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INVITED MINI REVIEW

Cesarean Myomectomy: Necessity or Opportunity?

Anahita R. Chauhan[1]

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About the Author

Dr. Anahita Chauhan is former Professor and Unit Head in the Department of Obstetrics and Gynecology at Seth G. S. Medical College and K.E.M. Hospital in Mumbai, India. She is Honorary Consultant at Saifee Hospital, Mumbai. She serves as Second Joint Assistant Editor of the Journal of Obstetrics and Gynecology of India and as Office Bearer (Librarian) of the Mumbai Obstetric and Gynecological Society.

Abstract Fibroids in pregnancy are increasingly common, due to advanced maternal age, better diagnostic tools and use of assisted reproductive techniques. Cesarean section (CS) is the commonest mode of delivery in these patients. Cesarean myomectomy (CM) is the term used to describe the removal of fibroids at CS; it has always been a controversial topic, with two schools of thought. Some obstetricians advise against it due to the traditional fear of massive obstetric hemorrhage and its attendant complications. However, recent literature advocates elective or opportunistic myomectomy in well-selected cases during CS. This is especially valuable in low-resource settings where the patient may be spared a repeat surgery and problems of anesthesia and cost associated with it. This review examines the recent published data on CM, its indications, technique, safety and applicability in modern obstetrics.

Keywords Fibroids · Pregnancy · Cesarean myomectomy

Anahita R. Chauhan is Former Professor and Head of Unit, Department of Obstetrics and Gynecology, Seth G.S. Medical College and K.E.M. Hospital, Mumbai, Maharashtra, India.

✉ Anahita R. Chauhan
anahitachauhan@gmail.com

[1] Department of Obstetrics and Gynecology, Seth G.S. Medical College and K.E.M. Hospital, Mumbai, Maharashtra, India

Introduction

Fibroids in pregnancy are increasingly common due to factors like delayed childbearing and advances in infertility treatment and are more often diagnosed due to better imaging techniques. The reported prevalence of uterine leiomyomas in pregnancy is between 2 and 11%. They may remain asymptomatic, or complicate pregnancy in any trimester; miscarriage, increase in size of fibroid, pain due to red degeneration, malpresentations, preterm labor, obstructed labor and postpartum hemorrhage (PPH) may occur in 10–30% of these patients.

There are a few case reports in the literature of successful myomectomy in the antenatal period, mainly late first or second trimesters, for giant or very large fibroids which are symptomatic and present with pain, compressive symptoms or hydroureter/hydronephrosis. Though rarely performed, myomectomy should be considered in any trimester when patient presents with severe acute abdominal pain not relieved by analgesics, suspected torsion of subserous pedunculated fibroid or rapid increase in the size of the fibroid with compression symptoms [1].

The reported incidence of cesarean section (CS) in patients with fibroids is as high as 73%, and this may be due to reasons related or unrelated to the fibroids themselves. Over a hundred years ago, Sir Victor Bonney is credited with performing and reporting the first CS with removal of six fibroids in a 30-year-old woman, who "safely passed through three subsequent pregnancies" with a scarred uterus. However, Bonney warned about faulty suturing and risk of scar rupture [2]. Surgical removal of the myoma at CS, referred to as cesarean myomectomy (CM), has traditionally been discouraged due to the high risk of hemorrhage which may lead an unwanted obstetric hysterectomy, and peri- and postoperative morbidity in the form of severe anemia, blood transfusions or puerperal sepsis. Indications for CM in the past were only out of necessity; however in recent years, emerging data support the safety of opportunistic or elective removal of myomas at CS. This review examines the literature on CM, its indications, technique, safety and applicability.

