



Endoscopic retrograde cholangiopancreatography during pregnancy without radiation

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Abstract

AIM: To present our experience with pregnant patients who underwent endoscopic retrograde cholangiopancreatography (ERCP) without using radiation, and to evaluate the acceptability of this alternative therapeutic pathway for ERCP during pregnancy.

METHODS: Between 2000 and 2008, six pregnant women underwent seven ERCP procedures. ERCP was performed under mild sedoanalgesia induced with pethidine HCl and midazolam. The bile duct was cannulated with a guidewire through the papilla. A catheter was slid over the guidewire and bile aspiration and/or visualization of the bile oozing around the guidewire was used to confirm correct cannulation. Following sphincterotomy, the bile duct was cleared by balloon sweeping. When indicated, stents were placed. Confirmation of successful biliary cannulation and stone extraction was made by laboratory, radiological and clinical improvement. Neither fluoroscopy nor spot radiography was used during the procedure.

RESULTS: The mean age of the patients was 28 years (range, 21-33 years). The mean gestational age for the fetus was 23 wk (range, 14-34 wk). Five patients underwent ERCP because of choledocholithiasis and/or

choledocholithiasis-induced acute cholangitis. In one case, a stone was extracted after precut papillotomy with a needle-knife, since the stone was impacted. One patient had ERCP because of persistent biliary fistula after hepatic hydatid disease surgery. Following sphincterotomy, scoleces were removed from the common bile duct. Two weeks later, because of the absence of fistula closure, repeat ERCP was performed and a stent was placed. The fistula was closed after stent placement. Neither post-ERCP complications nor premature birth or abortion was seen.

CONCLUSION: Non-radiation ERCP in experienced hands can be performed during pregnancy. Stent placement should be considered in cases for which complete common bile duct clearance is dubious because of a lack of visualization of the biliary tree.

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Key words: Cholangitis; Choledocholithiasis; Endoscopic retrograde cholangiopancreatography; Jaundice; Pregnancy

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INTRODUCTION

Hormonal changes during pregnancy increase the lithogenicity of bile and impair gallbladder emptying, which create a favorable environment for gallstone formation. The prevalence of gallstones in pregnancy has been reported as 3.3%-12.2%^[1-3]. Acute cholecystitis is the second most common non-obstetric emergency in pregnant women. Choledocholithiasis and consequent

Table 1 Demographic and laboratory results of the patients

| Patient number | Age (yr) | WBC/ μ L | AST (IU/L) | ALT (IU/L) | GGT (IU/L) | Bilirubin (mg/dL) | Ultrasonography | MRCP |
|----------------|----------|--------------|------------|------------|------------|-------------------|-----------------|---------------------|
| 1 | 32 | 10.800 | 61 | 58 | 144 | 1.09 | Normal | Fistula presence |
| 1 ¹ | 32 | 6.690 | 52 | 54 | 136 | 0.75 | Normal | Fistula persistence |
| 2 | 33 | 12.000 | 244 | 186 | 324 | 16.5 | Stone in CBD | - |
| 3 | 27 | 11.500 | 126 | 92 | 212 | 10.8 | Stone in CBD | - |
| 4 | 21 | 14.000 | 204 | 144 | 289 | 4.85 | Stone in CBD | - |
| 5 | 28 | 15.200 | 195 | 127 | 326 | 15.3 | Stone in CBD | - |
| 6 | 29 | 14.300 | 262 | 210 | 188 | 8.22 | Dilated CBD | Stone in CBD |

¹Same patient with repeat ERCP. WBC: White blood cells; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; CBD: Common bile duct.

complications such as pancreatitis and cholangitis are potentially lethal diseases for the mother and fetus. Acute pancreatitis in pregnancy has been shown to be closely related to gallstone disease^[4]. Biliary pancreatitis has been found to be associated with 15% and 60% of maternal and fetal mortality rates, respectively^[5].

During pregnancy, the treatment is usually conservative since surgery is associated with an increased rate of complications such as preterm labor and spontaneous abortion. In choledocholithiasis, endoscopic retrograde cholangiopancreatography (ERCP) is the first-line treatment of choice. One should try to avoid the use of fluoroscopy during pregnancy, especially in the first trimester. ERCP with 3.2 min mean fluoroscopy time and 310 mrad estimated mean fetal radiation exposure has been found to be safe for the mother and fetus during pregnancy^[6]. However, a clear-cut safe radiation dose for ERCP in pregnancy is still unknown. Here, we present our experience with pregnant women who underwent ERCP without using radiation.

