VIA MEDICA

ORIGINAL PAPER / GYNECOLOGY

Ginekologia Polska
2019, vol. 90, no. 10, 549–556

ISSN 0017–0011

DOI: 10.5603/GP.2019.0095

Obesity as a risk factor of in-hospital outcomes in patients with endometrial cancer treated with traditional surgical mode

Slawomir M. Januszek, Edyta Barnas, Joanna Skret-Magierlo, Jakub Sokolowski, Pawel Sczerba, Rafal Januszek, Wojciech Domka, Tomasz Lozinski, Marek Kluza, Tomasz Kluz

Gynaecology and Obstetrics Clinic, Clinical District Hospital No. 1, Rzeszow, Poland

ABSTRACT

Objectives: Abdominal obesity is a risk factor for endometrial cancer. The negative impact of individual parameters of obesity on the procedural effects of endometrial cancer surgical treatment has been suggested. The aim of the current study was to estimate the relationship of particular parameters of obesity and in-hospital outcomes in patients treated surgically due to endometrial cancer.

Material and methods: The study included 70 women treated surgically for endometrial cancer. Pre-operatively, mass, body mass index (BMI), waist circumference, waist-hip ratio and selected anatomical indices were measured. The duration of surgery, hospitalisation, and the loss of haemoglobin served as parameters of in-hospital procedure success. Also, procedural-related complications were estimated.

Results: There were 37 (52.8%) obese females in the current study. They were obese patients presenting more advanced clinical stages of endometrial cancer before operation. The duration of operation (94.9 ± 21.6 min. vs. 76.1 ± 13.5 min., $p < 0.0001$), hospitalisation (12.4 ± 3.4 days vs. 10 ± 2.3 days, $p = 0.0009$) and haemoglobin loss (2.5 ± 0.9 g/dL vs. 1.9 ± 0.8 g/dL, $p = 0.004$) were significantly greater in obese patients. Multivariate analysis, among the independent predictors of the duration of operation, has confirmed the correlation between BMI, waist circumference and weight and the duration of hospitalisation. Waist and hip circumference and BMI coupled with external conjugate dimension and intertrochanteric distance have been linked with haemoglobin loss. The strongest correlation for the duration of operation, hospitalisation and haemoglobin loss was noticed for waist circumference ($r = 0.7$, $r = 0.57$ and $r = 0.59$).

Conclusions: Waist circumference and BMI are strong predictors of in-hospital outcomes among patients with endometrial cancer treated via traditional surgical operation.

Key words: abdominal obesity; BMI; cancer of endometrium; operative time; perioperative outcomes

Ginekologia Polska 2019; 90, 10: 549–556

INTRODUCTION

Endometrial cancer is the most common cancer of the female reproductive organs. It is ranked fourth in terms of the incidence of malignant tumours. In the years 1963–2008, a significant increase in the incidence of malignant neoplasms of endometrial cancer was observed (1,023 and 4,820 cases, respectively, in 1963 and 2008) [1]. There was also an increase in the percentage of malignant tumours in this organ among all malignancies in women from 5.3% to 7.4%. The standardised incidence rate in 1963 and 2008 was 5.9 and 14.4 per 100,000 women, respectively. According to Bidziński, it is likely that the growing trend in the incidence of malignant neoplasms of the uterus will persist [1]. On the other hand, mortality from endometrial malignancies in the last decades has significantly decreased. Standard mortality rates in 1963 and 2003 were 9.1 and 2.2, respectively [1]. The occurrence of endometrial cancer is associated with economic and cultural fluctuations in developed countries that bring about lifestyle changes, which, among others, involve obesity, diabetes, hypertension, metabolic syndrome, multiparity, treatment with exogenous oestrogens unbalanced with gestagens or treatment with tamoxifen [2, 3]. The prolonged life expectancy in women in Poland and other European countries also contributes to an increase in the incidence of endometrial cancer. Most cases occur

