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Bile duct injuries in laparoscopic era

HISTORY OF LAPAROSCOPIC CHOLECYSTECTOMY

As a cause of hospitalisation, gallstones are the most common and costly digestive disease. Cholecystectomy is the standard method for treating symptomatic gallstones and gallbladder disease. Until the end of the 1980s, the surgery was done as an “open” procedure, requiring a large abdominal incision, a five- to six-day hospital stay, followed by three- to six-week convalescence. The advent of laparoscopic cholecystectomy as an alternative to conventional cholecystectomy marks a new mile stone in medical history. Laparoscopic cholecystectomy was first performed in France in 1987 (9), in the United States in 1988, and in Poland in 1991 (6). It is performed using video-telescopic visualisation of the gallbladder and surrounding vital strictures. After distension of the abdominal cavity with carbon dioxide gas, the laparoscopic imaging and surgical instruments are introduced through multiple incisions for visualisation, manipulation and dissection. Surgeons now consider laparoscopic cholecystectomy to be the “gold standard” when removal of the gallbladder is necessary.

EPIDEMIOLOGY OF THE BILE DUCT INJURIES

Every new procedure creates its own complications, and laparoscopic cholecystectomy is no exception. Based on currently available data, it is apparent that complications of laparoscopic cholecystectomy occur infrequently, although evidence indicates that the incidence of bile duct injuries (BDI) is increased compared with the incidence from open cholecystectomy. Operating with video laparoscopic guidance eliminates three-dimensional depth of perception, limits the ability of the surgeon to direct the view of the operating field and decreases tactile discrimination. These shortcomings may account for the increased incidence of bile duct injuries that have been observed in the operative experience of surgeons (3). The incidence of bile duct injuries after laparoscopic cholecystectomy varies widely in the literature. In some series, bile duct leakage from the cystic duct or the so-called duct of Luschka, an intrahepatic radicle, has been excluded because it is not considered important. In other series these minor injuries are included because patients’ burden is not always limited and even severe biliary peritonitis and sepsis can occur after these minor lesions. The real incidence of injuries is also influenced by the method used for data collection (11). In two reviews the incidence after an open procedure has been reported as 0.2% and 0.7% (10, 16), whereas the incidence after laparoscopic cholecystectomy was respectively 0.81 and 0.5%. One of the best studies, an audit from the West of Scotland, showed an incidence of 0.6%. The incidence decreased from 0.8 to 0.4% over the years.

CLINICAL PRESENTATION OF THE BDI

The classic injury that can occur during cholecystectomy is the cutting of the common bile or common hepatic ducts. Typically, injury to the bile duct occurs when a surgeon cuts the common bile duct mistaking for the cystic duct and thereby violating cardinal axiom of biliary surgery that every structure must be clearly identified before cutting. C u s c h i e r i (12) identified two major groups of errors, namely misidentification of the anatomy of the biliary tract as being the dominant factor in around 70% of the injuries, and technical errors leading to bleeding and subsequent clipping of the biliary duct/artery or leading to bile leakage by inadequate clipping or traction and subsequent wall injuries. Three different groups of patients can be identified according to the clinical presentation and this is mainly dependent on the time interval between the procedure, the start of first symptoms, and the detection of injury.

1. *Injury detected during laparoscopic cholecystectomy.* Around 15–30% of the injuries are detected during the initial surgical procedure. Generally, biliary leakage is the first symptom, but in some patients the injuries are detected during intraoperative cholangiography, showing filling of the distal common bile duct with contrast into the duodenum and without filling of the intrahepatic radicals.

2. *Delayed identification of a BDI.* The time interval between the initial laparoscopic procedure and diagnosis of a BDI varies widely. Most patients suffer from a delayed identification but this might be due to patient bias. The early symptoms are generally non-specific (nausea, vomiting, anorexia abdominal pain, and low-grade fever). The vagueness of the symptoms might be responsible for the delay in diagnosis. These patients were frequently discharged from hospital and re-admitted a few days later because of persistent vague abdominal complaints. Patients with delayed detection of injuries are suffering from bile leakage resulting in a biloma and biliary peritonitis or from (sub)total occlusion of the common bile duct leading to obstructive jaundice in the early phase. This is frequently followed by biliary leakage and biliary peritonitis due to the increasing intraductal pressure and subsequent leakage at the site of clips after 1–2 weeks. The presenting symptoms may vary widely and frequently not in accordance with the severity of the injury or extent of the intra-abdominal bile collection. A biloma can exist for a long period of time before symptoms occur.

3. *Long symptom-free interval* (three months to even more than one year). These patients present with obstructive jaundice due to a stricture of the common bile duct generally without cholangitis. It has been suggested that these late bile duct strictures originate from ischemic lesions caused by extensive dissection or partial occlusion of the common bile duct with a clip during the initial procedure.

DIAGNOSTIC PROCEDURES

When complications occur the surgeon should be familiar with the systematic diagnostic approach, that is from less invasive to more invasive. Initial clinical assessment includes history, physical examination, and laboratory investigations with haematological and biochemical studies. Ultrasound as a first non-invasive procedure can detect abnormal fluid collection at the gallbladder fossa, a common duct diameter of more than 10 mm with or without demonstrable retained stones. Subsequent percutaneous aspiration of bile will establish the diagnosis. The next step should be visualisation of the biliary tract by magnetic resonance cholangio-pancreatography or endoscopic visualisation (MRCP or ERCP). This enables not only to establish the diagnosis, but to identify the nature and level of the lesion. If MRCP is not available and ERCP only shows the distal bile duct that is occluded by a clip, percutaneous transhepatic cholangiography (PTC) can be performed to visualize the proximal biliary

tract. Occasionally, scintigraphy can be helpful to show leakage. Surgical reconstruction without visualisation of the entire biliary system should not be attempted.

