

MR cholangiopancreatography of a case with a biliary tract variation and postoperative biliary duct injury

Murat Kocaoğlu, Mehmet Şahin Uğurel, Nail Bulakbaşı, İbrahim Somuncu

ABSTRACT

Because of the increasing frequency of surgical procedures such as hepatic resection, partial liver transplantation, and laparoscopic cholecystectomy, the number of patients requiring biliary imaging has increased. In this report, magnetic resonance cholangiopancreatography findings of a case with an aberrant right posterior hepatic duct draining directly into the gallbladder, which was overlooked prior to laparoscopic cholecystectomy, is presented and the importance of magnetic resonance cholangiopancreatography in the evaluation of congenital biliary anomalies and iatrogenic bile duct injury is discussed.

Key words: • cholangiopancreatography, magnetic resonance • bile ducts • abnormalities • postoperative period

Knowledge of biliary anatomy and its potential variations prior to hepatobiliary interventions such as laparoscopic cholecystectomy, partial liver resection, and liver transplantation has gained extra importance in the prevention of possible complications (1, 2). Moreover, if biliary damage occurs, imaging of the biliary system is required to determine the appropriate therapy. In this report, our aim is to present the magnetic resonance cholangiopancreatography (MRCP) appearance of a rare biliary tree variation, which had been overlooked prior to laparoscopic cholecystectomy, and to discuss the importance of MRCP in the diagnosis of iatrogenic biliary injury. In addition, biliary tree anatomic variations are briefly reviewed.

Case report

A 22-year-old woman was admitted to the hospital with the complaints of right upper quadrant pain, nausea, and vomiting following laparoscopic cholecystectomy. Surgical records of the patient documented the presence of a second duct (other than the cystic duct) draining into the gall bladder, which was mistakenly dissected and ligated. For three weeks, approximately 500 ml/day bile drainage was noted from the catheter placed in the gallbladder fossa. There was no free or loculated fluid in the abdomen on ultrasonography. The biliary system was reported to be normal by endoscopic retrograde cholangiopancreatography (ERCP), performed twice, two days apart (Figure 1). In biliary scintigraphy, the radionuclide passage to the duodenum lumen, the gallbladder fossa, and the drainage catheter was seen (Figure 2). Since the symptoms could not be explained with these findings, the patient was evaluated with MRCP. Breath hold coronal half-Fourier acquisition single-shot turbo spin echo (HASTE) (TR/TE: 11.9/95 msec; flip angle: 150°; slice thickness: 4 mm; matrix: 240x256; FOV: 400X400; acquisition time: 20 seconds) and coronal/sagittal rapid acquisition with relaxation enhancement (RARE) (TR/TE: 2800/1100 msec; flip angle: 150°; slice thickness: 70 mm; matrix: 240x256; FOV: 200X200; acquisition time: 7 sec) sequences were used. In addition, cholangiogram-like MR images were obtained with maximum intensity projection (MIP) technique. An aberrant, dilated right hepatic duct draining into the gallbladder fossa with bile leakage in that site and drainage of the bile via catheter were noted (Figure 3). The common hepatic duct and cystic duct stump were normal. An aberrant right hepatic duct, entering directly into the gallbladder, which was dissected accidentally during surgery, was suggested. Upon the patient's request and the decrease of bile from the catheter to 100 ml/day, the patient was discharged, with the assumption that the aberrant bile duct end was going to close spontaneously. The catheter had been withdrawn in another medical center since the bile leakage disappeared. Two months later, the patient was referred to our hospital with severe abdominal

From the Department of Radiology (M.K. ✉ kocaoglumurat@yahoo.com), Gülhane Military Academy of Medicine, Ankara, Turkey.

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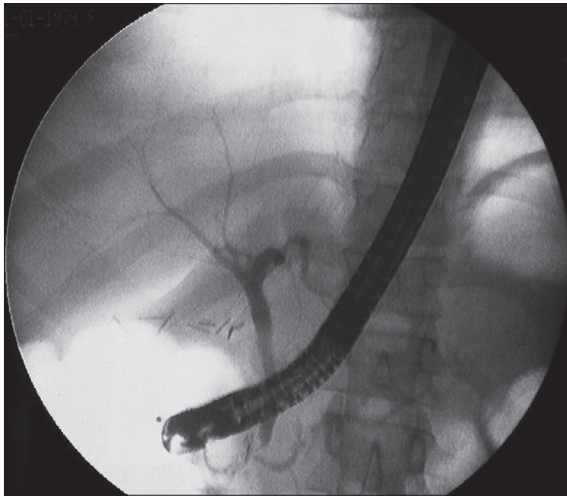


Figure 1. A normal biliary tree is seen on endoscopic retrograde cholangiopancreatography (ERCP).

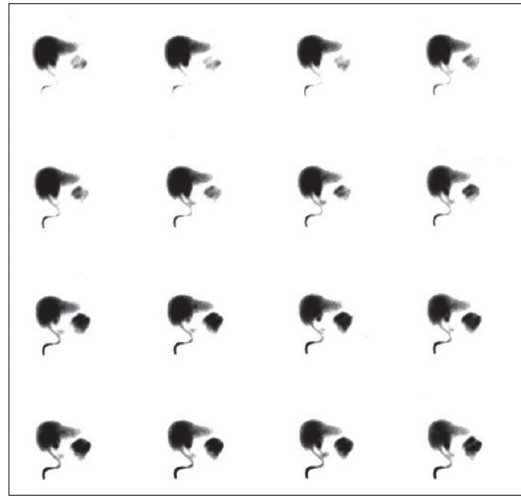


Figure 2. Hepatobiliary scintigraphy demonstrates the radionuclide passage to both the duodenum lumen and the drainage catheter. No leakage is noted.

