



Case Report

The role of common bile duct exploration with biliary drainage in choledocholithiasis during pregnancy

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ABSTRACT

Pregnancy is a risk factor for gallstone disease and may evolve into symptomatic choledocholithiasis/ common bile duct (CBD) stone; however, the treatment of choice is controversial and may not apply to all gestational ages. Standard therapy with endoscopic retrograde cholangiopancreatography (ERCP) exposes the patient and fetus to ionizing radiation; hence other strategies are needed to address this problem. We report a case of 29 years old female presented with biliary pain and jaundice. The patient was pregnant at 14 weeks gestation age. Laboratory data showed biliary obstruction, and abdominal ultrasound showed multiple bile duct stones with significant dilatation in the CBD. CBD exploration with external biliary drainage was performed to treat obstructive jaundice while avoiding ionizing radiation exposure to the fetus and patient. After the procedure, the patient showed clinical improvement. CBD exploration with external biliary drainage avoids ionizing radiation in choledocholithiasis management. This method may be applied as a temporary emergent treatment of obstructive jaundice in pregnant patients with gestational age sensitive to ionizing radiation.



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### INTRODUCTION

Epidemiological studies have shown that women are more likely to have a gallstone, and the risk is higher when taking hormonal drugs and during pregnancy (Everson, 1993). The prevalence of gallstones in pregnant women is 12.2%, with an increase relating to the gravida of patients. Most patients are asymptomatic. However, with the increasing size of the gallstone, the risk of impacting the neck of the gallbladder increases, increasing the risk of biliary colic attack (Valdivieso et al., 1993).

In pregnant women, there is a progressive increase in biliary cholesterol saturation due to increased cholesterol secretion with a decrease in bile acid secretion (Kern et al., 1981). The hepatic effect of estrogen might cause higher cholesterol secretion, while lower bile acid secretion might be due to an impairment of motility by progesterone (Everson et al., 1991; Shaffer et al., 1984; Everson, 1993). Other risk factors of gallstone disease include family history, genetic predilection, ethnic background, age, obesity, metabolic syndrome, drugs, diet, and chronic liver disease (Stinton & Shaffer, 2012).

Gallstones may cause complications such as cholangitis and choledocholithiasis. The management is challenging since standard therapy with endoscopic retrograde cholangiopancreatography (ERCP) exposes the fetus and the patient to ionizing radiation (Chamberlain & Croagh, 2020). This case report will focus on obstructive jaundice in pregnancy bile duct exploration and T-tube drainage for the treatment.

