Minimally Invasive Techniques in Myomectomy and Fertility Outcomes: A Narrative Review of the Current Evidence

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Abstract

Uterine leiomyomas (fibroids) are common benign tumours affecting women of reproductive age. While most are asymptomatic, a significant proportion experience symptoms affecting their quality of life. Surgery is a definitive treatment for fibroids, where minimally invasive surgical (MIS) techniques have become the preferred approach for preserving fertility. This narrative review provides an overview of the current literature regarding fertility outcomes of different MIS techniques, including conventional laparoscopy, robot-assisted laparoscopy myomectomy (RALM), and mini-laparotomy. The studies reviewed reveal favourable pregnancy outcomes in general which were comparable between laparoscopy, and RALM, single-site and mini-laparotomy. In RALM, higher preterm rates were associated with a higher number of fibroids being removed. The data was inconsistent regarding laparotomy compared to laparoscopy. Further comparative research may be warranted to determine the specific differences regarding fertility outcomes.

Introduction

Uterine leiomyomas, more commonly known as fibroids, are hormone-dependent monoclonal expansions of the myometrium [1]. They are the most common type of benign gynaecological tumour and especially affect women of reproductive age, with an estimated 70-80% of women being diagnosed by the age of 50 in the US [2]. Although the majority of women with fibroids are asymptomatic, around 30-40% of women experience significant morbidity with pelvic pain, abnormal uterine bleeding, bulk-related symptoms, infertility and obstetric complications [3-5].

Surgery is the definitive treatment of fibroids for symptomatic women, with the modality of choice depending on tumour characteristics, surgeon expertise and patient preference [6]. Minimally invasive surgical (MIS) myomectomies are currently considered the gold-standard over open laparotomy for women seeking to preserve fertility, however they still carry a risk of uterine scar dehiscence and subsequent effects on pregnancy outcomes [6, 7].

Traditional laparoscopy involves the placement of a visual port and trocars through several incisions for the instrumentation and visualisation of abdominal structures. Robotic-assisted laparoscopic myomectomy (RALM) most often utilises the Da Vinci system, where the surgeon remotely operates small, fully wristsed instrument arms from behind a console, with a stereoscopic monitor projecting high definition 3D video feeds from the camera. This allows for enhanced depth perception, mobility and control [8].

This narrative review aims to summarise the evidence to-date regarding the fertility outcomes of various MIS techniques in myomectomy.

Main Body

Fertility Outcomes
Conventional Laparoscopy

A retrospective cohort study conducted by Koo et al. documented the pregnancy outcomes in 523 women following laparoscopic myomectomy. 76.5% of women who desired pregnancy achieved full-term deliveries, with the average time to pregnancy being 14 months [9]. A prospective cohort study, involving 2050 women who underwent laparoscopic myomectomy, found 70% (386/550) of women who wanted pregnancy achieved success. However the study did not provide information regarding the number of natural or assisted pregnancies [10]. These results indicate laparoscopy as a favourable option, however proves insubstantial compared to average fertility rates following myomectomies in general. A recent systematic review, by Margueritte et al., collated results from RCTs and cohort studies (n=2852) and established a conception rate of 77.9% in women following vaginal route, laparotomy, laparoscopy or robot-assisted myomectomy [11].

Robotic-assisted Laparoscopy

There are few studies that have researched fertility rates following robotic myomectomy. A study by Londerfors et al. investigated pregnancy outcomes after RALM in women with deep intramural myomas. Their results indicated an overall pregnancy rate of 68%, in 22 women actively wanting to conceive within 10 months post operation [12]. Cela et al. examined pregnancy rates in 48 females following RALM for subserosal or intramural myomas, with seven out of nine (78%) females desiring pregnancy achieving so [13]. The study further evaluated ovulatory function pre and post operation by recording mean FSH, AFC and AMH, with no notable disparities found, indicating little to no effect on ovulatory function [13]. Both studies indicate promising pregnancy rates post RALM, however it is important to note the small patient numbers used. A retrospective study by Pitter et al. surveyed 426 women who underwent RALM and reported 50.8% of women who desired pregnancy were able to achieve it [14]. This was lower than the aforementioned studies following conventional laparoscopy, although the authors noted 60% of patients reporting infertility as the reason for undergoing myomectomy.

