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Myomectomy at the time of cesarean delivery: a single-center experience

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Background: The aim of this study was to examine the results of myomectomy for the removal of intramural and large myomas during cesarean section and to decrease the possibility of myomectomies in the future. *Methods*: Data from 99 patients who underwent cesarean myomectomy and 100 patients who underwent only cesarean section in our hospital between December 2015 and September 2020 were analyzed retrospectively. Age, gravida, parity, gestational week, cesarean section indication, previous delivery method, preoperative and postoperative hemoglobin value, performance of blood transfusion, duration of operation, length of hospital stay, and the number, diameter, location, and type of myomas were recorded. *Results*: The mean diameter of myomas in the patients was 5.9 $\pm$ 1.80 cm (4–15 cm). Among the patients, 90.9% had (Federation of Gynecology and Obstetrics) FIGO type 5–6 myomas, and 9.1% had FIGO type 3–4 myomas. The mean gestational week of all cases was 36.7 $\pm$ 2.8 weeks. Compared to the control group, the patients who underwent cesarian myomectomy had a higher duration of operation (45.1 $\pm$ 13 min to 25.8 $\pm$ 5 min, $p < 0.001$), hospital stay (2.4 $\pm$ 0.9 days to 1.9 $\pm$ 0.3 days, $p < 0.001$), and blood transfusion (0.09 $\pm$ 0.31 unit to 0.01 $\pm$ 0.1 unit, $p < 0.05$). However, none of the patients underwent hysterectomy, relaparotomy, or other major complications. *Conclusion*: Performing myomectomy during cesarean section increases the duration of hospitalization and the amount of blood transfusion but does not cause major complications and provides patients the benefit of avoiding a second surgery.

Keywords

Cesarean; Cesarean myomectomy; Myoma; Myomectomy

1. Introduction

Uterine myomas are the most common pelvic tumors in women [1]. The prevalence of myoma increases with maternal age. The incidence of myoma is higher in black women than in white women. Its prevalence increases to 10.7% in the first trimester [2]. However, increased parity and long-term breastfeeding are associated with a decrease in its prevalence [3].

Myomas are usually asymptomatic during pregnancy. The most common symptom is pain [4]. Pregnant women with myomas are at risk of premature birth, premature membrane rupture, fetal malpresentation, placental abruption, low gestational age, low birth weight, and delivery by cesarean section [5]. Myomas have adverse effects on economic costs and quality of life. The surgical approach forms the basis for myoma treatment. Various minimally invasive procedures are applied in treatment in addition to abdominal myomectomy and hysterectomy [6].

Given the increasing age of women at first pregnancy, pregnancy and myoma commonly occur together. Hence, the incidence of myomas and the rate of surgical intervention during cesarean sections are increasing [7].

The general opinion is to avoid myomectomy during cesarean section. However, in recent years, successful results have been reported in selected cases related to cesarean myomectomy [8–10]. The correct approach remains unclear, and surgeons find difficulties in decision making when encountering myomas during cesarean section. The objective of this study was to share our experience in selected challenging cases and to reduce the possibility of a second myomectomy in the future.

Compared with similar studies, our study involved a higher number of cases. In addition, this study was the first to include large myomas and those with an intramural component. Thus, we obtained data on possibly the worst outcomes.

2. Materials and methods

This study was designed retrospectively and conducted in a single center. We included 99 patients who underwent cesarean section and uterine myomectomy concurrently between December 2015 and September 2020 in our gynecology and obstetrics clinic as the study group. The indications for cesarean section were determined based on obstetric reasons. Cesarean section was indicated when the mass obstructs vaginal delivery. Otherwise, vaginal delivery was preferred in pregnant women with myomas. We included 100 cases who underwent cesarean section between the same dates and had no myoma as the control group. The study population consisted of a total of 199 patients. Patient information was accessed using the files in the archive system of our hospital and the information processing system. Age, gravida, parity, gestational week, indication of cesarean section, previous delivery, preoperative and postoperative

hemoglobin (HGB) levels, performance of blood transfusion, operation time, and length of hospital stay were determined from patient files. The number, diameter, location, and type of myoma were determined from ultrasonography reports, surgical notes, and pathology reports.