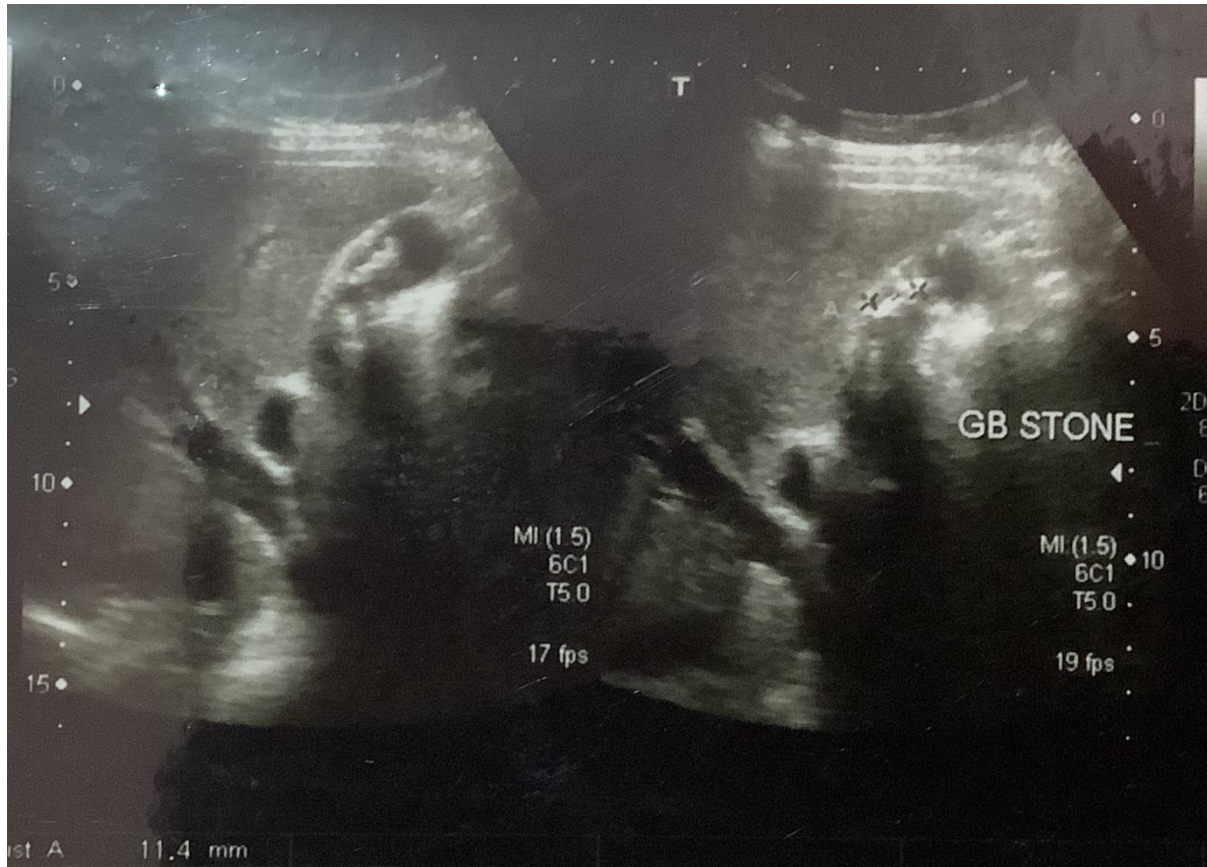
### CASE REPORT

A 29-year-old female came to the emergency room with a chief complaint of nausea,

vomiting every meal, and upper right abdominal pain that had been going on for two weeks. The patient said she had been admitted with a similar complaint with brief improvement. The patient also said the symptoms have worsened for the last two days, and she developed yellowish skin. The patient was pregnant at 14 weeks gestation with a history of hepatitis B infection. The patient had direct bilirubin of 8.09 mg/dL and total bilirubin of 12.50 mg/dL. The patient also had an increase in the liver enzyme (AST of 208 U/L and ALT of 128 U/L) with mild electrolyte imbalance (sodium 133 mmol/L and potassium 3.3 mmol/L). Two days prior, the patient underwent an abdominal ultrasound, and three 1.1 cm common bile duct (CBD) stones were found with significant dilatation in CBD, CHD (common hepatic duct), and IHBD (intrahepatic bile duct).

The common practice to treat the condition of this patient is using ERCP. Nevertheless, this procedure exposes the patient to ionizing radiation. Considering the gestational age, the patient refused to use any ionizing radiation during the treatment. Common bile duct exploration with external biliary drainage was chosen for the emergent treatment to resolve obstructive jaundice.

During surgery, it was found that the CBD was dilated about 2 cm, and a choledocholithotomy was performed to remove the gallstones. Normal saline was pushed in CBD with no resistance found, and T-tube drainage was placed in CBD. Post-op revealed the jaundice was reduced with minimal pain in the surgery site. Eight weeks of follow-up showed significant clinical improvement in the mother. Both the fetus and the mother were healthy during the follow-up period. T-tube drainage was planned to be removed after the delivery, along with ERCP to evaluate the patient.



**Figure 1.** An ultrasonographic exam showed the dilatation of CBD with a non-mobile 1.1 cm CBD stone

## DISCUSSION

Pregnancy predisposes to gallbladder diseases through increasing cholesterol secretion by estrogen and decreasing bile acid secretion by progesterone. Progesterone also causes a reduction in gallbladder contraction, hence increasing biliary stasis (Kern et al., 1981). Gallstones occur in 7% of nulliparous women, 12% in pregnant women, and 19% in women with two or more pregnancies. The symptoms are similar to gallstone disease in non-pregnant patients (Valdivieso et al., 1993; Parangi et al., 2007). The obstruction of the cystic duct causes symptoms of gallstones during bile expulsion from the gallbladder. The smooth muscle of the gallbladder contracts and activates visceral nerve fibers, causing referred pain in the associated dermatome in the epigastrium and

back. It is often poorly localized and coincides with vomiting/nausea. This condition may evolve into cholecystitis, choledocholithiasis, or cholangitis. (Beckingham, 2020) These complications only occur in 10% of symptomatic patients, making biliary obstruction due to choledocholithiasis quite rare (Chan & Enns, 2012).

