

Management Of Bile Duct Injuries After Cholecystectomy: Therapeutic Approach And Examination Of Possible Sources Of Error. Report of 2 cases.

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Abstract

Background: Bile duct injuries is the primary concern of general surgeons during and after cholecystectomy, with an incidence ranging from 0.08% to 0.4%. Through the description of two cases we intend to discuss the management of most frequent types of bile duct injuries after cholecystectomy and examine some possible sources of error.

Case reports: We have treated 2 cases previously operated by other surgical teams. Case report 1: patient undergoing laparoscopic cholecystectomy with lesion of the main bile duct, treated with its reconstruction with positioning of a T-drainage tube. Case report 2: patient with jaundice previously treated for incarcerated incisional hernia and gallbladder stones. We verified the presence of a stenosis of the main bile duct which was resolved with the positioning of a T-tube drainage

Discussion: Many descriptions and classifications regarding iatrogenic lesions of the bile duct after cholecystectomy have been described, although some of them represent a good guide on the surgical approach to be adopted, but the surgical skills possessed by the operator remain the most important variables

Conclusions: All possible precautions must be considered in order to avoid the possibility of damaging the biliary tree. In our opinion an anterograde approach during cholecystectomy offers greater safety.

Keywords: bile duct injuries, laparoscopic cholecystectomy, intraoperative cholangiography, fluorescence guided surgery, gallbladder stones.

Introduction

Cholecystectomy is one of the most commonly performed operation on the gastrointestinal tract, and it is the standard procedure in the treatment of symptomatic gallstones disease. Many studies have reported increased use of cholecystectomy after the spread of laparoscopy^[1], and this treatment is considered the gold standard. Bile duct injuries (BDI) remain the primary concern of general surgeons during and after cholecystectomy, with an incidence ranging from 0.08% to 0.4%^[2-4], in fact, iatrogenic biliary tract injuries can occur after surgical procedures involving the gallbladder and main biliary tract, pancreatic, gastric and liver surgery, laparoscopic cholecystectomy is responsible for 80% -85% of them^[5,6].

Anatomical variations in the extrahepatic biliary tract, combined with inflammation or obesity or wrong anatomical interpretation of the surgeon could represent the reasons for the complications^[7], among these the most frequent are bile leakage and biliary tract occlusion with obstructive jaundice. Sometimes BDI are recognized during the surgery, other times in the peri and postoperative period^[8-10]. Through the description of two cases we intend to discuss the management of most frequent types of bile duct injuries after cholecystectomy and examine some possible sources of error.

Case report 1

67-year-old man came to the emergency Department with abdominal pain in right hypochondrium, nausea and

asthenia. Anamnestically he underwent laparoscopic cholecystectomy at another hospital seven days before and was discharged in good health. After the ultrasound exam of the abdomen in urgency, which showed the presence of intra-abdominal effusion, he was hospitalized in our Department. Blood tests showed mild leukocytosis, moderate anemia (9.8 Hb), increased systemic inflammation indexes, direct and indirect bilirubin levels respectively 1.51 and 1.10 mg/dl. A computed tomography scan was requested which confirmed the presence of abundant intra-abdominal effusion in all peritoneal recesses with undilated internal bile ducts and hyperemic walls of the choledochus. (Figure 1).

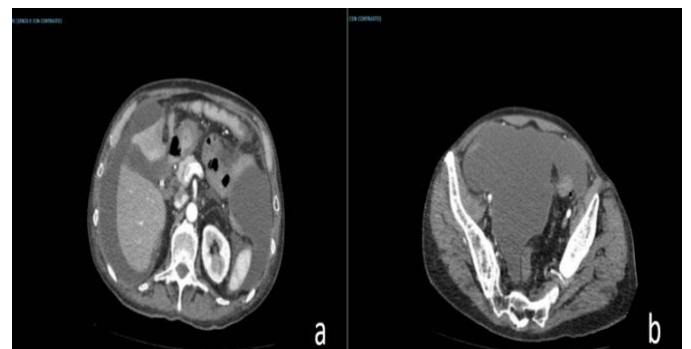


Figure 1. CT images. Abundant intra-abdominal effusion a) periepic and perisplenic effusion; b) effusion in Douglas space.

On the basis of clinical, laboratory and diagnostic / instrumental data it was decided to subject the patient to an exploratory laparotomy. During the surgery a toilet of the abdominal cavity was performed, were removed 2 liters of biliary effusion. Surgical site appeared altered by the outcomes of biliary leak and inflammation. Along the lateral wall of main bile duct, a open lesion was found so that after carrying out intraoperative cholangiography we proceeded to the reconstruction of the bile duct with the positioning of a T-tube biliary drainage. (Figure 2).

