SCIENIFIC PAPER

Laparoscopic Surgery in the Pregnant Patient: Results and Recommendations

Kerrey B. Buser, MD

ABSTRACT

Background: The complete experience of a single surgeon in a rural hospital over more than 11 years was evaluated with respect to laparoscopic operations performed on pregnant patients.

Methods: A retrospective analysis of all laparoscopic operations was carried out with respect to number and types of operations, stage of pregnancy, complications, and fetal outcomes.

Results: Between October 1995 and January 2007, 36 laparoscopic operations were conducted on 36 pregnant patients. This represents the largest single-surgeon case experience ever reported for nonobstetric laparoscopic surgery performed during pregnancy. The majority of cases were conducted for symptomatic gallbladder disease. There was one complication of uterine penetration by a cannula, early in the series, without fetal injury. Operations were conducted in each trimester, including the late third trimester, with 100% live births of normal infants.

Conclusion: Laparoscopic surgery can be safely conducted in pregnant patients, in any trimester. Pregnancy should no longer be considered a contraindication to laparoscopic surgery. The limiting factor of prime importance is an awareness of one's own capabilities and limitations. The surgeon must be skilled in advanced laparoscopic techniques and in surgical obstetrics. A rural hospital setting is suitable for this type of procedure if there is a strong support structure in place to deal with potential complications.

Key Words: Laparoscopy, Pregnancy, Laparoscopic cholecystectomy, Laparoscopic appendectomy, Duodenal bile aspirate, Acalculous cholecystitis.

Tri-County Hospital, Lexington, Nebraska, USA.

Presented as a scientific paper at the 16th SLS Annual Meeting and Endo Expo 2007, San Francisco, California, USA, September 5–8, 2007.

Address correspondence to: Kerrey B. Buser, MD, 1101 Buffalo Bend, Lexington, Nebraska 68850, USA.

INTRODUCTION

The worldwide proliferation of laparoscopic surgical skills over the past 2 decades has garnered a wealth of practical surgical experience in a variety of clinical settings. Training and experience have enabled surgeons to provide advanced surgical techniques for patients even in remote rural environments. As a surgeon's technical competence develops, that skill may be applied in more demanding situations, such as the pregnant patient who develops an urgent surgical condition. Such a patient may present at anytime, anywhere, and the involved surgeon must be prepared to make treatment decisions based on the patient's condition and circumstance, the surgeon's ability, and the available support mechanisms.[1]

PATIENTS AND METHODS

From October 1995 through January 2007, there were 2783 births at the Tri-County Hospital in Lexington, Nebraska. Lexington is a rural community of approximately 11000 persons. Thirty-seven laparoscopic operations were performed on 36 of the pregnant patients in this series, all by a single surgeon (the author). All patients had severe disease symptoms that either failed attempts at conservative medical management aimed at delaying surgery until the postpartum period, or that posed an immediate threat to the patient and her successful continuation of her gestation.

Local anesthesia was utilized in port sites for improved postoperative analgesia, which minimized narcotic requirements after surgery. A modified Hasson technique was used for initial entry and insufflation via direct visualization of the fascial opening and trocar insertion without use of blindly inserted insufflation devices. Initial entry was a supraumbilical (or subxiphoid), modified Hasson, open-fascia technique under direct vision. The fascia, elevated by a towel clip, was incised in the midline sufficiently to pass a 10-mm cannula (with the trocar removed) directly into the abdomen, angled away from the visible uterus. Ultrasound was not required in order to identify the uterus. Patients were turned slightly to their left to minimize uterine compression of the vena cava, and low-level insufflation pressures were maintained throughout

the procedures. Fetal heart tones were checked preoperatively, again after induction of anesthesia, upon completion of the operation, in the recovery room, and every 4 hours until discharge the next morning. Uterine contraction monitoring was done every 4 hours and if the patient reported unusual pain or contractions. Tocolytic agents were not utilized prophylactically. All patients were monitored overnight for uterine irritability and fetal heart tone checks.

RESULTS

Of 2783 pregnancies, the operative incidence was 1.3%. The majority of cases were conducted for gallbladder disease, with a 3 to 1 ratio of cholecystectomy to appendectomy (the second most frequent procedure). A total of 37 operations were conducted upon 36 patients during 36 gestations with 100% of the patients having live births of normal infants **(Table 1)**.

As previously reported, one unusual patient required 2 separate laparoscopic operations during the same pregnancy: cholecystectomy at 6-weeks gestation and later at 20 weeks appendectomy and reduction of an ovarian torsion. Another patient, at term, underwent combined cesarian delivery (previously planned), and laparoscopic cholecystectomy. The cholecystectomy was performed first, because it was felt that it would be safer to conduct a cholecystectomy in a stable patient prior to any significant bleeding potentially encountered with child birth.[1]

Eight patients required surgery during their first trimester of pregnancy, and 7 underwent laparoscopic surgery during their third trimester. Twenty-two underwent surgery during the second trimester, which is the ideal time for interventions during a pregnancy.

