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COMPARATIVE ANALYSIS OF DELIVERY METHODS IN PREGNANT WOMEN WITH UTERINE FIBROIDS: VAGINAL DELIVERY, CESAREAN SECTION, AND THE ROLE OF CESAREAN MYOMECTOMY

Annotation: Uterine fibroids are increasingly encountered in pregnancy and influence the delivery route, the likelihood of cesarean section and the decision to perform myomectomy during cesarean section. This study compared the frequency and outcomes of vaginal and cesarean delivery in women with fibroids, defined indications for cesarean section and appraised the safety of cesarean myomectomy, using a structured synthesis of cohort studies, systematic reviews and meta-analyses (2017–2026). Cesarean section was the predominant route (about 46–62% of cohorts) and rose further with large (> 5 cm) and cervical or lower-segment nodules; the leading indications were obstructed labor, failure to progress and malpresentation. Cesarean myomectomy is feasible in selected patients but modestly increases blood loss, transfusion and operative time. Delivery planning should be individualized by nodule size, number and location; vaginal birth is preferred when the birth canal is unobstructed.

Keywords: uterine fibroids; leiomyoma; mode of delivery; cesarean section; vaginal delivery; cesarean myomectomy; postpartum hemorrhage; obstetric outcomes; pregnancy complications.

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СРАВНИТЕЛЬНЫЙ АНАЛИЗ СПОСОБОВ РОДОРАЗРЕШЕНИЯ У БЕРЕМЕННЫХ С МИОМОЙ МАТКИ: ВАГИНАЛЬНЫЕ РОДЫ, КЕСАРЕВО

СЕЧЕНИЕ И РОЛЬ КЕСАРЕВА СЕЧЕНИЯ С ОДНОВРЕМЕННОЙ МИОМЭКТОМИЕЙ

Аннотация: Миома матки становится все более распространенной во время беременности и определяет способ родоразрешения, вероятность кесарева сечения и решение о проведении миомэктомии во время кесарева сечения. В этом исследовании сравнивались частота и исходы вагинального и кесарева сечения у женщин с миомой, определялись показания к кесареву сечению и оценивалась безопасность миомэктомии при кесаревом сечении на основе структурного синтеза когортных исследований, систематических обзоров и метаанализов (2017–2026 гг.). Кесарево сечение было основным методом (приблизительно 46–62% когорт) и чаще встречалось при больших (> 5 см) и цервикальных или нижних сегментах; основными показаниями были осложненные роды, медленные роды и неправильное положение плода. Миомэктомия при кесаревом сечении может быть выполнена у отдельных пациенток, но незначительно увеличивает кровопотерю, переливание крови и продолжительность операции. Планирование родов должно быть индивидуальным в зависимости от размера, количества и расположения узлов; Если родовые пути не заблокированы, предпочтительнее вагинальные роды.

Ключевые слова: миома матки; лейомиома; способ родоразрешения; кесарево сечение; вагинальные роды; миомэктомия при кесаревом сечении; послеродовое кровотечение; акушерские исходы; осложнения беременности.

1. Introduction

Uterine fibroids (leiomyomas) are the most common benign neoplasm of the female reproductive system, occurring in up to 30–40% of women of reproductive age. As childbearing is increasingly deferred, 2.7–10.7% of pregnancies are now associated with fibroids [9, 10]. Although most affected women can achieve a successful term pregnancy owing to advances in ultrasound, minimally invasive surgery and perinatal care, fibroids remain a risk factor that can complicate gestation and, critically, the delivery itself [10].

Large or unfavorably located nodules can distort the uterine cavity, obstruct the birth canal, provoke malpresentation, impair myometrial contractility and disturb placentation, shifting the balance from vaginal birth toward operative delivery [4, 8, 9]. Our earlier literature analysis showed that postpartum

hemorrhage (PPH) occurs approximately 2.5 times more often in women with fibroids, that fundal nodules delay placental separation in up to 30% of cases, and that cervical or isthmic localization is a recognized indication for abdominal delivery [10]. Nodules enlarge most during the first ten weeks and early second trimester and then stabilize or regress in the third trimester as estrogen-dependent stimulation wanes [5, 10]; three mechanisms explain their effect on delivery: mechanical distortion, contractile dysfunction and altered vascular and placental function [5, 8, 10].