Discussion

The management of uterine leiomyoma during pregnancy is mainly conservative (or symptomatic), and its definitive management (myomectomy) is usually done after the puerperal period. Previously, obstetricians avoided myomectomy during cesarean section (CS) as the procedure was associated with severe hemorrhage because of the increased blood supply due to pregnancy; probably the only exception being a pedunculated fibroid. It goes without saying that CM may have to be performed expediently in unavoidable circumstances, such as where the myoma is directly over the line of the uterine incision, or is obstructing the lower uterine segment and access to the baby, or inadvertent entry into the fibroid when the placenta is implanted over it, or when closure of the uterine incision is not possible without its removal. On the other hand, controversy still exists about elective myomectomy at CS, mainly due to concerns about maternal safety and postoperative morbidity. Majority of the literature on CM focuses on size, number and location of fibroids, intraoperative blood loss, operative time, postoperative fall in hemoglobin level and hospital stay. Newer meta-analysis also addresses the long-term effects and subsequent pregnancy outcomes.

Sparic selected 36 women at term with single anterior wall or lower segment fibroid who underwent CM (study group) versus 17 women who underwent CS without myoma removal (control group), with the aim of evaluating the safety of CM. There were no significant differences in socio-demographic or clinical features between the two groups. The average size of fibroid was 55.4 and 47.2 mm in study and control groups, respectively. Though the average duration of surgery was longer and intraoperative blood loss was more frequent in the study group, this was not statistically significant. No major complications were encountered in the CM group, leading them to conclude that CM in cases with single anterior wall and lower segment fibroids does not cause increased perioperative morbidity, hence can be considered safe [3].

Kwon studied the safety of CM in large myomas > 5 cm. Of 165 pregnant women with fibroids who delivered by CS, 96 underwent only CS, while 65 underwent CM. There were no differences in maternal characteristics, myoma type or operative outcome in patients in the two groups, nor were there any differences in mean hemoglobin change or operative time. They concluded that CM is safe and effective for large myomas > 5 cm [4].

In a meta-analysis of available data, Song et al. reviewed nine case–control studies which included more than 1000 women with fibroids, of whom 41% underwent CM and 59% underwent CS alone. They found no major differences in safety parameters like intraoperative blood loss, need for transfusion, surgical time or postoperative morbidity. However, they concluded that though CM is a reasonable option for some women, no definite conclusions can be drawn as the data were of low quality [5].

Regarding technique of CM, the standard principles of myomectomy which are routinely practiced apply: preferably an intracapsular myomectomy, use of sharp dissection or electrocautery, careful attention to hemostasis, obliteration of dead spaces to prevent postoperative hematoma in

the myoma bed and good approximation of the myometrium with 2- or 3-layered closure with delayed absorbable sutures. Tinelli states that as the uterus grows more rapidly than the fibroids in pregnancy, the uterine incision is smaller compared to non-pregnant uterus. Suturing the pregnant uterus is also easier as it is more elastic. She recommends that intracapsular technique should be employed; the only drawback is slightly longer operative time [6].

Additional techniques to prevent blood loss like stepwise devascularization and preoperative placement of balloons in the uterine arteries have also been described in case reports of CM, but no recommendations can be made at present. A novel surgical technique referred to as endometrial myomectomy has been described by Hatirnaz [7]. They conducted a retrospective cohort study which compared endometrial myomectomy in 22 cases versus serosal myomectomy in 24 women, and found that median surgical time and blood loss were more for serosal route; they concluded that endometrial myomectomy was superior to serosal myomectomy in terms of morbidity as well as prevention of future adhesion formation. The impact of this transendometrial approach has also been described by Huang et al. in a longitudinal study which looked at obstetric outcomes of subsequent pregnancies in 63 women who underwent CM with transendometrial removal of fibroids in their previous pregnancy. They concluded that this technique may improve obstetric outcomes of subsequent pregnancy without causing any additional immediate and long-term adverse surgical outcomes or adhesion formation [8].