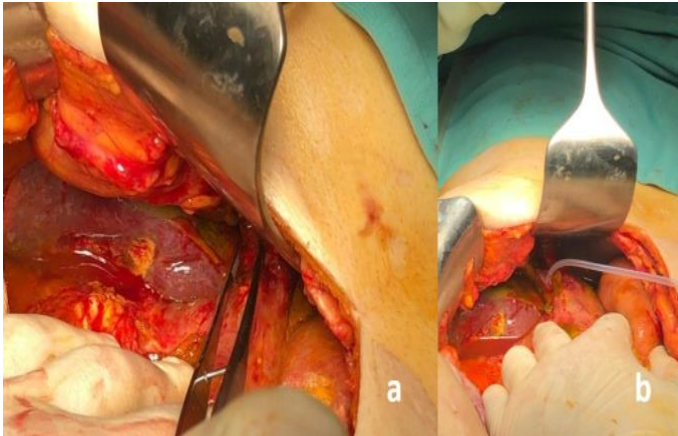


Figure 2. Intraoperative images. a) Lesion on lateral wall of Common bile duct; b) T Tube positioning.

The abdominal cavity was closed after placement of multiple drains. Postoperative course was characterized by an episode of high temperature on the first day, and bilirubin levels normalized on the second postoperative day. The T-tube was always functional and washed daily with physiological solution to avoid its obstruction. The abdominal perihepatic drainages first showed bile secretion, then normalized and removed in fifth (perisplenic), sixth (pelvic site), ninth (perihepatic site) postoperative day. The patient was discharged in fifteenth postoperative day in apyrexia and good clinical condition. Kehr drainage was removed after contrast control in the sixth postoperative week.

Case report 2

A 54-year-old woman with postoperative jaundice was transferred to our department. Ten days earlier, in another surgical department, she underwent an emergency median relaparotomy for incarcerated incisional hernia and asymptomatic cholelithiasis detected on a CT examination. In the subsequent postoperative period (first day), blood tests showed an increase in cholestasis and direct bilirubinemia. This increase also continued on the second and third postoperative days. The subsequent CT examination showed an interruption of the main bile duct and for this reason the patient came to our attention. The patient had high levels of direct bilirubinemia (19 mg / dl) and discomfort due to jaundice so we decided to perform an MRI scan to better evaluate the morphology of the biliary tree (figures 3) which confirmed the stop.

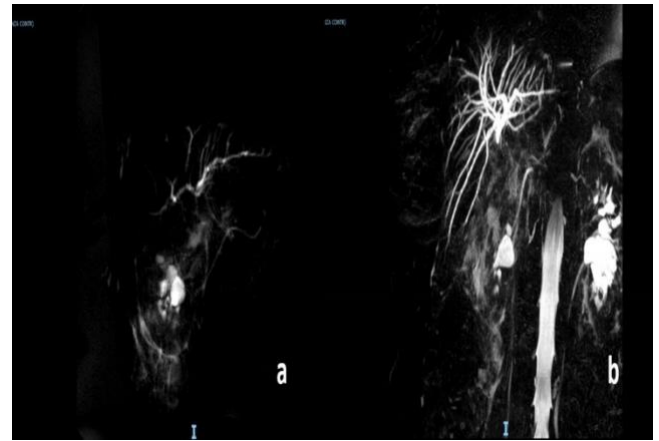


Figure 3. Magnetic resonance images. a) shows a sharp stop along the course of the biliary tract; b) dilatation of the intrahepatic bile ducts.

An indication was given to surgical treatment which can no longer be postponed. For better exposure of the operative site, a right subcostal incision was performed. The identification of the main biliary tract was not easy due to recent operation. Two sutures on the main bile duct have been identified without total interruption (Strasberg E4). Therefore, we proceeded to restore the patency of the main bile duct and positioned a T-tube biliary drainage (Figure 4).

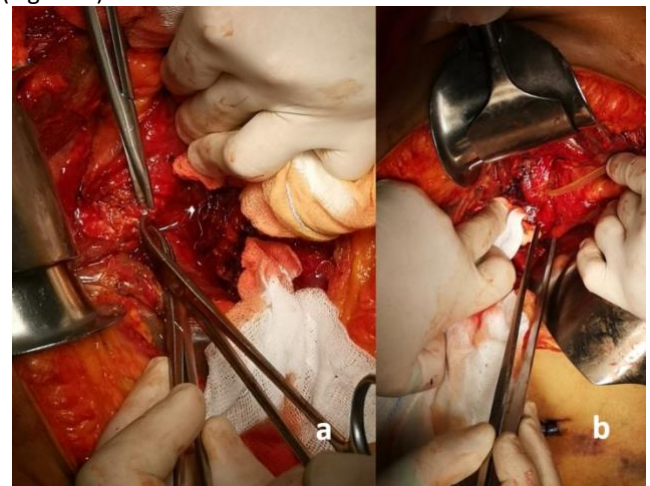


Figure 4. Intraoperative images. a) Cutting of ligatures that obstructed the bile duct; b) T Tube drainage positioning.

