Predictive efficacy of rectus abdominis muscle and psoas major muscle thickness for postoperative morbidity in patients with endometrial cancer

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Abstract

Objective: The association between skeletal muscle mass and postoperative morbidity in cancer patients has been demonstrated, but the results are not conclusive. The study aims to determine the predictive efficacy of rectus abdominis muscle (RAM) and psoas major muscle (PMM) thickness and other factors such as age, American Society of Anesthesiologists (ASA) score, operation duration, obesity, preoperative inflammatory markers, and pathological findings for postoperative morbidity.

Material and Methods: One hundred forty-one patients who underwent total abdominal hysterectomy + bilateral salpingo-oophorectomy + retroperitoneal lymphadenectomy + omentectomy for endometrial cancer were assessed retrospectively. Standard procedures (antibiotic prophylaxis and thromboembolism prophylaxis) were applied pre- and postoperatively, and the thicknesses of the RAM and PMM were measured by computed tomography. Postoperative morbidity was defined in the 3-month postoperative period as patients treated with a diagnosis of postoperative infection, those who developed pulmonary complications, thromboembolic complications, lymphatic drainage disorders, intracranial hemorrhage, and mortality.

Results: The mean thickness of the right-left RAM in the morbidity group was 7.4±2.1 mm, and 8.2±2.1 mm in the group without morbidity (p=0.038). On the other hand, the thickness of the right-left PMM was similar in both groups. When the predictive cut-off value for RAM thickness was 7.52 mm, the sensitivity, specificity, and negative and positive predictive values were 54.2%, 65.6%, 73.5%, and 44.8%, respectively. Advanced age, high ASA score, and extended operation duration were associated with an increased risk of morbidity in univariate analysis. However, multivariate analysis revealed that only age and operation duration were independent risk factors for postoperative morbidity [respectively, odds ratio (OR): 1.06, 95% confidence interval (CI): 1.01-1.12, p=0.033 and OR: 1.003, 95% CI: 1.0003-1.007, p=0.039].

Conclusion: Age and operation duration were identified as independent risk factors for predicting postoperative morbidity. However, it has been shown that a more comprehensive evaluation, including RAM thickness and ASA score alongside these two factors, could provide more definitive results. [J Turk Ger Gynecol Assoc. 2025; 26(2): 121-9]

Keywords: Endometrial cancer, postoperative morbidity, sarcopenia, rectus abdominis muscle, psoas major muscle

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Introduction

Endometrial cancer is the most common gynecological cancer in developed countries and the second most frequent after cervical cancer in developing nations. Approximately 287,100 new cases are diagnosed annually worldwide (1). About 70% of these patients are identified at an early stage, with a 5-year survival rate of 80%, while those at stages IVA and IVB have 5-year survival rates of 17% and 15%, respectively (2).

The primary treatment for endometrial cancer is surgical, and it includes hysterectomy, bilateral salpingo-oophorectomy and lymphadenectomy in patients deemed at risk for extrauterine disease (3). These surgeries can be performed using laparoscopic, robotic, or open abdominal techniques. Surgical complications may include surgical site infections, thromboembolism (pulmonary emboli, deep vein thrombosis), and pulmonary complications (atelectasis, pulmonary disease). The rate of postoperative morbidity in patients undergoing primary surgery is reported to be between approximately 14% and 21% (4).

The likelihood of developing postoperative surgical site infections and other complications vary based on age, incision type, surgical procedure, operation duration, intraoperative hemorrhage volume, preoperative antibiotic prophylaxis, and the patient's comorbidities (5). Moreover, conditions characterized by low skeletal muscle mass, such as sarcopenia and myosteatosis, marked by increased fat and fluid infiltration into muscle, reflect reduced energy reserves and inadequate nutrition and are associated with chronic systemic inflammation (5-7). Sarcopenia has been shown to be associated with prolonged mechanical ventilation, longer stays in hospitals and intensive care units, postoperative complications, and increased mortality (8,9). Consequently, inadequate muscle mass has been linked to increased postoperative morbidity and mortality (10-12).

