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Original Research

Myomectomy during cesarean section: is it a redundant or a feasible procedure?

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Summary

Aim: The aim of this study was to evaluate the postoperative course of myomectomies performed during cesarean deliveries at a tertiary hospital and determine the safety of this procedure. *Materials and Methods:* The clinical characteristics and postoperative outcome of 64 patients who underwent cesarean myomectomy and 75 patients who underwent cesarean delivery only were compared retrospectively. The operative times and complete blood count (CBC) parameters obtained preoperatively and on the first and second postoperative days were recorded. The clinical course of each pregnancy and postoperative complications, such as bleeding necessitating blood transfusions, fever and uterine atony were recorded. *Results:* No difference was detected in the mean preoperative and postoperative days 1 and 2 CBC parameters between the two groups. The change between preoperative and postoperative day 1 mean CBC parameters was not significantly different between the two groups, however the mean change in the CBC parameters between preoperative day 1 and postoperative day 2 was statistically significantly higher in the myomectomy group (p = 0.034) when compared with the non-myomectomy group. The mean operative time in the cesarean myomectomy group was significantly longer than the non-myomectomy group (p = 0.004). *Conclusions:* A higher amount of blood loss is encountered in those who underwent cesarean myomectomy than those who underwent cesarean delivery only, however, because the incidence of severe hemorrhage is not significantly different between the two groups, hence the authors conclude that cesarean myomectomy is a safe and feasible procedure, for subserosal as well as for intramural ones.

Key words: Myomectomy; Cesarean section; Fibroids; Operative bleeding.

Introduction

The prevalence of uterine fibroids during pregnancy is between 2% and 12% [1-3]. Offering concurrent myomectomy during cesarean delivery remains unclear. Obstetricians have been discouraged from removing fibroids during cesarean delivery due to a higher risk of severe hemorrhage, uterine atony, and the need for hysterectomy following such operations [4]. On the other hand, it has been suggested that if not removed, large fibroids may lead to subinvolution of the uterus, postpartum uterine atony, and endometritis after delivery [5, 6]. Fibroids have also been associated with reduced fertility, preterm delivery, intrauterine growth restriction, placenta previa, abruptio placenta, pelvic pain, and dysfunctional labor [3]. In patients not surgically treated or for a fibroid during cesarean delivery, a myomectomy may be required at a later date to prevent subfertility, future pregnancy complications, to treat pressure symptoms or excessive uterine bleeding. The prospect of another surgery increases cost, morbidity, and complications associated with anesthesia and operating in a previously operated abdomen. Therefore, it seems reasonable to offer concurrent myomectomy during cesarean section if the fibroid can be safely excised.

In this study, the authors aimed to evaluate the postoperative course of patients who underwent myomectomies during cesarean deliveries at the present institution and to determine safety and present their experience.

Materials and Methods

The authors retrospectively analyzed 139 pregnant women with fibroids who delivered via cesarean section at the Health Sciences University Kanuni Sultan Suleyman Hospital in Istanbul between 2013 and 2016. The study group consisted of 64 patients who underwent cesarean delivery with concurrent myomectomy and the control group consisted of 75 patients who underwent cesarean delivery without myomectomy.

All cesarean deliveries were performed electively under general anesthesia and with low transverse uterine incisions by two surgeons (HK and LST). For those who underwent myomectomy, a longitudinal incision was made over the fibroid based upon its location (Figure 1). In patients with multiple myomas, all visible myomas were excised if they were in the myomectomy group. In all patients with dystocia due to the large size or close proximity of the fibroid to the uterine incision, myomectomy was performed after delivery of the fetus to prevent complications in future deliveries. Following myomectomy, the myometrial incision was closed in several layers using 1-0 polyglycolic acid sutures (Figure 2). Following delivery, 30 IU of oxytocin in 500 ml normal saline was administered to prevent excessive hemorrhage. Additionally,

