

# Inadvertent Perforation of a Gravid Uterus During Laparoscopy

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## ABSTRACT

**Background:** Laparoscopic surgery is safe in pregnancy, but is not without risk. Inadvertent uterine perforation of the gravid uterus is a rare complication.

**Cases:** Three pregnant women had inadvertent uterine perforation during laparoscopic surgery. All patients were counseled regarding the risks of an “incidental fetoscopy” and elected to continue the pregnancy. Two delivered after preterm premature rupture of membranes at 32 and 36 weeks’ gestation, and one twin pregnancy delivered at 30 weeks due to preeclampsia.

**Conclusion:** Surgical planning of the gravid patient undergoing laparoscopic surgery should include demarcation of the most superior aspect of the uterine fundus, either via physical examination or, if not conclusive, via preoperative or intraoperative ultrasound.

**Key Words:** Laparoscopy, Uterine Perforation, Pregnancy Complications, Laparoscopy in Pregnancy.

## INTRODUCTION

Nonobstetric-related surgeries occur in approximately 1%–2% of pregnancies. The most common indications for abdominal surgery during pregnancy include appendicitis, cholecystitis, adnexal torsion, bowel obstruction, and trauma. Concerns for causing fetal harm have historically made surgeons hesitant to operate on pregnant women. However, delaying necessary surgical treatment for conditions such as appendicitis have also been shown to increase perinatal morbidity and mortality. Studies have shown laparoscopy to be a safe option during pregnancy, and results in less postoperative pain, hospital length of stay, recovery time, and wound complications compared to laparotomy. Potential risks of laparoscopy performed in pregnant patients include miscarriage and preterm labor.<sup>1,2</sup>

We discuss a series of three patient cases involving a rarely reported complication of laparoscopic surgery in pregnant patients—uterine perforation resulting in “incidental fetoscopy.” Managing this complication as well as recommendations for prevention of uterine perforation during laparoscopy are discussed.

## CASES

### Case 1

The patient was a 33-year-old, gravida, 1; para, 0; BMI (body mass index), 31 kg/m<sup>2</sup>; who presented at 19 weeks’ gestation with acute right lower abdominal quadrant pain, nausea, and vomiting. She was found to have mild leukocytosis and was recommended to undergo diagnostic laparoscopy due to clinical suspicion for appendicitis. Imaging was not obtained prior to surgery. In the operating room, the uterus was palpated 2 cm below the umbilicus. A 5-mm incision was made 10 cm above the umbilicus and a Veress needle was inserted until adequate carbon dioxide insufflation was achieved. The Veress needle was then replaced with 5-mm trocar via blind technique. When the laparoscope was inserted, fetal parts were seen within the amniotic sac. The instruments were immediately removed, and the decision was made to convert to a midline laparotomy by extending the incision

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vertically from the epigastrium to the umbilicus. Two small uterine lacerations and a Veress needle mark were seen in the anterior portion of the fundus with minimal leakage of fluid. The uterine lacerations were repaired using 2–0 Polysorb suture. Further exploration of the abdomen revealed a normal appendix and a large 12-cm fibroid that filled the pelvis. The patient's pain was attributed to a degenerating fibroid, and the appendix was not removed. The patient's postoperative course was uncomplicated and she was discharged 9 days later.

At 32 and 5/7 weeks' gestation, the patient presented to Labor and Delivery after preterm premature rupture of membranes (PPROM) and contractions. Placental abruption was suspected. Due to breech presentation, the patient underwent primary cesarean section. The infant's birth weight was 1990 g (50th percentile for gestational age) with Apgars of 6 and 8 at 1 and 5 minutes of life, respectively. The infant required 1 day of ventilator support, but otherwise had an uneventful NICU (neonatal intensive care unit) stay and was discharged at 33 day of life. This patient case was described in detail by Joumblat et al. in 2012.<sup>3</sup>

### Case 2

The patient was a 31-year-old female, gravida, 2; para, 1; BMI (body mass index), 22 kg/m<sup>2</sup>; who presented at 32 and 1/7 weeks' gestation with acute right lower quadrant pain, nausea, vomiting, and mild leukocytosis. The patient's history was significant for prior cesarean delivery and scant prenatal care. Initial abdominal ultrasound and magnetic resonance imaging could not adequately view the appendix and were "equivocal" for appendicitis, and thus the patient was admitted for observation. The following day, the patient's pain and leukocytosis worsened. Due to clinical suspicion for appendicitis, the patient underwent a laparoscopic appendectomy. A subxiphoid incision was made through which a 5-mm trocar was inserted under laparoscopic visualization ("direct entry"), at which time fetal parts were seen. The uterus was observed for a period of time and no leakage of fluid was seen through the uterine laceration. Fetal heart tones were confirmed and a normal deepest vertical pocket of amniotic fluid of 6 cm was seen on ultrasound. The surgeons proceeded to complete the appendectomy, which was noted to be mildly inflamed. As a precaution against preterm labor, antenatal corticosteroids were administered postoperatively. On postoperative day 2, the amniotic fluid index remained normal and the patient was discharged home. She was followed with nonstress testing.

