, BMI: Body mass index, OR: Odds ratio, CI: Confidence interval, N/A: Non-applicable

level. Another study involving 124 patients with mid- or low rectal cancers from the same institution also indicated that distal intramural and mesorectal cancer spread is rare, with only three (2.4%) mid-rectal cancers showing distal viable cancer spread and only one tumor deposit 2 cm below the inferior tumor edge. In any of these patients, no viable metastatic lymph nodes were described below the tumor level.[14] Additionally, a more recent study from Turkey suggests that a sufficient distal resection margin following preoperative chemoradiation is 1 cm for most rectal cancers located 2-12 cm from the anal verge.[15]

In the present study, the mean length of the distal resection margin was 3.3 cm in the PME group, which is considered adequate for proper oncologic resection. There was no substantial difference in the mean length of the distal resection margin between the groups (3.3±1.4 cm for PME vs. 3.3±1.6 cm for TME). The rate of tumoral involvement in the distal resection margin was extremely low and similar between the groups, with only 1 patient in the PME group and 3 patients in the TME group showing involvement (4.2% vs. 2.2%, respectively). Additionally, no substantial differences were detected regarding radial resection margin involvement (4.2% vs. 2.9%). Regarding the harvested lymph node status, the mean number of total and positive lymph nodes was similar between the groups. These findings align with those reported by Guedj et al.[10,14]

Further risk-adjusted analyses were performed to determine whether PME negatively impacted these pathological outcomes, considering substantial differences between the groups in perioperative factors such as tumor stage, distance of the tumor from the anal verge, and use of neoadjuvant chemoradiotherapy. Even after these analyses, PME was not found to be a risk factor for distal and radial resection margin positivity and did not adversely affect the nodal harvest.

Since neoadjuvant chemoradiotherapy is associated with a lower lymph node yield,[16] the higher usage of this treatment in the TME group (87.3% vs. 37.5%) may account for the lack of differences in lymph node counts between the groups in our study. Another crucial factor in rectal cancer surgery is the quality of the mesorectal excision. Jiménez-Toscano et al.[17] suggest focusing on the quality of the surgical procedure to preserve an intact mesorectum, as the integrity of the mesorectum is associated with local and distal recurrences and survival. Our results demonstrate that PME does not impair the quality of the surgical procedure, as complete mesorectal excision was achieved in 86% of patients in the PME group and 88% in the TME group, showing no substantial difference.

To the best of our knowledge, only three previous studies have investigated the clinical and oncological outcomes of PME in patients with mid-rectal cancer.[17-19] However, these studies also included patients with upper rectal cancer. In a cohort of 172 patients reported by Kanso et al.[18], 45 had mid-rectal cancer, and the authors concluded that PME can be safely performed with a low risk of stoma creation, and the prognosis remains comparable to that with TME. In another study involving 211 patients with mid- and upper rectal cancers, participants were divided into four groups based on the distal margin (Q1: <10 mm, Q2: 11-20 mm, Q3: 21-30 mm, Q4: >31 mm). No differences were detected in 5-year local recurrence-free survival, disease-free survival, or overall survival. The authors noted that PME with a shorter distal resection margin does not compromise oncological outcomes.[17] Finally, in a propensity-score matching study that included 671 patients with mid- and upper rectal cancers, Kim et al.[19] reported similar survival rates between the PME and TME groups. The postoperative complication rate was higher in the TME group (21.4% vs. 14.5%), and incontinence was independently associated with TME. The authors recommended PME for patients with mid-rectal cancer when the lower margin is more than 5 cm from the anal verge.[19]

The present study is unique as it solely includes data from a homogenous cohort of patients with mid-rectal cancer. In addition to comparable pathological outcomes, univariate analysis of the postoperative clinical outcomes revealed a substantially lower rate of stoma creation in the PME group (58.3% vs. 85.8%). Additionally, the rate of anastomotic leaks was also lower in the PME group (4.2% vs. 8.9%), although this difference did not reach statistical significance. Rectal sparing is expected to benefit these short-term outcomes, as the risk associated with these outcomes is suggested to decrease with a longer rectal stump.[20] However, following risk adjustment, PME was found to have a similar likelihood of stoma creation and anastomotic leaks compared with TME. This may be explained by the relatively small number of patients in this study. Further research with a larger sample size may yield more favorable results regarding these outcomes following PME.

Study Limitations

The retrospective nature of the data obtained from the prospectively maintained national database and the focus on short-term outcomes are two major limitations of this study. Additionally, there is always a risk of data entry errors, which could affect the validity of the findings. Furthermore, no data regarding the functional evaluation of the PME and TME procedures were included. It is known that if more than 3 cm of rectal stump is preserved, function is normal or subnormal in more than 90% of patients.[10,21] Thus, conservation of the lower rectum with PME can potentially decrease the risk of low anterior resection syndrome.

Conclusion

Our findings suggest that PME does not compromise surgical resection margins or short-term outcomes in patients with mid-rectal cancer. However, these results need to be confirmed with larger cohorts, and further studies are needed to evaluate functional outcomes.

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Ethics

Ethics Committee Approval: This study was approved by the Acıbadem University Faculty of Medicine Ethics Committee (approval number: ATADEK 2023-05/150, date: 24.03.2023).

Informed Consent: Retrospective study.

Authorship Contributions

Concept: V.Ö., N.O., Design: V.Ö., N.O., Data Collection or Processing: V.Ö., Analysis or Interpretation: V.Ö., N.O., Literature Search: V.Ö., N.O., Writing: V.Ö., N.O.

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RESEARCH ARTICLE

Outcomes of Loose Seton Followed by Fistulotomy in Transsphincteric Perianal Fistulas: A Retrospective Study

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ABSTRACT

Aim: This retrospective study aimed to investigate the outcomes of the "loose seton followed by fistulotomy" technique in patients with transsphincteric perianal fistulas, focusing on the effectiveness of this surgical technique in achieving fistula tract healing while preserving anal sphincter function.

Method: A total of 114 patients with transsphincteric anal fistulas underwent surgery at the University of Health Sciences Turkey, Samsun Training and Research Hospital between September 2015 and December 2023. The technique of loose seton followed by fistulotomy was employed, and patient data, including demographics, surgical procedures, incontinence scores, complications, and recurrence rates, were collected and analyzed using statistical methods.

Results: During a median follow-up period of 27.8 weeks, complete healing of the fistula was observed in all patients (100%), with no cases of seton loss or recurrence observed in five patients (4.8%). The median incontinence scores post last operation and at present were significantly improved compared with preoperative scores. The overall incontinence rate postoperatively was found to be 1.8%.

Conclusion: The loose seton followed by fistulotomy technique demonstrated favorable outcomes in terms of fistula healing, low rates of incontinence, and acceptable recurrence rates. Despite the need for multiple surgeries in some cases, the benefits of this approach in preserving continence and reducing recurrence support its suitability for treating transsphincteric perianal fistulas.

Keywords: Perianal fistula, loose seton, fistulotomy, transsphincteric fistula, incontinence

Introduction

Perianal fistulas are a common condition affecting the anorectal region, with cryptoglandular abscesses accounting for the vast majority of cases.[1] The primary goal of surgical treatment is to achieve complete healing of the fistula tract while preserving anal sphincter function. The seton technique is commonly employed in transsphincteric fistulas to prevent incontinence by promoting fibrosis in the surrounding tissue. Traditionally, the "cutting seton" has been utilized for an extended period, but serious adverse effects, such as patient discomfort due to pain and relatively high rates of incontinence, have been reported.[2,3] The loose seton technique is often used for palliation in cases of perianal abscesses and symptom control. However, it has also been demonstrated that using a loose seton followed by fistulotomy yields favorable results with acceptable lower rates of incontinence.[4-7]

In this retrospective study, we aim to investigate the outcomes of loose seton followed by fistulotomy in patients with transsphincteric perianal fistulas.

