Management guidelines for incidental uterine surgery in early pregnancy: a case report of a robotic myomectomy at 4 weeks gestation after a false-negative pregnancy test

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Objective: To share our case and offer guidance to practitioners on the management of incidental uterine surgery in early pregnancy. Although elective uterine surgery should be avoided during pregnancy, there is always a chance of undetected pregnancy at the time of surgery, even after all precautions have been taken. There is currently minimal literature on the management and outcomes of uterine surgery during pregnancy.
Design: Case report.
Setting: University Hospital.
Patient: A 42-year-old G1P1 female with symptomatic fibroids desiring fertility-sparing surgery was retroactively found to be 4 weeks pregnant at the time of surgery, even after a negative pregnancy test and low suspicion for pregnancy under Centers for Disease Control and Prevention guidelines.
Intervention: Robotic-assisted laparoscopic myomectomy performed with a false-negative urine pregnancy test at the time of surgery.
Main Outcome Measures: Guidance for surveillance and management options during continued pregnancy after robotic uterine surgery and cavity disruption by a uterine manipulator performed at 4 weeks gestation that went undetected at the time of surgery.
Results: The patient was able to undergo an uncomplicated delivery by cesarean section at 38 weeks and delivered a healthy infant.
Conclusion: Using a multidisciplinary approach, we describe guidelines for antepartum surveillance uterine surgery during an undetected pregnancy, which resulted in the delivery of a term healthy infant. (F S Rep® 2024;5:219–22. ©2024 by American Society for Reproductive Medicine.)
Key Words: Myomectomy, early pregnancy, fertility-sparing surgery, pregnancy surveillance, maternal-fetal medicine

INTRODUCTION

In our case, we reviewed a patient who was undergoing fertility-sparing surgery for symptomatic uterine fibroids and was found to be 10 weeks pregnant at her postoperative follow-up, with undetected early pregnancy at the time of surgery. To our knowledge, there are limited data on invasive uterine procedures that involve placing an intracavitary uterine manipulator in early pregnancy, and only 1 other case involving a myomectomy in early undetected pregnancy. Our aim in reviewing this case is to bring awareness to health-care providers that even after taking all precautions to ensure a negative pregnancy before elective uterine surgery, there is always a chance of a false-negative result. With this case report, we offer guidance for surveillance and management options during continued pregnancy after a robotic-assisted laparoscopic myomectomy was performed at 4 weeks gestation that went undetected using a urine pregnancy test and reported menstrual timing. Using a multidisciplinary approach, our patient was able to undergo an uncomplicated delivery by cesarean section at 38 weeks and delivered a healthy infant.

Received December 1, 2023; revised April 15, 2024; accepted April 16, 2024.
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F S Rep® Vol. 5, No. 2, June 2024 2666-3341

https://doi.org/10.1016/j.xfre.2024.04.002

CASE REPORT

The patient was a 42-year-old G1P1 who presented to the clinic with secondary infertility after trying to conceive naturally for 9 months. Her obstetrical history included a single-term delivery 18 months prior by low transverse cesarean section because of anatomical issues with her uterine fibroids. The patient had a history of heavy menstrual periods thought to be secondary to uterine fibroids, resulting in iron-deficient anemia that required blood transfusions. The patient previously had cyclic menses lasting 5 days that became slightly more irregular during the 6 months before receiving iron infusion. During the work-up, an ultrasound showed a posterior 7-cm fibroid and a right lateral 3-cm fibroid. The uterine cavity could be visualized but was displaced anteriorly. A pelvic magnetic resonance imaging (MRI) reported a 12.3 × 8.6 × 11.9-cm uterus with a left lateral myometrial fibroid measuring 6.6 × 7.1 × 7.7-cm that slightly distorted the cavity with internal degeneration. There were also smaller myometrial fibroids seen in the lower uterine segment bilaterally measuring between 10 and 14 mm. Options were discussed, and the patient elected fertility-sparing surgical removal of fibroids and was scheduled for a robotic myomectomy.

