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Cesarean myomectomy and possible risk factors for admission to intensive care unit – a retrospective study

Miomektomia podczas cięcia cesarskiego i możliwe czynniki ryzyka przyjęcia do oddziału intensywnej terapii – badanie retrospektywne

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Abstract

Objectives: *Cesarean myomectomy (CM) allows to remove fibroids and to restore uterine anatomy during delivery, combining two operations in one. It was opposed in the past due to surgical risks, although many reports showed that CM was not associated with increased morbidity. The risk for admission to an intensive care unit (ICU) following CM - as an objective indicator of maternal morbidity, potentially resulting in greater morbidity for patients, increased length of hospital stay, and higher hospital costs – has been poorly evaluated in the literature. The aim of our investigation is to estimate risk factors for ICU admission after CM.*

Material and methods: *The patients were subdivided into two groups: 57 women who were postoperatively admitted to the ICU (study group), and 45 women not treated in the ICU (control group). The p-value of <0.05 was considered as statistically significant.*

Results: *Data showed no statistically significant differences with regard to demographic factors, comorbidity and indications for cesarean section, as well as experience of the surgeon, number of hysterotomies, and incidence of emergency CS between the two groups. The most common reason for admission to the ICU was intraoperative hemorrhage (61.40%). As for the surgical characteristics, the study group showed significant increase in the rates of intraoperative transfusion (p=0.000) and intraoperative hemorrhage (p=0.000), as well as prolongation of surgical time (p=0.002). Myoma type and size were also significantly different between the groups (p=0.003 and p=0.000, respectively).*

Conclusions: *The most important factor contributing to ICU admission after CM is intraoperative hemorrhage in case of bigger myomas and prolonged surgeries.*

Key words: **myomectomy** / **cesarean section** / **cesarean myomectomy** / / **intensive care admission** / **myoma** / **fibroid** /

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Streszczenie

Cel pracy: *Miomektomia podczas cięcia cesarskiego (CM) pozwala na usunięcie mięśniaków i zachowanie anatomii macicy podczas porodu, łączy dwie operacje w jedną. W przeszłości nie zalecana z uwagi na ryzyko okołooperacyjne, jednak doniesienia nie potwierdzają zwiększonej chorobowości związanej z CM. Ryzyko przyjęcia do oddziału intensywnej opieki medycznej (ICU) w związku z CM – jako obiektywny wskaźnik chorobowości matek, przedłużony pobyt w szpitalu i wyższe koszty leczenia szpitalnego – są słabo przeanalizowane w piśmiennictwie. Celem naszego badania było oszacowanie czynników ryzyka przyjęcia do ICU po CM.*

Materiał i metoda: *Pacjentki podzielono na dwie podgrupy: 57 kobiet przyjętych do ICU po operacji (grupa badana) i 45 kobiet nieleczonych w ICU (grupa kontrolna). Jako istotne statystycznie przyjęto p <0.05.*

Wyniki: *Dane dotyczące czynników demograficznych, chorób współistniejących i wskazań do cięcia cesarskiego, jak również doświadczenie chirurga, liczba histerotomii i obecność pilnych wskazań do cięcia cesarskiego nie wykazały istotnych statystycznie różnic między dwiema grupami. Najczęstszą przyczyną przyjęcia do oddziału intensywnej opieki medycznej był krwotok śródoperacyjny (61.40%). Grupa badana cechowała się zwiększoną ilością śródoperacyjnych transfuzji krwi (p=0.000) i śródoperacyjnych krwotoków (p=0.000), jak również wydłużeniem czasu operowania (p=0.002). Typ i rozmiar mięśniaka były także istotnie różne w obu grupach (p=0.003 i p=0.000, odpowiednio).*

Wnioski: *Najważniejszym czynnikim ryzyka przyjęcia do ICU po CM jest krwotok śródoperacyjny w przypadkach większych mięśniaków i przedłużonego czasu operacji.*

Słowa kluczowe: **miomektomia / cięcie cesarskie / miomektomia podczas cięcia cesarskiego / oddział intensywnej terapii / mięśniak / włókniak /**

Introduction

High rates of cesarean sections (CSs) in women with myomas were observed during the first half of the twentieth century and confirmed by later studies [1]. Myomectomy during CS was considered a high-risk intervention for intraoperative and postoperative complications, including hysterectomy. Thus, numerous obstetricians recommend cesarean myomectomy (CM) only in cases of fetal extraction and lower uterine segment (LUS) suturing difficulties [2, 3]. Conversely, various reports showed that CM was not associated with increased morbidity [4, 5, 6], combining two operations in one. In fact, CM allows to avoid the risks of re-laparotomy and further anesthesia, thus reducing the costs of re-hospitalizations, re-operations and indirect costs of absence from work [1].