The European Consensus (European Working Group on Sarcopenia in Older People) defines computed tomography (CT) and magnetic resonance imaging as the gold standards for estimating muscle mass (13). According to the same consensus, measuring skeletal muscle area in images is a valid criterion for estimating muscle mass (13). Additionally, measurements of the thickness of the rectus abdominis muscle (RAM) have been shown to identify sarcopenia (14), and similarly, the thickness of the psoas major muscle (PMM) is a marker of skeletal muscle mass (15).

Few studies have investigated the impact of the RAM on morbidity in cancer patients. Zhuang et al. (16) demonstrated that RAM thickness was significantly different between groups with and without postoperative morbidity in patients undergoing radical resection for colorectal cancer, thus identifying it as a significant predictive factor for postoperative complications. Liu et al. (17) have also identified preoperative RAM thickness as being associated with postoperative morbidity in patients undergoing surgery for colon cancer. However, Shachar et al. (18) found that patients with a thicker RAM had a higher risk of surgical site infections in adult solid tumors. They suggested that this might be due to increased blood flow in the muscle tissue leading to higher bacterial colonization and infection risk (18). Thus, the effectiveness of RAM thickness as a predictor of postoperative morbidity remains unclear.

This study primarily aims to define the impact of CT-measured thickness of the RAM and PMM on postoperative morbidity in patients undergoing surgery for endometrial cancer. Secondarily, it explores the role of other factors [American Society of Anesthesiologists (ASA) score, age, duration of operation, obesity, preoperative inflammatory markers, and pathological findings] in determining postoperative morbidity.

Material and Methods

In this study, we retrospectively analyzed patients who underwent elective laparotomy for endometrial cancer between September 2019 and April 2023, after ethical approval was obtained for the study. Ethical approval was granted by the Ethics Committee of Ankara Bilkent City Hospital (approval number: E2-23-4349, date: 19.07.2023). Patient data were retrieved from the hospital's electronic data-based system, pathology reports, and patient files. Staging was performed according to the International Federation of Gynecology and Obstetrics (FIGO) 2009 system.

The study group comprised 141 patients who met the predefined inclusion criteria. Included ones were those who underwent surgical procedures involving total abdominal hysterectomy + bilateral salpingo-oophorectomy + retroperitoneal lymphadenectomy + omentectomy through a xiphopubic median incision and had undergone abdominopelvic imaging with CT in the month preceding surgery. Patients who underwent surgery through any incision other than a xiphopubic median incision, those treated with minimally invasive surgical techniques (laparoscopic or robotic), those without a CT scan of the abdominopelvic in the month prior to surgery, those who have not undergone total abdominal hysterectomy + bilateral salpingo-oophorectomy + retroperitoneal lymphadenectomy + omentectomy in the surgical procedure, those who underwent additional cytoreductive surgical procedures, those whose final pathology included a sarcoma component, and those with diagnosed synchronous tumors were excluded from the study.

Preoperative thromboembolism prophylaxis for the patients included administration of low molecular weight heparin subcutaneously according to the Caprini scoring system

(19), and 2 grams of cefazolin intravascularly 30 minutes before skin incision. Patients allergic to cefazolin were given a combination of gentamicin and clindamycin. Postoperative morbidity was defined as occurring within 3 months after surgery and included postoperative infections (surgical site infections; deep surgical site infections, incision line infections, cellulitis, subcutaneous abscess, psoas major abscess, non-surgical site infections; pulmonary or other system infections), atelectasis, thromboembolic complications (deep vein thrombosis, pulmonary thromboembolism, cerebrovascular emboli), lymphatic drainage disorders (chylous ascites and lymphangitis), intracranial hemorrhage, and mortality.

Muscle measurements

Preoperative CT images were used to measure each patient's right and left RAM and PMM. These measurements were taken at the broadest cross-section of the muscles, identified at the level of the L_{4-5} intervertebral disk in the axial section. The arithmetic mean of the measurements for each muscle was calculated and recorded in the database.

