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Original Article

Association of clinical outcomes and complications with obesity in patients who have undergone abdominal myomectomy

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Abstract

Background: This study aimed to evaluate the association between complications and clinical parameters with obesity in 273 women who have undergone abdominal myomectomy during the study period.

Methods: The patients were classified into two groups according to body mass index (BMI) ($\leq$30 kg/m^2 and >30 kg/m^2). Demographic, preoperative and postoperative clinical parameters were evaluated.

Results: Demographic, preoperative and postoperative clinical parameters were evaluated. The results showed statistically significant differences between the obese and non-obese groups in terms of age, gravidity, diameter of fibroid (DOF), postoperative hemoglobin, duration of hospital stay, and complications. Patients in the obese group had greater DOF and complications such as hemorrhage, postoperative fever, wound infection and ileus ($p < 0.05$).

Conclusion: Based on our results, we conclude that obesity adversely affects the clinical outcomes of patients who undergo abdominal myomectomy.

Keywords: abdominal myomectomy; fibroid; obesity

1. Introduction

Uterine fibroids (UF) are the most common neoplasms of the uterus, with approximately 25–30% of women suffering from the disorder.[1] Among these women, 50% are symptomatic and present with complaints, such as vaginal bleeding, pelvic pain, pressure sensation, severe anemia, and urethral obstruction.[2,3]

Myomectomy is performed mainly in women who desire to protect their fertility.[4] Although new techniques developed for myomectomy are used widely with lower ratios of complications (e.g., decreased hospitalization, less blood loss, fewer postoperative adhesions, and shorter recovery), most myomectomies are still done via laparotomy.[5]

In regard to the association of obesity with the development of UFs, the risk of fibroids developing in women weighing 70 kg is three times greater than in women weighing 50 kg.[6] Independent of body mass index (BMI), central obesity (excess fat in the upper trunk region) is associated with changed estrogen metabolism, insulin resistance, hyperinsulinemia, and decreases in sex hormone-binding globulin levels, which results in the promotion of myometrial smooth muscle cell proliferation.[7] All over the world, a minimally invasive approach, including laparoscopic and robotic myomectomy, is used increasingly in the management of UFs.[8] Because these approaches require skilled clinicians in

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endoscopic surgery, myomectomy is still being performed via laparotomy in many institutions.[9]

In this study, we evaluated the association between obesity and clinical parameters in women who had undergone abdominal myomectomy.

2. Methods

This retrospective study was conducted from January 2009 to December 2012 in the Zekai Tahir Burak Women's Health Education and Research Hospital, Ankara, Turkey. This is a tertiary teaching and research hospital in the middle region of Turkey. The data was collected from the hospital database and patient notes; a descriptive analysis was performed on the patients' characteristics and demographics. The ethics committee of the hospital approved the study. Due to the retrospective design of the study, we did not obtain informed consent from the subjects.

The analyses took into account the factors of age, BMI [weight, kg/(height, m)^2], gravidity, parity, diameter of the fibroid (DOF), preoperative and postoperative hemoglobin levels, white blood cell count, thrombocyte count, neutrophil–lymphocyte ratio (NLR), CA125 levels, duration of postoperative hospital stay, and postoperative complications (wound infections or dehiscence).

The diameter and location of the fibroids were determined preoperatively by ultrasonography. After taking the patient's history, including the obstetrical and gynecological history, an abdominal myomectomy was performed. The surgical indications were categorized into symptoms of bleeding, pain or pressure, fertility, and other. The surgical technique was as follows: Pfannenstiel incision or mini-laparotomy was performed on all patients. After the peritoneal cavity was opened, the pelvic organs and upper abdomen were explored, and a vertical incision was made through the uterine wall above the fibroids, using a coagulating or cutting electrode. The UF was then fixed with a towel clamp, and the cleavage plane between the fibroid and normal myometrium was dissected using either a finger or a mosquito clamp. The fibroids were removed, and the remaining cavity was repaired by continuous suturation.[10]

3. Statistics

Statistical analyses were carried out using SPSS 15.0, the statistical software package for Windows (SPSS Inc., Chicago, IL, USA). The normal distribution of the data was assessed using the Kolmogorov–Smirnov test. Continuous and normally distributed variables were presented as means ± standard deviations, and intragroup differences were investigated using the Student *t*-test. Continuous variables with non-normal distribution were expressed as medians (minimum–maximum), and differences between variables were analyzed using the Mann–Whitney *U* test. Categorical variables were expressed in percentages. The sample size was determined according to the results of the central limit theorem, which indicated that we needed at least 30 individuals in each subgroup.[11] Differences between categorical data were evaluated using the Chi-square (χ^2) test. Logistic regression method was used to evaluate the risk factors for early and late complications in women undergoing abdominal myomectomy after adjusting for age. Two-sided p values were considered statistically significant at $p < 0.05$.