The risk for admission to an intensive care unit (ICU) following CM – a complication potentially resulting in greater morbidity for patients, increased length of hospital stay and higher hospital costs - has been poorly evaluated in the literature [7, 8].

Objectives

We investigated patients subjected to CM, evaluating the incidence of postoperative admission to the ICU, and surgical as well as clinical indicators that may affect the risk of ICU admission after CM.

Material and methods

This retrospective study included patients who underwent CM during a five-year period in a single institution. The study was approved by the Local Ethics Committee. All patients gave informed consent for the operation. Indications for CM included patient wishes, symptomatic myomas, myoma previa, and degenerative myoma. Exclusion criteria were as follows: placenta previa or placental abruption, congenital or acquired coagulopathy, multiple pregnancy, and additional surgical procedure during CS (except myomectomy). The study group consisted of 57 women who were postoperatively admitted and treated in the ICU (group I), whereas 45 women who were not admitted to the ICU after CM (group II) constituted the control group. Admission to the obstetric ICU was indicated in subjects with intraoperative and/or immediate postoperative complications, at risk for deterioration of their condition after CM, requiring more detailed observation during postoperative care and those requiring hemodynamic monitoring after CM. Admission to the ICU was based on the assessment by the surgeon or the anesthesiologist during and/or immediately after the operation and is not routine practice after CM. All controls after CM were treated at the ward. Duration of the ICU treatment was determined by the number of days in the ICU until hospital discharge. Demographic, clinical, obstetric, surgical and ICU parameters are presented in the Results section.

CMs were performed by the same surgical hospital staff, preferably from the edge of the CS incision (for myomas close to the LUS). In case of myomas located far from hysterotomy, myomectomies were performed by a new incision.

Myomectomy was always performed by sharp myoma dissection. No tourniquet and electro surgery were used. Suturing of the fibroid fovea was performed using two layers of interrupted sutures. A baseball-type suture was used for the serosa as the third layer. At the end of suturing, all patients received a drop of 10 IU of Oxytocin i.v. As antibiotic prophylaxis, all patients received a drop of Cefuroxime 1.5 g i.v. and a postoperative drop of Cefuroxime 1.5 g every 8 hours daily for three days, and uterotonic drugs (10 IU oxytocin i.v. infusion at 60 ml per hour) during the three days. After surgery, we recorded frequency and types of clinical, obstetric and surgical parameters, including CM complications.

All statistical analyses were performed using the SPSS software package (version 17.0; Chicago, IL, USA). Continuous variables were expressed as mean and standard deviation (SD), while categorical variables were expressed as absolute numbers. Comparisons between the two groups with normality and homogeneity of variances were performed by two-tailed unpaired Student's *t*-test. Alternatively, comparisons between groups with abnormality and heterogeneity of variances were performed by Welch *t*-test. Associations between qualitative variables were assessed through Pearson's chi-square test. A p-value of <0.05 was considered as statistically significant.