Statistical analysis

Statistical analyses were performed using SPSS v26, with a p-value of <0.05 considered statistically significant. The distribution of continuous variables was examined using histograms and the Shapiro-Wilk test. Variables that conformed to a normal distribution were presented with mean and standard deviation, whereas those that did not conform were described using median and range. Categorical variables were expressed as numbers and %. Differences between two independent groups were analyzed using the independent t-test for normally distributed variables and the Mann-Whitney U test for non-normally distributed variables. The chi-square test was employed to compare categorical variables. Logistic regression was conducted to predict morbidity, and the effects of independent variables were presented as odds ratios with 95% confidence intervals (CIs). The diagnostic performance of variables was assessed using the receiver operating characteristic (ROC) curve and the area under curve (AUC) values. Optimal sensitivity and specificity were determined using the Youden Index method.

Results

The mean age of the patients was 63.6±9.1 years (range: 34-84 years). The mean tumor size was 5.6±3.1 cm (range: 0.3-18 cm). It was found that 93 patients (66%) had endometrioid-type endometrial cancer according to the final pathology. Fifty-two (36.9%) patients were staged as stage I, while 14 (9.9%) were at stage IV. The median number of total lymph nodes removed was 45 (range: 8-126). Pelvic and/or paraaortic lymph node metastasis were identified in 40 (28.4%) patients, cervical stromal and/or glandular invasion in 29 (20.6%), lymphovascular space invasion in 49 (34.8%), and adnexal spread in 22 (15.6%). Positive peritoneal cytology was recorded in 13 (9.2%) patients (Table 1).

The mean body mass index (BMI) was 32.2±6.6 kg/m^2 (range: 21-62 kg/m^2). The mean operation time was 259.6±108.6 minutes (range: 90-680 minutes), the mean perioperative red blood cell transfusion was 0.2±0.7 units (range: 0-4 units), and the mean perioperative fresh frozen plasma transfusion was 0.1±0.4 units (range: 0-3 units). The mean ASA score was 2.2±0.6 (range: 1-4). The mean thickness of the right-left RAM was measured at 7.9±2.2 mm (range: 3.3-13.5 mm), and the mean thickness of the right-left PMM was 32.1±4.8 mm (range: 20.8-42.8 mm) (Table 2).

One hundred and eight (76.6%) patients had at least one comorbidity. The three most common comorbidities were hypertension in 89 (63.1%) patients, diabetes mellitus in 52 (36.9%), and asthma in 10 (7.1%) (Table 3).

Morbidity and mortality data

Morbidity occurred in 48 (34%) patients and mortality in 3 (2.1%). Two patients developed more than one morbidity. The most common causes of morbidity were non-surgical site infections (n=17, 35.4%), surgical site infections (n=11, 22.9%), and atelectasis (n=5, 10.4%) (Table 4). All mortality cases were due to pulmonary thromboembolism. These 3 patients were in the geriatric age group with an ASA score of 3. The pathology results for 2 of the deceased were reported as endometrioid adenocarcinoma and for 1 as serous adenocarcinoma. Two deaths occurred within 7 days postoperatively, while one occurred on postoperative day 42.

Laboratory findings were similar between groups with and without morbidity development. However, the morbidity group was older, had longer operation times, higher ASA scores, and a lower mean RAM thickness than the non-morbidity group (Table 5). The mean age in the morbidity group was 66.6±7.8 years versus 62.1±9.3 years in the non-morbidity group (p=0.005). The operation time was longer in the morbidity group, with a mean of 287.9±114.7 minutes compared to 245.1±103 minutes in the non-morbidity group (p=0.026). The ASA score was higher in the morbidity group, with a mean of 2.3±0.6 compared to 2.1±0.6 in the non-morbidity group (p=0.038). The mean thickness of the right-left RAM was significantly lower in the morbidity group compared to the non-morbidity group (7.4±2.1 vs. 8.2±2.1 mm; p=0.039). However, PMM thickness did not predict morbidity; the mean thickness in the morbidity group was 31.8±4.8 mm, compared to 32.3±4.9 mm in the non-morbidity group (p=0.614). No significant differences were