Myoma types were grouped as subserous, mural, and submucous, and their locations were grouped as fundal, corpus anterior, corpus posterior, and cervical. Pedunculated myomas and myomas less than 4 cm in size were not included in our study. In multiple myoma cases, the largest diameter of myoma nodule was taken as a basis.

The time from the end of the operation until the control hemogram test was taken was planned to be 8 hours on average. The HGB limit for postoperative transfusion was determined to be 8 mg/dL. The measurement of operation time was initiated with the first skin incision.

In patients with pre-eclampsia, the condition may affect the length of hospital stay due to the cesarean section procedure; hence, the lengths of hospital stay in these patients were not included in the calculations of postoperative length of hospital stay. In addition, abruptio placenta, placenta previa, and coagulopathy may affect the amount of bleeding; hence, the amount of bleeding in patients with these conditions was not included in the calculation of the amount of bleeding.

The minimum professional experience of the surgeons operating on the patients in the study and control groups was 5 years. Hysterectomy, need for intensive care, relaparotomy, major organ and vascular injury, and massive blood transfusion were not observed in any patient.

2.1 Ethical considerations

Before the study was started, necessary approval was received from the local ethics committee of our hospital with the 2021/702 numbered decision. This study was conducted following the ethical principles of the Declaration of Helsinki.

2.2 Statistical analysis

Data were checked for normality by using the Kolmogorov-Simirnov test, histograms, and skewness and kurtosis values. Median, interquartile range, and means with standard deviations were reported for continuous variables. Categorical data were reported as frequencies and percentages. The Mann-Whitney U test in non-parametric data and the independent sample *t*-test in parametric data were used to compare differences between the control group and patients who underwent cesarean myomectomy. The relationships between categorical data were assessed using Pearson chi-square tests. In chi-square tests with a degree of freedom greater than 1, pairwise comparisons (post-hoc) were performed using a Bonferonni-corrected *p*-value. Data were analyzed using SPSS version 23.0 (SPSS, Statistical Package for Social Sciences, IBM Inc., Armonk, NY, USA), and a *p*-value of less than 0.05 was considered to be statistically significant.

3. Results

3.1 Demographic and clinical characteristics of patients who underwent cesarean myomectomy

The demographics and clinical characteristics of the patients who underwent cesarean myomectomy are displayed in Table 1. The mean age was 34.17 $\pm$ 5.89 years. The mean values for gravida, parity, abortus, and gestational week were as follows: 2.54 $\pm$ 1.57, 1.28 $\pm$ 1.35, 0.25 $\pm$ 0.58, and 36.71 $\pm$ 2.82, respectively. The preoperative and postoperative HGB values of the 99 patients who underwent cesarean myomectomy were 11.84 $\pm$ 1.80 and 10.34 $\pm$ 1.67 mg/dL, respectively. Nine units of blood were transfused to four patients (four units to one patient, two each units to two patients and one unit to one patient). Blood transfusion was carried out in these patients during and after the operation due to intraoperative blood loss. The mean amount of blood transfusion was 0.09 $\pm$ 0.31 units in the study group. Apart from these, four patients were transfused before the operation due to chronic anemia. In these patients, the transfusion was not related to bleeding. The mean duration of operation and hospital stay were 45.05 $\pm$ 13.22 min and 2.41 $\pm$ 0.94 days, respectively. The mean number of myomas was 1.32 $\pm$ 0.82. The mean birth weight of the newborns was 2937.55 $\pm$ 664.37 g.

Thirty-seven (37.4%) patients were primigravid, whereas 29 (29.3%) and 33 (33.3%) patients previously underwent cesarean section and vaginal delivery, respectively. Sixty-nine (69.7%) patients had anterior myomas, and 90 (90.9%) had subserosal myomas. The mean size of the myomas was 5.9 $\pm$ 2.80 cm. Fetal distress was the most frequent indication in all patients (19.2%).