Results

A total of 102 patients were included in the study. The study and control groups were not different in terms of age, number of previous births and miscarriages, gestational age at delivery, and fetal position. CM following the delivery of the fetus was performed in 101 cases, and there was 1 case of myomectomy and inverted T incision prior to the delivery of the fetus. Out of 101 women, LUS incision was first sutured in 93 patients, while in 8 patients myomectomy was performed through the LUS incision. After CM, 57 (55.88%) women were admitted to the ICU (group I), while 45 (44.12%) women were treated at the ward. Mean duration of the ICU treatment was 1.39±1.33 days (range 1-7). None of the patients was re-admitted to the ICU. The most common indication for ICU admission was intraoperative hemorrhage, in 35 patients (61.40%): clinicians intraoperatively administered one unit of packed RBC in 25 women and more than one unit in three, while others were not transfused. The second most common indication for ICU admission was the need for intensive surveillance after surgery, based on operative team judgment, in 16 (28.07%) patients. Postoperative hemorrhage was the indication for treatment in the ICU in 4 (7.02%) patients. In two of them, the postoperative hemorrhage was stopped by uterotonics, in one by instrumental revision of the uterine cavity and tamponade apposition, while the fourth was submitted to relaparotomy and surgical hemostasis. Three women who had postoperative hemorrhage received polytransfusion: eight, seven and three units of packed RBC, while 1 subject did not receive a transfusion. Febrile morbidity and bacteremia after CM was present in 1 patient who previously had had a myomectomy. Intestinal sub-occlusion after surgery occurred in 2 women, one of whom was the patient submitted to relaparotomy after CM for postoperative hemorrhage. Hematoma of the anterior abdominal wall and the uterus were not recorded after a standard ultrasound exam before discharge. As far as other surgical complications were concerned, there were no cases of dehiscence of the surgical wound, intraoperative injuries of the digestive and urinary organs, postpartum hysterectomy and/or ligature of the hypogastric arteries. In the study group, apart from the above mentioned re-laparotomy for postoperative hemorrhage, 1 pregnant woman with two previous laparotomic myomectomies received a CM, followed by an inverted T incision.

Statistical comparison of the two groups considered the history of previous laparotomy and myomectomy as possible associated risk factors for ICU admission. The two groups did not differ significantly with regard to the number of previous laparotomies and myomectomies, although 7 out of 8 pregnant women who had a previous myomectomy were postoperatively admitted to the ICU, without statistical difference (p=0.061). The groups did not significantly differ with respect to the indications for CS. Controls mostly showed non-obstetric indications for CS, such as ophthalmic, cardiac, orthopedic and neurosurgical indications in 17.78% of the women, whereas myoma previa was the most frequent indication (17.54%) in the study group. Comparison of the CM characteristics revealed lack of differences in surgical experience, number of hysterotomies, and incidence of emergency CS between the groups. CM was carried out by experienced obstetricians, and mean number of years of practice of the surgeon was 16.78 ± 6.59 years. As far as the number of hysterotomies for fetal extraction and myomectomy was concerned, CM was performed through single hysterotomy in 8 (7.84%) patients, 78 women (76.48%) had two uterine incisions, while 16 women (15.69%) had three or more hysterotomies. A statistically significant difference between the groups was found in the following: time required for surgery, incidence of intraoperative bleeding, and the need for intraoperative transfusion. Study group patients had, on average, 12 min. longer operation (73.68 vs. 61.33 min), with more frequent intraoperative bleeding (56.14% vs. 8.89%) and, consequently, the need for intraoperative transfusion (49.12 % vs. 6.67%). The number of intraoperatively administered RBC units was significantly higher in the study group (31 vs. 3, p = 0.000): 25 patients received a single unit, while 3 received 2 units. Comparison of the number and location of myomas did not differ significantly between the groups, while patients admitted and treated in the ICU differed significantly in terms of myoma size and type (mean size of the myomas: 27 mm bigger than others, and 59.65% were intramural or multiple myomas). All comparison data between the groups are presented in Table I.

Discussion

CM, according to our results, was associated with ICU treatment in 55.88% of the patients. Our findings cannot be compared to other literature data due to the fact that some authors reported the indications and outcome of admission to an ICU during the puerperium [7, 8], but not in patients after CM. When describing myomectomy complications, most authors did not specify either the incidence or duration of the ICU treatment [5,9]. In our report, the most frequent indication for ICU admission was intraoperative hemorrhage. Intraoperative and postoperative hemorrhage together accounted for 68.42% of ICU admissions. Kim et al. [9], investigated risk factors for complications in patients submitted to CM. They had 90% of patients who underwent both, uterine arterial embolization and internal iliac artery embolization (on demand) to stop perioperative bleeding in the group with complications. These authors did not specify how many patients required ICU admission. Nevertheless, uncontrolled hemorrhage, the most serious complication of CM and indication for postpartum hysterectomy, was not registered in any of the patients, and there were no cases of ligature of the hypogastric arteries. The literature reported studies on CM without postpartum hysterectomy [4, 5]. Obstetric hemorrhage that requires postpartum hysterectomy in order stop the bleeding is a common indication for ICU admission and treatment in the puerperium [8]. According to another study [2], hysterectomy was required in 3 out of 9 women who underwent CM due to intensive bleeding. Seffah [10] reported 44 re-laparotomies after