Corresponding author:
Slawomir M. Januszek
Gynaecology and Obstetrics Clinic, Clinical District Hospital No. 1, 2 Szopena St, 35–055 Rzeszow, Poland
e-mail: sjanuszek4@gmail.com

in postmenopausal women (75%) [1]. Obesity in women aged 50–59 is the most important risk factor for the development of endometrial cancer [2]. It was estimated that an increase in body mass by 10 kg in women in this age range results in a threefold higher risk of disease, an increase in mass above 20 kg increases the likelihood of the disease even tenfold [4]. In a meta-analysis of 19 reviews and prospective studies, Renehan et al. [5] also found that each increase in BMI by 5 kg/m^2 significantly increased a woman's risk of developing endometrial cancer (RR 1.59, 95% CI 1.50–1.68). Not only does obesity have impact on cancer-related death, but through its association with co-morbidities (diabetes mellitus and hypertension), it significantly effects all-cause mortality. The Gynaecologic Oncology Group, in a review among 380 patients with endometrial cancer, found that morbid obesity was associated with higher mortality (HR 2.77, 95% CI 1.21–6.36) from causes other than endometrial cancer or disease recurrence [6]. Endometrial cancer is not a homogeneous tumour, both in terms of histological structure or clinical exponents. Classically, according to Bokhman, two types of histopathology are distinguished: Type 1 — more frequent, endometriotic cancer, Type 2 — less frequent, non-endometroid cancer. Non-endometroid carcinomas include serous and clear cell carcinomas. The second type of endometrial tumours has a vague etiology and worse prognostics [7, 8]. Type 1 is etiopathogenetically associated with excessive oestrogen stimulation and obesity [9]. We assume that in about 80% of endometrial cancers, it is reasonable to find these compounds. According to the World Cancer Report, obesity accounts for 40% of all endometrial cancer cases [2]. Obesity is an important social and health problem. It is estimated that the issue of overweight and obesity affects 50–65% of the European population. In summary, there are discrepancies in the assessment of the influence of obesity regarding the course of surgically treating endometrial cancer due to the use of various parameters of obesity in the literature.

The aim of the current study was to assess the relationship between obesity parameters and procedural indices with emphasis on the duration of operation, hospitalisation and haemoglobin loss after the operation.

MATERIAL AND METHODS

70 patients treated at the Clinical Department of Gynaecology of the Provincial Specialist Hospital due to endometrial cancer in the period from February to August 2011. The study included patients qualified for transabdominal hysterectomy with diagnosed endometrial cancer based on histopathological examination of uterine scrapings. The research project was an observational prospective study of standard treatment. Before the operation, a clinical interview was performed. This included age, births, education in years, prior abdominal surgeries and comorbidities. In the preoperative study, the following parameters were determined: height, weight, waist and hip circumference in cm with a measuring tape, pelvic bone dimensions using a pelvis meter. Also, body mass index (BMI) and waist-hip ratio (WHR) were calculated in the study group. According to the World Health Organization, overweight and individual degrees of obesity are determined by defined ranges of BMI. Overweight was defined as BMI in the range 25–30 kg/m^2. Class I obesity is within the range 30–35 kg/m^2, while class II obesity is within the range of 35–40 and class III obesity values are > 40 kg/m^2. Patients were qualified for the hysterectomy procedure according to the current Polish guidelines [10]. In the current study obesity was defined as the BMI ≥ 30 kg/m^2. The surgery treatment included: removal of the uterus with adnexal tracts, systemic pelvic and para-aortic lymphadenectomy(FIGO I–G1/G2 and myometrium invasion > 50%, G3) removal of the greater omentum (Excision of the greater omentum in serous endometrial carcinoma and sarcocarcinoma) [11]. In the perioperative period, selected parameters were monitored and they were recognised as indicators of in-hospital outcome of operational treatment: the duration of surgery (minutes), the loss of haemoglobin — the difference in the serum concentration before surgery and on the second day after surgery (g/dL), the occurrence of procedural-related complications, and the duration of hospitalisation (days).

The study has been approved by the local University of Rzeszów ethics committee. The protocol complied with the Declaration of Helsinki, and all participants provided written informed consent before enrolment.