Two interesting articles in 2015 looked at surgical decision making. Sparic analyzed the intraoperative decision to perform CM in 102 of 185 women with myomas who underwent CS and found that CM was mostly performed in younger women, usually by experienced surgeons. The overall number and size of the fibroids was not an important factor in the decision; rather the pedunculated or subserous fibroids were invariably removed [9]. Similarly, Topcu et al. from Turkey retrospectively reviewed 76 women who had CM vs. 60 women with fibroids who underwent CS alone. They found that subserosal fibroids were more likely to be removed rather than intramural ones; size of the fibroid did not affect the decision process. Both studies concluded that CM is a safe procedure [10].

Dedes performed a multivariate regression analysis on a retrospective cohort of 162 women with fibroids undergoing CS (48 underwent CM), to evaluate risk factors for adverse events. Parameters studied were blood loss, fall in hemoglobin, surgical time, localization, type and size of fibroid, BMI $\geq$ 30 kg/m^2, age $\geq$ 40 years. Regardless of whether myomectomy was performed or not, myomas $>$ 5 cm were associated with increased blood loss and women $\geq$ 40 years of age had significant postoperative fall in hemoglobin. CM of multiple myomas, as well as those with pedunculated and subserosal myomas, was associated with both increased blood loss and surgical time compared to women with CS alone. There were no cases of hysterectomy or blood transfusions [11].

Akbas et al. evaluated the safety of myomectomy for intramural fibroids in a subgroup of 63 women who underwent CM. They concluded that though intramural fibroids can be safely removed during CS, large fibroids and additional hysterotomy incisions increase the surgical time and risk of hemorrhage [12].

Turgal performed a cross-sectional study and evaluated mild-to-moderate postoperative adhesion formation between uterus and omentum, adnexal adhesions, incision site adhesions and adhesions causing surgical difficulty in women who had previously undergone CM for small subserosal, pedunculated or intramural fibroids, and were undergoing repeat CS 1–5 years later. He found no statistical difference in the adhesions between these patients and controls who had not undergone myomectomy during their previous CS [13].

Dogan reviewed retrospectively the postoperative complications in 267 patients with fibroids and 267 age- and parity- matched controls. One hundred and twenty-four of 267 patients underwent CM. Though the CM group was associated with higher need for transfusion and lower hemoglobin postoperatively, there was no increase in the risk of hysterectomy and other life-threatening complications [14].

Though most of the previously quoted studies are from Western literature, CM may have more relevance in low-resource settings where the same woman may have to undergo multiple surgeries in her reproductive lifespan for fibroids and CS. If both procedures can be performed at the same sitting, it may obviate the need for myomectomy at a later date, with its attendant hospitalization, risk of anesthesia and surgical morbidity, and cost. In case CM is not performed, there is a risk of subinvolution of the uterus in the puerperal period, along with other known complications of fibroids like anemia and heavy menstrual bleeding in the non-pregnant interval. The patient is also at risk of problems such as red degeneration in subsequent pregnancy, and in case the fibroid is in the lower uterine segment, future pregnancy may require a classical CS to achieve delivery. On the other hand, CM may promote VBAC in subsequent pregnancies. These are all potential advantages of CM and are probably the most compelling reason to evaluate CM especially in resource-poor settings. The question is whether competent and experienced surgeons should take the opportunity to perform myomectomy, when easily possible and feasible, at CS.

In a 2013 review of CM in Africa, Awoleke supports the argument for CM as it could eliminate multiple surgeries for both indications. He emphasizes that careful selection of the patient, thorough preoperative counseling especially when patient requests removal of previously diagnosed fibroids at CS, an experienced surgeon and facilities for postoperative management, will increase the safety of the procedure. However, he cautions that large RCTs are required before any recommendations [15].