On the day of surgery, the patient reported that menses had started 7 days prior, putting the patient in the follicular phase of her cycle. She reported that the bleeding pattern was normal for her typical menses. She had a negative urine pregnancy test on the day of surgery before undergoing a robotic-assisted laparoscopic myomectomy. Intraoperative findings included an approximately 20-week fibroid uterus, with her largest fibroid measuring approximately 7 cm and being posterior fundal, corresponding to the MRI images. A 3-cm fundal fibroid and multiple smaller 2-cm anterior fibroids were also present. During the procedure, a Harris-Kronner Uterine Manipulator manipulator was placed in the uterine cavity. After the robot was docked, all fibroids were removed with a harmonic device and tenaculum without entering the endometrial cavity. For the largest posterior fundal fibroid, the myometrium was closed in a 2-layer fashion with a running 2–0 V-loc suture. This was then followed by a serosal closure with an imbricating baseball stitch using a 2–0 V-loc suture. The smaller fibroid incisions were also closed in the same fashion. All fibroids were then morcellated and removed through a mini-laparotomy.

The patient recovered well and was healing appropriately at the 2-week postoperative visit. At the 6-week postoperative visit, the patient revealed that she had multiple positive home pregnancy tests despite abstaining from intercourse postoperatively. An abdominal ultrasound was performed that showed a 10-week and 2-day viable intrauterine pregnancy with positive cardiac motion, putting the patient at approximately 4 weeks gestation at the time of myomectomy.

Maternal-Fetal Medicine was consulted given limited data in the literature regarding pregnancy complications with myomectomy performed in early pregnancy. Given the likely increased risk of uterine rupture and abnormal placentation, the plan of care was to include ultrasounds every 2 weeks to evaluate pregnancy and myometrial thickness, as well as a pelvic MRI at 24 weeks. The patient was also given significant warnings regarding signs of a uterine rupture. The patient also sought second opinions with physicians in both Houston and San Francisco who agreed with the proposed plan for pregnancy monitoring and felt that the risk for rupture was greater at her prior cesarean section site compared with the posterior wall myomectomy site given that the endometrial cavity was not entered during the myomectomy. After further discussion, the patient felt comfortable with the plan and chose to continue management as outlined.

During her antepartum course, the patient had reassuring ultrasounds with a uniform posterior uterine wall thickness of 1.75 cm. The patient had an anterior placenta that was implanted above the bladder and below the area of myomectomy. A pelvic MRI during the pregnancy showed no evidence of previa. Unrelated to myomectomy, the patient's pregnancy was otherwise complicated by gestational thrombocytopenia vs. immune thrombocytopenia purpura, for which she was followed by a hematologist. Delivery planning was discussed, and a cesarean section at 37 weeks was recommended. The patient was counseled extensively that even despite negative imaging, she was still at high risk for a morbidly adherent placenta at the time of delivery, which would necessitate a hysterectomy. After multiple discussions, the patient ultimately chose to have a repeat cesarean delivery at 38 weeks with bilateral tubal ligation to prevent further pregnancy. The patient underwent an uncomplicated scheduled delivery of a healthy infant weighing 3,620 g with an appearance, pulse, grimace, activity, and respiration score of 8 out of 9. The prior uterine scar and myometrial incisions were intact without thinning at the time of delivery. No other comment was made regarding the appearance of the prior myometrial incision on the operative note. Both mother and infant did well postpartum and were discharged home on postpartum day 3 with follow-up scheduled. Patient consent for publication of the case report was obtained before submission.

DISCUSSION

In this case report, we review a patient who had a robotic-assisted laparoscopic myomectomy with a uterine manipulator placed inside the uterine cavity at 4 weeks of gestation after a false-negative pregnancy test. There are limited data and only 1 prior case was reported of myomectomy in early pregnancy, given that precautions are taken to avoid elective uterine surgery in pregnancy, and surgery should be canceled when a patient has a positive pregnancy test on the day of the procedure (1). The Centers for Disease Control and Prevention report that we can be reasonably certain a patient is not pregnant if they fit one of the following conditions: when it is $\leq$7 days after the start of normal menses; when the patient has not had intercourse since the start of the current menses; when the patient has been correctly and consistently using a reliable form of birth control; when the patient is $\leq$7 days after spontaneous or induced abortion; when the patient is within 4 weeks postpartum; or when the patient is exclusively breastfeeding, amenorrheic, and $<$6 months

postpartum (2). The patient reported menses started exactly 7 days before surgery and had not had intercourse this cycle, putting the patient in the early follicular phase of the menstrual cycle and fitting the Centers for Disease Control and Prevention guidelines for low suspicion of pregnancy with no reason to further investigate a negative urine pregnancy test. Our patient reported that her menses may have been implantation bleeding given the timing of approximately 3 weeks gestation, which she had mistaken for her period.