Statistical analysis

Continuous variables are expressed as mean ± standard deviation. Categorical variables are introduced as numbers and percentages. Normality was assessed with the Shapiro-Wilk test. The Mann-Whitney U test was used for non-normally distributed continuous variables. Univariate and multivariate regression analysis were used to find significant predictors of in-hospital outcomes. The analysed procedural indices (duration of operation, duration of hospitalization and the extent of hemoglobin loss) were assessed as continuous variables. Also predictors of clinical outcomes were assessed as continuous variables or dychotomic when appropriate. Multifactorial analysis was performed by backward elimination. Also, Spearman's correlations were calculated for possible relationships between selected factors and pre-specified indicators of in-hospital outcomes. The p-value < 0.05 was considered statistically significant. All analyses were performed with JMP®, Version 13.1.0 (SAS Institute INC., Cary, NC, USA).

RESULTS

General characteristics

The patients' epidemiology and tumour characteristics are presented in Table 1. In the studied group, 81.43% presented a BMI > 25 kg/m^2 (Fig. 1). While 37 patients presented with BMI > 30 kg/m^2 (52.8%). Most often, the patients were diagnosed and operated in stage I of the cancer according to FIGO — Table 2. In the preliminary analysis of the results of surgical treatment, we observed that the average duration of abdominal hysterectomy due to endometrial cancer was 86 ± 20.4 minutes, the average duration of hospitalisation was 11.3 ± 3.1 days, the average loss of haemoglobin measured as a difference measured in g/dL before surgery and on the second day after surgery was 2.2 ± 0.9 (Tab. 3).

The duration of the operation

The duration of the operation was significantly longer in patients with BMI value ≥ 30 kg/m^2 compared patients with BMI value < 30 kg/m^2 (94.9 ± 21.6 vs. 76.1 ± 13.5 days, $p < 0.0001$). The duration of operation time correlated positively with body mass, BMI value, hip circumference, WHR, intertrochanteric distance, interspinous distance, intercristal distance, external conjugate and prior abdominal surgery, while a negative correlation was found with

Table 1. Patients epidemiology and tumour characteristics

Variable			Overal group N = 70 (%)
Place of residence	Rural region		26 (37.2)
	Urban region		24 (34.3)
	Town > 50,000 residents		20 (28.5)
Menstrual status	Before menopause		61 (87.1)
	After menopause		9 (12.9)
Parity	Nulliparous		14 (20.1)
	Uniparous		16 (22.8)
	Multiparous		40 (57.1)
Histopathological type	Endometrioid	G1	36 (51.4)
		G2	24 (34.2)
		G3	5 (7.1)
	Clear-cell		1 (1.4)
	Serous		2 (2.8)
	Adenosquamous		1 (1.4)
	Non-epithelial		1 (1.4)
Staging according to FIGO classification	I		52 (74.3)
	II		11 (14.3)
	III		5 (7.1)
	IV		2 (2.8)
Co-morbidities	Diabetes mellitus		17 (24.8)
	Hypertension		32 (54.8)
	Coronary artery disease		5 (7)
	History of venous occlusive disease		3 (5.2)
	Arrhythmias		6 (8.4)
	Priorcerebral stroke		2 (2.8)
	Chronic heart failure		4 (5.6)
	Bronchial asthma		5 (7)
	Chronic pulmonary obstructive disease		3 (4.2)
	Hyperthyroidism		4 (5.6)
	Hypothyroidism		3 (4.2)
	Cholelithiasis		6 (8.4)
	Diathesisurica		2 (2.8)
	Osteoarthritis		9 (12.6)

the number of births. This is presented in Table 4. Univariate regression analysis confirmed significant relationships between operation duration and body mass, BMI, waist circumference, hip circumference, WHR, intertrochanteric distance, interspinous distance, intercristal distance, prior abdominal surgery, hypertension, diabetes, chronic obstructive pulmonary disease and hypothyroidism. This is presented in Table 5. Multivariate regression analysis among the above-mentioned factors confirmed significant relationships between the duration of the operation and waist circumference ($p < 0.0001$), body mass ($p < 0.0001$), chronic obstructive pulmonary disease ($p = 0.001$), BMI ($p = 0.0002$), intertrochanteric distance ($p = 0.01$) and hypothyroidism ($p = 0.02$).