Generally, either openly or laparoscopically, choledocholithiasis is approached by ERCP or bile stone exploration. (Beckingham, 2020) The main concern of ERCP in pregnancy is that it exposes the patient and fetus to ionizing radiation during fluoroscopy. Ionizing radiation directly acts on the tissue's biochemical structure, including DNA, protein, and other molecules. Ionizing radiation also causes the formation of free radicals that can indirectly



break the structure of the cell’s critical part. Radiation increases the risk of teratogenicity to childhood cancer. The severity is dose-dependent yet also stochastic. The fetus is most susceptible to ionizing radiation during organogenesis [2-7 post-conception] and in the early fetal period [8-15 post-conception]. Radiation exposure in fetal development also increases the risk of the number of non-malignant problems, including failure to implantation during blastogenesis [0-2 weeks post-conception]; major malformation and growth restriction during organogenesis [2-7 weeks post-conception]; and growth restriction, IQ reduction, mental retardation, malformations, also miscarriage during fetogenesis [8-38 weeks post-conception] (Williams & Fletcher, 2010; Jackson et al., 2008).

Despite the radiation risk, several studies report that ERCP can be performed if indicated. The only meta-analysis about ERCP in pregnancy that we can find has been done by Azab et al., showing that ERCP is a relatively safe bile duct decompression procedure to prevent life-threatening complications both to the mother and fetus. Maternal adverse

events of ERCP include pancreatitis, bleeding, and cholecystitis, which are higher than usual ERCP outcomes. ERCP is associated with preeclampsia, preterm labor, and intrauterine growth retardation. Regarding the fetal adverse event, there is no report of malformation due to ERCP; however, radiation exposure before 16 weeks of gestational age increases the risk of intellectual disability (Azab, et al., 2019).

The estimated radiation dose absorbed during ERCP in pregnancy varies from 0.4 – 3.1 mSv (Kalaleh et al., 2014; Tham et al., 2003). However, radiation exposure is recommended not to exceed 1 mSv in the first trimester and 5 mSv in the whole pregnancy. Furthermore, there is a concern that these estimations underestimate scattered radiation (Chan & Enns, 2012). Due to the sensitivity to radiation regarding the patient’s gestation age, open cholecystectomy and CBD exploration with external drainage was chosen.

Surgical management is considered safe whenever cholelithiasis in pregnancy becomes symptomatic. A study by Otheman et al. (2012) shows that conservative management of cholelithiasis in pregnancy is associated with recurrent biliary symptoms, increased visits to the

**Table 1.** Comparison of CBD exploration with external drainage to ERCP in the treatment of CBD stone

	CBD exploration with external drainage	ERCP
<b>Benefits</b>	<ul style="list-style-type: none"> <li>Does not exposes the patient and fetus to ionizing radiation.</li> </ul>	<ul style="list-style-type: none"> <li>Standard treatment for CBD stone.</li> <li>Well studied; however, studies of ERCP in pregnant patients are limited.</li> </ul>
<b>Harms</b>	<ul style="list-style-type: none"> <li>Limited study, to the general population and pregnant patients.</li> <li>External drain is left, causing discomfort to the patient.</li> </ul>	<ul style="list-style-type: none"> <li>Exposes the patient to ionizing radiation.</li> </ul>



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emergency department, higher hospitalization, and more likely to undergo cesarean section (compared to operative and endoscopic groups). This fact is further confirmed by a multicentre study of 78 pregnant women reveals that out of patients managed medically, 34% had relapses requiring hospitalization prior to delivery, 28% developed preterm contractions needed tocolytic drugs, 22% required labor induction to decrease the severity of their biliary disease, 17% had a preterm delivery, and 9% had an emergency cesarean for fetal distress. In contrast, 31% of patients treated with open or laparoscopic cholecystectomy had a premature contraction that responded to tocolysis. No report of preterm delivery, relapse of disease after surgery, maternal ICU admission, or maternal/fetal death was reported in the surgery group (Lu et al., 2004).

External drainage after open common bile duct exploration in pregnancy is not well studied. Biliary drainage is traditionally inserted to prevent the build-up of bile in CBD because of temporary swelling. Bile leak into the peritoneal cavity also can be life-threatening. Moreover, the dye can be injected into the tube to look for the residual stone. However, the use of drainage is controversial. Biliary drain correlates with longer operation time and extended hospital stays; there is no significant difference in mortality and morbidity (Gurusamy et al., 2013). Further study to determine its applicability is required.

### CONCLUSION

Pregnancy is a risk factor for biliary stone disease. While ERCP is generally accepted in pregnant patients who develop symptomatic choledocholithiasis, management approaches require consideration of gestational age since certain periods have high sensitivity to ionizing radiation. This case report demonstrates successful management of biliary obstruction

due to cholelithiasis with the treatment of CBD stone exploration with external biliary drain. The patient and the fetus are healthy during our eight weeks follow-up. This study may be applicable to a pregnant patient with biliary obstruction that is gestational age sensitive to ionizing radiation while considering the harm versus the benefit to the patient. The clinical benefit of this technique compared to traditional ERCP is unclear due to limited studies.

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