The implantation phase consists of 3 steps: apposition, adhesion, and invasion. The implantation site in the human uterus is usually in the upper posterior wall in the midsagittal plane and begins once the morula enters the uterine cavity. Apposition occurs 2–4 days after the morula enters the cavity with prostaglandin E2 as one of the main regulators as the blastocyst turns into the inner cell mass and trophectoderm. The blastocyst is unstable at the apposition phase and can easily be flushed from the endometrial surface (3). Adhesion is more stable and occurs as the blastocyst trophectoderm sticks to the endometrial lumen through cellular adherent molecules. Invasion follows as fetal trophoblasts migrate into the maternal decidua and constrict blood flow between the fetus and mother. The window of implantation occurs between 6 and 12 days postovulation, which would have occurred well before the patient's surgery. At the time of surgery (4 weeks of gestation), the embryo would have been 0.25 inches in length. Given the typical implantation site at approximately 4 weeks of gestation, the embryo would have been less likely to be disrupted using the Harris-Kronner Uterine Manipulator uterine manipulator, which curves anteriorly and does not usually reach the fundus of the uterus.

As far as instrumentation used during the myomectomy, our main energy source was through the harmonic scalpel. The harmonic scalpel is a surgical instrument that uses ultrasonic energy converted to mechanical energy at the active blade and is used to simultaneously cut and cauterize tissue. One of its advantages is that it has minimal thermal spread and smoke production (4, 5). Thermal spread caused by the harmonic scalpel is limited to areas <1.6 mm beyond the tissue bundle or vessel. Although the harmonic has minimal thermal spread, the location of the patient's fibroid, the posterior fundal, does correlate with the usual location of implantation and therefore is concerning for potential thermal damage to the fetus, but no evidence of injury was noted throughout the pregnancy or after delivery.

Although the risks after an opening myomectomy during an active pregnancy are not well established, the risks associated with pregnancy after myomectomy have been studied more extensively, with inconclusive findings. Some of the theoretical risks include uterine rupture, preterm birth, and abnormal placentation. Abnormal placentation is thought to occur when Nitabuch's layer is incompletely formed between the placenta and the myometrial layer. Even when the endometrial cavity is not entered, a scarred uterus after myomectomy has a less intact Nitabuch's layer, leading to an increased risk for placenta accreta. However, a study of 176 women who had a prior myomectomy reported a low absolute risk of accreta after a prior myomectomy and concluded that a prior myomectomy is not associated with higher risks of uterine rupture (6). On the other hand, a systematic review found that for pregnancies after myomectomy, the incidence of uterine rupture was 9.3 of 1,000 compared with 0.6 of 10,000 in an unscarred uterus and 22/10,000 in those with a prior cesarean delivery (7, 8).

Although there are not many comparable situations to reference in counseling our patient, an open myelomeningocele repair is an intrauterine fetal surgery in which a uterine incision is intentionally made during pregnancy, from which conclusions can be extrapolated to apply to our patient. In the Management of Myelomeningocele Study trial, they found a 1% risk of uterine rupture, a 9% risk of uterine dehiscence, and no maternal deaths (9). The uterine closure mechanism used in this trial is very similar to that of our case in that we both used a multilayer closure with an imbricating type stitch on the uterine serosa. Per the report, their uterine closure consisted of a two-layer approach, with the first layer incorporating the uterine membranes and then a second imbricating layer of suture (9). Our closures differ in that their surgeries were performed open compared with our robotic technique, and we did not go through to the endometrium in our case. Regarding preterm birth, history of an operated leiomyomatous uterus was shown to be associated with a relative risk ratio of 2.8 for spontaneous preterm birth over a patient without a myomatous uterus (10).