3.2 Comparison of demographic and clinical characteristics between patients who underwent cesarean myomectomy and the control group

A Mann-Whitney U test indicated that the patients who underwent cesarean myomectomy had significantly higher age (U = 2860.50, z = –5.15, $p < 0.001$), duration of hospital stay (U = 3272.50, z = –5.56, $p < 0.001$), duration of operation (U = 555.00, z = –10.96, $p < 0.001$), and transfusion (U = 4446.50, z = –3.00, $p = 0.003$) than the control group.

However, a Mann-Whitney U test indicated that the control group had significantly higher gravida (U = 4059.00, z = –2.26, $p = 0.024$), parity (U = 3722.00, z = –3.12, $p = 0.002$), and gestational week (U = 3645.00, z = –3.30, $p = 0.001$) than the patients who underwent cesarean myomectomy. Finally, the independent sample *t*-test indicated that the control group had significantly higher postoperative HGB than the patients who underwent cesarean myomectomy (t = 2.138, df = 193, $p = 0.034$).

Regarding other demographic and clinical characteristics, no significant difference was found between the two groups ($p > 0.05$). Hysterectomy, need for intensive care, relaparotomy, major organ and vascular injury, and massive blood transfusion were not observed in either patient group. Comparison of demographic and clinical characteristics in pa-

Table 1. Demographic and clinical characteristics of patients who underwent cesarean myomectomy.

N = 99	Mean ± SD
Age	34.17 ± 5.89
Gravida	2.54 ± 1.57
Parity	1.28 ± 1.35
Abortus	0.25 ± 58
Gestational week	36.71 ± 2.82
Preoperative HGB	11.84 ± 1.8
Postoperative HGB	10.34 ± 1.67
Transfusion	0.09 ± 0.31
Duration of operation	45.05 ± 13.22
Duration of hospital stay (days)	2.41 ± 0.94
Number of myomas	1.32 ± 0.82
Birth weight	2937.55 ± 664.37
Previous delivery method	n (%)
NVD	33 (33.3)
C/S	29 (29.3)
Primigravida	37 (37.4)
Location of myomas	
Anterior	69 (69.7)
Posterior	12 (12.1)
Fundus	17 (17.2)
Intraligamentary	1 (1)
Type of myomas	
Subserosal	90 (90.9)
Submucosal	2 (2)
Intramural	7 (7.1)
Indication	
Fetal distress	19 (19.2)
Duplicate	16 (16.2)
Old	11 (11.1)
Preeclampsia	5 (5.1)
Breech presentation	11 (11.1)
Twin pregnancy	6 (6.1)
CPD	9 (9.1)
Non-progressive action	5 (5.1)
Myoma uteri	3 (3)
History of previous myomectomy operation	4 (4)
PL previa	4 (4)
Anhydroamniosis + IUGR	1 (1)
IVF pregnancy	1 (1)
Oblique lie	1 (1)
Large baby	2 (2)
Fetal distress + maternal ARDS	1 (1)

HGB, hemoglobin; NVD, normal vaginal delivery; C/S, cesarean section; IUGR, Intrauterine growth restriction; CPD, Cephalopelvic Disproportion; IVF, *In vitro* fertilization; ARDS, Acute respiratory distress syndrome.

tients who underwent cesarean myomectomy and the control group is given in Table 2.

3.3 Relationship between previous delivery method and groups

A chi-square test of independence was performed to examine the relationship between the groups and the previous delivery method. The relationship between these variables was significant (χ^2 = 47.519, $p < 0.001$). The patients who underwent cesarean myomectomy had a significantly higher percentage of primigravida (37.4%) than the control group (11.0%). Relationships between previous delivery method and groups are shown in Table 3.

4. Discussion

Most women with myomas give birth through vaginal delivery. Standard obstetric indications for cesarean delivery apply to pregnant women with myoma. Delivery by cesarean section can be considered if fetal descent may be prevented by a myoma. Women with retroplacental or anterior lower uterine segment myoma at cesarean delivery are at high risk for intrapartum or postpartum bleeding; therefore, appropriate preparations should be made before the operation [11].