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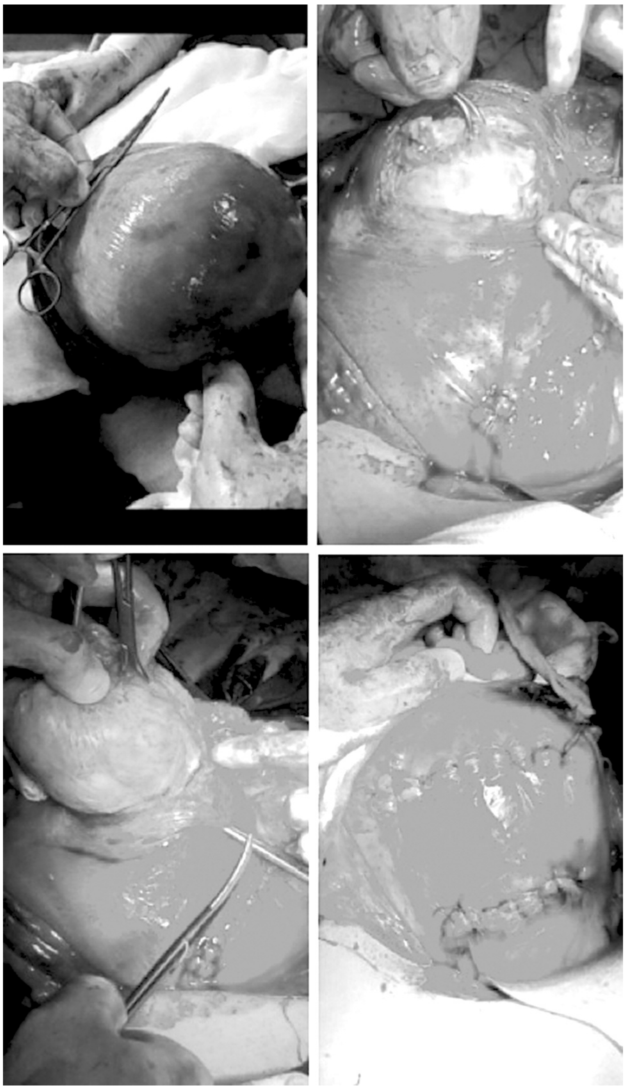

Figure 1. — Intramural myomectomy during cesarean section

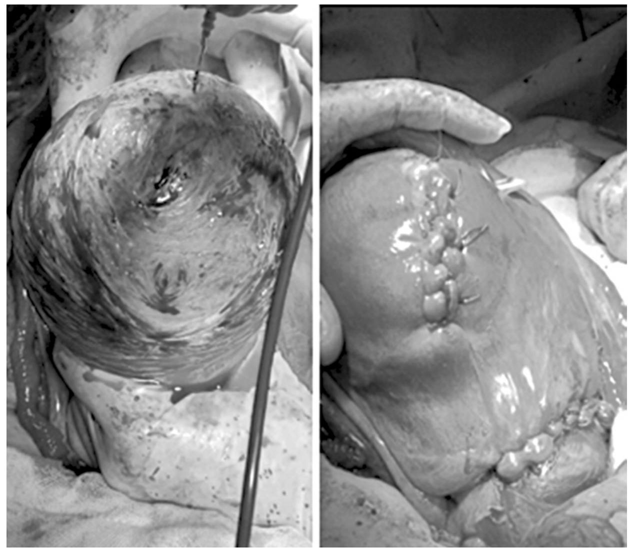

Figure 2. — Myomectomy and sutured cesarean and myomectomy incision.

methylergonovine maleate or misoprostol were administered for those patients who developed uterine atony or severe uterine bleeding.

Patient characteristics such as age, parity, and BMI, as well as the location, size, and number of fibroids were recorded for each patient. All cesarean sections were performed for obstetrical indications. Women with hypertensive disorders, placental abruption, placenta previa, and/or placental insertion anomalies were excluded from the study.

Myomectomies were performed in order to improve pain and prevent complications in future deliveries, such as dystocia, patient preference, or fibroid torsion. Operative duration and complete blood count (CBC) parameters obtained preoperatively and on postoperative day 1 and day 2 were recorded. Clinical course of pregnancy and postoperative complications such as bleeding, need for blood transfusion, fever, uterine atony, and ileus were reviewed.

The SPSS Statistics 22 program was used for statistical analysis. The distribution of data was determined with the Shapiro–Wilk test. Descriptive and quantitative parameters with normal distributions were compared between groups using Student's *t*-test, whereas the Mann–Whitney U test was used to compare parameters without a normal distribution. The repeated-measures ANOVA was used to compare parameters obtained preoperatively, postoperatively, and prior to discharge. The Bonferroni test was used to determine duration of time for detection of a difference in preoperative and postoperative blood parameters. For qualitative data comparison, the chi-squared, continuity correction, and Fisher's exact tests were used. A *p*-value of less than 0.05 was considered statistically significant.