Similarly, Kumar from Karnataka, India, has published his experience of CM in 21 cases compared to 42 cases of CS alone, with encouraging results. There were a total of 30 fibroids which were removed in these 21 cases: 81% were subserosal; 56.76% fibroids were situated in fundal region, and 38.11% were in lower segment. Primary outcome measures were hemorrhage and need for blood transfusion. Two cases in the CM group required transfusion; no patients required hysterectomy. Potential advantages of CM as stated by him are, avoiding a second surgical procedure or "interval myomectomy" with its attendant risks of anesthesia and surgical difficulties due to previous CS, better obstetric outcome in subsequent pregnancies as known complications of pregnancy with fibroids will be negated, increased chances of VBAC in subsequent pregnancies, and cost saving by combining two surgeries [16].

Another Indian study by Kanthi et al. compared the blood loss in a single fibroid in 33 patients who underwent CM (average myoma size 66.9 mm, 73% subserous) with 32 cases who underwent abdominal myomectomy (average myoma size 96.4 mm, 72% intramural) Though they found a correlation between drop in hemoglobin and size of fibroid, this was similar in the two groups and they concluded that blood loss is comparable in CM and abdominal myomectomy patients [17].

Though there is strong evidence in support of CM, the obstetrician should be wary about the life-threatening complications of massive blood loss, need for obstetric hysterectomy and blood transfusion and need for ICU; as well as the potential late complications such as adhesion formation, scar integrity in subsequent pregnancy and risk of uterine rupture. There is paucity of literature about these issues, mainly due to low-quality evidence. Sparic et al. question whether the complication rate of CM is underreported and suggest that the risk–benefit analysis of CM should be re-evaluated as more older women with fibroids are likely to get pregnant with assisted reproductive techniques [18]. Akkurt et al. retrospectively studied the short- and long-term outcomes in 91 women undergoing CM and compared with 60 women with CS alone; there were no short-term differences except slightly longer surgical times with CM group. Mean follow-up was 6.3 years, where subsequent pregnancy and recurrence rates in the CM group were 35 and 5.5%, respectively. Mild-to-severe adhesions following CM were seen in 25% of subsequent pregnancies. They concluded that recurrence of myoma was relatively low following CM, and that subsequent pregnancy is protective for recurrence of myoma [19].

A recent 2017 systematic review and meta-analysis of 19 observational studies (total of 3900 women) by Pergialiotis et al. studied intra- and perioperative maternal morbidity of myomectomy at CS. 2301 women underwent CM, while 1599 had CS only. They found a mild drop in hemoglobin (mean difference 0.25 mg/dL, 95% CI 0.06–0.45) and longer operative time (mean difference 13.87 min, 95% CI 4.78–22.95) in the myomectomy group, but no increase in major hemorrhage, blood transfusion rate or postoperative fever. They concluded that CM may be considered in cases of isolated myomas, although randomized trials are needed [20].

In a review on trends and controversies in CM, Sparic et al. found that CM is generally safe for easily accessible anterior wall subserous and pedunculated fibroids, where additional incisions are not required. On the other hand, multiple myomas, deep intramural, cornual and posterior wall myomas are associated with more surgical complications, increased blood loss and surgical time; hence, they state that myomectomy at CS still remains controversial. They concluded that the risk–benefit ratio should be still evaluated with randomized controlled trials, in order to achieve more data on CM [21].

Conclusions

Necessary or emergency CM is resorted to by most surgeons to deliver the baby or suture the uterus. The literature supports elective or opportunistic CM as a safe and viable option especially in low-resource settings; however, most of the published data are retrospective. Centers where CM is likely to occur as a routine practice should be adequately staffed and have blood bank facilities. Recommendations for standardization of best practices for CM, including case selection, surgical techniques and options for hemostasis, are only possible with accurate reporting of complications, long-term follow-up of cases, more robust data and larger randomized trials. Till then, surgeons should exercise caution before advocating CM as standard practice.

Compliance with Ethical Standards

Conflicts of interest Dr Anahita Chauhan declares that she has no conflict of interest.

Ethical Approval All procedures followed were in accordance with the ethical standards of the Institutional Ethics Committee and with the 1975 Declaration of Helsinki, as revised in 2008 (5).

Informed Consent Informed consent was obtained from all patients for being included in the study.

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