In our study, the mean age of the cesarean myomectomy group was 34 years, which was higher than that of the control group (age = 29, $p < 0.001$). The number of gravida and parity were higher in the normal cesarean group than those in the control group. With the development of auxiliary reproductive techniques, maternal age is increasing worldwide. Increased maternal age increases the incidence of myoma. Parity and breastfeeding have a reducing effect on myomas. This phenomenon may be related to the high level of gravida and parity in the control group [3, 12].

In our study, length of hospital stay, operation time ($p < 0.001$), and number of transfusions ($p < 0.05$) were higher in the cesarean myomectomy group than in the control group. The mean length of hospital stay was 2.4 days in the myomectomy group. Sakıncı *et al.* [13] reported that the duration of hospital stay and operation time were significantly higher in 83 patients who underwent corporeal myomectomy and 80 patients who underwent corporeal myomectomy. In a retrospective study comparing 212 patients who underwent cesarean myomectomy or normal cesarean section, Şentürk *et al.* [14] found HGB level, complication rate, and number of transfusions similar in both groups and reported that cesarean myomectomy was a safe procedure, including removal of myomas over 5 cm.

Akbaş *et al.* [15] reported that 63 patients who underwent myomectomy during cesarean section had longer operative time and higher HGB loss, and this difference increased when involving myomas over 5 cm. El-Refaie and Özcan *et al.* [16, 17] reported that hospital stay and operation times were significantly longer. In a prospective case control study of 68 patients by Tinelli *et al.* [18], the mean length of hospital stay was reported to be 5 days. Huang *et al.* [19] reported in their meta-analysis that cesarean myomectomy cases stayed in the hospital for 0.18 days longer than the control group. The hospital stay rate of 2.4 days in the current study is much lower than the average found in the current literature. The duration of operation was 25 min in the normal cesarean group and 45 min in the cesarean myomectomy group. Our cesarean myomectomy rate was below the average found in the literature [7]. Caesarean section and caesarean section my-

Table 2. Comparison of demographic and clinical characteristics in patients who underwent cesarean myomectomy and the control group.

	Mean ± SD	U	z	*p*
Age		2860.50	−5.15	<0.001
Control	29.40 ± 6.15			
CM	34.17 ± 5.89			
Gravida		4059.00	−2.26	0.024
Control	2.79 ± 1.10			
CM	2.54 ± 1.57			
Parity		3722.00	−3.12	0.002
Control	1.71 ± 1.01			
CM	1.28 ± 1.35			
Abortus		4470.00	−1.93	0.054
Control	0.10 ± 0.30			
CM	0.25 ± 0.58			
Gestational week		3645.00	−3.30	0.001
Control	37.93 ± 1.34			
CM	36.71 ± 2.82			
Transfusion		4446.50	−3.00	0.003
Control	0.01 ± 0.10			
CM	0.09 ± 0.31			
Duration of operation		555.00	−10.96	<0.001
Control	25.85 ± 5.08			
CM	45.05 ± 13.22			
Birth weight		3949.50	−1.69	0.091
Control	3101.50 ± 412.73			
CM	2937.55 ± 664.37			
Duration of hospital stay		3272.50	−5.56	<0.001
Control (n = 100)	1.91 ± 0.38			
CM (n = 94)	2.43 ± 0.96			
		t	df	*p*
Pre-op HGB		0.937	183.29	0.350
Control (n = 100)	12.08 ± 1.52			
CM (n = 95)	11.85 ± 1.82			
Post-op HGB		2.138	193	0.034
Control (n = 100)	10.87 ± 1.49			
CM (n = 95)	10.39 ± 1.65			

CM, cesarean myomectomy.

Table 3. Relationship between previous delivery method and groups.

