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Review Article

Role of Therapeutic Interventional Radiology in Chronic Cholecystitis Management

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Abstract

Background: Biliary system is a network of ducts within the liver, gallbladder, and pancreas that flow into the small intestine. When bile is not completely drained from the gallbladder, it can precipitate as sludge, and can turn into gallstones. Interventional radiology defined as a medical specialization that including performing a group of imaging procedures to obtain images of the inside of the body. Advances in methods and technology have enhanced patient treatment by offering minimally invasive procedures including percutaneous drainage, biopsy, and stone removal. Interventional radiology has an established and expanding role in the diagnosis and management of patients with both benign and malignant biliary disease.

Aim: In this review, we will look into role of therapeutic interventional radiology in Gallbladder and biliary tree disease management.

Conclusion: Interventional radiology tends to play a vitally important role in treating patients with gallbladder and bile duct disease. Future studies should be conducted to assist identifying role of therapeutic radiology in patients with gallbladder and biliary tree disease.

Keywords: Biliary Tree Diseases; Interventional Radiology; Gallbladder Disease Management; Cholecystitis.

Introduction

Biliary system is a network of ducts within the liver, gallbladder, and pancreas that flow into the small intestine. When bile is not completely drained from the gallbladder, it can precipitate as sludge, and can turn into gallstones. Biliary obstruction from multiple causes, such as biliary duct squeezing or neoplasms, can also lead to gallstones [1]. There were several factors make gallstone formation and gallbladder disease more likely; as a person grows older the prevalence increases. Furthermore, Obesity increases the chance of forming gallstones due to increases in biliary cholesterol secretion, especially in women. On the other hand, secondary to biliary stasis, patients with drastic weight loss or fasting have a higher chance of gallstones. The frequency of developing gallstones rises with age each year. More than one-quarter of women over age 60 will have gallstones [2]. In the United States, about 700,000 cholecystectomies are performed annually for gallbladder disease. More than 20 million Americans have biliary stones [3].

The pathophysiology of this disease is occlusion of the cystic duct or malfunction of the gallbladder emptying mechanics. Gallstones are formed from different materials, such as bilirubinate and cholesterol. Such materials increase the risk of cholecystitis and cholelithiasis in conditions such as sickle cell disease, where red blood cells contain excess bilirubin and contain pigmented stones [4]. Mild cholecystitis presents with mild symptomatology that may be followed by acute exacerbations of more pronounced symptoms (acute biliary colic), or can progress to a more serious type of cholecystitis that needs immediate intervention (acute cholecystitis) [5].

The abdominal ultrasonic is the test of choice for diagnosing of cholecystitis. It is non-invasive, and can reliably test the gallbladder for a wall or inflammation that is dense. Diagnosing gallstones or sludge is perhaps the best method [6].

Interventional radiology defined as a medical specialization that including performing a group of imaging procedures to obtain images of the inside of the body. Moreover, the interventional radiologist carefully used these images to diagnose injury and disease, and to perform a range of interventional medical procedures [7, 8].

Therapeutic procedures include percutaneous drainage-decompression of the biliary tree or gallbladder, dilation of a bile duct stenosis or surgical anastomosis, placement of end biliary plastic or metal stents, removal of gallstones, and eventually, percutaneous intraluminal treatment of biliary tumors [9].

Since the early reports of percutaneous transhepatic cholangiography in the 1960s percutaneous biliary intervention has been practiced, and is now a common procedure for the interventional radiologist. However, in interventional radiology, biliary tract procedures often pose some of the most demanding and complex problems. Improvement of both technology and procedures over the past three decades has resulted in a continuing expansion of the field of biliary interventional practice [10]. Thus, the role of Interventional Radiology in diagnosing and treating patients with both benign and malignant biliary disease is developed and expanding.

In this review, we will look into role of therapeutic interventional radiology in gallbladder and biliary tree diagnosis and management.

Different biliary interventional techniques

Endoscopic procedures

Some steps of progress have been seen in the area of biliary therapeutic endoscopy. Of the various problems encountered by the endoscopist, strictures of the biliary tree probably pose one of the most frustrating of therapeutic dilemmas [11]. Although there are technical and cost considerations, the interventional radiologist may apply this useful tool to patients with a wide range of biliary diseases (eg, patients with retained intrahepatic stones, patients with suspected lesions requiring biopsy, etc) [12]. Also, is a primary therapeutic procedure for the management of biliary obstruction secondary to both benign and malignant causes [13]. A randomized controlled trial and meta-analyses have suggested that the endoscopic drainage approach provided superior results to both the transhepatic approach [14] and open surgical bypass in patients with malignant biliary obstruction [15, 16].

Endoscopic retrograde cholangiopancreatography (ERCP) is the preferred method of accessing the biliary system if possible. It used as a diagnostic and interventional procedure technique by using both endoscopy and fluoroscopy for examination and intervention of the biliary tree and pancreatic ducts.

During (ERCP), the success rates of biliary cannulation are greater than 90 % [17, 18]. However, cannulation failure may occur, particularly in complex patients with surgically altered anatomy, malignant invasions of major papilla and biliary tract, high grade stricture, or periampullary diverticulum. Currently accepted quality indicators for (ERCP) decrease cannulation failure rates to 3% to 5% in the hands of high volume endoscopists [19].

Furthermore, (ERCP) is the preferred procedure for biliary drainage for various pancreatic-biliary disorders. It is successful in 90% of the cases, but is unsuccessful in cases with altered anatomy or with tumors obstructing access to the duodenum [20]. Recently, endoscopic ultrasound has been used to assist biliary drainage in low obstructions where endoscopic retrograde cholangiopancreatography fails [21]. However, in too low or too high obstructions the success rate of endoscopic approach is less and, in such cases, percutaneous technique is preferred [22,23].

