Single Case

Utilizing Percutaneous Cholecystostomy Tube as a Temporary Minimally Invasive Approach for Acute Cholecystitis during Third Trimester of a High-Risk Pregnancy

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Keywords

Percutaneous cholecystostomy · Cholecystitis · High-risk pregnancy · Multiple gestations · Laparoscopic cholecystectomy

Abstract

Laparoscopic cholecystectomy (LC) is the treatment modality of choice for symptomatic cholelithiasis and cholecystitis during pregnancy and is associated with shorter length of stay, shorter operative times, and fewer complications compared to open cholecystectomy. However, in high-risk pregnant patients, LC can be challenging. Percutaneous cholecystostomy tube (PCT) offers a temporary management option during the peripartum period until interval LC is performed. We present a case of a high-risk pregnancy involving a 41-year-old woman at the 34th week of gestation with a dichorionic-diamniotic-twin gestation with signs and symptoms of acute cholecystitis. Given the patient's high-risk status, a less intensive intervention, PCT, was performed for gallbladder decompression. An interval LC was performed on postpartum day 4 after caesarean section. Current surgical guidelines suggest that laparoscopy can be safely used to treat biliary disease during pregnancy in all trimesters. Although rarely used as a first-line intervention for gallbladder disease, PCT is an important minimally invasive procedure for treatment of cholecystitis in patients who are poor surgical candidates. Our case is unique due to the twin gestation, advanced maternal age, and gestational age.

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Introduction

Cholecystitis is the second most common non-obstetric surgical cause of acute abdominal pain during pregnancy [1]. The most common cause of cholecystitis is cystic duct obstruction due to gallstones or biliary sludge. If left untreated, the increased pressure in the gallbladder due to the buildup of mucus can lead to gallbladder hydrops (mucocele), inflammation (cholecystitis), empyema (suppurative cholecystitis), ischemia, necrosis (gangrenous cholecystitis), and even perforation [2]. Laparoscopic cholecystectomy (LC) has become the treatment modality of choice for cholecystitis during pregnancy and has been shown to be safe for both the mother and the fetus [3].

Limited data exist on LC in high-risk pregnant surgical patients, such as multiple gestations and advanced maternal age. Percutaneous cholecystostomy tube (PCT) is a safe technique that involves using ultrasound or computed tomography to perforate the gallbladder. A wire-guided pigtail catheter is then securely placed. The tube is taken out after approximately 6–8 weeks when the inflammation is resolved, most commonly at the time of interval cholecystectomy. Biliary decompression with a PCT may prevent worsening inflammation and resulting complications [4–6]. A recent review article showed that this approach resolves acute cholecystitis for approximately 90% of patients and is especially useful for those who cannot safely undergo LC [6]. Utilizing PCT offers a temporary management option during the peripartum period until interval LC can be performed safely.

Case Report/Case Presentation

A 41-year-old woman, gravida 5, para 4, at 34 weeks, presented for the second time to the ED with epigastric and right upper quadrant (RUQ) pain, associated with middle back pain. She had a dichorionic-diamniotic-twin gestation with a known medical history of choledocholithiasis, tobacco use, and class III obesity. Six weeks into her pregnancy, she presented with epigastric and RUQ pain. On workup, she was found to have an abnormal liver function test with increased bilirubin (shown in Table 1). Ultrasound of the abdomen showed an 18 mm non-obstructing, mobile gallstone with nonthickened gallbladder wall (measuring up to 2 mm: shown in Fig. 1a). However, the sonographic Murphy's sign was positive. Additionally, the common bile duct measured 17 mm (shown in Fig. 1b). Given the high suspicion for common bile duct stones, the patient underwent endoscopic retrograde cholangiopancreatography

Table 1. Summary of relevant lab values

Laboratory tests	1st trimester (6-week gestation)	3rd trimester (34-week gestation)		Postpartum (2 days)
		pre-PCCT	post-PCCT	
ALP, U/L	166	160	149	127
AST, U/L	149	16	14	17
ALT, U/L	300	9	10	11
Bilirubin-D, mg/dL	1.0		0.1	
Bilirubin – total, mg/dL	1.9	0.5	0.6	0.3
Protein total, g/dL	7.8	6.8	5.5	6.0
Albumin, g/dL	4.2	3.2	3.1	3.0
WBC, 10 ⁹ /L	7.8	12.1	15.9	8.5

ALP, alkaline phosphatase; AST, aspartate transaminase; ALT, alanine transaminase; WBC, white blood cells.