At 36 and 5/7 weeks, the patient presented to Labor and Delivery with ruptured membranes. The patient was delivered by an elective repeat cesarean section, and no evidence of her prior uterine injury was seen intraoperatively. The infant weighed 2315 g at birth (5th percentile for gestational age) with Apgars of 9 and 9. The patient was discharged home with her infant on postoperative day 2.

### Case 3

The patient was a 30-year-old female, gravida, 2; para, 0; BMI (body mass index), 33 kg/m<sup>2</sup>; at 17 and 6/7 weeks' gestation with a spontaneous monochorionic-diamniotic twin pregnancy who presented with abdominal pain, nausea, and vomiting, and found to have leukocytosis. She had multiple episodes of biliary colic with known cholelithiasis but failed expectant management. She was recommended to undergo laparoscopic cholecystectomy. Examination performed prior to surgery revealed the uterine fundus just above the umbilicus. An epigastric incision was made 6 cm above the umbilicus and a Veress needle was inserted to insufflate the abdomen. A 5-mm trocar with blunt tip was inserted "1 inch deep" and the laparoscope was then introduced into the abdomen and fetal parts were seen. The trocar sheath was immediately removed, and a different trocar was inserted in the right upper quadrant. Survey of the abdomen revealed a laceration in the uterine fundus, but no leakage of fluid or bleeding was observed. The uterine laceration was not repaired. The surgical team proceeded with resection of the gallbladder without any further complications.

At 30 and 2/7 weeks, the patient developed elevated blood pressures and proteinuria, and met criteria for preeclampsia with severe features. She was admitted to Labor and Delivery to receive a course of antenatal corticosteroids to promote fetal lung maturity while receiving intravenous magnesium sulfate for 48 hours, and started on oral labetalol. At 30 and 6/7 weeks, the patient had recurrent severe range blood pressures despite multiple doses of intravenous antihypertensive medication, and was delivered via cesarean section. No evidence of the prior trocar injury to the uterus was seen during the cesarean section. Twin A weighed 1590 g at birth (26th percentile for gestational age) with Apgar scores of 5 and 7 at 1 and 5 minutes of life. Twin B weighed 1080 g at birth (<1st percentile for gestational age) with Apgar scores of 5 and 7 at 1 and 5 minutes of life. Both neonates were admitted to the NICU (neonatal intensive care unit) for respiratory distress, hyperbilirubinemia, and hypoglycemia until 28 (twin A) and 49 (twin B) days of life. The mother had an

uncomplicated postpartum course and was discharged home on postoperative day 4.

## **DISCUSSION**

Inadvertent perforation of a pregnant uterus during laparoscopic surgery is a rare and potentially preventable complication. A few individual cases have been reported in the literature. Buser<sup>4</sup> published a retrospective analysis of 36 laparoscopic surgeries performed on pregnant women over a 12-year period by a single surgeon and noted one case that was complicated by uterine perforation during placement of a blunt trocar. Mala et al.<sup>5</sup> described a case of a pregnant woman undergoing laparoscopy at 24 weeks' gestation due to concern for internal herniation of her roux-en-Y gastric bypass. During laparoscopic entry with an optical trocar, the gravid uterus was inadvertently perforated and a fetal foot could be seen.<sup>5</sup> Friedman et al.<sup>6</sup> reported another case in which a 21-week pregnant uterus was punctured with a Veress needle which resulted in spontaneous rupture of membranes and subsequent loss of the pregnancy. These cases highlight the need for obstetricians to be involved in preoperative planning of pregnant patients undergoing laparoscopic surgery.