Materials and Methods

This study was conducted at the University of Health Sciences Turkey, Samsun Training and Research Hospital following approval from the Local Ethical Committee (approval number: 2024/2/3, date: 17.01.2024). Between September 2015 and December 2023, a total of 114 patients with transsphincteric anal fistulas underwent surgery in the department and were included in the study. Patients with other types of fistulas and those undergoing concurrent perianal surgical procedures were

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not included in the study. The diagnosis of perianal fistula was made through physical examination by identifying the external opening of the fistula around the anal canal and through magnetic resonance imaging by detecting the fistula tract. The primary outcome of this study was to assess the effectiveness of the loose seton followed by fistulotomy and the rate of incontinence.

Procedure

All patients underwent surgery under spinal anesthesia while in the jackknife position. The anal canal was examined to evaluate internal openings of the fistula tract and exclude other possible pathologies. In some cases, hydrogen peroxide solution was injected through the external opening to identify the tract. The fistula tract was completely excised until the external anal sphincter was reached, after which a seton was inserted and loosely tied. A circular piece cut from the thickest part of a sterile surgical glove was chosen as the seton material.

Postoperative Care and Follow-up

Patients were allowed oral intake 4 hours after the operation and discharged on postoperative day 1. They were then evaluated every 6-8 weeks, and surgery was performed when a seton revision was required or a definitive fistulotomy was indicated.

Data Collection and Analysis

Patient characteristics, demographic features, past medical history, operation times and frequencies, incontinence scores, complications, and recurrence rates were obtained from patient records, as well as through on-call interviews or outpatient clinic visits.

The Wexner Scoring System–a fecal incontinence score ranging from 0 to 20, where 0 is perfect continence and 20 is complete incontinence; it is also termed the Cleveland Clinic Fecal Incontinence Severity Scoring System–was used for incontinence scoring (Table 1)[8]. The patients were divided into two groups based on their incontinence scores; the first group included patients with an incontinence score of <8, and the second group included patients with an incontinence score of ≥8.

Table 1. The Wexner Scoring System

Type of incontinence	Frequency				
	Never	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Gas	0	1	2	3	4
Wears pad	0	1	2	3	4
Lifestyle alteration	0	1	2	3	4

0 = perfect, 20 = complete incontinence, Never = 0 (never), Rarely = <1 month, Usually = <1 week, Always = ≥1/day

Statistical Analysis

Statistical analysis was performed using SPSS software version 25. The Kolmogorov-Smirnov test was used to assess the distribution of the data in the analysis. The Wilcoxon signed-rank test was chosen for comparing non-parametric dependent variables. For comparing categorical variables, the chi-squared and Fisher's exact tests were employed. The Mann-Whitney U test was used to determine the difference between non-parametric independent variables in the paired groups. Values with a p-value of <0.05 were considered statistically significant.

Results

Between 2015 and 2023, a total of 114 patients underwent surgery for transsphincteric fistulas in the hospital's surgical department. Patient characteristics and demographical features are summarized in Table 2. During a median follow-up period of 27.8 weeks, no patient experienced seton loss and recurrence was observed in only two patients. The median number of operations was three. Complete healing of the fistula was observed in all patients (100%). The median incontinence scores post last operation and at present were determined as 1 and 0, respectively. When comparing the median preoperative incontinence score with the median postoperative incontinence score, a statistically significant difference was found (0 vs. 1,

Table 2. Descriptive features of the patients

Mean age (SD) (years)	**44.78 (13.1)**
Sex n (%)	
Male	100 (87.7%)
Female	14 (12.3%)
Total	114
Preoperative abscess	
Yes	58 (50.9%)
No	56 (49.1%)
Number of external os	
1	102 (89.5%)
2	11 (9.6%)
3	1 (0.9%)
Number of operations	
2	67 (58.8%)
3	29 (25.4%)
4	14 (12.3%)
5	4 (3.5%)
Median follow-up time (min.-max.)	27.8 weeks (4-183)

SD: Standard deviation, min.: minimum, max.: maximum

p<0.001). However, no significant difference was found between the preoperative median incontinence score and the current median incontinence score (0 vs. 0, p=0.244).

Patients were divided into two groups based on their incontinence scores. When comparing the preoperative patient numbers with the post-last-operation and current patient numbers in these groups, no significant difference was found (Table 3). The relationship between postoperative incontinence scores and the number of operations performed, as well as the presence of abscesses before the operation, could not be determined (Table 4). During the follow-up period, recurrence occurred in five patients (4.3%).

Discussion

The findings of this study shed light on several important aspects related to the management of perianal fistulas and the impact on incontinence outcomes. The results indicate the efficacy of the loose seton followed by fistulotomy technique in achieving the primary objective of fistula tract healing while preserving anal sphincter function.

The absence of a significant difference between preoperative and current status incontinence scores suggests that the surgical approach employed in this study may contribute to maintaining continence levels postoperatively. However, the observed difference between preoperative and current status incontinence groups highlights the need for further investigation into factors influencing long-term continence outcomes in patients with perianal fistulas.

In our study, only five patients had Wexner scores ≥8 in long-term follow-up. Three of these patients already had incontinence scores >10 before surgery (10, 12, and 15, respectively). The patient with an incontinence score of 15 showed a decrease to 10 in postoperative follow-up. No change was observed in the patient with a score of 12. The patient with a score of 10 had an increase in postoperative incontinence score to 13. Among the two patients with preoperative incontinence scores of 0, the postoperative scores were 8 and 10. As a result, out of a total of 111 patients who did not have preoperative incontinence, only 2 were found to have postoperative incontinence (1.8%). When compared with the cutting seton, this rate remains quite low. The rates of fecal incontinence following cutting seton procedures vary between 8.4% and 60% in the literature.[9,10] The rates of fecal incontinence following loose seton procedures have been reported as 0-17% in various studies.[1,4,6,7,11] Our results are consistent with the literature. The low incontinence rate is one of the most significant advantages of the loose seton compared with the cutting seton.

Interestingly, no significant difference was found in the preoperative incontinence scores between patients with and without preoperative abscesses, indicating that the presence of an abscess may not necessarily predict preoperative continence status. However, the significant difference in current incontinence scores between these groups underscores the potential impact of abscess formation on postoperative continence outcomes. This result, although different from that of the study by Sungurtekin et al.[7], may be attributed to the difficulty in identifying anatomical structures due to the intense inflammation caused by the abscess, leading to the observed difference between the abscess group and the non-abscess group.[6]

One of the most significant disadvantages of loose seton application is the potential need for multiple surgeries in patients. Nearly half (41.2%) of our patients needed to undergo three or more surgeries. Similar results are also found in the literature.[6,12,13] Furthermore, the analysis comparing patients requiring three or more surgeries with those requiring two surgeries revealed no significant differences in postoperative or current status incontinence scores. This suggests that the number of surgeries may not be a significant predictor of long-term continence outcomes in patients with perianal fistulas, highlighting the importance of individualized treatment approaches based on patient characteristics and disease severity.

In our study, the recurrence rate was determined to be 4.3%, which is consistent with the literature.[1,4,6,11,14,15] Studies have identified various risk factors for recurrence. These risk factors include high transsphincteric fistulas, situations where the internal opening cannot be located, a history of previous anal surgery, and multiple fistula tracts.[14-16] In our study, out of the five patients who experienced recurrence, two had a history of previous anal surgery. Additionally, three patients had anal abscesses.

Table 3. Comparison between the preoperative incontinence group and the post-last-operation incontinence group

Patient group	Preoperative	After last operation	
Low score (n)	112	110	
High score (n)	2	4	p=0.069*
Total (n)	114	114	

*Fisher's exact test

Table 4. Comparison of preoperative incontinence scores between groups with and without preoperative abscesses

Preoperative abscess	Preoperative incontinence score	
Yes	0 (0-16)	p=0.064
No	0 (0-3)	

Study Limitations

Our study has some limitations that should be addressed. Comparisons with other types of fistulas and treatment methods were not made. Additionally, the sample size was relatively small, which reduces the statistical power of the study. Our median follow-up period was relatively short; consequently, we are unable to comment on the long-term outcomes of the "loose seton" method.