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Table I. Characteristics and differences between the investigated groups: 57 patients who were postoperatively admitted and treated in the ICU, as group I, and 45 controls, not transferred to ICU, postoperatively treated at the ward, as group II.

Indication for admission to the ICU in the study group				
Indication			**No. of patients**	
Intraoperative hemorrhage			35	
Intensive monitoring			16	
Postoperative hemorrhage			4	
Febrile morbidity with bacteremia			1	
Intestinal sub-occlusion			1	
Patient characteristics				
Characteristics		**Group I**	**Group II**	**p**
Age (years)		34.68±4.72	34.30±4.37	0.665[a]
Number of abortions		1.61±0.88	1.51±0.87	0.557[a]
Parity		1.16±0.41	1.18±0.44	0.815[a]
Gestational age (weeks of gestation)		38.75±2.11	39.29±1.50	0.154[b]
Fetal presentation	Cephalic	42	37	0.646
	Breech	9	6	
	Oblique	2	1	
	Transverse	4	1	
Presence of comorbidity				
Characteristic		**Group I**	**Group II**	**p**
Previous myomectomy		7	1	0.061
Previous laparotomy		11	6	0.723
Indications for cesarean section				
Indication for CS		**Group I**	**Group II**	**P**
Disproportion		7	7	0.549
Previous cesarean		2	3	
Previous myomectomy		6	1	
Hypertension		7	2	
Fetal malpresentation		7	7	
Prolonged first stage of labor		1	3	
Myoma previa		10	7	
Fetal indications		8	7	
Other (non-obstetric) indications		9	8	
Surgery characteristics				
Characteristic		**Group I**	**Group II**	**P**
Duration of surgery (min.)		73.68±21.22	61.33±15.93	0.002[b]
Surgeon's years of practice (year)		16.58±6.55	17.04±6.71	0.725[a]
Number of incisions		2.09±0.66	2.44±0.80	0.282[a]
Incidence of emergency CS		25	14	0.188
Incidence of intraoperative transfusion		28	3	0.000
Incidence of intraoperative hemorrhage		35	4	0.000
Myoma characteristics				
Characteristics		**Group I**	**Group II**	**P**
Number of myoma (n)		1.95±1.44	1.64±1.09	0.246[b]
Myoma size (mm)		67.33±36.54	40.76±22.92	0.000[b]
Myoma type	Pedunculated	8	1	0.003
	Subserous	15	26	
	Intramural	9	2	
	Multiple	25	16	
Myoma localization	Fundal	5	3	0.800
	Anterior wall	32	29	
	Posterior wall	13	10	
	Isthmicocervical	4	1	
	Cornual	3	2	

[a] Unpaired Student *t* test
[b] Welch *t* test

CS and, including 17 hysterectomies, with 3 of them performed for massive hemorrhage after CM. To the best of our knowledge, that study, although not primarily investigating complications of CM, is the only one reporting fatal outcome after CM. Intraoperative hemorrhage, as the most frequent indication for ICU admission in our study, emerged as the consequence of high rate of intraoperative RBC transfusions, although most of them were single unit. The trend to over-transfuse obstetric patients is well-documented in the literature [11, 12]. Preliminary experience in this area indicates that this problem can be solved with the use of intraoperative cell salvage [13]. The second reason for a relatively high incidence of ICU admissions in our study was intensive monitoring upon surgeon's and/or anesthesiologist's request, although the patients were in stable condition. Postpartum hemorrhage was the third most common reason for ICU admission. It is often encountered in women in advanced maternal age and multiparas. Lack of statistically significant differences in this aspect can be explained by prevalent finding of relatively old pregnant women and term pregnancies.