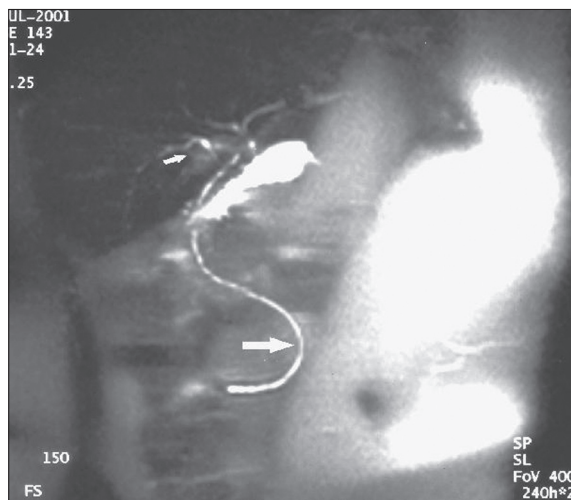


Figure 3. On MIP (maximum intensity projection) MRCP image, an aberrant, mildly dilated right hepatic duct drains into the gallbladder fossa (short arrow). Additionally, bile leakage in that site and in the drainage catheter is seen (long arrow). The common hepatic duct, common bile duct, and cystic duct stump are normal.

pain and suspected peritonitis. She was febrile, hypotensive, tachycardic, and had a small amount of fluid in the gallbladder fossa on ultrasonography. Although purulent fluid was drained from the gallbladder fossa with an explorative laparotomy, her status progressively declined and she died of sepsis within a few days.

Discussion

According to Couinaud's classification, the liver is divided into eight discrete segments, each having its own portal venous support and hepatic venous drainage. Biliary ducts extend parallel to each portal venous system. The right hepatic duct drains the segments of right liver lobe and it has two branches; right posterior segmental duct drains segments VI and VII and right anterior segmental duct drains segments V and VIII. The right pos-

terior segmental duct extends almost horizontally and the anterior segmental duct vertically. The right anterior and posterior segmental ducts join to form the right hepatic duct. The left hepatic duct is formed by the union of the ducts between segments II and IV. The right and left hepatic ducts form the common hepatic duct (CHD). The bile duct that drains the caudate lobe enters directly into the beginning of either of these two. Classically, the cystic duct enters the CHD. This normal biliary anatomy is seen in only 58% of the population, which means a significant number of people have variations that can complicate a possible laparoscopic or explorative operation (1, 4). The most frequent anatomic variation (13-19%) is the right hepatic duct's entrance directly into the left hepatic duct before the usual confluence site of the right and left hepatic ducts (1,

4). In 12% of the healthy population, the posterior hepatic duct drains into the anterior duct from the right lateral side (1). Triple confluence (of the right posterior and anterior segmental ducts, and left hepatic duct) to form a common bile duct (CBD) is another frequent variation. In general, the cystic duct has three variations: cystic duct insertion from a lower level, medial cystic duct insertion, and parallel extension of the cystic duct and CHD (4).

During laparoscopic cholecystectomy, the biliary injury rate and biliary tree variation rate have been reported as 0.1%-3.4% and 3.7%, respectively (5). Right hepatic duct's direct entrance into the gallbladder is a very rare variation and intraoperative cholangiography has been the method of choice in the demonstration of biliary variations (6, 7). Although this method provides high quality images, it has some limitations, such as the time consuming nature of the technique, requirement of experience, and non-satisfactory success rates (71%). CT cholangiography is beneficial in demonstrating biliary anomalies with a high success rate (97%), however it has lower specificity, a high rate of adverse contrast media reactions, and uses ionizing radiation (8). In search of a technique to elucidate any possible biliary tree variation before laparotomic or laparoscopic gall bladder operations, ERCP has proven to be highly sensitive and specific with its high resolution images and the advantage of allowing implementation of therapeutic interventional procedures at the same session. Its contraindications such as pregnancy and serious cholangiopancreatic disease and

complications including pancreatitis, cholangitis, sepsis, adverse reactions to contrast media, bile duct or duodenum perforation, and aspiration limit its widespread utilization (9, 10). In the present case, ERCP was negative since the contrast agent could not opacify the dissected aberrant ductus retrogradely.

Although direct drainage of an aberrant right posterior hepatic duct to the gallbladder had been reported by intraoperative cholangiography and ERCP, to the best of our knowledge, this is the first case that has been demonstrated by MRCP. MRCP is a non-invasive method for demonstrating anatomic variations in the biliary and pancreatic ducts (3, 11). Additionally, MRCP is a useful diagnostic tool in patients suspected to have bile duct injury secondary to surgery. MRCP is capable of showing the type and site of injury and helps in deciding the appropriate management, whether surgical or percutaneous. With heavily T2 weighted sequences, signals from either static or slowly-moving liquids are augmented, and liquid-filled compartments like bile ducts or pancreatic ducts and the contrast between ducts and base are made evident without using a para-

magnetic contrast media. There is no MRCP related complication and there is no need for patient preparation. The rate of unsuccessful MR imaging is only 1%-4%. In addition, examination time is as short as 5 to 10 minutes and its cost is lower than ERCP (3,10).

In conclusion, although performance of routine MRCP prior to cholecystectomy is still controversial and necessitates further studies, this non-invasive method should be used in the detection of iatrogenic bile duct injuries as a first step modality to lead the diagnosis confidently and non-invasively.

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