Table 1. Age and pathological characteristics of endometrial cancer

Parameters	Mean ± SD	Median	Range
Age, years	63.6±9.1	64	34-84
Tumor size, cm	5.6±3.1	5	0.3-18
Number of removed lymph nodes	47.7±19.1	45	8-126
		n	%
Tumor types	Endometrioid/serous type	93/37	66/26.2
	Clear cell/mixed type	4/5	2.8/3.8
	Other types	2	1.4
Stage-FIGO 2009	$I_A/I_B/II$	52/31/5	36.9/22/3.5
	III_A/III_B	6/3	4.3/2.1
	III_{C1}/III_{C2}	6/24	4.3/17
	IV_A/IV_B	3/11	2.1/7.8
Depth of myometrial invasion	No invasion	8	5.7
	<1/2	58	41.1
	≥1/2[1]	69	48.9
	Uterine serosa	6	4.3
Cervical invasion	No invasion	112	79.4
	Glandular	1	0.7
	Stromal/glandular	28	19.9
Lymphovascular space invasion	Negative/positive	92/49	65.2/34.8
Peritoneal cytology	Negative/positive	128/13	90.8/9.2
Adnexal metastasis	Negative/positive	119/22	84.4/15.6
Lymph node metastasis	Negative	101	71.6
	Pelvic only	6	4.3
	Paraaortic only	4	2.8
	Pelvic and paraaortic	30	21.3

[1]: Excluding uterine serosa. FIGO: International Federation of Gynecology and Obstetrics, SD: Standard deviation

found between the two groups regarding perioperative red blood cell and fresh frozen plasma use (p=0.341, p=0.440, respectively) (Table 5). Hypertension, diabetes mellitus, tumor type, and FIGO 2009 stage showed no association with morbidity development (Table 6).

Receiver operating characteristic analysis

In the ROC analysis (Figure 1), the AUC for the mean thickness values of the right-left RAM was found to be significant (p<0.05). The optimal cut-off value for RAM thickness was calculated to be 7.52 mm. The 95% CI sensitivity was 54.2%, and specificity was 65.6%. The positive predictive value was 44.8%, and the negative predictive value was 73.5%. When employing a threshold of 7.52 mm, the risk of morbidity development increased from 26.5% to 44.8% (p=0.024). These findings indicate that the mean thickness of the right-left RAM has a moderate performance in predicting morbidity.

Regression analysis

When a logistic regression model was constructed to predict morbidity using age, average values of the right-left RAM, ASA, and operation time were used as variables, and age and operation time were independent predictors of morbidity. An increase of one unit in age increased the risk of morbidity by 1.06 (95% CI=1.01-1.12; p=0.033), and an increase of one unit in operation time increased the risk by 1.003 (95% CI=1.0003-1.007; p=0.039) (Table 7).

Discussion

The present study, aimed at evaluating the predictive capacity of CT-measured RAM and PMM thicknesses for postoperative morbidity in patients undergoing surgery for endometrial cancer, appears to be the first of its kind according to the current literature. Our findings indicate that the non-morbid group had a higher mean thickness of the right-left RAM than those who developed morbidity (8.2 mm vs. 7.4 mm;

Table 2. Demographic, laboratory, and muscle thickness characteristics of patients

Parameters	Mean ± SD	Median (range)
Height, cm	158±5.9	158 (140-173)
Weight, kg	80.5±16	80 (52-150)
BMI, kg/m^2	32.2±6.6	31 (21-62)
Albumin, g/L	42.7±4.3	43 (27-51)
Hemoglobin, g/dL	12.3±1.7	12.4 (7.4-16.5)
Leukocyte count, x10^6/L	7288±2577.3	7020 (2950-23.380)
Neutrophil count, x10^6/L	4709±2161.2	4510 (1650-20.690)
Lymphocyte count, x10^6/L	1924±743	1760 (470-5090)
Operation duration, minutes	259.6±108.6	240 (90-680)
Number of RBC suspensions	0.2±0.7	0 (0-4)
Number of FFP units	0.1±0.4	0 (0-3)
ASA score	2.2±0.6	2 (1-4)
RL-RAM thickness, mm	7.9±2.2	7.85 (3.3-13.5)
RL-PMM thickness, mm	32.1±4.8	32.4 (20.8-42.8)

BMI: Body mass index, RBC: Red blood cell, FFP: Fresh frozen plasma, RL-RAM: Right-left rectus abdominis muscle, RL-PMM: Right-left psoas major muscle, ASA: American Society of Anesthesiologists, SD: Standard deviation