A small number of patients with history of previous myomectomy and laparotomy might be the reason for the absence of differences regarding these two possible comorbidity factors. Previous myomectomy is a known risk factor for severe complications of classical abdominal myomectomy [14]. Nevertheless, in our study, previous myomectomy did not influence the ICU admission. Although cases of successful repeated myomectomy during CS are reported [15], the literature findings suggest a higher incidence of complications on repeated myomectomy [16].

The absence of significant differences in CS indications can be explained by insufficient sample size to demonstrate the possible existence of this influence. A high percentage of elective CS in the study explained the lack of influence of CS type on admission to the ICU.

Hemorrhage usually occurs during myoma enucleation and uterine suturing. Thus, the size of the defect caused by myoma enucleation and speed of hysterorrhaphy is essential in order to avoid excessive blood loss, as was confirmed even in cases of minimally-invasive surgery [17]. Surgical experience is critical for quick removal of the myoma. Adequate reconstruction of the uterus with minimal blood loss in a short period of time cannot be achieved without adequate surgical skills, determined by great surgical experience. Nevertheless, in cases of CM, time required for establishing uterine hemostasis and duration of the operation are influenced mainly by characteristics of the fibroids and, primarily, by their size: bigger myomas necessitating longer surgeries are associated with significant blood loss and risk of ICU admission. Since intraoperative hemorrhage was the most common indication for treatment in the ICU, this may explain why surgical experience did not significantly affect the ICU admission rates. Thus, the effect of the duration of the operation and the size of myomas on the risk for ICU admission is the result of pronounced intraoperative hemorrhage in case of longer operation and larger fibroids. The literature data confirm that the number and size of the myomas can influence the duration of the CM, as well as complication rate [1,18]. Two incisions in the uterus are the most common consequence of a single fibroid. This may explain the lack of influence of the number of fibroids and uterine incision on the ICU admission documented in our study.

Most authors agree that pedunculated and subserous fibroids can be safely enucleated during CM [4,5]. Other types of fibroids, such as intramural and multiple, frequently cause perioperative complications, mainly hemorrhage [5], and thus possibly the need for ICU admission. In our study, 43.86% of the patients who required ICU treatment had multiple myomas, while 57.78% of patients who did not require ICU treatment had subserous myomas. Most of the studied patients had anterior fibroids. CM is considered relatively safe for women with fibroids on the anterior wall of the uterus, which can explain the absence of the influence of localization of fibroids on ICU admission [4]. The absence of a significant association between localization of the myomas and ICU admissions rates can also be explained by an insufficient sample size to demonstrate the possible existence of such a connection, which cannot be ruled out completely.

The main limitations of our study concerned a relatively small number of patients and the fact that the data were analyzed retrospectively. Another limitation included the institutional organization of the ICU for obstetric patients, which is a 5-bed facility, located in close proximity of the Delivery Ward and CS Operating Room, with the possibility to the operating team to indicate the admission following CS, thus allowing quite liberal admission policy.

Conclusions

CM was recently promoted in various studies as a procedure without any serious or life-threatening complications, provided it is carried out by an experienced surgeon. Regardless, our investigation, analyzing the following risks of ICU admission after surgery, concluded that CM is associated with the risk of admission to the obstetric ICU. The most important factor that contributes to this is perioperative blood loss in cases of multiple and intramural myomas, bigger myomas and prolonged surgeries. Therefore, even with the benefit of two operations in just one surgery, we should consider the additional risk of admission to ICU after CM.

Conflict of interests

Authors certify that there is no actual or potential conflict of interest in relation to this article and they reveal no financial interests or connections, direct or indirect, or other situations that might raise the question of bias in the work reported or the conclusions, implications or opinions stated, including pertinent commercial or other sources of funding for the individual authors or for the associated departments or organizations, personal relationships or direct academic competition.

Authors' contribution:

1. Radmila Sparić – conception and design, acquisition, analysis and interpretation of data, drafting the article, revising the article critically for important intellectual content.
2. Marcello Guido – conception and design, acquisition, analysis and interpretation of data, drafting the article, revising the article critically for important intellectual content.
3. Andrea Tinelli – conception and design, acquisition, analysis and interpretation of data, drafting the article, revising the article critically for important intellectual content.

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Authors' statement

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