4. Results

During the study period, 273 patients underwent abdominal myomectomy at the current clinic. The mean age of the patients was 37.9 ± 5.7 years, and their mean BMI was 28.9 ± 3.0 kg/m^2. The median numbers of gravidity, parity, and abortion were 2 (0–8), 0 (0–4) and 0 (0–6), respectively. Forty-three (19.4%) patients had previously undergone at least one major abdominal surgery.

The patients were divided into two groups according to BMI (≤30 kg/m^2 and >30 kg/m^2). One hundred and eighty three patients had a BMI of ≤30 kg/m^2 and 90 patients had a BMI of >30 kg/m^2. The former, BMI >30 kg/m^2, indicated obesity. Table 1 summarizes the demographic and clinical differences between the groups. The mean age, gravidity, parity, abortion, DOF, postoperative hemoglobin levels, duration of hospital stay (DHS) and postoperative complications were statistically significantly different between the groups ($p < 0.05$). The correlation analysis found a correlation among BMI and age, gravidity, DOF, preoperative hemoglobin, postoperative hemoglobin, the number of erythrocyte suspension transfused and DHS (Table 2). The surgical indications for the majority of patients were menometrorrhagia and pelvic pressure. Place of fibroid (POF) and ABO blood groups did not differ between the two groups ($p > 0.05$). Early and late complications were more common in the obese group.

Table 1
The demographic and clinical features between the groups.

Variables	Patients with BMI ≤30 (n=183)	Patients with BMI >30 (n=90)	p
Age (years)	36.0 ± 4.0	41.7 ± 4.1	<0.001
Gravidity (min–max)	2 (1–4)	3 (1–5)	<0.001
Parity (min–max)	1 (1–4)	2 (1–5)	<0.001
Abortion	0.0 ± 1.0	1.0 ± 1.0	<0.001
BMI (kg/m^2)	27.0 ± 2.2	31.9 ± 1.5	<0.001
DOF (cm)	6.0 ± 2.0	7.0 ± 2.0	<0.001
Preoperative Hb (g/dL)	12.7 ± 1.3	12.4 ± 1.3	0.052
Postoperative Hb (g/dL)	11.1 ± 1.6	10.4 ± 1.6	0.002
Urea (mg/dL)	26.3 ± 7.6	25.7 ± 7.2	0.546
Creatinine (mg/dL)	0.7 ± 0.1	0.7 ± 0.1	0.439
AST (U/L)	18.0 ± 3.7	19.5 ± 6.7	0.234
ALT (U/L)	15.1 ± 6.0	17.6 ± 10.2	0.053
Platelets (×10^3/μL)	271.5 ± 89.8	283.7 ± 84.2	0.261
WBC (×10^3/μL)	7.1 ± 2.6	7.1 ± 2.7	0.391
AFP (mg/L)	2.1 ± 1.8	2.4 ± 1.6	0.075
NLR	2.2 ± 1.1	2.0 ± 1.0	0.187
DHS (days)	2.8 ± 1.0	3.3 ± 1.8	0.001

$p < 0.05$ is considered statistically significant.
AFP = alpha-fetoprotein; ALT = alanine transaminase; AST = aspartate transaminase; BMI = body mass index; DHS = duration of hospital stay; DOF = diameter of fibroid; Hb = hemoglobin; NLR = neutrophil/lymphocyte ratio; WBC = white blood cell.

Table 2
Correlation between BMI and demographic and clinical characteristics of the patients.