Conclusion

In conclusion, despite its disadvantages of requiring a long treatment duration and multiple surgical procedures, the loose seton procedure is preferred in transsphincteric fistulas due to its low rates of incontinence and recurrence. Further comprehensive studies with longer follow-up periods should support this recommendation.

Ethics

Ethics Committee Approval: This study was conducted at the University of Health Sciences Turkey, Samsun Training and Research Hospital following approval from the Local Ethical Committee (approval number: 2024/2/3, date: 17.01.2024).

Informed Consent: Retrospective study.

Authorship Contributions

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

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

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RESEARCH ARTICLE

General Surgeons' Approach to Pilonidal Abscess in Turkey: Results of a Nationwide Survey

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ABSTRACT

Aim: This nationwide survey study aimed to determine the initial and definitive treatment strategies for pilonidal abscess (PA) that are used by general surgeons in Turkey.

Method: Surgeons working at centers in Turkey were sent an electronic questionnaire focusing on diagnostic, perioperative, and postoperative management options for PA. The questions were prepared based on an extensive assessment of the literature and were evaluated for usability prior to distribution. A survey consisting of 20 questions was sent to surgeons and surgical residents via email. The survey link was kept active for 1 month to give the surgeons enough time to complete it.

Results: Of the 520 participants, 64% defined themselves as general surgeons and 9.5% as colorectal surgeons. The most preferred surgical approaches among the participants were as follows: day surgery unit (75.2%), local anesthesia (82.8%), and drainage through the most fluctuant location (65.1%). Irrigation of the cavity was applied by 70% of the participants (38.8% with saline and 32.3% with hydrogen peroxide). The majority (82.5%) prescribed oral antibiotics following PA drainage. Definitive treatment was scheduled within a timeframe of 4-8 weeks by 45.6%. Participants who performed concurrent phenol application were more likely to perform a definitive treatment if the patient becomes symptomatic ($p<0.001$, odds ratio: 10,819, 95% confidence interval: 2,682-43,645).

Conclusion: The study revealed that there are different approaches to the management of PA among surgeons in Turkey. Guidelines and consensus studies should be conducted to achieve the best results in the management of PA.

Keywords: General surgery, management, pilonidal abscess, surgeon approach, treatment

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Introduction

Pilonidal disease (PD) is an inflammatory condition arising from a foreign-body reaction triggered by the ingrowth of hairs in the gluteal cleft or their migration to this area from elsewhere in the body. Although it was previously categorized as congenital, PD is now regarded as acquired.[1]

The disease can be present in various forms: asymptomatic, as a simple cyst, an acute abscess accompanied by cellulitis, or as chronic discharging sinuses.

Approximately 60% of patients present with an acute abscess that may be accompanied by cellulitis.[2] More than half of these patients benefit from simple incision and drainage. Symptoms persist after the initial drainage in the remaining half, necessitating definitive surgery.[3-5] There is no consensus on the optimal pilonidal abscess (PA) treatment, with treatment options varying from needle aspiration to wide cyst excision.[2-5] Some authors endorsing excision or cyst unroofing with curettage or the lay-open technique[4,6] advocate the single-step approach with curative intent. Others aim to convert the emergency into an elective procedure by aspirating PA with a needle or draining it through a small incision.[3,5] Limited studies have also been published regarding endoscopic pilonidal sinus treatment (EPSIT), considered a single-step approach with low recurrence rates.[6-8]

Results related to the initial approach to PA are generally derived from studies that also include chronic PD, and limited data focuses solely on acute conditions. Guidelines and consensus reports from key associations on the best approach for PA are based on the limited literature available.[9-12]

This study aims to identify the preferred treatments for PA among general surgeons in Turkey. The secondary aims are to identify strategies for postoperative follow-up (e.g., antibiotic use and wound care) and definitive treatment (e.g., timing and procedure). The results of this survey will be crucial in determining the approach of surgeons in Turkey to managing PA and laying the groundwork for a series of planned future studies.

Materials and Methods

Survey

The study protocol was approved by a İstanbul Medipol University National Ethical Committee (approval no: 727, date: 31.08.2023). An electronic survey was created using SurveyMonkey[13] (https://surveymonkey.com), and the study's steering committee determined the questions. Prior to creating the questionnaire, the steering committee conducted a comprehensive 10-year literature review, searching databases (e.g., Embase, MEDLINE, Web of Science, PubMed, and Cochrane Library) following the Checklist for Reporting Results of Internet E-Surveys statement.[14] Publications in English were considered, and the steering committee tested the usability and technical functionality of the survey.

The questionnaire consisted of 20 questions, and it took approximately 4 minutes to complete. The first question requested consent, and questions 2-7 gathered personal information, job titles, surgical interests, and the yearly quantity of PD procedures conducted by the participants. Questions related to disease diagnosis (question 8), perioperative strategy (questions 9-13), surgical treatment choices (questions 13, 14), antibiotic administration (questions 15-17), postoperative management (question 19), and preference for permanent treatment (question 20) were included.

The survey, designed as a closed survey, was distributed via email to 1,860 members of the Turkish Surgical Association (TSA), comprising surgeons and surgery residents. The participants' email addresses were obtained through the TSA. The survey was conducted voluntarily, and no incentives were offered to the participants. Upon registration for the survey, the participants provided their names and email addresses, which were subsequently recorded in the system. This was used for identification purposes. The estimated time to complete the survey, the researchers' identities, and the study's aims were provided on the introduction page of the survey. All questions were on a single page, and the participants could review and change their responses before finishing. Cookies were used to assign a unique user ID to each participant's computer to prevent repeated entries. The data were collected between August 8 and September 8, 2023. Three reminder emails were sent to non-responders at one-week intervals after the first email.

Retired surgeons, participants who did not complete all survey questions, and those who did not indicate their consent were excluded from the analysis.

Statistical Analysis

The data were analyzed based on sociodemographic characteristics and variables associated with the responses. The response percentages were calculated by dividing the number of participants for each response by the total number of replies received for that question. Continuous data were summarized using means and standard deviations, whereas categorical variables were examined using proportions. Pearson's chi-squared test was used to compare categorical data across groups. Dummy variables were created, and logistic regression was performed using a stepwise variable selection technique. Three models were constructed using the data, with each model corresponding to one of the answers provided in the previously mentioned question. All database variables, encompassing the dependent variables, were treated as dummy variables. The categories for each variable

were grouped to ensure an adequate sample size. Due to the dichotomization of the dependent variables through the grouping procedure, explanatory variables were selected based on the Akaike information criterion using a logistic stepwise regression model. Considering the many tests conducted, p-values below 0.05 were carefully assessed to address the potential risk of false positives.

Results

Demographic and Occupational Characteristics

Table 1 provides an overview of the demographic and occupational characteristics of the participants. Out of the 520 participants meeting the inclusion criteria, the majority (82.3%) were men, with a wide age distribution, with a significant proportion notably falling between 31 and 40 years old (31.9%). In terms of professional roles, almost half were attending surgeons (47.8%), and a substantial portion worked in university or training and research hospitals, representing 55.6% of the settings. Most participants identified themselves primarily as general surgeons (64%).

Surgical Approach

Table 2 details the surgical methods used. Regarding yearly PA drainage, 36.9% of the participants reported draining over 30 abscesses. Almost all of the participants (99.2%) relied on physical examination for diagnosis, with 75.2% preferring the day surgery unit. Local anesthesia was the most favored approach (82.8%), with short- and fast-acting local anesthetics being the top choices (80.8%).

Drainage of PA from the most fluctuant location was the preferred approach for 65.1% of the participants. When irrigating the cavity following abscess drainage, 38.8% of the surgeons used normal saline, and 32.3% used hydrogen peroxide. Additionally, 62% of the surgeons chose to perform incision and drainage as a standalone treatment without further therapies.