CLASSIFICATION OF THE BDI

The generally accepted Corlette-Bismuth classification for bile duct lesions relates in detail to the level of injury (2). It cannot be used for all injuries to select a treatment, especially not for bile leaks after laparoscopic surgery, as well as for patients with limited stenosis of the CBD suitable for nonsurgical treatment. The new classification systems for BDI have been developed in recent years. McMahon et al. (8) suggested a division into minor and major bile duct injuries. This is helpful to differentiate the minor lesions as cystic duct leakage from major injuries of CBD, but not to select treatment options. Therefore, Strasberg et al. (13) reported a very detailed classification (types A–E) including various sub-classifications (E1–E4). This classification is very useful to select treatment by a multidisciplinary approach and to select patients who are candidates for referral centres. In 1993, a relatively simple classification with direct implication for further treatment was developed. In this classification, a BDI is defined as any clinically evident damage to the biliary system including the cystic duct and intrahepatic radicals (1). Four types of BDI can be identified: (A) cystic duct leaks or leakage from aberrant or peripheral hepatic radicles including so-called duct of Lushka; (B) major bile duct leaks with or without concomitant biliary strictures; (C) bile duct strictures without bile leakage, and (D) complete transection of the bile duct with or without excision of a part of the bile duct. This classification is helpful to select treatment for patients with BDI and also useful to analyse the long-term results according to the severity/nature of lesion.

MANAGEMENT OF THE BDI

The management of a BDI detected during laparoscopic cholecystectomy is dependent on local expertise. If sufficient experience in hepatobiliary surgery is not available, biliary drainage should be performed and the patient should be referred to a centre. If the local anatomy is unclear one should abandon further exploration, because it could lead to proximal extension of the lesion, sacrificing of normal, healthy duct tissue, damage to the arterial supply or clipping or ligation of the hepatic artery and thus will have a negative effect on the reconstruction in the near future. With the help of an experienced surgeon, further laparoscopic or open exploration can be performed to identify the structures in the hepatoduodenal ligament and the severity of the injury. If a common bile duct lesion is adequately identified and not associated with extensive damage or tissue loss and thus suitable for primary repair, an end-to-end anastomosis should be performed over T-tube for drainage. This procedure is associated with a high incidence of late bile duct strictures, but provides optimal internal biliary drainage with reasonable chance for cure. It also creates the optimal circumstances for reconstructive surgery by means of an elective hepatico-jejunostomy at later stage. Endoscopic stenting and/or balloon dilatation may be successful in these patients after primary repair and even if not successful, it does not adversely affect surgical reconstruction. If part of the bile duct is accidentally resected but the proximal duct is well below the bifurcation of the hepatic duct and local circumstances (experience) are optimal, an acute reconstruction by hepatico-jejunostomy can be performed. Patient with BDI, that are detected at the later phase, should not undergo exploration before classification of the injury, except in patients with severe biliary peritonitis who cannot be managed by percutaneous drainage. In patients with delayed diagnosis, drainage should be performed preferably by ERCP and stent insertion or PTC. Both techniques can be combined with US- or CT-guided percutaneous drainage of a bile collection. An important factor for surgical outcome is the timing of reconstruction. It has been suggested that surgical reconstruction by hepatico-jejunostomy in the late acute postoperative phase is associated

with a higher risk of postoperative complications such as bile leakage and eventually stenosis of the anastomosis. Therefore, patients are sent home with a drainage catheter and a collection bag and some of these patients will have a nasogastric tube or percutaneous gastric catheter to replace bile into the duodenum. Reconstruction of the biliary tract is performed electively after 6–8 weeks.

ROLE OF THE DRAINAGE IN THE PREVENTION OF THE BDI OR BILE LEAKS FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY

Bile leak, defined as a clinically significant fistula or collection, is one of the complications that may follow open and laparoscopic cholecystectomy. Although it may be a consequence of injury to the common bile duct, it may also occur as a result of leakage from an incompletely secured cystic duct or from small ducts which empty directly into the gallbladder from the liver. Since *Langenbuch* (7), the value of routine drainage after cholecystectomy has remained controversial. Some authors have suggested that to perform cholecystectomy without drain would be medico-legally unacceptable (4).

In contrast to this extreme viewpoint, many surgeons point to the reports in the published literature demonstrating that cholecystectomy has been performed for many years without the use of drains (10,14). The case for avoiding the use of drains is supported by the numerous studies demonstrating a higher incidence of postoperative morbidity associated with the use of drains (5,15).

Bile leakage is seen more frequently after laparoscopic than open cholecystectomy for reasons that are currently unclear. Some authors believe that the use of routine gallbladder bed drainage is justified for this reason alone. It is performed as a passive tube or suction drainage and does not always secure postoperative evacuation of fluid and prevention of liquid collections. Some authors propose modifications consisting of using a larger bore of drain and different methods of its placement. On the other hand, the majority of laparoscopic surgeons do not drain the gallbladder bed.

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SUMMARY

The article describes the problem of bile duct injuries after laparoscopic cholecystectomy. Epidemiology, diagnostic and therapeutic management were presented based on the current literature review.

Uszkodzenia dróg żółciowych w epoce zabiegów laparoskopowych

W artykule poruszono problem uszkodzeń dróg żółciowych u pacjentów poddanych laparoskopowej cholecystektomii. Przedstawiono między innymi epidemiologię, diagnostykę i postępowanie w oparciu o dostępną literaturę.