Fig. 1. Upper: ultrasound, at 6-week pregnancy showing distended gallbladder (a) containing mobile 18 mm gallstone in the fundus (white arrow) and dilated common bile duct to 17 mm (white arrow in (b)). Lower: ultrasound, at 34-week pregnancy, showing signs of early acute cholecystitis, with a distended gallbladder containing sludge and nonmobile gallstones impacted in the neck of the gallbladder (white arrow at (c)).

with sphincterotomy. Two stones (8–9 mm) were removed. She was discharged home 2 days later. However, during the ED visit at week 34 gestation, her symptoms were severe and associated with nausea. On abdominal exam, she had marked epigastric and RUQ tenderness. Laboratory tests demonstrated mild leukocytosis (12.1×10^9 cells/L). A RUQ ultrasound examination at week 34 showed a distended gallbladder containing nonmobile gallstones and sludge that impacted the neck of the gallbladder, measuring about 1 cm with normal wall thickness and a positive sonographic Murphy sign (shown in Fig. 1c). The ultrasound also showed no biliary duct dilation (5 mm common bile duct), a normal appearing pancreas, and splenomegaly. Given the persistence of symptoms, mild leukocytosis, and the presence of an impacted stone in the neck of the gallbladder, the patient was diagnosed with early acute cholecystitis, and therefore, an intervention was indicated. The patient was started on parenteral antibiotics and was counseled on available options (i.e., cholecystostomy tube, cholecystectomy: laparoscopic vs. open approach), risks of each option on both the mother and fetus, and alternative treatment (i.e., antibiotics only, with the possible outcome of failure and the need for invasive procedure). Weighing the risks and benefits of each option, the patient elected to proceed with PCT.

PCT was performed under general anesthesia with endotracheal intubation. The patient was placed in the left lateral position. Ultrasound and fluoroscopic guidance were utilized for needle placement and monitoring needle, spot image documentation, guidewire, and catheter manipulations. Using a Seldinger technique, a 19-gauge sheath needle was used in the RUQ to gain access to the gallbladder, transhepatically. A needle was placed through a safe access

Fig. 2. This image shows a PCT site in the right anterior axillary line of a 34-week twin pregnant woman.

Fig. 3. Intraoperative cholangiogram during LC showing normal biliary anatomy with no obvious filling defects. Additionally, PCT can be seen in the gallbladder.

route into the gallbladder. A guidewire was advanced through the sheath and the tract was dilated with a fascial dilator. A 10-Fr pigtail drainage catheter was locked into place in the gallbladder. The drainage catheter was secured, and the tube was placed on gravity drainage (shown in Fig. 2). Gram-stain of the fluid returned negative for bacteria. However, it was positive for *Candida dubliniensis* (shown in Table 1). The potential reason for negative bacteria culture is that the patient was already on antibiotics. The presence of *C. dubliniensis* was unusual in this case. While the significance of this infection is not clear, a literature search has shown that biliary candidiasis caused by *C. dubliniensis* is extremely rare [7]. The patient remained in the hospital for 2 days and was discharged.