Postoperative Care

Table 3 presents a detailed analysis of the postoperative treatment and follow-up procedures in PA management. Most surgeons (82.5%) prescribed oral antibiotics following PA drainage, with a smaller percentage combining oral and local antibiotics (8.7%), or opting not to use antibiotics at all (7.3%). Regarding antibiotic preference, 75.2% of the participants chose anti-aerobic and anti-anaerobic antibiotics.

Regarding the timing for definitive treatment following PA drainage, the largest group (45.6%) recommended a window of 4-8 weeks.

Concerning the initiating of antibiotic treatment, 73.1% reported routinely using antibiotics, whereas 24.2% were influenced by deep surgical infection or cellulitis. Over half of the participants (56.5%) recommended changing the dressing once a day for wound care (Table 4).

Question-Based Stepwise Regression

A stepwise regression analysis was conducted to determine whether surgeons who expressed a high level of adherence to a specific treatment in some questions also demonstrated a similar tendency toward treatment approaches in other questions. Significant results from the questions (Q) and subsequent answers (A) using the stepwise regression model are provided in the appendices.

Table 1. Demographic and occupational characteristics of the participants

	n	%
Q2: Age		
20-30	77	14.4
31-40	171	31.9
41-50	130	24.3
51-60	83	15.5
61-70	49	9.1
71-80	10	1.9
Q3: Gender		
Woman	77	14.4
Man	441	82.3
Other	0	0
Q4: Academic position		
Resident	114	21.3
Attending surgeon	256	47.8
Assistant professor	37	6.9
Associate professor	62	11.6
Professor	51	9.5
Q5: Setting		
University hospital	109	20.3
Training and research hospital	189	35.3
State hospital	109	20.3
Private hospital	88	16.4
Private office	22	4.1
Q6: Specialty		
Breast and endocrine surgeon	71	13.2
Bariatric and metabolic surgeon	9	1.7
Hepatobiliary surgeon	7	1.3
Gastrointestinal surgeon	39	7.3
Colorectal surgeon	51	9.5
General surgeon	343	64

Table 2. Surgical approaches

	n	%
Q7: How many PAs do you drain in one year?		
0-10	104	19.4
11-20	127	27.3
21-30	91	17
>30	198	36.9
Q8: What do you use in the diagnosis of PA?		
Medical history	207	39.8
Physical examination	516	99.2
Ultrasound	54	10.4
MRI or CT	18	3.5
Q9: Where do you usually drain PA?		
Office	138	25.7
Day surgery unit	403	75.2
Operation room	177	33
Q10: What is your preferred analgesia/anesthesia method for PA drainage?		
Local anesthesia	444	82.8
General anesthesia	23	4.3
Spinal/regional anesthesia	95	17.7
Local anesthesia with sedation	104	19.4
Other	7	1.3
Q 11: Which of the followings do you prefer for local anesthesia?		
Short- and rapid-acting local anesthetics	433	80.8
Long- and slow-acting local anesthetics	42	7.8
Local anesthetic ointments	7	1.3
Combination of rapid- and slow-acting anesthetics	69	12.9
Cold spray	43	8
I do not use local anesthetics	21	3.9
Q12: What is your preference for the incision location for PA drainage?		
The most fluctuant location	349	65.1
Close to midline	76	14.2
Lateral	48	9
Enlarging the existing pit or connect it with other pits	41	7.6
Q13: How do you treat PA?		
Incision and drainage	64	11.9
Incision, drainage, and irrigation with serum physiologic	208	38.8
Incision, drainage, and irrigation with hydrogen peroxide	173	32.3
Incision, drainage, and irrigation with povidone iodine	76	14.2
Other	5	1
Q14: Do you apply any concurrent treatments during PA drainage?		
No, only incision and drainage	323	62.1
Unroofing and drainage	135	26
Drainage and phenol (crystalized or liquid) application	68	13.1
Drainage and laser ablation	4	0.8
Drainage and EPSIT	3	0.6
Other	5	1

PA: Pilonidal abscess, MRI: Magnetic resonance imaging, CT: Computed tomography, EPSIT: Endoscopic pilonidal sinus treatment

Those that may be important in clinical practice are listed below.

Participants who typically performed PA drainage in the operating room (Q9) showed a significant preference for concurrent unroofing with PA (Q14) (Appendix 1.1). The surgical approach of "incision, drainage, and irrigation with hydrogen peroxide" (Q13) was significantly associated with concurrent unroofing (Q14) (Appendix 1.2). Furthermore, participants who perform concurrent phenol application with PA drainage (Q14) are more inclined to administer definitive treatment if the patient is symptomatic (Q20) (Appendix 1.3). Additionally, the choice of "local antibiotic application and closed dressing with sterile gauze or sponge" for dressing type (Q19) was significantly correlated with the surgical approach of "unroofing, incision, drainage, and irrigation with hydrogen peroxide" (Q13) (Appendix 1.4).

Discussion

This study sheds light on the preferred approaches of surgeons in Turkey regarding managing PA, which are briefly mentioned in guidelines but still present unresolved issues in the literature.[9-12] These unsolved problems are as follows: the initial treatment of PA (incisional or excisional), the timing of definitive treatment (concurrent with abscess drainage or delayed, and if delayed, by how long), and the role of antibiotics in treatment. The survey findings indicated that one-third of the participants favored unroofing over simple incision and drainage for treating PA. Additionally, 16%

Table 3. Approaches to postoperative care and follow-up

	n	%
Q15: What is your practice regarding the use of antibiotics after PA drainage?		
Oral antibiotics	429	82.5
Local antibiotics	6	1.2
Oral and local antibiotics	45	8.7
I do not use antibiotics	38	7.3
Q16: Which antibiotics do you prefer?		
Anti-aerobic	47	9
Anti-anaerobic	39	7.5
Both aerobic and anti-anaerobic	391	75.2
I do not use antibiotics	32	6.2
Other	4	0.7
Q17: What is the primary factor that influences your tendency to initiate antibiotics?		
I routinely use antibiotics	380	73.1
Presence of deep surgical infection or cellulitis	126	24.2
Atypically located abscess	28	5.4
Regarding culture result	23	4.4
Immune deficiency	61	11.7
Comorbidity (diabetes, COPD, etc.)	84	16.2
Other	1	0.2
Q18: What is your approach to wound care following PA drainage?		
Changing the dressing once a day	294	56.5
Changing the dressing twice a day	71	13.7
Changing the dressing when it gets wet	132	25.4
I do not recommend dressing	18	3.5
Other	4	0.7
Q19: What kind of dressing do you recommend after PA drainage?		
Cleaning with povidone iodine and closed dressing with sterile gauze or sponge	289	55.6
Cleaning with serum physiologic and closed dressing with sterile gauze or sponge	121	23.3
Washing with water and soap in the shower and closed dressing with sterile gauze or sponge	117	22.5
Local antibiotic application and closed dressing with sterile gauze or sponge	43	8.3
I do not recommend dressing	19	3.7
Other	9	1.7
Q20: When do you typically recommend definitive treatment after PA drainage?		
In the same session	16	3.1
<4 weeks	101	19.4
4-8 weeks	237	45.6
>8 weeks	90	17.3
When it becomes symptomatic	61	11.7
Other	11	2.1

PA: Pilonidal abscess, COPD: Chronic obstructive pulmonary disease

Table 4. Responses to question 17: What is the primary factor that influences your decision to start antibiotics? (multiple answers can be marked)

	n	%
I start antibiotics routinely for every patient	438	72.7
In the presence of deep surgical area infection/cellulitis	168	27.9
In atypically located abscesses	41	6.8
Based on culture results	8	5. 4
In patients with immunodeficiency	84	13.9
In the presence of comorbidities (diabetes, COPD, etc.)	104	17.3
Other (please specify)	4	0.66

COPD: Chronic obstructive pulmonary disease

reported performing definitive treatment in the same session. Those who applied phenol (13%) did so with curative intent and did not plan any definitive treatment unless the patient became symptomatic again. These results are consistent with one-third of the procedures performed in the operating room. Two-thirds of the participants routinely use oral antibiotics predominantly. Almost all of the participants recommended closed dressing following the procedure.

