Robotic-assisted cholecystectomy in the third trimester of pregnancy

Marvelyn Y. Iweh MS, Seham Azzam BS, Jocelin Loewen BS, Christopher Wilhelm BS, Nathan Kragh APRN, FNP-C, ENP-C, Basem Soliman MD, PhD

Abstract

Acute and chronic cholecystitis commonly occur during pregnancy. Hormonal changes during pregnancy put women at a higher risk of forming gallstones and biliary dyskinesia leading to disease. The standard of care for acute cholecystitis is to have an elective cholecystectomy within 48 hours. Extensive research exists on the current practice of performing a laparoscopic cholecystectomy in pregnancy. Based on our review of the current literature, there is only one report that details a robotic cholecystectomy performed on a pregnant patient. This report will detail the methods used to perform the surgery and steps taken to ensure the safety of mother and fetus. It will describe the unique circumstances surrounding the robotic technique used in this case and include the demographics and background of this patient, in an effort to promote this technique in future cases.

Keywords: obstetrics, acute cholecystitis, symptomatic cholelithiasis, pregnancy, laparoscopic cholecystectomy, robotic-assisted cholecystectomy

Introduction

Symptomatic cholelithiasis and acute cholecystitis are common in pregnancy due to estrogen and progesterone changes leading to increased gallstone formation and biliary dyskinesia.[1] Many patients with acute cholecystitis choose for elective cholecystectomy, but this surgery is usually avoided in pregnancy due to the associated risks. These include increased intraabdominal pressure that could decrease the uteroplacental blood flow leading to fetal hypoxia, fetal acidosis due to absorption of carbon dioxide, fetal injury due to a trocar or needle perforation, and subsequent premature rupture of membranes and preterm delivery.[2] However, contemporary research has found that laparoscopic cholecystectomies in pregnancy are generally safe for both the mother and fetus in all trimesters of pregnancy.[3,4] Moreover, this method presents with fewer complications than open cholecystectomies,[4] and a laparoscopic cholecystectomy is the second most common non-obstetric operation during pregnancy.

Corresponding author: **Marvelyn Iweh**
Contact Information: Marvelyn.Iweh@ttuhsc.edu
DOI: 10.12746/swrccc.v12i50.1221

Case

The patient was a 39-year-old Hispanic woman G12 P7-0-4-7 at 29 weeks with a past medical history of gestational hypertension, gestational diabetes, transient ischemic attack (TIA), and asthma. She presented to the emergency department (ED) with right upper quadrant (RUQ) pain, nausea, and vomiting. The patient was hospitalized and discharged several times due to similar symptoms. Upon discharge, symptomatic management was recommended and consisted of a low-fat diet at home, particularly protein shakes instead of fatty, protein-rich meals. Unable to tolerate this diet,

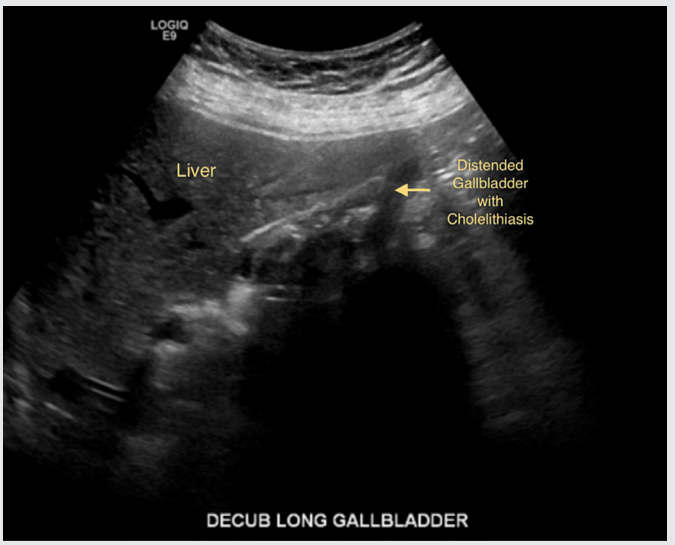

Figure 1. Ultrasound of the right upper quadrant. The figure shows a distended gallbladder in a decubitus long gallbladder view with cholelithiasis present.

she presented to the ED with postprandial pain, nausea, vomiting, and episodic RUQ pain. A RUQ ultrasound revealed a distended gallbladder with cholelithiasis without obstruction (Figure 1). Laboratory values (Table 1) showed elevated ALT and AST (83 U/L and 43 U/L, respectively) but a normal WBC (5.7 l/micro L). She was diagnosed with symptomatic cholelithiasis and received standard management of IV fluids and electrolyte replacement. She was admitted and taken to the operating room for a robotic cholecystectomy within 24 hours of presentation. Ultrasound fetal heart rate monitoring, preoperatively and intra-operatively, was obtained to ensure and maintain fetal well-being.