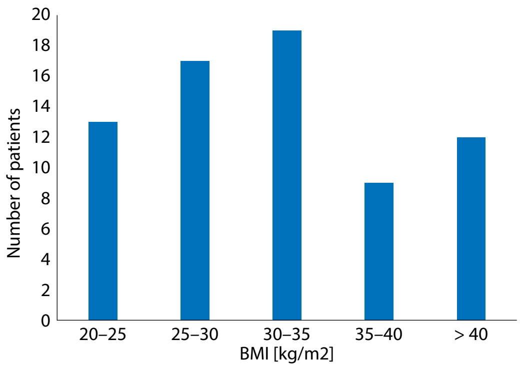

Figure 1. Patient distribution according to body mass index (BMI) value; BMI — body mass index

The duration of hospitalisation

The mean duration of hospitalisation was significantly longer in patients with BMI value ≥ 30 kg/m^2 compared to those with BMI value < 30 kg/m^2 (12.4 ± 3.4 vs. 10 ± 2.3 days, $p = 0.0009$; Tab. 3). The duration of hospitalisation correlated significantly positively with body mass, BMI, waist circumference, hip circumference, WHR, , intertrochanteric distance, interspinous distance, intercristal dimension, external con-

Table 2. Clinical stages according to International Federation of Gynaecology and Obstetrics (FIGO) 2008 — comparison of the number of patients in each stage of cervical cancer depending on the presence of obesity (Chi square test)

Stages of severity	Overall group N = 70	Obese (BMI ≥ 30 kg/m^2) N = 37	Non-obese (BMI < 30 kg/m^2) N = 33	p value
Stage I				
A	34 (51.4)	15 (40.6)	19 (57.4)	0.15
B	16 (22.8)	8 (21.6)	9 (27.2)	0.58
Stage II	11 (14.3)	5 (13.5)	5 (15.4)	0.84
Stage III				
A	5 (7.1)	5 (13.5)	0	–
B	1 (1.4)	1 (2.7)	0	–
C1	1 (1.4)	1 (2.7)	0	–
C2	0	0	0	–
Stage IV				
A	0	0	0	–
B	2 (2.8)	2 (5.4)	0	–

BMI — body mass index

Table 3. Comparison of selected indices in obese and non-obese patients

	Overall group	Obese (BMI ≥ 30 kg/m^2)	Non-obese (BMI < 30 kg/m^2)	p value
Age, years	61.3 ± 10.4	63.3 ± 9	59.1 ± 11.5	0.09
Intertrochromatic dimension, cm	35.3 ± 2.1	36.2 ± 2	34.2 ± 1.8	< 0.0001
Intersubular dimension, cm	26.9 ± 2	27.6 ± 2.1	26.2 ± 1.7	0.0006
Intercristal distance, cm	32.3 ± 3	33.7 ± 2.5	30.7 ± 2.7	< 0.0001
External conjugate, cm	22.2 ± 1.5	22.8 ± 1.4	21.5 ± 1.4	0.0002
Duration of operation, minutes	86 ± 20.4	94.9 ± 21.6	76.1 ± 13.5	< 0.0001
Duration of hospitalisation, days	11.3 ± 3.1	12.4 ± 3.4	10 ± 2.3	0.0009
Loss of haemoglobin, g/dL	2.2 ± 0.9	2.5 ± 0.9	1.9 ± 0.8	0.004

BMI — body mass index

jugate, prior abdominal surgery, clinical stages according to FIGO classification and histopatological grading. This is presented in Table 4. Univariate regression analysis also revealed significant relationships between the duration of hospitalisation and body mass, BMI, waist circumference, hip circumference, WHR, intertrochanteric distance, interspinous distance, external conjugate prior abdominal surgery, hypertension, diabetes, chronic obstructive pulmonary disease, hypothyroidism and heart failure. This is presented in Table 5. Multivariate regression analysis among the above-mentioned factors confirmed that the duration of hospitalisation was significantly associated with waist circumference, hip circumference, prior abdominal surgery hypothyroidism and BMI.