One complication occurred. The sixth patient in the series sustained a uterine perforation with a blunt cannula (trocar removed), while the surgeon attempted to insert the camera-telescope that was somewhat resistant to passage through that cannula. No fetal injury resulted, and no uterine repair was required, (an intraoperative telephonic consultation was obtained with a perinatologist). The patient was monitored closely for signs of uterine irritability. After initial recovery from the laparoscopic cholecystectomy and discharge from the hospital, the patient later underwent cesarian delivery of a healthy infant. The cesarian was prompted by an episode of premature labor that could have been related to late effects of the previous uterine cannulation.

Table 1.
Laparoscopic Operations in 2783 Pregnant Patients Performed by One Surgeon October 1995–January 2007*

Trimester			Operation Performed		
1st	2nd	3rd	Cholecystectomy	Appendectomy	Other
8	22	7	27	9	1

*Thirty-six pregnancies required 37 laparoscopic operations with 100% live births of normal infants.

DISCUSSION

The pregnant patient is mired within a physiologic circumstance that promotes the dysfunction of the biliary and gastrointestinal systems, while making the precise diagnosis of such conditions more difficult than if the patient was not masked by the pregnant state. Pregnancy induces a variety of mechanical, hormonal, and chemical alterations that may confuse and mislead even the most experienced clinician. In the past, a surgeon's natural inclination, when faced with a pregnant patient experiencing abdominal pain, was to temporize. This tendency, was rooted in the misconception that surgical intervention was likely to injure the fetus, and has been responsible for delays in diagnosis and treatment, which ultimately, and all too often, actually resulted in the unfavorable outcomes the temporization had meant to avoid (a classic self-fulfilling prophecy). Such treatment-delayed poor outcomes from the past have been associated with severe, acute abdominal pathology in pregnant patients. More thoughtful and earlier laparoscopic interventions should lessen the impact of such dire straits by averting the progression of mild or moderate pathology to the more severe and threatening conditions. Laparoscopy during pregnancy is no more dangerous to either the mother or the fetus than laparotomy is, and may be safer.[1–3] Pregnancy should no longer be considered a contraindication to laparoscopic surgery.[4]

Nonobstetrical surgical problems complicate up to 2% to 3% of pregnancies.[5,6] Symptomatic gallbladder disease is the most common reason for nongynecological operations during pregnancy and should be ruled out as a cause of hyperemesis gravidarum. Gallstones are present in 12% of all pregnancies, and more than one-third of the symptomatic patients fail conservative medical management and require cholecystectomy. Laparoscopic surgery has been demonstrated to be a safe, definitive treatment for even complicated biliary disease during pregnancy.[7]

Appendicitis, cholecystitis, pancreatitis, bowel obstruction, and trauma are the major nonobstetric abdominal

conditions noted in pregnancy that require surgical intervention. Most episodes of pancreatitis in pregnancy are gallbladder disease related.[6] The unpredictable clinical course of biliary related pancreatitis and the risk of severe relapse later in pregnancy are strong arguments for early surgical intervention.

Several studies have documented the safety of laparoscopic cholecystectomy and appendectomy during pregnancy. It has also been shown that laparotomy has a relatively higher risk of complications, increased pain, and longer hospitalizations compared with laparoscopy.[8,9]

There has been some concern that poor results, complications, or both of these, are not reported and that most reports coming from major medical centers may not reflect the actual results obtained in smaller practice settings.[10] The findings reported in this article and the author's practice setting would argue against such concerns.

Third trimester laparoscopic surgery has been demonstrated to be feasible.[1] Advocates for third trimester laparoscopic surgery point out that the risk of laparoscopic insufflation pressures should represent less of a threat to the fetus than the manual retraction of the uterus that may be required with open laparotomy.[11]

Gallstones, biliary sludge, and cholecystitis cause the most gallbladder related pain. Sludge is considered a precursor to the formation of gallstones, which are formed from crystallization of cholesterol, calcium, and bile salts. Multiparity is considered a risk factor for gallstone formation.[6] In the author's practice, duodenal bile aspirates obtained via diagnostic upper gastrointestinal endoscopy have been utilized to demonstrate micro-crystals and/or white blood cells, (indicating biliary inflammation), in severely symptomatic patients suspected of having biliary dyskinesia or acalculous cholecystitis when ultrasonography has been nondiagnostic. There is a high correlation with histologic evidence of gallbladder pathology and symptomatic relief when a positive duodenal bile aspirate is followed by cholecystectomy. The endoscopic method of bile aspirate sampling also is a valuable tool for ruling out other sources of gastrointestinal pain, such as gastritis or peptic ulcer disease, which might otherwise be missed and not benefitted by cholecystectomy.