Variables	CC	p
Age	0.484	0.001
Gravidity	0.248	0.001
Parity	0.212	0.001
Abortion	0.150	0.013
DOF	0.239	0.001
Preoperative Hb	−0.127	0.036
Postoperative Hb	−0.188	0.002
Postoperative gravidity	−0.230	0.001
Postoperative abortion	−0.150	0.013
Urea	−0.020	0.742
Creatinine	0.043	0.483
AST	0.072	0.235
ALT	0.123	0.043
Platelets	0.098	0.107
WBC	−0.052	0.391
CA125	−0.032	0.599
CA19.9	−0.030	0.622
AFP	0.108	0.075
NLR	−0.080	0.188
Es Tx	0.131	0.030
DHS	0.211	0.001
Postoperative complication	0.187	0.002

$p < 0.05$ is considered statistically significant.
AFP = alpha-fetoprotein; ALT = alanine transaminase; AST = aspartate transaminase; CC = correlation coefficient; DHS = duration of hospital stay; DOF = diameter of fibroid; Es Tx = erythrocyte suspension transfusion; Hb = hemoglobin; NLR = neutrophil/lymphocyte ratio; WBC = white blood cell.

The most common complication was hemorrhage. Erythrocyte suspension transfusion occurred in eight patients with 20 U in the non-obese group and in 10 patients with 43 U in the obese group (Table 3).

Logistic regression method demonstrated that BMI, POF, and preoperative serum CA-125 levels were found to be risk factors for early and late complications with odds ratios (95% confidence interval) as: 1.446 (1.218−1.717), 5.875 (1.557−22.160) and 1.025 (1.006−1.044), respectively (Table 4).

5. Discussion

In this study, we aimed to evaluate the association between BMI and clinical parameters in 273 women who underwent abdominal myomectomy. We found that obesity adversely affected the length of hospital stay and complications such as hemorrhage, postoperative fever, wound infection and ileus in patients who underwent abdominal myomectomy. UFs are the most common benign gynecological tumors in women of reproductive age. Although they can cause significant health concerns, the etiology of these neoplasms is not yet understood.[12] Experimental and epidemiological studies have established that ovarian steroid hormones play an essential role in the pathogenesis of this disease. Specifically, the growth of uterine fibroids depends on the ovarian hormones, estrogen and progesterone.

Table 3
Comparison of surgery indication, place of fibroid and complications between groups.

Variables	Patients with BMI ≤30, n (%)	Patients with BMI >30, n (%)	p
Indication for surgery			
Pain	57 (31.2)	16 (17.8)	0.013
Infertility	20 (10.9)	8 (8.9)	
Menometrorrhagia	51 (27.9)	39 (43.3)	
Malignancy suspected	1 (0.5)	1 (1.1)	
Pelvic pressure	54 (29.5)	26 (28.9)	
Total	183 (100)	90 (100)	
POF			
Subserosal	47 (25.7)	16 (17.8)	0.337
Submucosal	3 (1.6)	2 (2.2)	
Intramural	133 (72.7)	72 (80)	
Total			
Early complication			
Hemorrhage	9 (64.4)	10 (71.4)	0.046
Bowel injury	1 (7.1)	0	
PO fever	2 (14.3)	4 (28.6)	
Hysterectomy	1 (7.1)	0	
Hematoma	1 (7.1)	0	
Total	14 (100)	14 (100)	
Late complication			
Wound Infection	0	11 (45.8)	<0.001
Dehiscence	1 (50)	1 (4.2)	
Ileus	1 (50)	12 (50)	
Total	2 (100)	24 (100)	
Es Tx (units)			
0	175 (95.6)	80 (88.9)	0.142
≥1	8 (4.4)	10 (11.1)	
Total	183 (100)	90 (100)	
Blood group			
ARH+	64 (34.5)	27 (30)	0.430
BRH+	31 (17.0)	23 (25.6)	
ORH+	52 (28.5)	22 (24.5)	
ABRH+	3 (1.6)	4 (4.4)	
ARH−	8 (4.5)	1 (1.1)	
BRH−	15 (8.3)	8 (8.9)	
ORH−	9 (5.0)	4 (4.4)	
ABRH−	1 (0.6)	1 (1.1)	
Total	183 (100)	90 (100)	

Es Tx = erythrocyte suspension transfusion; PO = postoperative; POF = place of fibroid.
Data are presented as n (%). Pearson Chi-square test and Fisher's exact test were used. $p < 0.05$ is considered statistically significant.