MATERIALS AND METHODS

Seven hundred and fifty ERCP procedures for choledocholithiasis and/or choledocholithiasis-induced acute cholangitis were performed on 597 patients in our Endoscopy Unit at Vakif Gureba Research and Training Hospital from 2000 to 2008. Six out of 598 ERCP patients were pregnant. One patient with biliary fistula caused by surgery for hepatic hydatid disease was also included in the study. The data regarding laboratory, ultrasonographic and endoscopic findings, and clinical course of the patients were analyzed. Magnetic resonance cholangiopancreatography (MRCP) was used for diagnosis of fistula after hydatid surgery, and for control of fistula closure after the first ERCP procedure in the patient with hepatic hydatid disease. MRCP was also used for diagnosis of choledocholithiasis in the patient with elevated bilirubin levels and a dilated common bile duct shown by ultrasonography. Patients with fever, jaundice, abdominal pain and radiological findings were diagnosed with choledocholithiasis-induced acute cholangitis.

All patients included in the study signed an informed consent for the procedures, after receiving an explanation on the risks, benefits and alternatives of ERCP and associated therapeutic procedures.

The patients were counseled by the Gynecology and Obstetrics Department before the procedure. Pre-procedural complete blood count, bilirubin, transaminase and γ -glutamyl transferase levels were noted. The fetal heart sounds were controlled before the ERCP procedure. Pethidine HCl (≤ 100 mg) and midazolam (≤ 3 mg) were used for analgesia and sedation. The patients were positioned in the left lateral position to avoid vena caval or aortic compression. After introducing the duodenoscope into the duodenum, the bile duct was cannulated with a guidewire through the papilla, and bile aspiration and/or visualization of the bile oozing around the guidewire was used to confirm correct cannulation. Following sphincterotomy, the stones were extracted by balloon sweeping. When indicated, stents were placed.

Confirmation of successful therapeutic ERCP was made by laboratory and clinical improvement of the patients. After all ERCP procedures, one experienced and the same radiologist performed ultrasonographic evaluation of the biliary system in order to eliminate inter-observer variations. Neither fluoroscopy nor spot radiography were used during the procedure. After the ERCP procedure, laboratory findings and clinical progression of the patients were recorded and followed until discharge.

RESULTS

The mean age of the patients was 28 years (range, 21-33 years). The mean gestational age of the fetus was 23 wk (range, 14-34 wk). The demographic and laboratory data of the patients are shown in Table 1. The treatment results and obstetric findings of the patients are summarized in Table 2. There were no complications related to sedoanalgesia in the mother and fetus after the procedure.

In one case, stone extraction after precut papillotomy with a needle-knife was performed since the stone was impacted. One patient had ERCP because of persistent biliary fistula after hepatic hydatid disease surgery. Following sphincterotomy performed by bipolar current, scoleces were extracted from the common bile duct. Two weeks later, since the fistula persisted, repeat ERCP was performed and a polyethylene stent was placed. The fistula was closed after the procedure. The laboratory abnormalities of the other patients with choledocholithiasis and/or choledocholithiasis-

Table 2 Treatment results and obstetric findings

| Patient number | Diagnosis | Procedure | CBD content | Gestational time (wk) | Delivery time (wk) |
|----------------|---------------------------------|--|-----------------|-----------------------|--------------------|
| 1 | Biliary fistula ¹ | Sphincterotomy and scoleces extraction | Scoleces | 19 | |
| 1 | Persistent fistula ² | Stent placement | - | 21 | Term |
| 2 | Choledocholithiasis | Sphincterotomy and stone extraction | Stone | 14 | 34 |
| 3 | Choledocholithiasis | Sphincterotomy and stone extraction | Stone | 20 | 36 |
| 4 | Choledocholithiasis | Sphincterotomy and stone extraction | Multiple stones | 34 | Term |
| 5 | Cholangitis | Sphincterotomy and stone extraction | Impacted stone | 28 | 36 |
| 6 | Choledocholithiasis | Sphincterotomy and stone extraction | Multiple stones | 23 | Term |

¹After hydatid disease surgery; ²Same patient with repeat ERCP.

induced acute cholangitis were normalized after ERCP. Ultrasonographic confirmation of stone extraction was made in all patients. Post-ERCP complications, premature birth, abortion or intrauterine growth retardation were not observed. The clinical follow-up of the patients until discharge was uneventful.

DISCUSSION

Cholangitis in pregnancy is a serious condition for the mother and fetus, and results in high mortality and morbidity. ERCP is the first-line treatment of choice for cholangitis and pancreatitis caused by choledocholithiasis. However, the use of ERCP in pregnancy is limited because of the use of radiation. In previously described ERCP procedures performed during pregnancy, abdominal shielding was used to minimize radiation exposure^[7]. Fetal damage by radiation is related to the time of pregnancy and the radiation dose. Several studies have demonstrated that ERCP can be successfully and safely performed during pregnancy^[2,6,8-10]. The role of ERCP during pregnancy for complicated biliary tract diseases is well established. However, there remains the primary concern of fetal safety in relation to exposure to ionizing radiation. The putative risks may include fetal death, intrauterine growth retardation, malformations, and childhood cancer. It has been recommended that imaging modalities without ionizing radiation be used during pregnancy^[9]. Therefore, attempts for complete exclusion of radiation are of paramount importance in ERCP. The literature has shown that ERCP can be performed safely without necessitating fluoroscopic use^[11,12].