Table 1. Laboratory Tests on Admission

Parameter	Value	Reference Value
Total Protein	6	6.4–8.9 g/dL
ALT	83	7–52 U/L
AST	42	13–39 U/L
WBC	5.7	4.8–10.8 K/uL
Hemoglobin	11.8	12.0–16.0 g/dL
Hematocrit	34.9	37.0–47.0%
Neutrophils	87.9	40.0–74.0%
Lymphocytes Absolute	0.6	0.9–5.2 K/uL
Lymphocytes	11	19.0–48.0%
Monocytes	1	3.0–9.0%
Monocytes Absolute	0.1	0.2–1.0 K/uL

AST: Aspartate Transaminase, ALT: Alanine Transaminase, WBC: White Blood Cells

Surgical procedure

Pneumoperitoneum access occurred via an Optiview five mm left upper quadrant (LUQ) trocar, later replaced with an eight mm trocar. Three secondary trocars were placed, one in the umbilical region and two in the RUQ area. A recent gastric sleeve caused omental adhesions to the patient's anterior abdominal wall. The intra-abdominal pressure was 10–12 mmHg throughout the operation. She was placed in the reverse Trendelenburg position and rolled to the left. The robot was then docked. After initial instruments were placed, the surgeon un-scrubbed for console dissection, focusing attention on the RUQ. The patient had a distended gallbladder with a mildly thickened wall. The gallbladder dome was grasped and retracted over the liver's right lobe. Then, the infundibulum was grasped and retracted superiorly and medially, and the posterior lateral wall was bluntly dissected. The liver edge was dissected using an electrocautery Bovie hook. The visceral peritoneum over the cystic ampullary junction was taken down on both sides, creating a window between the cystic artery and cystic duct and between the cystic artery and liver until a "critical view of safety" was obtained. An ICG-enhanced cholangiography via a peripheral vein was performed. The cystic and common bile ducts were identified, then the gallbladder was dissected from the liver using electrocautery. The robot was undocked while the camera remained for visualization with laparoscopic instruments. The RUQ was irrigated until clear, no bleeding or bile leakage occurred, and hemostasis was achieved. The gallbladder was placed in a retrieval bag for removal. The patient was moved to a supine position. The supra-umbilical incision was closed. All instruments and other ports were removed under direct vision, no bleeding was noted, and the camera was removed. The abdomen was deflated, and the

umbilical port was removed. The retrieval bag was removed, passed off the table, and sent to pathology. All other port site incisions were closed. The diagnosis from the pathology report stated chronic cholecystitis with cholelithiasis and an obstructed cystic duct. The total operative time was one hour and twenty-one minutes.

Postoperative course

Her postoperative course was uncomplicated, and she had no signs or symptoms of early labor, no cervical changes, no regular contractions, and normal fetal monitoring. She tolerated a regular diet, was independently ambulatory, and had well-controlled pain. Home discharge was on postoperative day one, 48 hours after ED admission. She successfully delivered at 38 weeks and six days via cesarean and received bilateral tubal ligation without complication. She was discharged 48 hours after delivery.

Discussion

Cholelithiasis and related complications are common occurrences in the general population, and pregnant women are no exception. Following acute appendicitis, acute cholecystitis is the second most common cause of acute abdomen in pregnant women with cholelithiasis accounting for 90% of presentations.[5] Despite this frequency, pregnant women have significantly fewer cholecystectomies than non-pregnant women,[5] due primarily to surgeons' overall reluctance to operate on pregnant women for fear of complications. Gallaher et al. details that studies have shown earlier intervention is a more suitable option to decrease morbidity. Compared with medical management, early laparoscopic cholecystectomies in pregnancy have been shown to lower maternal-fetal complications, with only 1.6% of early operative management resulting in complications compared to 18.4% in delayed management.[6] Extensive research exists on the operative management of cholecystitis via a laparoscopic cholecystectomy in pregnancy.