Pregnancy Related Outcomes

Pitter et al investigated pregnancy outcomes in 127 females who had conceived following robotic myomectomy. There were 92 successful pregnancies, with a considerable proportion of babies being born prematurely (13 born between 33-35 weeks, 1 at 28-32, and 2 < 28 weeks), with higher preterm rates being associated with a greater number of myomas removed [15]. The study also reported one incidence of uterine rupture and adhesions discovered in 11.4% [15]. There are no other studies to our knowledge that have associated RALM to preterm birth.

A retrospective cohort study, documenting pregnancy outcomes in women following conventional laparoscopic myomectomy, recorded outcomes to be no different than the general population [9]. They also found 0.6% of women to experience uterine rupture, which was insignificantly different to the general population.

MIS compared to Open Laparotomy

Laparotomy versus laparoscopic myomectomy

A meta analysis, which analysed data from 829 patients, across 5 articles, examined fertility outcomes post laparotomic versus laparoscopic myomectomy. The results were inconsistent regarding pregnancy rates based on surgical approach, with one RCT finding no significant difference, two indicating a trend toward increased pregnancy rates among patients who received laparoscopy, and one noting higher pregnancy rates in patients receiving a laparotomic myomectomy [16]. Surgical method was not associated with the subsequent route of delivery (caesarean vs vaginal birth), and rates of premature births were statistically similar between groups [16]. This finding is in keeping with a study by Seracchioli et al, which found no significant difference in pregnancy rate after laparotomy (55.9%) versus laparoscopy (53.6%) [17].

Minilaparotomy versus laparoscopic myomectomy

Two studies compared laparoscopic myomectomy to myomectomy with minilaparotomy [18, 19]. A retrospective, nonrandomized control trial (n=136) by Malzoni et al. found a significant increase in pregnancy
rates among patients who underwent laparoscopic myomectomy compared to mini laparotomy (74% vs. 50%) [18].

In contrast, a cohort study of 164 patients demonstrated similar spontaneous pregnancy rates between groups (mini-laparotomy 51% vs. laparoscopic myomectomy 56%) [19].

Fertility outcomes between MIS techniques

**Robotic Myomectomy vs Conventional Laparoscopy**

A meta-analysis was conducted by Iavazzo et al., contrasting robotic assisted vs laparoscopic myomectomy. Two studies (n=88) were included regarding postoperative fertility outcome, with no statistical significant difference being observed (OR 2.03; 95 % CI 0.29–14.11) [20].

**Conventional Laparoscopy vs Single site laparoscopy**

A case-control study (N=135) examined pregnancy rates in women following a traditional multi-port approach versus single-site myomectomy for patients with fibroids less than 8 cm. The study found no significant differences between groups regarding pregnancy rates (50% vs. 67%, p=0.38), and no difference in the time to first pregnancy after surgery (7.6 vs. 10.1 months) [21].

**Conclusion**

In conclusion, data from the available studies suggest that myomectomy is generally associated with favourable fertility outcomes, with conventional laparoscopy, RALM and laparotomy all having similar rates of successful pregnancies after surgery and no differences in mode of delivery. Overall, potential complications such as uterine rupture and adhesion formation are low in incidence, and more studies should be conducted into the potential association between RALM and preterm birth. Thus far there is limited evidence regarding differences between the individual MIS techniques, with inconsistent results being reported among studies. Further research and meta-analyses may be needed in order to clarify any true differences between these methods, which may better guide the clinical decision-making process in achieving optimal outcomes.

**References**