In each of the patient cases described, uterine perforation occurred despite placing the laparoscopic ports well above the estimated fundal height. Determining fundal height on clinical examination can potentially be difficult in obese patients (such as with Case 1 and Case 3), as well in presence of significant fibroids (as in Case 1). Estimating fundal height based on gestational age can also be inaccurate in cases of multiple gestation (as in Case 3). Though notably, Case 2 did not have any of these issues. If the superior edge of the uterine fundus cannot be clearly delineated via physical examination, then ultrasound imaging may be necessary to document the fundal height. Preoperative ultrasound may be useful to document the location of the superior aspect of the uterus by using a marking pen on the maternal abdomen. Alternatively, intraoperative ultrasound guidance of Veress needle placement may be used to provide real time information of the instrument location relative to the uterus. Using Hasson open technique for laparoscopic entry is also recommended over blind entry methods to avoid causing injury to the pregnant uterus.<sup>2,3</sup>

The risks of accidental gravid uterine perforations that can occur during laparoscopy and how to manage these complications can be extrapolated from our existing knowledge with fetoscopy performed during minimally invasive

fetal procedures. Operative fetoscopy involves inserting a 2–4-mm trocar under ultrasound guidance through the maternal abdomen and uterus into the amniotic cavity to access the fetus, placenta, or umbilical cord. After the procedure is completed, the trocar(s) are removed from the abdomen. The sites of uterine perforation from the trocars generally do not require repair. The risks of operative fetoscopy include PPROM, oligohydramnios, preterm delivery, chorioamnionitis, fetal injury, and pregnancy loss. Additionally, there are concerns for the potential risk of fetal anemia, placental abruption, and fetomaternal hemorrhage in cases where the trocar perforates the placenta.<sup>7</sup> However, Yamamoto et al.<sup>8</sup> compared 48 cases of fetoscopic laser ablation that required transplacental trocar entry to 127 cases of transamniotic entry and found no significant differences in rates of PPROM, placental abruption, miscarriage, or perinatal survival.

If accidental perforation of the pregnant uterus occurs during laparoscopic surgery, intraoperative consultation with an obstetrician or maternal-fetal medicine specialist would be advised. Conversion to exploratory laparotomy is not necessary if adequate inspection of the uterus can be obtained with laparoscopy. Uterine lacerations do not necessarily require surgical repair. After operative fetoscopy, the uterine trocar insertion sites are routinely left “unrepaired.” The uterus contracts and closes the holes. Additional suturing could potentially cause more harm by increasing the risk of membrane rupture. Thus, if a uterine laceration is hemostatic with minimal amniotic fluid leak, the best policy is to leave it alone. If repair is indicated, the laceration could be closed using 0 polydioxanone suture (PDS) or any large delayed absorbable suture, which is commonly used to close hysterotomies during open fetal surgery.<sup>3</sup> Postoperatively, these patients should be observed for any subsequent signs of preterm labor, PPROM, or placental abruption. Ultrasound should also be performed to confirm fetal viability and assess amniotic fluid volume. A detailed anatomical survey should be done to assess for any fetal injuries or signs of membrane separation. Fetal middle cerebral artery Doppler assessment can be performed to evaluate for fetal anemia, especially in cases in where placental perforation is suspected. Anti-D immunoglobulin should be administered to any patients who are Rh negative and consider obtaining a Kleihauer-Betke test. If there are concerns that a patient is high risk for preterm labor following uterine perforation during laparoscopic surgery, a course of antenatal corticosteroids for fetal benefit can be considered. Though all three of the cases described in this paper were delivered by cesarean section, given that vaginal delivery is considered safe after

operative fetoscopy, it may be reasonable to offer vaginal delivery in cases of small uterine perforations that occur during laparoscopy.

The incidence of injury to the gravid uterus during laparoscopy has not been well studied, but is likely a low occurrence. The cases described in this paper only represent a small fraction of the numerous laparoscopies performed in pregnant women within our large health system. Larger studies reviewing laparoscopic cases in pregnant patients would be needed to determine the incidence of this complication.

In conclusion, inadvertent uterine perforation of the gravid uterus is a rare complication of laparoscopic surgery during pregnancy. If physical examination cannot clearly delineate the superior edge of the uterine fundus, then preoperative ultrasound, intraoperative ultrasound, or utilization of the Hasson open trocar technique may be necessary to prevent this complication.

### Teaching Points

1. Uterine perforation during laparoscopy in pregnant women is a rare complication.
2. In cases in which the uterine fundus cannot be clearly identified via physical examination, preoperative mapping of the uterine fundus using ultrasound and marking the fundal height, intraoperative ultrasound guidance of Veress needle insertion, or utilizing Hasson open trocar technique are some methods that can be used to avoid uterine injury during laparoscopy.

3. After excluding direct injury to the fetus or placenta, postoperative counseling and management after inadvertent uterine perforation may be similar to patients who underwent fetoscopy for fetal therapy.

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