Results

Comparisons of clinical characteristics of patients in study and control groups are presented in Table 1. Nine (14.6%) patients underwent myomectomy to prevent complications in future deliveries, 27 (42.2%) to prevent dystocia due to fibroids, 17 (26.6%) for pain management, six (9.4%) due to patient preference, and five (7.8%) for other reasons. Duration of myomectomy ranged from 8 to 85 (mean, 25.98 ± 14.98) minutes. The mean operative time in the cesarean myomectomy group was significantly longer than in the non-myomectomy group ($p = 0.001$). Difficulty of delivery was significantly higher in the myomectomy group than in the non-myomectomy group ($p = 0.001$).

There were no statistically significant differences between groups with regards to incidence of cephalopelvic disproportion, fetal distress, malpresentation, preterm delivery before 37 weeks of gestation, preterm premature rupture of membranes, and intrauterine growth retardation.

Characteristics in size, type, and location of fibroids are shown in Table 2. The incidence of intramural and cervical fibroids was significantly higher in the myomectomy group compared with the non-myomectomy group.

There were no differences in the rate of oxytocin infu-

Table 1. — *Patient characteristics of the study and control group.*

	Non-myomectomy group [n=75]	Myomectomy group [n=64]	*p*
Age (years)	33.05±5.29	34.81±5.64	[a]0.061
BMI (kg/m²)	34.26±4.64	34.58±5.13	[a]0.706
Gravidity (n)	2 [1-12]	2 [1-16]	[b]0.137
Parity (n)	1 [0-9]	1 [0-4]	[b]0.229
Number of live offspring (n)	1 [0-9]	1 [0-4]	[b]0.319
Gestational week at birth	38 [22-41]	38 [23-49]	[b]0.781
Duration of surgery (min)	39.60±15.80	65.58±22.8	[a]0.001**
Difficulty in delivery of the baby (Fetal dystocia)	12 [16%]	27 [42.2%]	[c]0.001**
Previous mode of delivery			
Nulliparity	35 [46.7%]	25 [39.1%]	[c]0.070
NSD	16 [21.3%]	17 [26.6%]	
C/S	23 [30.7%]	15 [23.4%]	
NSD and C/S	1 [1.3%]	7 [10.9%]	
Neonatal weight (gr)	2800.07±987.00	2775.27±1062.90	[a]0.887
Apgar 1	8 [0-10]	8 [0-9]	[b]0.340
Apgar 5	9 [0-10]	9 [0-10]	[b]0.724
Type of uterine incision at cesarean			
Low uterine transverse	74 [98.7%]	62 [96.9%]	[c]0.550
Vertical	1 [1.3%]	1 [1.6%]	
Other	0 [0%]	1 [1.6%]	

*[a] Student t-test; [b] Mann Whitney U Test; [c]Chi-Square Test and Continuity Correction; **p < 0.01; Results are reported as mean ± standard deviation, median [minimum-maximum] and n [%]; NSD: normal spontaneous delivery, C/S: cesarean delivery.*

Table 2. — *Comparison of fibroid characteristics of the study and control groups.*

	Non-myomectomy group [n=75]	Myomectomy group [n=64]	*p*
Size of fibroid	4 [1-13]	4.5 [2-12]	[a]0.155
Type of fibroid			
Subserosal	38 [50.7%]	22 [34.4%]	[b]0.001**
Intramural	13 [17.3%]	28 [43.8%]	
Submucosal	3 [4%]	6 [9.4%]	
Multiple	21 [28%]	8 [12.5%]	
Location of the fibroid			
Fundus	18 [24%]	16 [25%]	[b]1.000
Body	37 [49.3%]	31 [48.4%]	[b]1.000
Cervix	3 [4%]	10 [15.6%]	[b]0.040*
Fundus and body	7 [9.3%]	2 [3.1%]	[b]0.178

*[a] Mann Whitney U Test; [b]Chi-Square Test, Continuity Correction and Fisher's Exact Test; Results are presented as median [minimum-maximum] and n [%]; *p < 0.05; **p < 0.01.*

Table 3. — *Comparison of postoperative clinical parameters between the study and control groups.*