Performing the procedure in the operating room or office setting presents advantages and disadvantages. The operating room environment may provide surgeons with the opportunity for a more aggressive and definitive approach. However, there is limited data in the literature comparing simple incision and drainage with excision or unroofing. In a randomized controlled trial involving 150 patients comparing simple incision and drainage with unroofing, the latter demonstrated superiority, exhibiting a higher complete healing rate at 10 weeks (96% vs. 79%, p=0.001) and a lower recurrence rate at 65 months of follow-up (11% vs. 45%, p=0.001).[4] Another study by Garg et al.[5] reported a cure rate of 97% with unroofing along with curettage. Although guidelines recommend incision and drainage followed by delayed elective surgery following the resolution of inflammation,[9,11] a meta-analysis documented a pooled recurrence rate of 4.47% (95% confidence interval: 0.029-0.063) following unroofing, debridement, and open treatment for both chronic PD and PA, which appears favorable compared with incision and drainage.[15]

The results concerning the initial approach to PA are predominantly derived from studies that also encompass chronic PD, with limited data focusing solely on acute conditions. Even fewer studies address the necessity and timing of definitive surgery following the initial approach. In a prospective randomized study, 102 patients presenting with PA were divided into 2 groups: the first underwent simple drainage followed by excision and primary closure 3 weeks later, and the second group received excision and was left for secondary healing.[16] The group undergoing simple drainage exhibited a higher rate of recurrent abscess at 12 months of follow-up (14% vs. 0%, p<0.05) and a greater recurrence rate (42% vs. 11%, p<0.05).[16] Matter et al.[6] compared wide excision and simple drainage in 58 patients with PA and found recurrence rates of 55% and 41%, respectively, after a median follow-up of 6 years (p>0.05). Another retrospective study of 57 patients with a 4-year follow-up reported recurrence rates of 19% and 54% following wide excision-lay open and incision-drainage, respectively (p<0.05). However, the excision group exhibited unfavorable outcomes in terms of time needed to return to work and wound healing. Despite being small series, the high recurrence rates in these studies with long follow-up periods indicate that performing definitive wide excision in the same session does not offer an advantage, and 19%-50% of patients required elective intervention.[6] In our survey, surgeons who preferred to drain PA in the operating room demonstrated a higher tendency toward a curative approach in the same session. The necessity and cost-effectiveness of this approach, along with its impact on post-procedural return to work, pain management, and quality of life, remain unclear and warrant further evaluation.

Studies involving a small number of patients regarding the role of minimally invasive techniques in PA treatment have compared simple incision and drainage with endoscopic PA treatment, demonstrating faster wound healing with endoscopic treatment (16 vs. 35 days, p=0.0018). However, the eventual need for definitive surgery was similar in both groups.[7,8] Only 1% of the surgeons participating in our survey employ treatments such as laser and EPSIT concurrently.

In chronic PD surgery, excisional methods with off-midline techniques are considered the gold standard. However, there is insufficient data regarding approaches to abscess drainage.[10-12] The optimal site for draining a PA remains unclear: some authors recommend a lateral incision, others suggest a cruciform incision, and some remain undecided.[17] Making a longitudinal off-midline incision is recommended based on anecdotal evidence, suggesting that midline wounds tend to

heal more slowly.[17,18] Conversely, some authors argue that an incision along the midline is more effective, as it directly targets the primary area affected by the disease.[19] In their study comparing PA drainage through midline and lateral incisions in 242 patients, Webb and Wysocki[20] demonstrated that abscesses drained from the midline had an average healing duration of 3 weeks longer. Most participants in our survey stated that they drained the PA from the most fluctuant location. A small portion preferred enlarging the existing pit or connecting it with other pits, which should be the subject of future studies.

Regarding the approach of delayed definitive treatment, half of the surgeons participating in the survey opt to do this between 4 and 8 weeks. Guidelines recommend definitive treatment once the inflammation heals.[11] The wound healing time was 1-120 days after simple incision drainage and 1-3 months after excision.[21] The optimal timing for undertaking definitive treatment remains a subject of debate. An important consideration is whether clinicians should delay definitive intervention until complete wound healing or resolution of infection. The available data to guide these decisions are insufficient, and further studies are needed. Phenol application is a widely practiced method in treating PD in Turkey. PD accompanied by an acute abscess is typically regarded as a criterion for exclusion in studies involving the application of phenol.[22,23] However, the literature suggests that phenol application simultaneously with abscess drainage yields acceptable results.[24,25]

Logistic regression results from our survey revealed that surgeons who utilize phenol (13%) during PA drainage typically do not plan further treatment if the patient remains asymptomatic. The potential for phenol treatment to yield definitive outcomes when administered alongside PA drainage warrants further exploration in prospective studies.

The use of antibiotics after draining a PA is a widely adopted approach,[26,27] targeting the common bacteria responsible for abscess formation.[28] In our survey, two-thirds of the participants routinely administered antibiotics, preferring oral aerobic and anti-anaerobic options. However, there is a need for studies specifically focusing on PA to evaluate the prophylactic or maintenance use of antibiotics and the optimal duration of their administration.

A great number of surgeons in Turkey continue to employ interventions such as irrigating wounds with hydrogen peroxide (26%) and using closed dressings with local antibiotics (8.3%). This is despite the lack of evidence supporting their beneficial impact on wound healing.[29-31] Our logistic regression analysis indicates that surgeons who irrigate wounds with hydrogen peroxide are more likely to apply dressings with local antibiotics. Although intraoperative hydrogen peroxide irrigation has been associated with a reduced risk of surgical site infection in orthopedic procedures,[32] guidelines advise against its use due to its adverse effects on wound healing. The daily practices of surgeons in Turkey diverge from recommendations supported by existing literature. Establishing a nationwide comprehensive prospective database and conducting studies to evaluate the impact of hydrogen peroxide application on healing following PA drainage would be beneficial.

Study Limitations

Our participants included very few colorectal surgeons, half did not work in teaching hospitals, and fewer than a third were academics. Therefore, our study is significant in reflecting the real-world situation in the field. Approximately 80% of the participants drained 10 or more PAs, a substantial indicator of its prevalence in Turkey.

However, the survey might not have reached every practicing surgeon. Since it was conducted via closed email, we only reached our target audience, and it was not randomly shared on social media. Although the participants are fairly heterogeneous, they represent the desired target audience. There were no questions or evaluations related to the quality of life. The survey was not open to patient participation and provided no information about patient-reported outcome measures.

Conclusion

Turkey is one of the countries where PD is most prevalent,[33] and surgeons frequently encounter PA in their daily practice. The results of this survey indicate that surgeons in Turkey should be encouraged to adhere to the guidelines for the treatment of PD. If they achieve favorable outcomes through alternative approaches, they should contribute to the literature by documenting their experiences.

In conclusion, neither studies nor PD guidelines fully address the challenges encountered in clinical practice. It may be advisable to consider PA as a distinct entity separate from chronic PD, warranting specialized studies of its own. We believe that the current gap in this field should be addressed by surgeons in Turkey documenting their experiences in approaching PA through well-designed randomized controlled trials.

Ethics

Ethics Committee Approval: The study protocol was approved by a İstanbul Medipol University National Ethical Committee (approval no: 727, date: 31.08.2023).

Informed Consent: Retrospective study.