Post-operative period was characterized by a slow but gradual descent of bilirubinemia and cholestasis. The patient was discharged on the tenth post-operative day in apyrexia and good clinical condition. T-tube drainage was removed after contrast control in the sixth postoperative week.

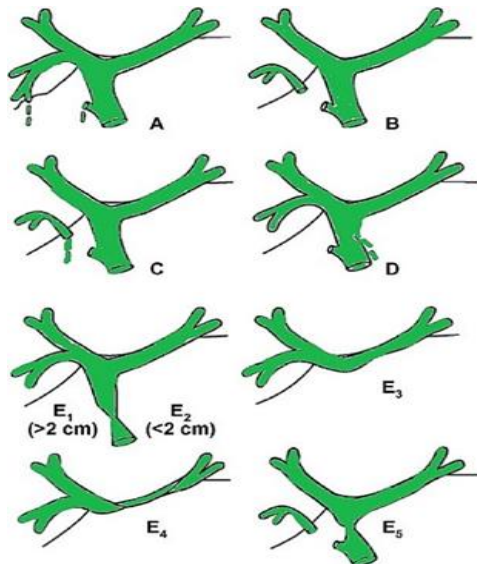


Figure 5. Strasberg classification.

Discussion

The description and classification of iatrogenic bile duct injuries after cholecystectomy should always include all clinically relevant data on each injury pattern, which will have an impact on surgical treatment and outcome^[11]. The first classification of bile duct injury is authored by H. Bismuth in 1982^[12], so was introduced before laparoscopy and it is not so comfortable to apply in laparoscopic cholecystectomy because most of technical factors and lesion mechanisms are different to open surgery. Stewart-Way classification involves four strata based on the mechanism and anatomy of injury^[13], in the Hannover classification, bile duct injuries were divided into five types from A to E, was published in 2007 but is poorly known in the world literature. It classifies injuries in relationship to the confluence and also includes vascular injuries^[14]. The Strasberg classification (Figure 5) represents an innovation compared to Bismuth classification, because it differentiates the small ones from the most important injuries that can happen during laparoscopic cholecystectomy. Type A represents a bile leak from the cystic duct or small ducts in liver bed. Type B is the occlusion of an accessory duct with no continuity with the common bile duct. Type C represents a transection without ligation of a bile duct. Type D is a partial section, lateral injury of a bile duct with no complete loss of continuity with the rest of the bile duct system. Finally type E is a complete section of the bile duct with subtypes according to the length of the stump (E1-E2 more or less than 2 cm, E3 transection in the hilum E4 separation of major ducts in the hilum, E5 Stricture of the main bile duct and the right posterior sectoral duct)^[15]. Repair of damaged Common Bile Duct is a technically challenging undertaking, that may best be performed by experienced hepatobiliary surgeons. However, the possible clinical and surgical scenarios and the consequent classifications continue to be always under review. We have reported two clinical cases concerning two of the most common scenarios.

First scenario: bile leak and coleperitoneum

Generally, bile leak scenario could be documented trans-operatively or in first postoperative week, with bile effusion recognized through surgical drains, or surgical wounds. Patients frequently complain abdominal pain, nausea, and sometimes fever. Strasberg classification is a supportive tool to select the best intervention for each case according to clinical case. In presence of this injury, diagnosis is made intra-operatively or in first postoperative week. During surgery after having performed the cholecystectomy and having appropriately clipped and dissected the elements, if bile is noted in the operating field, it is required to wash with physiological water and then apply a white gauze on which a color test is then performed to exclude the presence of bile. In this way, an attempt is made to verify that there is no biliary fluid. However, intraoperative tests may be negative, and damage of the bile duct may occur in the immediate post-operative period. This often occurs due to the falling of a clip on the cystic duct or following imprudent maneuvers with electrosurgery that can cause small areas of necrosis on the bile duct and following injury.