	Non-myomectomy group [n=75]	Myomectomy group [n=64]	*p*
Transfusion	0 [0-6]	0 [0-4]	[a]0.725
Duration of hospital stay (day)	2 [2-7]	2 [2-10]	[a]0.112
Fever	10 [13.3%]	8 [12.5%]	[b]0.320
Ileus	1 [1.3%]	3 [4.7%]	[b]0.271
Atony	11 [14.7%]	9 [14.1%]	[b]0.553

*[a] Mann Whitney U Test; [b] Continuity Correction and Fisher's Exact Test; Results are presented as median [Minimum-Maximum] and n [%]; *p < 0.05.*

sion, methylergonovine maleate or misoprostol administration between groups. In the cesarean myomectomy group, a Bakri balloon was used for one patient and bilateral uterine artery ligation was performed for management of severe uterine bleeding in one patient. Furthermore, the rate of drainage placement was significantly higher in the myomectomy group (10.9%) compared with the non-myomectomy group (1.3%, p = 0.024).

Table 3 compares the rate of postoperative complications between groups. No difference between postoperative com-

Table 4. — *Comparison of CBC parameters between the study and control groups.*

Hematocrit level	Non-myomectomy group [n=75]	Myomectomy group [n=64]	[a]*p*
Preoperative	34.84±3.92	36.06±4.49	0.088
Postoperative day 1	30.36±4.73	31.16±4.74	0.321
Postoperative day 2	30.37±4.64	30.35±3.41	0.974
Δ Preoperative - Postoperative day 1	-4.48±3.77	-4.9±3.31	0.489
Δ Preoperative - Postoperative day 2	-4.47±3.13	-5.71±3.73	0.034*
Δ Postoperative day 1- Postoperative day 2	0.01±4.00 -0.82±3.21	0.187	
[b]*p*	0.001**	0.001**	

*[a] Student t-test; [b] Repeated measures for ANOVA; *p < 0.05; **p < 0.01; Results are presented as mean ± standard deviation.*

Table 5. — *Evaluation of CBC parameters according to the type and the size of fibroid.*

Myomectomy Group [n=64]	Type of fibroid		*p* [a]	Size of fibroid		*p* [a]
Hematocrit level	Subserosal and submucosal [n=22]	Intramural [n=42]		< 5 cm [n=32]	≥ 5 cm [n=32]	
Preoperative	36.45±3.23	35.86±5.05	0.624	36.26±3.66	35.86±5.25	0.727
Postoperative Day 1	32.48±3.35	30.47±5.24	0.108	32.12±4.10	30.21±5.20	0.108
Postoperative Day 2	31.08±3.28	29.96±3.45	0.215	31.28±3.36	29.42±3.26	0.028*
Δ Preoperative - Postoperative day 1	-3.96±2.55	-5.39±3.58	0.103	-4.14±2.80	-5.66±3.65	0.067
Δ Preoperative - Postoperative day 2	-5.36±2.86	-5.90±4.14	0.592	-4.98±2.78	-6.44±4.42	0.119
Δ Postoperative day 1- Postoperative day 2	-1.40±2.51	-0.51±3.52	0.296	-0.84±2.32	-0.79±3.95	0.947
p[b]	0.001**	0.001**		0.001**	0.001**	
	Results are presented as Median ± Standard deviation, CBC, complete blood count			*Results are presented as Mean ± Standard deviation, CBC, complete blood count*		

*[a] Student t-test; [b] Repeated measures for ANOVA; *p < 0.05; **p < 0.01; Results are presented as mean ± standard deviation.*

plication rates was found in the subgroup analysis except for rate of postoperative fever in the non-myomectomy group (*p* = 0.042). Hysterectomy was not performed for any patient in either group.

Comparisons of CBC parameters between groups are shown in Table 4. No difference was detected in preoperative, postoperative day 1, and day 2 CBC parameters between groups. However, the mean change in the CBC parameters between preoperative and postoperative day 2 levels was significantly higher in the myomectomy group (*p* = 0.034) compared to the non-myomectomy group. 15.6% (10/64) of patients in the cesarean myomectomy group and 12% (9/75) in the non-myomectomy group received blood transfusions (*p* = 0.725). When preoperative and postoperative CBC parameters of patients who received blood transfusions were compared, it was noted that 50% (5/10) of patients in the cesarean myomectomy group and 22.2% (2/9) of patients in the non-myomectomy group received unnecessary transfusions. No patients received a massive blood transfusion (defined as ten units of blood transfusion within 24 hours) [7].