Authorship Contributions

Surgical and Medical Practices: İ.H.Ö., Ç.A., S.N.K., C.T., I.A., R.K., A.C.Y., C.B.K., T.K., İ.E.C., S.Z., Y.S., S.Z., E.K., Concept: İ.H.Ö., Ç.A., Design: İ.H.Ö., Ç.A., C.T., I.A., R.K., A.C.Y.,

C.B.K., T.K., İ.E.C., S.Z., Y.S., S.Z., E.K., Data Collection or Processing: İ.H.Ö., Ç.A., S.N.K., Analysis or Interpretation: İ.H.Ö., Ç.A., S.N.K., Literature Search: Ç.A., C.T., I.A., R.K., A.C.Y., C.B.K., T.K., İ.E.C., S.Z., Y.S., S.Z., Writing: İ.H.Ö., Ç.A., S.N.K., E.K.

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CASE REPORT

A Rare Case of Malignant Perivascular Epithelioid Cell Tumor Mimicking Ovarian Cancer

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ABSTRACT

Lower gastrointestinal bleeding is defined as bleeding that originates distal to the ligament of Treitz. Neoplasms causing lower gastrointestinal bleeding generally originate from the colon. A similar clinical picture can sometimes be caused by the invasion of the colon wall by intra-abdominal masses. Perivascular epithelioid cell tumors (PEComas) are mesenchymal neoplasms composed of histologically and immunohistochemically epithelioid or spindle cells, with immunoreactive properties for smooth muscle and melanocytic markers. The differential diagnosis of patients being evaluated for an intra-abdominal mass should be made meticulously. In the presence of atypical signs, extra care should be taken. This paper reports a case of an ovarian malignant PEComa presenting with melena from an ulcerated lesion in the transverse colon.

Keywords: GB100 protein, Melan-A, melena, perivascular epithelioid cell neoplasms, ulcer

Introduction

In 1992, Bonetti et al.[1] proposed the term "perivascular epithelioid" to describe morphologically and immunohistochemically unusual cell types with a perivascular distribution. These cells are immunoreactive for melanocytic markers, have an epithelioid appearance and a clear acidophilic cytoplasm, and show a perivascular distribution. Over time, this nomenclature has been applied to a family of tumors, including angiomyolipoma, clear cell sugar tumors, lymphangioleiomyomatosis, clear cell myomelanocytic tumor of the falciform ligament, and other unusual clear cell tumors. In 2002, due to the diversity within the perivascular epithelioid cell tumor (PEComa) family, the World Health Organization defined the diagnosis of PEComa as a "mesenchymal tumor composed of histologically and immunohistochemically distinct perivascular epithelioid cells".[2] Malignant PEComas are estimated to occur in 0.12–0.24 per million people worldwide.[3] We present an extremely rare case of ovarian PEComa with melena from a clinicopathological perspective.

Case Report

A 46-year-old woman presented with intermittent watery, tarry stools, accompanied by a change in stool frequency. On physical examination, a mass was palpated in the midline of the abdomen, and melena was also noted. Dynamic contrast-enhanced magnetic resonance imaging depicted a 21x14x10 cm right ovarian lesion with irregular borders and contrast enhancement (Figure 1). Colonoscopy revealed a 2x2 cm ulcerated lesion in the transverse colon. Although the histopathological examination of the biopsy showed malignant features, a clear diagnosis could not be made; therefore, the council decided to proceed with surgery. Exploratory laparotomy revealed a soft, fragile mass lesion with irregular borders invading the transverse colon (Figure 2). During surgery, en bloc resection of the mass with the transverse colon was performed. The frozen section analysis confirmed that the surgical margins were negative and ruled out adenocarcinoma. Immunohistochemistry examinations are summarized in Table 1. The final pathology indicated PEComa, as the tumor was large (≥5 cm), exhibited high nuclear grade cellularity, contained areas of coagulation necrosis, and had a high mitotic index (2 figures per 50 high magnification fields) and a cellular character (Figure 3). A positron emission tomography-computed tomography (CT) scan detected no residual lesion or metastasis. The patient's clinical follow-up protocol was determined by the multidisciplinary tumor board, and the patient received no further treatment. At the 6-month follow-

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up, the patient had no complaints, and abdominal and thorax CT scans were normal. Informed consent was obtained from the patient for this case report.

Discussion

We presented a rare case of ovarian PEComa. The colonoscopic biopsy performed for differential diagnosis did not provide a definitive pathological diagnosis. Furthermore, diagnosing this rare condition proved challenging even in the final pathology after surgery.

In the PEComa family, cells are located around small-to-medium-sized vessels and seem to form a vessel wall. It is necessary to make differential diagnoses of tumors with clear cell morphology from other spindle and epithelioid mesenchymal neoplasms, including gastrointestinal stromal tumors, tumors with positive melanocytic antigens (melanoma, clear cell sarcoma, smooth muscle cell tumors, and adrenal cortical cancers), rhabdomyosarcoma, myoepithelial tumor, mature adipose tissue tumors, and alveolar sarcomas. Clinical, morphological, and immunohistochemical features are considered for differential diagnosis.[4] PEComa express melanocytic markers [e.g., GB100 protein (HMB45), Melan-A, tyrosinase, and microphthalmia-associated transcription factor (MITF)]. They have a granular eosinophilic cytoplasm and express smooth muscle markers (e.g., smooth muscle actin, pan-muscle actin, muscle myosin, calponin, and h-caldesmon).[5] The most commonly expressed in cutaneous and sclerosing PEComas is desmin.[6] The most sensitive markers for PEComa are HMB45, Melan-A, and MITF.[7] This case of PEComa was positive for immunohistochemical staining of HMB45, Melan-A, and desmin.

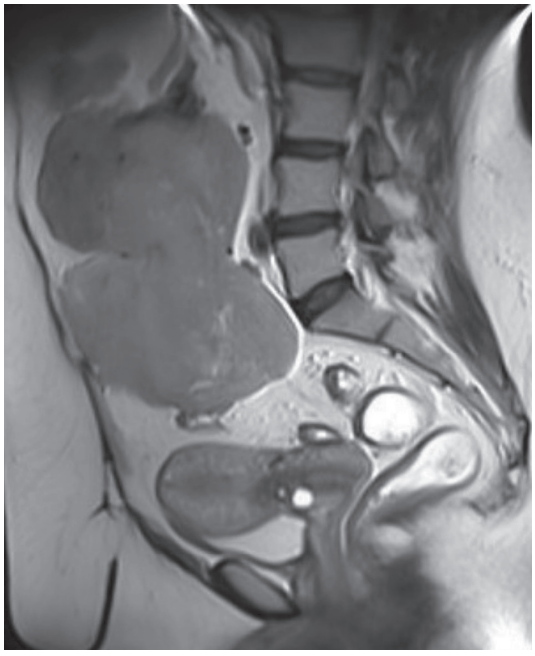

Figure 1. Preoperative magnetic resonance imaging

No clear optimal management strategy has been established in the treatment of PEComa. The most common treatment is surgical intervention. Treatment modalities (e.g., radiotherapy and chemotherapy) can be used in high-risk lesions. Neoadjuvant therapy has been administered in a limited number of cases, but desired outcomes have not been achieved. In a small group of patients, a diagnosis cannot be made without surgical resection, which leads to the inability to determine the treatment and to reduce its effectiveness. Heterogeneous results were achieved in the chemotherapy treatment of PEComas. Based on the current literature, it is difficult to determine the best chemotherapy regimen and efficacy.[8,9] The role of radiation therapy for PEComa remains unclear.[8,10] A specific group within the PEComa group shows aggressive features. The malignancy criteria in PEComas include histological features, a high mitotic index, tumor size of ≥5 cm, and the presence of vascular invasion and necrosis (Table 2). Meticulous follow-up and treatment plans should be made in this group.