Three decisions dominate intrapartum management: the mode of delivery, the indications that convert a candidate for vaginal birth into a candidate for cesarean section, and whether concurrent myomectomy is justified. Practice varies widely because national guidelines are inconsistent and high-quality randomized evidence is scarce [3]; the size and location thresholds that make cesarean myomectomy safe remain contested [6, 7, 11], and the prediction of delivery outcomes from fibroid morphology and the influence of prior myomectomy are still unresolved [9, 10]. The aim of this study was to compare delivery methods in pregnant women with uterine fibroids and to derive practical recommendations for intrapartum management by comparing the frequency of vaginal and cesarean delivery, ranking the indications for cesarean section, appraising cesarean myomectomy and formulating a decision algorithm.

2. Materials and Methods

This work was designed as a structured comparative synthesis of current evidence, since a trial randomizing women with fibroids to a delivery route is neither available nor ethically feasible; cohort studies, systematic reviews and meta-analyses were compared using a predefined framework aligned with PRISMA reporting principles. English- and Russian-language publications from January 2017 to March 2026 were identified in PubMed/MEDLINE, Scopus and Web of Science using combinations of the terms “uterine fibroid” or “leiomyoma”, “pregnancy”, “mode of delivery”, “cesarean section”, “vaginal

delivery" and "cesarean myomectomy"; reference lists of retrieved reviews and of our previous analysis [10] were hand-searched.

Records were included when they reported, in women with sonographically confirmed fibroids, the distribution of delivery route, the indications for cesarean section, or perioperative outcomes of cesarean myomectomy versus cesarean section alone. Case reports without comparative data, conference abstracts and studies not distinguishing fibroid status were excluded. For each study the design, sample size and outcomes of interest were tabulated and compared along three axes: mode of delivery, indications for operative delivery and cesarean myomectomy safety. Effect estimates (odds ratios, mean differences, 95% confidence intervals) are reported as published, without re-pooling. As only aggregate published data were analyzed, ethics approval and informed consent were not required.

3. Results

The synthesis drew on contemporary cohort studies and on systematic reviews and meta-analyses of cesarean myomectomy; the principal sources are summarized in Table 1.

Table 1. *Principal comparative studies included in the synthesis*

Study (year)	Design	Sample	Key finding relevant to delivery
Choudhary et al. (2023) [4]	Prospective cohort	110 pregnancies	Cesarean section was the most common route (61.8%); term delivery 80.9%; PPH 9.1%.
Al Sulaimani et al. (2021) [1]	Retrospective cohort	24,800 deliveries	Large fibroids significantly raised the cesarean rate ($p = 0.002$); 12.8% underwent cesarean myomectomy.
Karlsen et al. (2020) [8]	National cohort	91,292 women	Fibroid diagnosis linked to higher rates of adverse obstetric outcomes and operative delivery.
Huang et al. (2022) [7]	Systematic review / meta-analysis	23 studies; 8,016 women	Cesarean myomectomy feasible but with more hemorrhage; intramural, ≥ 7 cm and multiple nodules carry the highest risk.
Goyal et al. (2021) [6]	Systematic review / meta-analysis	Multiple cohorts	Documented a shift from contraindication to accepted indication for cesarean myomectomy.
Wang et al. (2025) [11]	Retrospective cohort	Cesarean myomectomy cases	Relatively safe for a single node ≤ 7.5 cm or total ≤ 14.5 cm; operative time should be minimized.
Ramasauskaite et al. (2026) [9]	Narrative review	—	Recommends US/MRI incision planning; trial of labor after uncomplicated myomectomy; uterine rupture 0.93%.

PPH = postpartum hemorrhage; US = ultrasound; MRI = magnetic resonance imaging.