For the remainder of the pregnancy, she tolerated the cholecystostomy tube well and was scheduled for an elective cesarean section. However, at 37-week gestation, she presented with dichorionic-diamniotic breech-breech twins, and therefore, a cesarean section was indicated. The results of this pregnancy were a healthy male and female infant weighing 3,185 g and 2,733 g, respectively. Two days after the birth of her twins, she experienced RUQ pain and flushed out 600 mL of dark bile from the cholecystostomy tube. She returned to the ED with abdominal tenderness and worsening RUQ pain. Ultrasound showed the cholecystostomy tube in the correct position and choledocholithiasis without an abscess. Blood analysis revealed unremarkable liver function tests and normal white blood count (WBC: shown in Table 1). Four days postpartum, the patient underwent LC with an intraoperative cholangiogram (shown in Fig. 3). During surgery, the PCT was removed. Postoperatively, the patient did well and was discharged home. Although the patient returned next day to the ED with worsening RUQ pain, this was related to inadequate pain control as both workup and imaging were non-concerning for peri-operative complications from LC and/or caesarean section. The pain spontaneously resolved. She was discharged 2 days later. Eleven months post-LC, the patient continues to do well.

Discussion/Conclusion

The circumstances under which PCT should be performed as opposed to laparoscopic or open procedure in acute cholecystitis in pregnancy remains unclear. The laparoscopic approach has become the preferred treatment modality for many surgical diseases during pregnancy in all trimesters and has been shown to be a safe procedure [8]. A recent study from a large national database found that patients who had undergone third-trimester LCs had an increased hospital stay and readmission when compared to women who underwent LC within the first 3 months postpartum. Prepartum LC was also associated with a two-fold increase in preterm delivery, which is significant because many organs, such as the brain and lungs finish development during the third trimester. Premature delivery interrupts this process leading to an increased risk of many long-term issues such as respiratory problems and learning disabilities [9, 10].

PCT offers patients with comorbid conditions a minimally invasive way to safely manage their acute cholecystitis [9]. PCT is associated with minimal risks when compared to LC. One study observed clinical improvement in all patients in all trimesters after PCT with no PCT-related complications (bleeding, bile leak, accidental catheter removal). Of the six total patients, four presented during the 3rd trimester. They were all treated with PCT, followed conservatively, and had no further biliary complications until it was time to do the LC after labor [10]. In another study, 54 of 55 (98%) patients who had biliary sepsis and septic shock, comorbidities, or who were not responding to medical therapy were successfully treated with PCT. Complications included 1 patient who required surgical intervention due to hepatic bleeding and dislodgement of the catheter in 9 patients. Of the 31 patients who underwent delayed surgery, there were no surgical complications such as associated mortality, severe morbidity, or bile duct injury [11].

Studies have shown that the incidence of biliary disease is correlated with modifiable factors (e.g., pregnancy, higher body mass index) and non-modifiable risk factors (e.g., increased age and higher parity) [2, 12, 13]. Elevated levels of progesterone and estrogen during pregnancy increase cholesterol production and decrease contractile force of the gallbladder muscles, respectively, leading to cholestasis and gallstone formation in pregnant women [2, 14]. Our patient presented with acute cholecystitis in the setting of many modifiable and non-modifiable risk factors. Nonoperative management of symptomatic cholelithiasis during pregnancy has an increased chance of reoccurrence early postpartum, requiring repeated hospitalizations [15]. Therefore, early LC postpartum is important in patients who undergo PCT during pregnancy since recurrence of biliary disease is associated with worse outcomes.

Our patient presented with a high-risk pregnancy due to twin gestation, advanced maternal age, gestational age, and acute cholecystitis. Although rarely used as a first-line intervention for gallbladder disease, PCT is an important minimally invasive procedure for the treatment of cholecystitis in patients who are poor surgical candidates. In the late third trimester, given the challenges of small operative field due to enlarged uterus and risk of complications, PCT should be considered for initial management and be followed with interval cholecystectomy for patients in their childbearing period.

Statement of Ethics

Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images. This case report was reviewed and deemed nonresearch by the WMU Homer Stryker M.D. School of Medicine Institutional Review Board. No protected health information or other uniquely identifying information is included in this article.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Y.H. wrote the initial draft. K.P. and S.S. edited the manuscript and provided intellectual input.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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