Delay in treatment of biliary disease during pregnancy has been related to increased morbidity, which can be avoided with safe, laparoscopic cholecystectomy.[12] Laparoscopic surgery is recommended in all cases of symptomatic gallbladder disease that do not respond adequately to conservative medical treatment and in all complicated forms, such as acute cholecystitis or acute pancreatitis.[13]

Complications from appendicitis that occur during pregnancy include preterm labor, increased maternal morbidity, and early fetal delivery or fetal loss. Fetal loss varies between 3% and 5%, without perforation and can be as high as 36% when perforation occurs.[6] Therefore, the pregnant patient suspected of having acute appendicitis should be treated as if she were not pregnant, and a higher than usual negative appendix result should not be criticized. Immediate exploration after appropriate resuscitation is mandated regardless of the gestational age.[14]

Laparoscopic surgery for appendicitis and cholelithiasis during pregnancy has been recommended as the new standard of care for the management of these conditions.[15]

Laparoscopic management of adnexal masses in pregnancy is a safe and effective procedure that allows a shorter hospital stay, a reduced rate of postoperative complications and decreased maternal and fetal morbidity compared with traditional surgery.[16] When the diagnosis is uncertain, the surgeon can often utilize laparoscopy to identify appendicitis, ovarian masses, ovarian torsion, and ectopic pregnancy.[17]

CONCLUSION

This author has previously reported on the feasibility of laparoscopy during all 3 trimesters and the particular precautions that need to be taken in the rural setting.[1] Those same precautions actually apply equally well to larger practice settings and urban circumstance.

Laparoscopic abdominal operations can be safely conducted in pregnant patients, in any trimester, but the limiting factor of prime importance is an awareness of one's own capabilities and limitations. The surgeon must be skilled in advanced laparoscopic techniques and in surgical obstetrics, or have immediate consultative operative assistance available. A strong support structure must be in place in advance to deal with potential complications, and the surgeon should not hesitate to ask for assistance when needed.

References:

1. Buser KB. Laparoscopic surgery in the pregnant patient – one surgeon's experience in a small rural hospital. *JSLS*. 2002;6: 121–124.

2. Brooks DC, Sznyter LA. Approach to abdominal pain in preg-

nant patients. *Sci Am Surg*. [serial online]. 2000; section VII: chapter 11. Available at: http://webmd-practice.webmd.com/sas.

3. Bell RH. Gastrointestinal conditions. *J Am Coll Surg*. 2000; 190(2):140–141.

4. Curet MJ. Special problems in laparoscopic surgery: previous abdominal surgery, obesity, and pregnancy. *Surg Clin North Am*. 2000;80(4):1093–1110.

5. Melnick DM, Wahl WL, Dalton VK. Management of general surgical problems in the pregnant patient. *Am J Surg*. 2004; 187(2):170–180.

6. Angelini DJ. Obstetric triage revisited: update on non-obstetric surgical conditions in pregnancy. *J Midwifery Womens Health*. 2003;48(2):111–118.

7. Sungler P, Heinerman PM, Steiner H, et al. Laparoscopic cholecystectomy and interventional endoscopy for gallstone complications during pregnancy. *Surg Endosc*. 2000;14(3):267–271.

8. Carter JF, Soper DE, Operative laparoscopy in pregnancy. *JSLS*. 2004;8(1):57–60.

9. Carter JF, Soper DE, Laparoscopy vs. laparotomy in pregnancy. *Laparoscopy Today*. 2005;4(1):12–15.

10. Fatum M, Rojansky N. Laparoscopic surgery during pregnancy. *Obstet Gynecol Surv*. 2001;56(1):50–59.

11. Andreoli M, Kelly-Sayegh S, Hoefer R, Matthers G, Mann WJ. Laparoscopic cholecystectomy for recurrent gallstone pancreatitis during pregnancy. Available at: http://www.sma.org/smj96nov21.htm.

12. Muench J, Albrink M, Serafini F, Rosemurgy A, Carey L, Murr MM. Delay in treatment of biliary disease during pregnancy increases morbidity and can be avoided with safe laparoscopic *cholecyste*ctomy. *Am Surg*. 2001;67(6):539–543.

13. Grigoriu M, Palade R, Basile D, Grigoriu C. Laparoscopic cholecystectomy during pregnancy. *Chirurgia (Bucur)*. 2003; 98(5):453–457.

14. Curet MJ. Laparoscopic surgery and the pregnant patient. In: Zucker KA, ed. *Surgical Laparoscopy*, 2nd ed. Philadelphia, PA: Lippincott Williams Wilkins; 2001;735–739.

15. Rollins MD, Chan KJ, Price RR. Laparoscopy for appendicitis and cholelithiasis during pregnancy: a new standard of care. *Surg Endosc*. 2004;18(2):237–241.

16. Mathevet P, Nessah K, Dargent D, Mellier G. Laparoscopic management of adenexal masses in pregnancy: a case series. *Eur J Obster Gynecol Reprod Biol*. 2003;108(2):217–222.

17. Parungo CP, Brooks DC. The pregnant surgical patient. *ACS Surgery* 2006. Available at: http://www.medscape.com/viewarticle/524442.