	Previous delivery method			χ^2	*p*
	NVD	C/S	Primigravid		
	n (%)	n (%)	n (%)		
Groups				47.519	0.001
Control	11 (11.0%)	78 (78.0%)	11 (11.0%)		
CM	33 (33.3%)	29 (29.3%)	37 (37.4%)		

NVD, Normal vaginal delivery; C/S, cesarean section; CM, cesarean myomectomy.

omectomy volumes were high because the surgeons were in a tertiary center. The short operation time of our patients may be the effect of increased surgical experience.

In our study, the control group had significantly higher postoperative HGB values than the patients who underwent cesarean myomectomy ($p < 0.05$). In a study comparing 47 and 94 patients who underwent cesarian myomectomy and normal cesarean, respectively, Hassiakos *et al.* [20] did not find a difference in HGB changes between the two groups, although the difference between the preoperative and postoperative HGB mean values of the groups was statistically significant. In their meta-analysis, Pergialiotis *et al.* [21] reported a relationship between operation time and HGB decrease in patients who underwent cesarean section myomectomy compared with those who underwent only cesarean section delivery; furthermore, no major bleeding or transfusion need was detected. Guler *et al.* [22] found no significant difference in preoperative, postoperative, and mean

HGB between 65 and 82 patients who underwent intramural myomectomy and subserosal myomectomy, respectively.

In our study, 69% of the myomas were anterior, 90% of the myomas were subserosal (FIGO 6 [66.4%] and FIGO 5 [34.5%]), and the mean myoma diameter was 5.9 cm. Consistent with findings in the literature, the myomas in our study were mostly located in the anterior corpus [23, 24]. Sparic *et al.* [10] reported that corporeal myomectomy did not cause an increase in perioperative morbidity and was safe in patients with anterior myomas. Kaymak *et al.* [25] compared 40 patients who underwent cesarean myomectomy with 80 patients with myomas as the control group and found that the average myoma size was 8.1 cm. Park *et al.* [26] warned that the operation time would be longer than usual in myomas exceeding 6 cm. Zhao *et al.* [27] stated a high risk for postpartum bleeding if cesarean myomectomy was performed in myomas over 5 cm and fetal weight was over 4000 g. Sparic *et al.* [28] stated that the type and size of myomas and the duration of surgery were related, and the size of the defect caused by myoma enucleation and suture rate had a significant effect on the formation of intraoperative bleeding. Furthermore, surgeons should exercise great care when performing corporeal myomectomy on mothers over 40 years of age [29].

In our study, no hemostatic method (tourniquet, uterotonic drugs, vasopressin, vascular ligation, etc.) was performed. Ehigiegba *et al.* [30] reported that myomectomy in cesarean section is no longer as dangerous as many people believed with sufficient surgical experience and the use of high-dose oxytocin infusion. In a study where cesarean section myomectomy and abdominal myomectomy were compared, Kanthi *et al.* [31] reported that the contraction power of a pregnant uterus was effective in reducing blood loss that cesarean myomectomy can be performed safely in single myomas and that it is similar to abdominal myomectomy in terms of blood loss.

The limitations of the study are its retrospective design, all myomectomy operations being performed by experienced surgeons, and the lack of results related to postpartum bleeding. We believe that the size of the patient population and the mean myoma diameter are the strengths of the study.

5. Conclusions

The safety of cesarean myomectomy remains unclear in the literature. Our experience has shown that it prolongs operation time, blood transfusion rate, and hospital stay. In addition, no hysterectomy, relaparotomy, massive transfusion, or major organ damage was found. Myomectomy performed during cesarean section reduces the possibility of a second surgery. Surgeons should consider all these factors when deciding to perform myomectomy.

Author contributions

ST and MRG conceived and designed the experiments; SA, CA, MRG, and ST performed the experiments; ST and MRG analyzed the data; MRG and ST contributed reagents and materials; CA and ST wrote the paper. All authors read and approved the final manuscript.

Ethics approval and consent to participate

All subjects provided their informed consent for inclusion before they participated in the study. The study was performed in accordance with the Declaration of Helsinki and was approved by the Institutional Ethics Committee of Gazi Yasargil Training and Research Hospital (2021/702).

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Conflict of interest

The authors declare no conflict of interest.

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