Therapeutic ERCP is used routinely in pregnancy, with strict indications in clinical practice. Although the literature related to radiation exposure in ERCP has shown that ERCP is safe and effective in the early period after the procedure, the long-term negative effects of radiation exposure of children are unknown. Late adverse effects, such as cancer, may take years to develop after delivery, therefore, it is very difficult to determine the safe dose of radiation in pregnancy for ERCP. In order to overcome this problem, ERCP without radiation in pregnancy should be the first-choice treatment modality for therapeutic ERCP procedures.

In our study group, we cannulated the bile duct with the assistance of a guidewire. Cannulation was

confirmed by bile aspiration and/or visualization of the bile oozing around the guidewire after cannulation. Afterwards, bipolar biliary sphincterotomy with balloon sweeping of the biliary duct was performed. At least three times, the stone extraction balloon catheter had to be passed inside the bile duct and pulled out to achieve complete ductal clearance in patients with multiple stones. Improvements in laboratory, clinical and ultrasonographic findings were used as simple and accessible reference points for tracking the patients after ERCP. Maintenance of normal findings during follow-up of the patients after ERCP was thought to be related closely to the success of the procedure with regard to stone extraction. As wire-guided cannulation in non-radiation ERCP has the limitations of incorrect placement of the wire in the cystic duct and retained proximal stones after the procedure, choledochoscopy, real-time percutaneous ultrasonography, linear echoendoscopy, and intraductal ultrasonography are recommended for improving the performance of non-radiation ERCP^[12]. Linear echoendoscopy, intraductal ultrasonography, and choledochoscopy may necessitate additional sedoanalgesia, which has a potentially jeopardizing effect on the fetus. As a result of this concern, we recommend simple monitoring of the patient with ultrasonography and biochemical and clinical parameters after the procedure. In our study, no complication was observed using these monitoring procedures.

Here, we presented six pregnant women with different etiologies, who underwent successful ERCP without the use of fluoroscopy. One case that makes our series interesting is the patient with biliary fistula after hepatic hydatid surgery. The patient was operated on because of liver hydatid disease that imitated acute abdominal findings. As a result of persistent biliary fistula after the operation, she underwent ERCP and sphincterotomy. Since the fistula lasted for an additional 2 wk after the procedure, which was documented by continuous drainage of the bile from the catheter and by MRCP, repeat ERCP with stenting was performed. In the following period, the clinical course was uneventful with closure of the fistula, and delivery occurred without any complication. The stent was removed after delivery.

In conclusion, there have been only a few studies of non-radiation ERCP during pregnancy. Therapeutic non-radiation ERCP with wire-guided cannulation, in

pregnant women with strong indications for ERCP, may be an effective treatment strategy in experienced centers. Laboratory and ultrasonographic follow-up of the patients after the procedure may be a safe, simple and cost-effective strategy for monitoring the effectiveness of the procedure. Stent placement should be considered in cases in which clearance of the common bile duct has failed. Larger studies are needed to draw strong conclusions about non-radiation ERCP.

COMMENTS

Background

Acute cholecystitis is the second most common non-obstetric emergency in pregnant women. Choledocholithiasis and consequent complications such as pancreatitis and cholangitis are potentially fatal diseases for the mother and fetus. During pregnancy, treatment is usually conservative since surgery is associated with an increased rate of complications such as preterm labor and spontaneous abortion. In choledocholithiasis and/or choledocholithiasis-induced acute cholangitis, endoscopic retrograde cholangiopancreatography (ERCP) is the first-line treatment of choice. Already, it has been reported that non-radiation ERCP might be an option for pregnant women with choledocholithiasis and/or choledocholithiasis-induced acute cholangitis.

Research frontiers

Non-radiation ERCP has been used in some studies for the treatment of choledocholithiasis in pregnant women and strict guidelines have not been established.

Innovations and breakthroughs

The authors reported that therapeutic non-radiation ERCP with wire-guided cannulation in pregnant women with strong indications for ERCP may be an effective treatment strategy in experienced centers. Laboratory and ultrasonographic follow-up of the patients after the procedure may be a safe, simple and cost-effective strategy for monitoring the effectiveness of the procedure.

Applications

This study may be useful for showing the safety and effectiveness of non-radiation ERCP in pregnant women with choledocholithiasis and/or choledocholithiasis-induced acute cholangitis or biliary fistula.

Peer review

This study examined the acceptability of ERCP without radiation during pregnancy. The authors showed their experience with six pregnant women who underwent ERCP without using radiation. The results are interesting and may form a reference for the treatment of pregnant women with strong indications for ERCP.

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