Table 4. Significant correlations between selected indices and haemoglobin loss during operation, duration of operation and hospitalisation

Predictors	Δ Hb before and two days after operation [g/dL]		Duration of operation [min.]		Duration of hospitalisation [days]	
	R coefficient	p value	R coefficient	p value	R coefficient	p value
Weight, kg	0.54	< 0.0001	0.59	< 0.0001	0.48	< 0.0001
Body-mass index, kg/m^2	0.55	< 0.0001	0.57	< 0.0001	0.48	< 0.0001
Waist circumference, cm	0.57	< 0.0001	0.7	< 0.0001	0.59	< 0.0001
Hip circumference, cm	0.46	< 0.0001	0.57	< 0.0001	0.43	0.0002
Waist-hip ratio	0.42	0.0003	0.36	0.002	0.35	0.003
Intertrochromatic dimension, cm	0.33	0.004	0.45	0.001	0.25	0.03
Intersubular dimension, cm	–	–	0.36	0.002	0.31	0.008
Intercristal distance, cm	0.43	0.0002	0.39	0.0007	0.25	0.03
External conjugate, cm	0.48	< 0.0001	0.28	0.02	0.33	0.004
Prior abdominal surgery	0.42	0.0003	0.29	0.014	0.41	0.0005
Number of births	–	–	–0.28	0.017	–	–
Clinical stages, FIGO	0.29	0.01	–	–	0.24	0.04
Histopathology, grading	–	–	–	–	0.25	0.04

Δ Hb — the difference in the serum concentration before surgery and on the second day after surgery

Table 5. Predictors of blood loss, duration of operation and hospitalisation assessed by univariate regression analysis

Predictors	Δ Hb before and two days after operation [g/dL]		Duration of operation [min.]		Duration of hospitalisation [days]	
	ß (95% CI)	p value	ß (95% CI)	p value	ß (95% CI)	p value
Weight, kg	0.018 (0.008–0.028	0.00006	0.641 (0.439–0.842)	< 0.0001	0.081 (0.048–0.115)	< 0.0001
Body-mass index, kg/m^2	0.043 (0.018–0.068)	0.001	1.554 (1.061–2.048)	< 0.0001	0.205 (0.124–0.286)	0.0009
Waist circumference, cm	0.02 (0.01–0.031)	0.0002	0.759 (0.564–0.955)	< 0.0001	0.102 (0.069–0.135)	< 0.0001
Hip circumference, cm	0.018 (0.005–0.032)	0.005	0.681 (0.408–0.954)	< 0.0001	0.082 (0.037–0.126)	0.0005
Waist-hip ratio	4.123 (1.605–6.64)	0.002	102.39 (45.27–159.5)	0.0006	15.55 (6.784–24.33)	0.0007
Intertrochromatic dimension, cm	–	–	3.929 (1.833–6.024)	0.0004	0.424 (0.086–0.761)	0.014
Intersubular dimension, cm	–	–	–	–	0.397 (0.042–0.753)	0.028
Intercristal distance, cm	0.082 (0.013–0.151)	0.02	2.341 (0.793–3.89)	0.004	–	–
External conjugate, cm	0.273 (0.15–0.396)	< 0.0001	–	–	0.534 (0.059–1.009)	0.028
Prior abdominal surgery	0.361 (0.109–0.614)	0.006	7.016 (1.128–12.904)	0.02	1.461 (0.615–2.306)	0.001
Hypertension	0.246 (0.041–0.451)	0.019	7.857 (3.328–12.38)	0.0009	1.033 (0.322–1.743)	0.005
Diabetes mellitus	–	–	4.955 (0.192–9.718)	0.04	1.059 (0.351–1.767)	0.004
COPD	–	–	8.647 (1.23–16.063)	0.023	1.258 (0.116–2.399)	0.031
Hypothyroidism	–	–	11.86 (5.475–18.257)	0.0004	1.708 (0.716–2.7)	0.001
Heart failure	–	–	–	–	1.684 (0.282–3.086)	0.02

Δ Hb — the difference in the serum concentration before surgery and on the second day after surgery; ß — coefficient beta; CI — confidence interval; COPD — chronic obstructive pulmonary disease