Subgroup analysis comparing CBC parameters of subserosal and submucosal fibroids with intramural fibroids revealed no statistically significant differences between groups (Table 5).

In another subgroup analysis according to size of the uterine fibroids, postoperative day 2 hematocrit and CBC parameter changes in patients with fibroids larger than 5 cm were statistically significant (Table 5). Related to this outcome, the rate of blood transfusion in patients with fibroids larger than 5 cm was higher (*p* < 0.012).

Discussion

A potential complication of leaving a large fibroid in the uterus in the immediate postpartum period is inadequate subinvolution and development of uterine atony, due to reduced myometrial contractility from the mass effect caused by the fibroid itself [8]. Although it is general practice to avoid cesarean myomectomies due to high complication rates reported by earlier studies, it may become inevitable in difficult deliveries or if myometrial repair is necessary [9-11]. In these cases, cesarean myomectomy have yielded good results, encouraging many obstetricians to begin performing such operations. Indeed, several authors have recently reported favorable outcomes after cesarean myomectomy performed in a well-selected population of patients [12-14].

One drawback of performing cesarean myomectomy may be the necessity for another operative delivery in a future pregnancy. Furthermore, it is not yet evident how myomectomies at cesarean delivery affect future fertility, although the results of a study conducted by Adesiyn *et al.* revealed a spontaneous pregnancy rate of 79.3% following cesarean myomectomy [15]. These data suggest that fertility is not adversely affected following this procedure. Additionally, due to the lack of randomized controlled trials, the population of patients who most benefit from cesarean myomectomies remains unclear. It is probably more beneficial to excise large fibroids rather than small ones, since those greater than 5 cm in size are more likely to be associated with pregnancy complications and more likely to become symptomatic in the near future, depending on their location [2, 16]. As suggested by Ehgiegba *et al.*, the benefit of excising a single 2–3 cm asymptomatic subserosal fibroid may be minimal [17]. This being said, although many patients will not fulfill acceptable indications for myomectomy at the time of cesarean delivery, the propensity of fibroids to enlarge and become symptomatic in the reproductive years is well known. One study reported a 34% increase in fibroid volume over the course of approximately three years following cesarean delivery in 22 patients, 40.9% of which had to undergo myomectomy or hysterectomy due to their symptoms [18]. Since fibroids are one of the most common reasons for hysterectomies worldwide [19], it seems prudent to consider myomectomy during cesarean deliveries at least in a group of patients most likely to become symptomatic, in order to avoid the prospect of another surgery in the future.

The surgeon may have difficulty in delivering the baby, especially when myomas are associated with the transverse incision of the lower uterine segment. This difficulty was the most seen reason for dystocia in the present study. The surgeon who is faced with fetal dystocia should decide whether to perform cesarean myomectomy, in order to avoid a more difficult future caesarean section.

Selection criteria for cesarean myomectomy have been based on location, number, and size of the fibroids. It is generally recommended to avoid excision of large, multiple, and intramural fibroids located in the fundal and corneal regions and those in close proximity of the fallopian tubes and large vessels [12-14, 20-22]. Spariç determined a cutoff size for a fibroid associated with intra- operative hemorrhage (defined as a 10% decrease in hematocrit during cesarean myomectomy) as 6.15 cm [23]. Nevertheless, Kwon *et al.* detected no significant differences in postoperative complication rates between those who underwent cesarean myomectomy for fibroids, regardless of size [24]. Similarly, Park *et al.* reported the only drawback in performing myomectomies for fibroids larger than 6 cm to be increased operative times; cesarean myomectomy was safe, irrespective of fibroid location [18]. Although cesarean myomectomy in the literature was performed primarily for subserosal fibroids, the majority of myo- mectomies in the present study were performed for intramural fibroids. Furthermore, no statistically significant difference was detected with respect to blood loss and other complications, between those with subserosal or submucosal fibroids and intramurally located fibroids. Additionally, patients with fibroids larger than 5 cm had significantly lower hematocrit levels on postoperative day 2 and required significantly more blood transfusions than those with smaller fibroids. The incidence of massive hemorrhage and other complications did not differ in the present study. Therefore, the authors conclude that, although patients with large fibroids are more likely to suffer from hemorrhage during excision, myomectomy is still a feasible option for this population of patients.