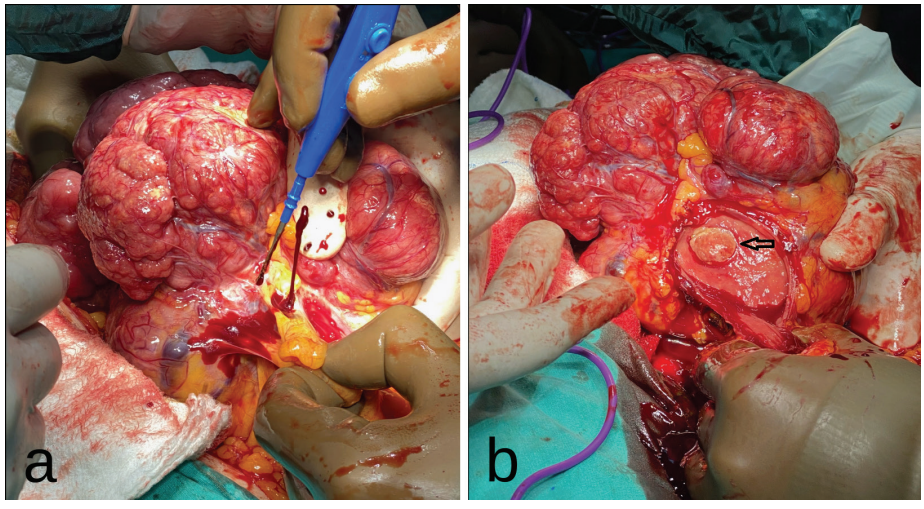

Figure 2. The appearance of a mass during surgery. a) Invasion area with transverse colon. b) Ulcerated area (arrow) formed in the colonic mucosa

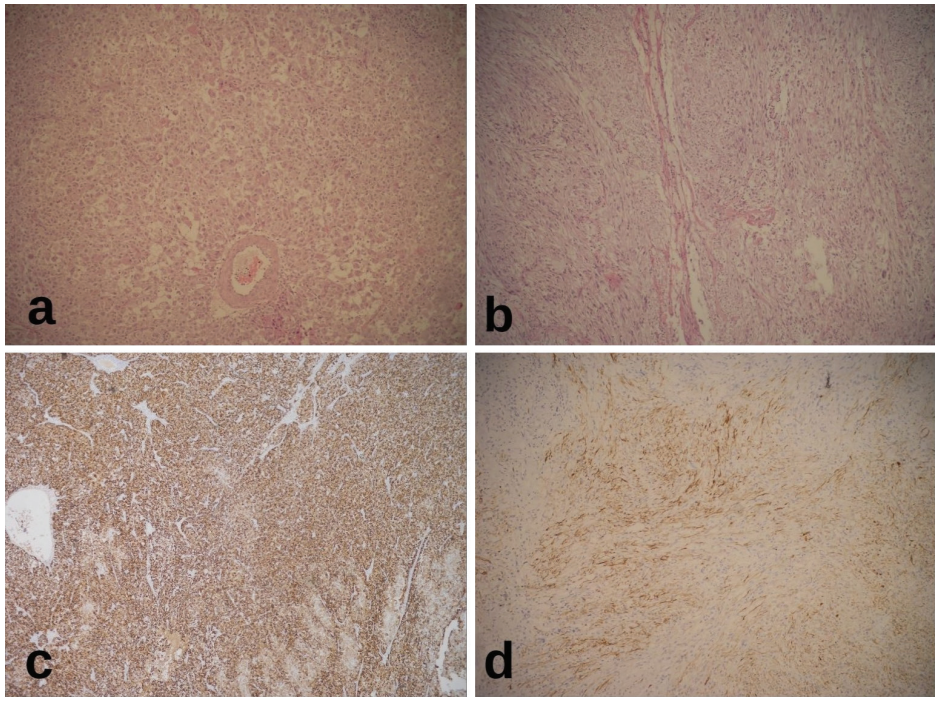

Figure 3. a) Epithelioid areas of PEComa with typical capillary-like vasculature and perivascular radial distribution of cells observed (hematoxylin-eosin, x400). b) Coexistence of spindled cells with epithelioid cells (hematoxylin-eosin, x400). c) Strong positive staining for HMB-45 and Melan-A observed (x400). d) Presence of desmin-positive spindled component (x400)

PEComa: Perivascular epithelioid cell tumors

Table 1. Immunohistochemical examinations and their results

Immunohistochemical examination	Result
HMB45	Positive
Desmin	Positive
Melen-A	Positive
SMA	Light staining
CD34	Positive in tumor vessels
Myosin	Positive
Vimentin	Positive
Ki-67	5-10%
PanCK	Negative
CD117	Mild, patchy positive
Dog 1	Negative
S-100	Negative
ER	Negative
PR	Negative

ER: Estrogen receptors, PR: Progesterone receptors

Table 2. Classification of PEComas

Category	Criteria
Benign	**None of:** Size ≥5 cm Infiltrative growth pattern High nuclear grade cellularity Mitotic rate 1/50 HPF* Necrosis Vascular invasion
Uncertain malignant potential	**One of:** Nuclear pleomorphism Multinucleated giant cell Size ≥5 cm
Malignant	**Two or more:** Size ≥5 cm Infiltrative growth pattern High nuclear grade cellularity Mitotic rate >1/50 HPF Necrosis Vascular invasion

*HPF: High power fields

PEComas tend to develop local recurrence or distal metastases, most commonly to the lung. Metastatic spread may occur years or decades after curative surgery. No definitive treatment has been described in the literature to date. Surgery is the optimal treatment option whenever appropriate, particularly in oligometastatic patients. Although treated with systemic chemotherapy regimens, their efficacy is relatively low. In addition, better survival rates were reported up to 12 months onset from the diagnosis of metastatic disease without any adjuvant therapy. The use of mTOR inhibitors as targeted therapies holds promise.[11]

Although our case had malignant features, no adjuvant treatment plan was made due to the absence of metastatic disease, and clinical follow-up was deemed appropriate according to oncological principles.

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Ethics

Informed Consent: Informed consent was obtained from the patient for this case report.

Authorship Contributions

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

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CASE REPORT

Goblet Cell Adenocarcinoma of the Appendix: A Case Report and Review of the Literature

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ABSTRACT

Goblet cell adenocarcinoma (GCA) of the appendix is a rare and aggressive neoplasm characterized by goblet-like mucinous cells. Due to its rarity, there is limited data on its clinical course and management. Typically diagnosed incidentally or when mimicking acute appendicitis, GCAs require careful management to mitigate the risk of disseminated disease. This report discusses a case involving a 64-year-old man diagnosed with low-grade GCA, including the diagnostic workup, treatment approach, and outcomes. The management strategies parallel those for colorectal cancer, with potential benefits from cytoreductive surgery and intraperitoneal chemotherapy. The aim of this report is to enrich the knowledge base and offer insights into optimal management strategies.

Keywords: Appendectomy, carcinoma of the appendix, goblet cell adenocarcinoma, goblet cell carcinoma

Introduction

Primary appendiceal neoplasms are rare, accounting for only 1% of gastrointestinal tumors, with an incidence of fewer than 0.05 cases per 100,000 annually.[1] These tumors include colonic-type adenocarcinomas, carcinoids, mucinous neoplasms, signet ring cell carcinomas, and goblet cell adenocarcinomas (GCAs), which constitute 14-19% of cases.[2,3] GCA is an amphicrine neoplasm characterized by goblet-like mucinous cells with neuroendocrine features and behaves aggressively like an adenocarcinoma variant.[2,3] The incidence of GCA exhibits no gender bias, and is typically diagnosed between the ages of 50 and 60.[1]

Patients with appendiceal GCA often present with symptoms that mimic acute appendicitis or indicate advanced disease. Up to one-third of cases are incidentally discovered during an appendectomy. Considering a right hemicolectomy is crucial; however, due to the rarity of the disease, there is no clear consensus on its management. This report discusses a case of appendiceal GCA and current management strategies.

Case Report

A 64-year-old man with no prior surgical history or comorbidities presented to the emergency department complaining of right lower quadrant (RLQ) abdominal pain and vomiting. During the physical examination, the patient exhibited focal peritonitis in the RLQ. A computed tomography (CT) scan of the abdomen and pelvis revealed evidence of acute appendicitis. A laparoscopic appendectomy was performed based on this diagnosis.