Procedure-related haemoglobin loss

The mean haemoglobin loss during periprocedural time was significantly higher in patients with BMI value ≥ 30 kg/m^2 compared to patients with BMI value < 30 kg/m^2 (2.5 ± 0.9 vs. 1.9 ± 0.8 g/dL, p = 0.004; Tab. 3). The degree of haemoglobin loss at the periprocedural time correlated significantly and positively with body mass, BMI, waist circumference, hip circumference, WHR, intertrochanteric distance, intercristal distance, external conjugate, prior abdominal surgery and clinical stages according to FIGO classification. This is presented in Table 4. Univariate regression analysis revealed significant relationships between periprocedural degree of haemoglobin loss and body mass, BMI, waist circumference, hip circumference, WHR, intercristal distance, external conjugate, prior abdominal surgery and hypertension. This is presented in Table 5. Multivariate regression analysis among the above-mentioned factors confirmed a significant relationship between the degree of haemoglobin loss during periprocedural time and external conjugate (p = 0.0002) and prior abdominal surgery (p = 0.001).

Anatomical parameters

Anatomical indices were significantly higher in patients with BMI value ≥ 30 kg/m^2 compared to patients with BMI < 30 kg/m^2, and they included intertrochanteric distance (36.2 ± 2 vs. 34.2 ± 1.8 cm, p < 0.0001), interspinous distance (27.6 ± 2.1 vs. 26.2 ± 1.7 cm, p = 0.0006), intercristal distance (33.7 ± 2.5 vs. 30.7 ± 2.7 cm, p < 0.0001) and external conjugate (22.8 ± 1.4 vs. 21.5 ± 1.4 cm, p = 0.0002). This is presented in Table 3.

Procedure-related complications

There were 5 perioperative complications: infection of the postoperative wound with impaired healing in 2 patients, intraoperative bladder injury in one patient, gastrointestinal obstruction in 1 case and intraoperative bleeding with the need to ligate the internal iliac artery in another patient. On average, patients with procedure-related complications showed higher obesity parameters: BMI (38 vs. 31.7 kg/m^2, p = 0.88) and waist circumference (119.6 vs. 103.7 cm, p = 0.54), compared to patients who had no procedure-related complications, however, those differences did not reach statistical significance.

DISCUSSION

The main findings of the current study are that patients with the mean BMI value > 30 kg/m^2 demonstrated longer duration of hospitalisation and operation, as well as greater haemoglobin loss during the periprocedural period. The second observation worth mentioning is that patients with obesity were diagnosed with endometrial cancer at more advanced stages according to the FIGO classification before the surgical treatment in comparison to non-obese patients. Thirdly, among predictors of the longer duration of operation we confirmed greater BMI, greater waist circumference and body mass. While among predictors of the duration of hospitalisation there were greater waist and hip circumference and greater BMI value. The external conjugate and intertrochanteric dimensions were found to be predictors of greater haemoglobin loss related to the procedure. The strongest correlation for the duration of operation, hospitalisation and haemoglobin loss was noticed for waist circumference. Moreover, patients with procedure-related complications were characterised by greater BMI value and waist circumference. The percentage distribution of obesity parameters showed that a significant percentage of patients with normal BMI presented abdominal obesity in the study group according to IDF criteria. Similar results were obtained in a study on the prevalence of metabolic syndrome in the population of the Tarnawa Dolna commune (70% of patients with abdominal obesity) [12]. The results of the study in the population of women treated for endometrial cancer show a higher incidence of this type of obesity than in the general population (> 90%). Most often, the patients' operations were diagnosed at stage I according to the FIGO classification. The average duration of surgery in the study group operated on for endometrial cancer is comparable to the results obtained at other centres [13, 14]. This study, however, used other parameters of blood loss (blood volume), and the average length of stay in hospital was much shorter. The effect of visceral obesity on the results of surgical treatment has not been studied. However, the influence of obesity measured by the BMI parameter on the duration of surgery and blood loss was demonstrated, which was also confirmed in the presented study for both the BMI parameter and waist circumference. In the current study, the greater waist circumference value is related to longer duration of the operation and hospitalisation, and among other natural explanations of that relationship are greater extent, incision and more complicated surgical procedure in obese compared to non-obese patients. This also definitely reflects directly greater haemoglobin loss during the procedure and remains in close relation to the more advanced disease in this particular group of patients. Interesting data were presented by Kerimoglu et al. [15]. Their study evaluated the effect of the percentage of body fat on surgical outcomes in women with endometrial cancer. In the group patients with an elevated % of body fat, a longer mean operation time was noted than in those with a % of body fat less than 32% (138.2 ± 27.1 vs. 119.3 ± 34.8 min, p = 0.043). Nonetheless, there were no differences between patient groups regarding rates of intraoperative complications, mean duration of hospital stay and postoperative complications [15]. However, in a cohort of 192 patients with differing BMI, Jan et al. showed that surgical operative time and mean length of hospitalisation in days were not significantly different among the 4 groups. In the obese group, there was significantly higher perioperative blood loss (p = 0.01), more wound abscess (p = 0.05) and more reinterventions for complications (p = 0.03) [16]. The incidence of postoperative complications in developed countries is estimated at 3–22% after surgical operations [11, 13, 15, 17]. Postoperative complications can be divided into early and late. The most common early complications in surgical gynaecology are: bleeding, bladder damage, ureters, intestinal perforation. The most frequent postoperative complications include infections, wound healing disorders, thromboembolic complications, cardiovascular complications, respiratory failure, gastrointestinal obstruction, renal failure, urination disorders, urogenital fistulas, intestinal fistulas. Co-morbidity of obesity and endometrial cancer may be associated with the increased rate of procedure-related complications. It has long been assumed that obesity can hinder the course of surgery. Some studies have shown that obesity is an obstacle to cancer staging in endometrial cancer [13], breast cancer [18] and gastric cancer [19]. A recent study identified EC patients with a body mass index (BMI) of ≥ 40 kg/m^2 at increased risk of developing surgical complications compared to their non-obese counterparts [20]. However, among 514 women with endometrial cancer, Bouwman et al. noted that obese and morbidly obese women experienced significantly more surgical complications than non-obese women (p = 0.010) [21]. This was confirmed in the present study.