There are numerous advantages to performing cesarean myomectomies. Li *et al.* found that cesarean myomectomies were easier to perform than routine myomectomies, due to the relatively smaller size of the fibroid compared to the distended pregnant uterus, leading to a smaller incision over the fibroid during cesarean section. They moreover stated that "the pregnant myometrium was easier to suture because of its more elastic and less fragile nature than that of a non-pregnant myometrium" [25]. Cobellis *et al.* noticed better uterine scar integrity on ultrasound during subsequent pregnancies in those who underwent cesarean myomectomies compared with those who underwent myomectomy at a later time [26]. This has been argued to be due to improved immunity during pregnancy [27]. Moreover, hypertrophic uterine muscle fibers in pregnancy allow for better hemostasis following cesarean myomectomy due to powerful uterine contractions [28].

In this study, the authors found that cesarean myomectomy was associated with a higher blood loss than cesarean delivery alone. However, the incidence of severe hemorrhage and other major complications did not significantly differ between groups. To assess the presence of such a possibility, the authors compared postoperative days 1 and 2 CBC levels (pre-discharge) and failed to find a difference. However postpartum fever was higher in the non-myomectomy group compared with the myomectomy group.

A recent meta-analysis, including nine studies comparing surgical outcomes of women who underwent cesarean myomectomies versus cesarean delivery alone reported a 0.30 g/dl higher drop in hemoglobin levels of cesarean myomectomy patients [19]. This difference did not reach statistical significance. In the present study, although the mean drop in hematocrit levels from preoperative to postoperative day 1 in the myomectomy and non-myomectomy groups were not significantly different, the drop between preoperative and postoperative day 2 (pre-discharge) hematocrit levels were significantly higher in the myomectomy group (5.71% in myomectomy *vs.* 4.47% in non-myomectomy groups). This may be attributed to the hypervolemic state of pregnancy, which may mask actual blood loss on the first postoperative day, with actual blood loss becoming more apparent on the postoperative second day. Nevertheless, because the number of blood transfusions was not significantly different between groups and no patient under- went postpartum hysterectomy, the authors can conclude that myomectomy is a relatively safe procedure that can be performed during cesarean deliveries in accordance with previous studies [29-31].

The successful excision of fibroids at cesarean delivery with recent reports of relatively low complication rates may be attributed to the implementation of various medical and surgical hemostatic measures, perhaps aided by the hypercoagulable state brought about by pregnancy. Incebiyik *et al.* reported the use of oxytocin infusion, electrocautery, and a tourniquet to compress the uterine arteries as an effective strategy in reducing blood loss [13]. Sapmaz *et al.* compared bilateral uterine artery ligation with tourniquet application during cesarean myomectomies, and although both methods were found to be comparable in reducing blood loss, the former method was preferred by the author because of its more permanent nature [32]. Desai *et al.* reported ligating the medial branches of the ovarian arteries near the cornual region, and the descending and ascending branches of the uterine arteries in nine patients with lowly situated fibroids, nearly half of which were intramurally located, as an effort to devascularize the uterus by blocking its collateral blood flow. Their reported mean blood loss was 430±97.5 ml, a value less than or equal to that encountered in most cesarean sections [12]. On the other hand, Kwon *et al.* reported using double-layered suturing of the myometrial bed, intraoperative, and postoperative uterotonics, and bimanual massage to be sufficient to control bleeding following cesarean myomectomy [24]. None of these techniques were used in the present study; the authors only used uterotonics and were able to maintain hemostasis in this study population. Nevertheless, the use of one or more of the aforementioned hemostatic measures in patients with large fibroids (>5 cm) may help decrease blood loss in such patients.

The limitations of this study are its retrospective nature and the type of anesthesia used. General anesthesia has been found to be associated with increased blood loss when compared with regional anesthesia [33].

Although earlier reports have stated otherwise, this study supports the accumulating body of evidence that cesarean delivery with concurrent myomectomy is safe and feasible for both subserosal and intramural fibroids. With the fear of abundant blood loss, surgeons have the tendency to apply drains during such operations, which is acceptable. The increased blood supply of the pregnant uterus may indeed predispose the patient to increased hemorrhage; however, implementation of medical and surgical measures to reduce blood loss have been shown to help prevent such complications. The decision to perform myomectomy in patients who deliver by cesarean section should be made on an individual basis after thorough discussion of the advantages and disadvantages with each patient. Future randomized controlled studies may help to determine which group of patients will benefit most from such an intervention.

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