There is 1 prior case reported that we know of with hysteroscopy, chromopertubation, and laparoscopic myomectomy that did enter the endometrial cavity on a patient who had a negative pregnancy test but was later found to be 2 weeks and 6 days of gestation at the time of surgery (1). During pregnancy, this patient had ultrasound monitoring at weeks 10, 13, 18, and 20 as well as an MRI with appropriate fetal growth, but the myometrial thickness assessment was not mentioned in their report. The investigators did, however, note that the week 37 ultrasound showed myometrial thinning, and the patient underwent a cesarean delivery that same day. The patient had an uncomplicated delivery and recovery, but it should be noted that the infant was born with a complex brain malformation. Per the investigators, it is difficult to estimate the influence that the invasive surgical procedure performed during very early pregnancy may have had on the complex disorder, as no other cases of comparable operations have been reported to date (1).

The information discussed helped us form the patient's plan for antepartum monitoring and delivery planning. The American College of Obstetricians and Gynecologists recommends cesarean delivery after myomectomy at a gestational age of 37–38 weeks, or 36–37 weeks in cases of complicated myomectomies, to try to prevent uterine rupture (11). The patient was counseled regarding this recommendation; however, the patient preferred to deliver at 38 weeks. Several reports have suggested that transabdominal ultrasonography may detect a defective uterus after a previous cesarean delivery and therefore may also be useful after myomectomy. A study in 2000 performed serial transvaginal ultrasonography between 19 and 39 weeks gestation to measure the thickness of the control and surgically repaired lower uterine segments by previous cesarean delivery (12). The lower uterine segment was significantly thinner in the cesarean group than in the

control group at 27 weeks and every week after 29 weeks of gestation. Additionally, Rozenberg et al. (13) indicated that the risk of uterine rupture in the presence of a defective scar was related directly to the degree of thinning of the lower uterine segment as measured using transabdominal ultrasonography at or near 37 weeks gestation. The risk of rupture increased significantly when the thickness was <3.5 mm. These findings imply that serial ultrasonography after myomectomy may be useful to evaluate scar thickness and, therefore, the risk of rupture. Our patient's posterior uterine wall was uniformly 1.75 cm. Although there is no formal recommendation for delivery timing regarding ultrasound findings, the patient's relatively thin posterior wall was concerned for an increased risk of rupture, which therefore further supports our recommendation for early-term delivery. Regarding abnormal placentation, some studies have found MR imaging to be useful as an adjunct to ultrasonography. However, the American College of Obstetricians and Gynecologists reports that it is unclear whether MRI improves the initial diagnosis of the placenta accreta spectrum beyond that achieved with ultrasonography (14). On the original ultrasound, our patient had a region of hypervascularity near the anterior midline uterine wall-placental interface at which potential focal accreta spectrum and placentation could not be ruled out. Because of this, an MRI was recommended to further assess both the placenta and any areas of uterine scar dehiscence, which helped to further rule out the placenta accreta spectrum.

CONCLUSIONS

This case demonstrated that even after taking the recommended standard precautions to ensure patients are not pregnant before elective uterine surgery, there is still a risk of a false-negative result, and practitioners need to be aware of management options. In our case, we discuss a patient who could reasonably be assumed to not be pregnant given the timing of her reported menses and negative preoperative urine pregnancy test but ended up being 4 weeks pregnant at the time of surgery. Even after a surgery involving intracavitary disruption with a uterine manipulator and multiple myometrial incisions, she went on to have an uncomplicated term delivery. Although all precautions should be taken to cancel elective uterine surgery on a patient in early pregnancy, the management of this case proposes guidance for counseling and antepartum monitoring when it occurs. With the use of a multidisciplinary approach involving Maternal-Fetal Medicine early in patient care, we propose using serial ultrasound monitoring and MRI for pregnancy and placental evaluation as well as myometrial thickness measurements to properly counsel patients and give optimal delivery timing to ensure a healthy infant and mother.

CRediT Authorship Contribution Statement

Abaigeal Thompson: Writing – review & editing, Writing – original draft. **Melanie Evans:** Writing – review & editing, Writing – original draft. **Patrick Weix:** Writing – review & editing, Writing – original draft.

Declaration of Interests

A.T. has nothing to disclose. M.E. has nothing to disclose. P.W. has nothing to disclose.

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