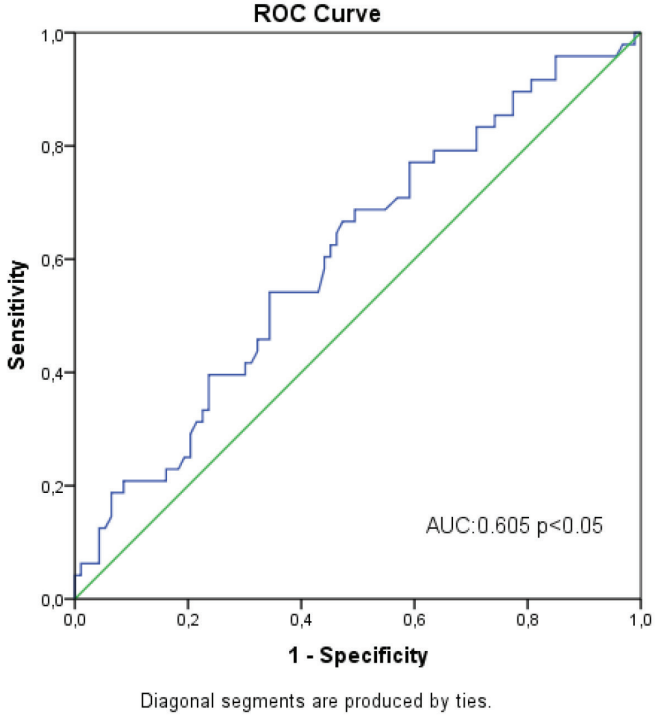

Figure 1. ROC curve for the average thickness values of right-left rectus abdominis muscle

ROC: Receiver operating characteristic

Table 3. Co-morbidity frequencies of the patients

Co-morbidity	n (%)
Hypertension	89 (63.1)
Diabetes mellitus	52 (36.9)
Malignancy (rectal cancer, breast cancer, colon cancer)	3 (2.1)
Schizophrenia	3 (2.1)
Asthma	10 (7.1)
Hypothyroidism	8 (5.7)
Coronary artery disease	5 (3.5)
Vertigo	3 (2.1)
Meningioma	1 (0.7)
Chronic obstructive pulmonary disease	5 (3.5)
Congestive heart failure	2 (1.4)
Hyperthyroidism	3 (2.1)
Sarcoidosis	1 (0.7)
Hyperlipidemia	4 (2.8)
Cerebrovascular disease	3 (2.4)
Heart valve disease	1 (0.7)
Parkinson's disease	1 (0.7)
Familial mediterranean fever	1 (0.7)
Mental retardation	1 (0.7)
Venous insufficiency	1 (0.7)
Rheumatic disease	1 (0.7)
Arrhythmia	1 (0.7)

p=0.039). When a threshold of 7.52 mm for RAM thickness was applied, the sensitivity was 54.2%, and the specificity was 65.6%. These values suggest that RAM thickness has a limited impact in predicting postoperative complications in patients treated surgically for endometrial cancer. Although RAM thickness above a specific value can predict morbidity risk, the multivariate analysis points to age and operation duration as independent risk factors for postoperative morbidity.

Studies highlighting the association between skeletal muscle mass and clinical outcomes in cancer cases have underscored the significance of the term sarcopenia (16,20). A meta-analysis examining the loss of muscle tissue and functionality due to aging, chronic diseases, and low physical activity has demonstrated that sarcopenia at diagnosis is associated with shorter survival in oncological patients (18). In research by Torres et al. (21), sarcopenia was found to be a strong predictor for survival in ovarian cancer when body composition was analyzed through CT scans. Seebacher et al. (22) suggest that preoperative sarcopenia is associated with shorter survival in patients treated with pelvic exenteration for recurrent gynecological malignancies. Although using a different measurement, consistent with our study, Wu et al. (23) found that low skeletal muscle mass in the PMM in hepatocellular carcinoma was a significant prognostic factor for overall and progression-free survival. However, low skeletal muscle mass in the RAM did not significantly predict oncological outcomes in their study (23).