Percutaneous Procedure and Percutaneous Trans-hepatic Cholangiography

Percutaneous cholecystostomy (PC) is a therapeutic technique traditionally considered a temporizing measure until interval cholecystectomy is performed [24]. Percutaneous transhepatic cholangiography (PTC) is a diagnostic and/or therapeutic technique that is performed by first entering the biliary tree with a needle and then usually shortly afterwards with a catheter (percutaneous biliary drainage or PBD) [25]. PC is now utilized more than previously thought although, as the surgically unfit and aging population is growing [26]. It is usually used for gallbladder drainage but can also be used for additional procedures such as trans-cystic cholangiography and bile duct drainage, stone extraction and lithotripsy [27]. The most common indications are in patients with acute calculous cholecystitis who are poor surgical candidates and in critically ill patients with acalculous cholecystitis [10].

In view of this increased utilization of PC, several groups have observed that percutaneous drainage may not only work as a temporizing measure but as the definitive treatment, given unexpectedly low rates of delayed surgical cholecystectomy or recurrent cholecystitis [28]. The rates of interval cholecystectomy or recurrent cholecystitis after PC range between 0 and 50% with the lowest rates observed in patients with acalculous cholecystitis [29, 30].

PC has been shown to be useful in treating the acute phase of acute cholecystitis. It was reported that PC had a relatively low mortality and high technical and clinical success rate which can be performed portably at the patients' bedside in the event that the patient is too unstable to be transported outside the ICU [31].

PC is minimally invasive method of percutaneous placement of a drainage catheter in the gallbladder lumen under ultrasound and fluoroscopic guidance. It can be performed using a transhepatic or transperitoneal approach [10]. Patients who are resistant to medical therapy should be acutely treated with PC until the episode of cholecystitis resolves. However, some patients are still poor surgical candidates and are managed with PC alone. This approach has demonstrated up to 90% effectiveness in treating cholecystitis [32] However, the recurrence risk of calculous cholecystitis has been reported to be ~25% [33].

In PTC; a contrast medium is injected into a bile duct in the liver, after which X-rays are taken. It allows access to the biliary tree in cases where endoscopic retrograde cholangiopancreatography (ERCP) has been unsuccessful. PTC may only be carried out with fluoroscopic guidance or with ultrasonic guidance (US [34]. In treating both benign and malignant biliary disease, percutaneous transhepatic interventional techniques also play an important role. It uses in the treatment of biliary obstruction when endoscopic techniques are not appropriate or have failed. these include complex hilar or intrahepatic bile duct obstruction, interventions involving biliary-enteric anastomoses (where the normal trans ampullary ERCP access is lost), the diagnosis and treatment of post-surgical bile duct injuries and as access for treatment of biliary stone disease [35]. Percutaneous transhepatic biliary drainage (PTBD) is an image-guided therapeutic technique involving bile duct cannulation, followed by internal/external catheter drainage of bile contents. It is performed following opacification of the biliary tree by needle-directed contrast through PTC. It is indicated for decompression of the biliary tree, most often in malignant obstruction, and is typically reserved for failure of endoscopic intervention or high intrahepatic obstruction [36]. In practice, (PTBD) has been a part of biliary obstruction treatment for more than four decades. In addition, percutaneous technique is effective in cases where endoscopy has failed, duodenal rigidity, large or multiple obstructions, failure to traverse the biliary stricture or failure to cannulate papilla, post-surgical patients with anatomy altered or biliary enteric anastomosis [37].

The practical success rate for PBD in dilated ducts is typically over 90%. The problem of PBD effectiveness in non-dilated ducts is more contentious, with some authors suggesting a success rate of between 65 – 80% [38, 39]. Percutaneous trans-hepatic endoscopic procedures achieve a good clinical success rate (80%) in patients with previously unsuccessful endoscopic retrograde cholangiography [40].

Transperitoneal approach

In transperitoneal approach, the membrane of the gall bladder is perforated directly through the abdominal wall. Sanjay et al., however, suggested that the transperitoneal route should be used when the gallbladder is grossly distended and adhering to the abdominal wall, or when unfavorable anatomy makes transhepatic access difficult [41]. The transhepatic approach was found to be the more appropriate treatment choice for acute cholecystitis AC. Other than the rate of recurrence of cholecystitis, which was found to be higher among patients treated with the transperitoneal approach, there were no variations in the characteristics of transhepatic and transperitoneal treatment modalities, respectively. So, the transhepatic route appears superior to the transperitoneal [42].

Combined procedures of interventional technique

Percutaneous transhepatic cholangiography (PTC) assisted ERCP is an alternative technique. The combined PTC–ERCP technique improves the success rate of biliary tract cannulation and facilitates treatment [43]. The biliary tree can be accessed either retrogradely by the endoscopic trans papillary route or antegradely by the ultrasonography-guided percutaneous transhepatic route. The combination of these two techniques to promote internal drainage and achieve biliary decompression constitutes the rendezvous maneuver [44]. Despite the popularity of the procedure, there is limited data regarding the outcome of combined PTC and ERCP for biliary intervention [45].

Conclusion

Interventional radiology tends to play a vitally important role in treating patients with gallbladder and bile duct disease. Future studies should be conducted to assist identifying role of therapeutic radiology in patients with with gallbladder and biliary tree disease.

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