Findings suggest that laparoscopic cholecystectomies are associated with faster recovery times, shorter hospital stays, and lower wound infection rates. Fetal heart Doppler ultrasound monitoring is recommended when performing a laparoscopic cholecystectomy in pregnancy, before, during, and after surgery to ensure fetal well-being.[7] This protocol was followed with our patient, in addition to close follow-up with her obstetrician. Commonly, laparoscopic cholecystectomies are performed until 34 weeks' gestation as outcomes are generally good.[7] Our patient was 29 weeks' gestation and considered a favorable candidate for the minimally invasive approach to cholecystectomy.

Robotic-assisted surgeries have been increasing in popularity. One study finds that patients undergoing robotic cholecystectomy have a shorter hospital stay and lower readmission rates than those who receive standard laparoscopic surgery.[8] Despite increased operative and hospital costs, the advantages of the robotic instrument articulation, three-dimensional view, and improved precision are some of the highlights of this approach.[8] For our patient, various reasons led to the decision to use the robot. Her gravid abdomen provided a narrower room to perform a cholecystectomy. The surgical robot allows for seven degrees of motion, much like the human wrist in traditional open surgery, unlike the four degrees of motion provided by the more rigid laparoscopic surgery instruments.[9] Therefore, the robotic approach provided increased range of motion and better articulation control, a better and safer option for our patient. The robotic three-dimensional vision allowed greater intuitive manipulation and a clearer view of structures.[9] This feature is the most crucial factor in choosing a robotic over a laparoscopic approach in a pregnant patient. Better visualization is instrumental in leading to safer outcomes.

Conclusions

Symptomatic cholelithiasis and cholecystitis are not uncommon in pregnancy. Early, minimally invasive cholecystectomy offers optimal outcomes in pregnant patients with cholelithiasis. Our case study involves a common clinical presentation and supports the need for more studies comparing robotic cholecystectomy versus traditional laparoscopy. A case series based on this case report can help make this comparison.

Article citation: Iweh MY, Azzam S, Loewen J, Wilhelm C, Kragh N, Soliman B. Robotic-assisted cholecystectomy in the third trimester of pregnancy. The Southwest Respiratory and Critical Care Chronicles 2024;12(50):45–48
From: Department of Surgery, Texas Tech University Health Sciences Center, Amarillo, Texas
Submitted: 9/4/2023
Accepted: 1/16/2024
Conflicts of interest: none

References

1. Celaj S, Kourkoumpetis T. Gallstones in pregnancy. JAMA 2021 Jun 15;325(23):2410
2. Stany MP, Elkas JC, Ramin SM. Laparoscopic surgery in pregnancy. URL: http://www. uptodate. com/contents. 2017.
3. Graham G, Baxi L, Tharakan T. Laparoscopic cholecystectomy during pregnancy: a case series and review of the literature. Obstetrical, Gynecological Survey 1998 Sep 1;53(9):566–74.
4. Nasioudis D, Tsilimigras D, Economopoulos KP. Laparoscopic cholecystectomy during pregnancy: A systematic review of 590 patients. International J Surgery 2016 Mar 1;27:165–75.
5. Kimura Y, Takada T, Kawarada Y, et al. Definitions, pathophysiology, and epidemiology of acute cholangitis and cholecystitis: Tokyo Guidelines. J Hepato-Biliary-Pancreatic Surgery 2007 Jan; 14:15–26.
6. Gallaher JR, Charles A. Acute cholecystitis: a review. JAMA 2022 Mar 8;327(10):965–75.
7. Ball E, Waters N, Cooper N, et al. Evidence-based guideline on laparoscopy in pregnancy: commissioned by the British Society for Gynaecological Endoscopy (BSGE) endorsed by the Royal College of Obstetricians & Gynaecologists (RCOG). Facts, Views & Vision in Ob Gyn. 2019 Mar;11(1):5.
8. Kane WJ, Charles EJ, Mehaffey JH, et al. Robotic compared with laparoscopic cholecystectomy: a propensity matched analysis. Surgery 2020 Feb 1;167(2):432–5.
9. Palep JH. Robotic assisted minimally invasive surgery. J Minimal Access Surgery 2009 Jan 1;5(1):1–7.