Silva de Paula et al. (24) have reported that muscle quality was the most crucial predictive parameter for surgical complications and argued that understanding the impact of muscle quality on adverse outcomes in cancer patients could be a promising approach. Our presented study found that only RAM thickness could predict postoperative morbidity in univariate analysis; however, this effect did not persist in multivariate analysis. The measurement of PMM thickness was inadequate in predicting postoperative morbidity.

Advancing age can increase the risk of postoperative morbidity. Hag-Yahia et al. (25) have shown that age is an independent prognostic factor for predicting postoperative complications in endometrial cancer. Guy et al. (26) have found that perioperative

Table 4. Causes of postoperative morbidity

Causes of morbidity (n=48; 34%)	n	%
Non-surgical site infection	17	35.4
Surgical site infection	11	22.9
Chylous ascites	9	18.7
Atelectasia	5	10.4
Pulmonary thromboembolism	4	8.3
Cellulitis	1	2
Subcutaneous abscess	1	2
Intracranial hemorrhage	1	2
Psoas abscess	1	2
Splenic infarction	1	2
Pleural effusion	1	2
Two patients developed more than one morbidity		

Table 5. Factors related with postoperative morbidity

Parameters	Postoperative morbidity		p-value
	Developed	Did not develop	
Age, years	66.6±7.8	62.1±9.3	**0.005**
Height, cm	159.1±6.0	157.4±5.8	0.109
Weight, kg	79.8±15.7	80.9±16.2	0.680
BMI, kg/m^2	31.5±6.6	32.6±6.6	0.334
Albumin, g/L	42.3±4.4	43±4.2	0.397
Hemoglobin, g/dL	12.4±1.8	12.3±1.6	0.615
Leukocyte count, x10^6/L	7558.1±3223	7149.4±2178	0.374
Neutrophil count, x10^6/L	4915.3±2863.5	4584.8±1694.9	0.342
Lymphocyte count, x10^6/L	1894.8±671.3	1939.1±780.4	0.738
Operation duration, minute	287.9±114.7	245.1±103	**0.026**
Number of RBC suspensions, unit	0.13±0.5	0.24±0.7	0.341
Number of FFP, unit	0.13±0.5	0.07±0.4	0.440
ASA score	2.3±0.6	2.1±0.6	**0.038**
RL-RAM thickness, mm	7.4±2.1	8.2±2.1	**0.039**
RL-PMM thickness, mm	31.8±4.8	32.3±4.9	0.614

BMI: Body mass index, RBC: Red blood cell, FFP: Fresh frozen plasma, ASA: American Society of Anesthesiologists, RL-RAM: Right-left rectus abdominis muscle, RL-PMM: Right-left psoas major muscle, SD: Standard deviation

Table 6. The relationship between co-morbidity and pathological findings and postoperative morbidity

		Postoperative morbidity		p-value
		Parameter developed	Did not develop	
		n (%)	n (%)	
Hypertension	None	13 (25)	39 (75)	0.083
	Present	35 (39.3)	54 (60.7)	
Diabetes mellitus	None	29 (32.6)	60 (67.4)	0.633
	Present	19 (36.5)	33 (63.5)	
Tumor type	Endometrioid	29 (31.2)	64 (68.8)	0.263
	Non-endometrioid	20 (41.7)	28 (58.3)	
FIGO 2009 stage	I-II	27 (30.3)	62 (69.7)	0.150
	III-IV	22 (42.3)	30 (57.7)	

FIGO: International Federation of Gynecology and Obstetrics

Table 7. Multivariate model for predicting postoperative morbidity

Parameters	OR	95% CI	p-value
Age, years[1]	Reference	1.01-1.12	**0.033**
	1.06		
RL-RAM thickness, mm[2]	Reference	0.69-1.05	0.166
	0.86		
ASA score[1]	Reference	0.76-3.20	0.228
	1.54		
Operation duration, minute[1]	Reference	1.0003-1.007	**0.039**
	1.003		

[1]: Median value, [2]:A cut-off value of 7.52 mm was used for the multivariate analysis of the mean right-left rectus muscle thickness, CI: Confidence interval, ASA: American Society of Anesthesiologists, RL-RAM: Right-left rectus abdominis muscle

medical and surgical complication rates linearly increased with older age, hospital stays lengthened, and discharge rates decreased in their study examining surgery for endometrial cancer. Conversely, Mascarella et al. (27) observed that while modeling age as both a categorical and continuous variable, it alone did not sufficiently predict major postoperative adverse events compared to other perioperative variables. In our study, age was an independent prognostic factor determining postoperative morbidity within 3 months postoperatively, with each unit increase in age raising the morbidity rate by 1.06 times.