In a prospective study conducted on a group of 233 patients operated on due to endometrial cancer, it was shown that the BMI value significantly and positively correlates with the duration of the surgery and the loss of haemoglobin during the periprocedural period. However, no relationships were found between obesity, the duration of hospitalisation and the occurrence of postoperative complications [14]. However, a study conducted in Turkey suggests that obesity in this group of patients does not significantly affect the number of acquired lymph nodes, the duration of hospitalisation or the number of procedure-related complications. However, this study was conducted on a relatively small group of 48 patients [22]. There are discrepancies in the literature regarding the influence of obesity on the occurrence of post-operative complications such as: infections, wound healing disorders, pulmonary embolism, and venous thromboembolism. Some authors mention visceral obesity as potentially crucial in understanding the real impact of obesity on the incidence of postoperative complications [22, 23]. On the basis of the conducted study, it could not be unequivocally determined whether there is a relationship between obesity and the occurrence of perioperative complications. The comparative group of patients with complications (5 patients), despite clear differences in parameters, did not demonstrate statistical significance. In the current study, there is no consensus in the assessment of the relationship between obesity and specific postoperative complications. Probably, chronic inflammation and metabolic disturbances observed in abdominal obesity contribute to postoperative complications such as: infections, wound healing disorders, circulatory and respiratory disorders [14]. In our study the highest predictive value for analysed parameters in- hospital outcomes among patients with endometrial cancer were BMI value and waist circumference.

CONCLUSIONS

Obesity predisposes to the later diagnosis of endometrial cancer at a more advanced stage, which may contribute to worse treatment results both in terms of the effectiveness of the procedure and mortality in the follow-up period. Waist circumference seems to be the most sensitive marker, indicating the possibility of extending the duration of the procedure and hospitalization, which is also associated with increased blood loss associated with the procedure. Therefore, waist circumference could serve as a tool for operational risk stratification. Further research will help determine a more accurate relationship between obesity and the occurrence of specific perioperative complications.

Limitations

This study can be referred to as a developmental study because it was conducted on a small group of patients. Also due to the relatively small group of patients studied, in the analysis we conducted, we focused on assessing trends and the relationship of individual indicators with treatment results. However, we have not attempted to isolate cut-off points for individual data above which the risk of losing large amounts of hemoglobin increases significantly.

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