Cesarean section emerged as the dominant route in fibroid pregnancies, in contrast to the general obstetric population. Reported cesarean proportions ranged from 46.2% in pregnancies after laparoscopic myomectomy [9] to 61.8% in an unselected tertiary cohort [4], and large fibroids (> 5 cm) significantly raised the cesarean rate (p = 0.002) [1]; case series of large or lower-segment fibroids reported near-universal cesarean delivery at 35–36 weeks [2]. This excess is driven largely by nodule size and location rather than by the mere presence of fibroids: women with small, non-obstructing nodules frequently achieve uncomplicated vaginal delivery, and about 90.4% of trials of labor after myomectomy end in vaginal birth [9]. Most authorities regard vaginal birth as the preferred route in the absence of a mechanical or obstetric contraindication [9, 10].

PPH is the dominant maternal concern: women with fibroids bleed about 2.5 times more often than unaffected women, and cesarean delivery itself carries a higher hemorrhage rate than vaginal birth, so the two risks compound when a large or lower-segment fibroid forces abdominal delivery [4, 10, 11]. In a tertiary cohort, threatened preterm labor occurred in 21.8%, blood transfusion in 20.0% and neonatal intensive care admission in 20.0% (14.5% after myomectomy) [4, 9]; the risk of uterine rupture after prior myomectomy was 0.93% (95% CI 0.45–1.92) [9]. When cesarean myomectomy is performed in appropriately selected patients, neonatal indices do not differ from cesarean section alone [11].

The indications for cesarean section cluster into four groups: mechanical obstruction (cervical or isthmic nodule obstructing the canal, or a large nodule preventing descent) [2, 10]; disordered labor, i.e. obstructed labor and failure to progress, which accounted for up to 62.5% of cesareans in one large-fibroid cohort [1]; fetal factors such as malpresentation due to a distorted cavity [9, 10]; and placental factors, including placenta previa or abnormal implantation [8, 10]. Previous complicated myomectomy with cavity entry or an extensive scar is a

further indication [9]. Small, non-obstructing fibroids are not, by themselves, an indication for cesarean section.

Removing fibroids during cesarean section is feasible in selected patients but not free of cost. In the meta-analysis of 23 studies (8,016 women), cesarean myomectomy was associated with a greater fall in hemoglobin, more hemorrhage, greater blood loss, a higher transfusion rate and longer operating and hospital times, with no difference in febrile morbidity (Table 2) [7]. Intramural nodules, size ≥ 7 cm and multiple fibroids drove most of the excess bleeding, and nodules at the cornua or adjacent to large vessels were considered unsuitable [7]. Cohort data show that fibroids ≥ 5 cm and macrosomia (birth weight ≥ 4,000 g) are the principal risk factors for severe PPH, and that safety is best preserved for single nodules ≤ 7.5 cm or a combined diameter ≤ 14.5 cm [11].

Table 2. *Perioperative outcomes: cesarean myomectomy versus cesarean section alone*

Outcome	Direction vs. cesarean alone	Source
Hemoglobin decline	Greater (MD +0.20 g/dL)	[7]
Hemorrhage incidence	Higher (OR 1.46, 95% CI 1.06–2.01)	[7]
Estimated blood loss	Greater (MD ≈ +46 mL)	[7]
Transfusion rate	Higher (OR 1.47, 95% CI 1.09–1.99)	[7]
Operative time	Longer (MD ≈ +10 min)	[7]
Postoperative hospital stay	Slightly longer (MD ≈ +0.2 day)	[7]
Febrile morbidity	No significant difference	[7]
Neonatal outcomes (weight, distress, asphyxia)	No significant difference	[11]

MD = mean difference; OR = odds ratio; CI = confidence interval.

Integrating these findings, the delivery route can be stratified by nodule size, number and location, with cesarean myomectomy as a conditional step; the resulting stepwise scheme is presented in Table 3.