Pathologic analysis of the specimen revealed a 1.5 cm diameter low-grade GCA (Figure 1) invading through the muscularis propria. Moreover, the tumor extended to the lateral surgical margin, and there was perineural invasion but no lymphovascular invasion. Furthermore, tumor cells stained strongly positive for chromogranin A (CgA) and focally positive for synaptophysin. Consequently, the specimen was classified as GCA, pathologic stage pT3NxMx.[4]

One week after the operation, plasma carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA19-9) levels were 3.96 ng/mL (0-5) and 17 U/mL (0-34), respectively.

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Additionally, abdominal-pelvic magnetic resonance imaging (MRI) revealed lymph nodes measuring 13 mm in size adjacent to the right iliac vein and minimal fluid in the perihepatic and perisplenic areas.

Subsequently, a right hemicolectomy was performed, and a pathologic examination revealed low-grade GCA infiltration in the right colon, with multiple foci on the serosal surface. The tumor had invaded the visceral peritoneum. Notably, of the 14 resected mesenteric lymph nodes, two were reported as metastatic. However, the surgical margins were tumor-free. Immunohistochemistry for synaptophysin and CgA was focally positive (Figure 2). The final pathologic staging of the tumor was pT4N1Mx.[4]

Following the hemicolectomy, plasma CEA and CA19-9 levels were 3.2 ng/mL (0-5) and 12 U/mL (0-34), respectively, with similar values measured during follow-up.

Postoperatively, adjuvant chemotherapy was discussed in a multidisciplinary tumor board. As a result, the patient received modified folinic acid, fluorouracil, and oxaliplatin every 2 weeks. Six months of chemotherapy were completed, and consecutive CT scans revealed no signs of recurrent disease. Furthermore, a subsequent colonoscopy performed 1-year after the initial diagnosis did not identify any malignant lesions. The patient has remained disease-free for 1.5 years during ongoing surveillance. Informed consent was obtained from the patient for this case report.

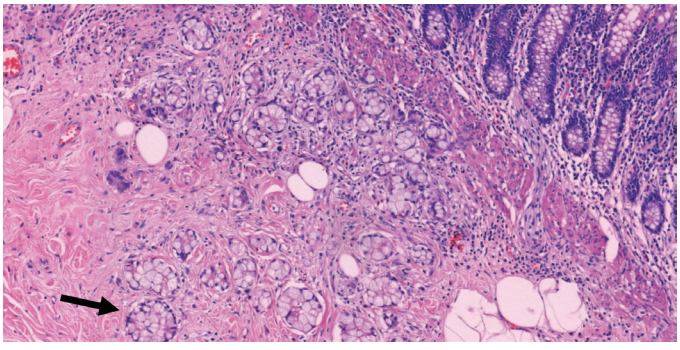

Figure 1. Low-grade goblet cell carcinoma of the appendix showing cohesive clusters of tumor cells with goblet-like mucinous cells (x15, Hematoxylin and eosin)

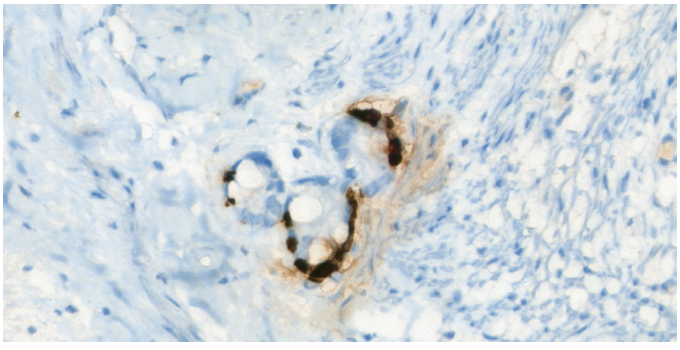

Figure 2. Chromogranin positivity in some of the tumor cells (x58, anti-chromogranin A)

Discussion

We presented a case involving a 64-year-old man initially diagnosed with acute appendicitis, who subsequently underwent a right hemicolectomy after a diagnosis of GCA was confirmed.

GCAs are classified as mixed adenoneuroendocrine carcinomas, displaying both neuroendocrine and glandular features. Histologically, they are characterized by goblet-shaped epithelial cells that contain mucin, often clustered in the lamina propria or submucosa of the appendix. These cells are distinctively marked by positive Periodic acid-Schiff staining, which helps differentiate them from appendiceal neuroendocrine tumors (NETs). Immunohistochemical markers such as CgA and synaptophysin show substantial expression, whereas CEA expression helps distinguish GCAs from appendiceal NETs. Cytokeratin (CK) staining for CK20 and CK19 also aids in differentiating them from adenocarcinomas.[5]

Due to the similarity of symptoms to various abdominal pathologies and gynecological malignancies, diagnosing appendiceal neoplasms can sometimes be challenging. Cases are typically diagnosed pathologically following an appendectomy. In some patients, preoperative CT imaging may raise suspicions of an appendiceal tumor. In such cases, or when an appendiceal tumor is suspected intraoperatively, diagnoses and surgical approaches can be refined through frozen-section analysis. For patients diagnosed with GCA, conducting abdomen-pelvis CT or MRI scans is advisable to ascertain the absence of locoregional or distant metastases.

In up to 80% of cases, CEA and CA19-9 levels are elevated. However, it is important to note that, unlike appendiceal NETs, serum levels of CgA hold no diagnostic value for GCA, as evidenced by our patient's case.

The prognosis of GCA is generally worse than that of appendix NETs but better than that of adenocarcinomas. The 5-year survival rate for GCA is approximately 90% for stage 1 and 2, 55-57% for stage 3, and 19% for stage 4 disease.[6] Among appendiceal tumors, GCAs have the lowest incidence of regional nodal metastases. Moreover, GCAs can also disseminate intraperitoneally, even without nodal metastases, a pattern similar to colorectal cancer (CRC), in which peritoneal tumor deposits are also observed.

Numerous cases of GCA are incidentally identified post-appendectomy, raising questions about the necessity for additional resection, such as right hemicolectomy. While randomized trials are lacking, studies have explored the potential benefits of right colectomy, especially in patients

with T3-T4 tumors.[7] Given the increased risk of metastases, a complete right hemicolectomy is recommended if the patient can tolerate further surgery. The American Society of Colon and Rectal Surgeons advocates for right hemicolectomy as the standard surgical treatment for GCA.[8]

The role of adjuvant chemotherapy for GCA has not been definitively established in randomized studies due to the rarity of this disease. Although the results regarding the survival benefit of adjuvant chemotherapy in non-metastatic GCA are conflicting,[9,10] similar to colon cancer, fluorouracil-based chemotherapy is recommended in the adjuvant setting.[8,11]

Treatment strategies for advanced appendiceal GCAs parallel those used for advanced CRC, involving fluoropyrimidine-based regimens. However, the specific roles of biologic agents such as bevacizumab and those targeting the epidermal growth factor receptor remain uncertain.[11] Notably, chemotherapy appears to yield superior responses in appendiceal GCAs compared with other adenocarcinomas of the appendix.[7] Limited data indicate that patients with isolated peritoneal spread might achieve prolonged survival through cytoreductive surgery coupled with hyperthermic intraperitoneal chemotherapy.[12,13]

Regarding post-treatment surveillance, given the aggressive nature of GCA, surveillance strategies similar to those used for CRC are recommended.[11]

GCA, a rare appendiceal tumor, combines adenomatous and neuroendocrine features. It is commonly diagnosed post-appendectomy, and early-stage cases often require a right hemicolectomy due to the risk of metastasis. Although the evidence is limited, adjuvant chemotherapy is typically recommended for localized disease. Continued research may lead to standardized treatment approaches, improving patient outcomes.

Ethics

Informed Consent: Informed consent was obtained from the patient for this case report.

Authorship Contributions

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

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

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