The duration of surgery is a significant factor in the success of surgical operations and the rapid recovery of patients. In a meta-analysis by Cheng et al. (28) examining the relationship between the duration of surgery and the risk of surgical site infection, they defined a direct proportional increase in surgical site infections with prolonged operation times, with each increment of 15, 30, and 60 minutes respectively increasing the rates of surgical site infections by 13%, 17%, and 37%. Mahdi et al. (29) demonstrated that surgeries lasting 15% longer than the average duration in obstetric and gynecologic procedures doubled the incidence of surgical site infections. In our study, we found that the duration of the operation is an independent predictor of postoperative morbidity. Specifically, we observed that for each unit increase in operation duration, there was a corresponding 1.003-fold increase in morbidity.

The ASA score is a measure used to classify patients' overall health status before surgery and has been directly linked to an increased risk of postoperative morbidity. Kastanis et al. (30) have demonstrated a direct relationship between higher ASA scores and increased postoperative morbidity, suggesting that higher scores correspond with increased morbidity rates. Bakkum-Gamez et al. (31) identified an ASA greater than 2 as a risk factor associated with superficial incisional surgical site infections. In our study, the ASA score was higher in the group that developed postoperative morbidity in univariate analysis; however, its effectiveness in predicting postoperative morbidity did not persist in multivariate analysis.

Obesity is associated with an increase in morbidity and mortality in the short and long term for surgical operations. Mahdi et al. (29), in their study examining the relationship between obesity and postoperative morbidity and mortality in endometrial cancer patients, found that morbidly obese patients mainly had higher rates of surgical and infectious postoperative complications. Smits et al. (32), in a study examining the impact of BMI on postoperative outcomes in ovarian cancer patients, showed that obesity increased wound complications and hospital stays but did not affect mortality. Conversely, our study did not find a significant relationship between BMI and postoperative morbidity.

Strengths of our study include the retrospective analysis of patients with endometrial cancer who underwent surgery via an elective laparotomy approach, the detailed evaluation of surgical procedures and preoperative preparations, and an adequate sample size of 141 patients compared to similar studies.

Study limitations

Due to the study's retrospective nature, potential limitations such as selection and information biases exist. Additionally, the inclusion of only patients meeting specific criteria may restrict the representation of the general population, affecting the general applicability of our findings due to the exclusion of patients undergoing minimally invasive surgical techniques or specific surgical procedures not being applied.

Conclusion

The study has identified age and operation duration as independent risk factors for predicting postoperative morbidity. However, a comprehensive assessment, including the thickness of RAM and ASA, could provide more definitive results. Particularly, preoperative RAM thickness evaluation could significantly contribute to postoperative risk management strategies. Conversely, our findings indicate that PMM thickness does not contribute to predicting postoperative morbidity risk. Consequently, this research highlights the need to consider multiple factors in assessing morbidity risk and underscores the importance of health status, age, RAM thickness, and operation duration. A holistic evaluation of these factors can be crucial in preparing patients for surgery and improving postoperative care plans.

Ethics

Ethics Committee Approval: *Ethical approval was granted by the Ethics Committee of Ankara Bilkent City Hospital (approval number: E2-23-4349, date: 19.07.2023).*

Informed Consent: *Retrospective study.*

Footnotes

Author Contributions: *Surgical and Medical Practices: H.B.R., T.A., F.K., T.T., Concept: F.K., T.T., Design: T.T., Data Collection or Processing: H.B.R., T.A., H.B., A.A.T., Analysis or Interpretation: H.B.R., T.A., O.A., Literature Search: H.B.R., H.B., O.A., A.A.T., T.T., Writing: H.B.R.,*

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