Table 3. *Stepwise delivery-decision scheme for pregnant women with uterine fibroids*

Step	Assessment	Recommended action
1	Antenatal mapping: serial ultrasound (± MRI) for size, number and location	Document nodule morphology; plan cesarean incision away from nodules if operative delivery is anticipated [9]
2	Cervical / isthmic (lower-segment) nodule obstructing the canal?	Yes → planned cesarean section. No → step 3 [2, 10]
3	Large nodule (> 5 cm) distorting the cavity or causing malpresentation?	Yes → favor cesarean; No → offer trial of vaginal delivery [1, 4]

Step	Assessment	Recommended action
4	Prior myomectomy?	Uncomplicated, no cavity entry → trial of labor with continuous monitoring; complicated / classical scar → planned cesarean [9]
5	If cesarean is performed: concurrent myomectomy?	Only if the nodule obstructs closure or is single ≤ 7.5 cm at a favorable site; avoid cornual / peri-vascular nodules; ensure uterotonics and hemostatic readiness [7, 11]
6	Intrapartum / postpartum	Anticipate PPH (≈ 2.5× baseline risk); active third-stage management; readiness for transfusion and prompt intervention [10]

The scheme is advisory and must be individualized; local guidelines and patient preference apply.

4. Discussion

This synthesis confirms and refines the message of our earlier analysis [10]: fibroids do not mandate abdominal delivery, but they raise its likelihood in proportion to nodule size and unfavorable location. The dominance of cesarean section in fibroid cohorts (≈ 46–62%) reflects a mixture of true mechanical need and a lower threshold for operative delivery when obstetricians anticipate obstructed labor or hemorrhage [1, 4]. Risk should therefore be stratified rather than assumed: small, non-obstructing nodules are compatible with a trial of vaginal birth, whereas cervical, isthmic and large lower-segment nodules are the true drivers of operative delivery [2, 10]. The uniformity of high cesarean rates conceals heterogeneity in case mix: series after laparoscopic myomectomy achieve vaginal birth in roughly half of cases, and trials of labor after myomectomy succeed in about 90% when the cavity was not breached [9]. The decisive variables are thus anatomical and surgical-historical, not the diagnostic label of “fibroid”.

The most important shift of the last decade is the reappraisal of cesarean myomectomy: pooled data show that, in experienced hands and with hemostatic measures, it is feasible with only modest excess blood loss, transfusion and operative time and without adverse neonatal outcomes [6, 7, 11]. Clear boundaries remain: intramural nodules, size beyond 5–7 cm, multiple nodules, cornual or peri-vascular location and macrosomia identify patients in whom bleeding risk may outweigh the benefit of avoiding a second operation [7, 11]. Conversely, the

mere presence of a fibroid should not lower the threshold for planned cesarean when the nodule would not obstruct labor [4], whereas attempting vaginal delivery despite a cervical or large lower-segment nodule risks obstructed labor and emergency delivery with hemorrhage. The evidence supports a middle path: planned cesarean for anatomically or obstetrically justified cases, a monitored trial of labor otherwise, and myomectomy as an add-on justified case by case [6, 7, 11]. Given the roughly 2.5-fold PPH risk, active third-stage management and readiness for transfusion are essential [10].

The limitations mirror those of the underlying literature: the absence of randomized comparisons of delivery route, heterogeneity in how fibroids are classified and measured, publication and referral bias in surgical series, and limited data linking nodule morphology to individualized outcome prediction [9, 10]. Prospective, morphology-stratified cohorts and, where feasible, pragmatic trials are needed.

5. Conclusion

In pregnant women with uterine fibroids, the delivery method should be individualized by nodule size, number and location rather than by the diagnosis alone. Vaginal delivery is preferred and frequently achievable when nodules are small and do not obstruct the birth canal; cesarean section is appropriately reserved for cervical/isthmic or large lower-segment nodules, malpresentation, disordered labor and placental complications. Cesarean myomectomy has moved from contraindication to a conditional, evidence-supported option, safe in carefully selected cases (principally single, favorably located nodules) when hemostatic precautions are in place. Because PPH is markedly more common in this population, anticipatory third-stage management is essential regardless of route.

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