Table 4
Logistic regression model for risk factors of early and late complications of myomectomy.

Outcome: complication	SE	Wald	P	OR	95% CI
DOF	0.114	0.832	0.362	1.109	0.888−1.386
Nulliparity	0.434	0.015	0.904	1.054	0.450−2.469
CA-125	0.010	6.541	0.011	1.025	1.006−1.044
Nonsubserosal	0.677	6.833	0.009	5.875	1.557−22.160
PAS	0.459	0.004	0.947	1.031	0.419−2.537
BMI	0.087	17.787	0.000	1.446	1.218−1.717

$p < 0.05$ is considered statistically significant.
BMI = body mass index; DOF = diameter of fibroid; PAS = previously abdominal surgery.

The literature reports inconsistent results for the relation of BMI and UF. Some studies have demonstrated an increased risk of UF with increasing BMI,[13,14,15] while others have not.[7,16,17] However, it is generally accepted that obesity is an important risk factor for UF, and increased BMI increases the risk of UF occurrence. It has been reported that the risk of development of UF increases by 21% with every increase of 10 kg in body weight.[7,18] However, the underlying mechanism between this association, as well as the interaction between adipose cells and uterine fibroid cells, has not yet been well established.

In our study, we found that the DOF was larger in obese women than in non-obese women. The BMI reflects the absolute measurement of body fat composition.[19] It may affect the development of UF through changes in the steroid hormone metabolism.[20] An inverse association between BMI and circulating levels of sex hormone-binding globulin has been shown. Once the amount of sex hormone-binding globulin decreases, the proportion of free estrogen, or the fraction available for biological activity, may increase.[7,21,22] Obesity also induces the hydroxylation of estrone to estriol. The increased levels of estriol then influence development of UF through the direct promotion of myometrial smooth muscle cell proliferation, as well as the enlargement of UF.[7,23]

It has been documented that central obesity is positively associated with age and parity,[24,25] as we found in our study. BMI is associated with the risk of complications after most surgical procedures. Previous studies have shown that obesity may increase the risk of bleeding during surgery requiring a blood transfusion,[26] the length of hospital stay,[27] and postoperative complications, such as surgery-related infections.[28] These associations can be explained by larger wound surfaces, deeper subcutaneous adipose tissue, and greater DOF, which may cause both a longer amount of time needed to reach the abdominal cavity and an increased amount of bleeding, impairing wound healing and causing a high rate of infectious agent exposure leading to wound infections. Another interesting finding of this study was the association between BMI and serum alpha fetoprotein (AFP) levels, which may indicate an important health problem. AFP is a fetal glycoprotein produced by the yolk sac and fetal liver, and it decreases rapidly after childbirth.[29] It increases mainly because of liver pathologies (steatosis, hepatitis, cirrhosis, carcinoma, etc.) in which the hepatocyte−hepatocyte interactions are altered and the normal architectural arrangements are lost. With increasing BMI, obesity-related inflammation is highly likely to cause hepatic steatosis, resulting in increased levels of serum AFP.[30]

Minimally invasive approaches have found more clinical usage in the management of UFs. Previous studies reported that, even in morbidly obese, laparoscopic myomectomy can be performed safely and is the preferred surgical method in obese patients.[31,32] The limitation of our study is the lack of comparison of our patients with patients who had endoscopic surgery. This was not possible because we do not perform laparoscopic or robotic myomectomy in our institution.

Our complication rate among patients who had undergone myomectomy was 19.7%. The risk factors for early and late complications of myomectomy have been presented in many studies, and some risk factors have been evaluated. Pundir et al found uterine size of 20 gestational weeks or more, previous abdominal myomectomy and myoma type were associated with increased complication rates.[33] Mettler et al found an association between the fibroid size, location and increased complication rates; and Roth et al showed that race was related to complications in patients who underwent abdominal myomectomy.[34,35] In our study, we demonstrated that CA-125 levels, nonsubserosal fibroid location and BMI were significantly valuable in predicting complications in patients who underwent abdominal myomectomy.

In conclusion, the findings of this study showed that increased BMI was associated with adverse clinical outcomes in patients who had undergone abdominal myomectomy, either during or after abdominal myomectomy. Therefore, necessary precautions should be taken against obesity in all women.

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