Second scenario: bile duct obstruction

Bile duct obstruction commonly manifests itself with abdominal pain in the upper right side, jaundice, nausea, itching dark urine and pale colored stools. The obstruction of the main bile duct is another possible unpleasant complication after cholecystectomy. Most of these patients have a complex Strasberg E injury identified in the trans-operative period. Some partial stenosis (Strasberg B and C) are not characterized by the immediate appearance of jaundice, and the signs can be non-specific and attributable to post-intervention pain (abdominal pain, general weakness, fever). The alteration of liver function tests can insinuate the suspicion of a lesion of the biliary tract, in order to monitoring the patient and identify a possible lesion as soon as possible to improve the prognosis. In 2018 at our Surgical Department were performed 220 cholecystectomies. We observed a conversion rate of 9%, and most of the surgical approaches were performed in urgency. No biliary lesions were reported. However, some cases of biliary tract lesions after cholecystectomy have come to our attention from neighboring hospitals. In 3 cases, the presence of bile nuances was observed from surgical drainage, without significant alterations in laboratory tests. In these cases no further instrumental checks were performed, but the patients underwent endoscopic procedures. The objective was to decrease intraductal pressure and consequently reduce the leakage (Strasberg type A injury). Almost all sub-vesical bile duct leaks could receive an intra-biliary stent placement or sphincterotomy by ERCP^[16,17]. In our case reports described a surgical approach was needed, as they were injuries respectively Strasberg type D and type E4. These patients have been operated in other hospitals and therefore we felt it necessary to compare with these colleagues.

First scenario reported an injury that occurred after a simple laparoscopic cholecystectomy (Strasberg type D). The surgeon in question reported not having noticed anatomical anomalies during the operation, but he claimed

to have used a different device different than usual, due to end of stock. No other significant consideration was reported. In the second scenario, the patient had to undergo an emergency operation for a strangulated incisional hernia, and the surgeon also performed a cholecystectomy, on indication provided by the previous CT exam which showed gallbladder stones. The surgeon reported having had difficulties during cholecystectomy, due to the unconventional access route, he reported difficulties due to the different access route and due to hemostasis problems he had to perform many surgical stitches. In both cases, the comparison with the first surgeons revealed anomalies regarding the normal practice of the operation: in the first case a different device was used than usual, in the second case a different access route led to anatomical and bleeding problems. Cholecystectomy is the treatment of choice for symptomatic gallstones but it can lead to post-operative biliary injuries. There are multiple reasons which can cause those injuries such as inexperience of the surgeon, anatomical variations, inflammation of gallbladder and surrounding tissues^[18-20]. Misidentification of the bile ducts is the leading cause of biliary injury. To avoid this, the technique should be employed with always the same procedure. Inexperienced surgeons should be cautious about using other technique, as this may increase the risk of biliary injury in difficult cases. Data suggest that these injuries should be managed by a hepatobiliary surgeon with great skills in biliary reconstruction, with good despite the injury that occurred^[21-23]. Contradictory meta-analyses regarding the usefulness of a T-tube in performing end-to-end ductal anastomosis, and other surgical procedures^[24-27], can be found in the literature. External T-tube drainage requires introduction of its short branches into the bile duct and conducting of its long branch through the abdominal wall outside. It can be removed percutaneously after restorative of the end-to-end ductal anastomosis. Despite the several publications and debates, there is still no unanimity concerning the best setting and method to avoid bile duct injuries. Most surgeons would agree about using the Critical View of Safety (CVS)^[28] method and intraoperative cholangiography (IOC)^[29]. The use of this approach is supported by the Task Force Safe Cholecystectomy (SCTF), employed by the Society of American Gastrointestinal Endoscopic Surgeons (SAGES)^[30]. However, there are other methods including various dissection techniques (infundibular, anterograde^[31], etc.), reference techniques, groove of Rouvière, node of Calot, or use of ultrasound, and others less employed. In the latter period many surgical groups show interest in Image guided-surgery is one of the mainstays of the emerging concept of “Precision Medicine and Surgery”, and aims to provide surgeons an enhanced appreciation of anatomical structures and improve the efficacy and safety of surgical procedures. Near-infrared fluorescence imaging is a novel and promising technique which could provide enhanced visualization of anatomy and organ functions based on the sensitive signal following the specific injection of fluorophores. Advantages such as optic-based detection, real-time imaging, integratable surgical

workflow and reasonable cost provide a rational for its application in various surgical procedures^[32]. At our department, anterograde dissection is used as a technique of choice during laparoscopic cholecystectomy. It is not only an easy and safe procedure, but it also seems to reduce intervention times. The prevention of BDI requires the secure identification of the cystic duct and the cystic artery before dissection and we think that anterograde dissection is the best way to do it. This technique, can be proposed as an easy, safe, and time-sparing technique and it should be chosen as a procedure for postgraduate students training in general surgery^[33].

Conclusions

Cholecystectomy, especially with a laparoscopic technique, is a routine operation but should not be underestimated. The reason is that the possible intraoperative complications may require a surgical reintervention, with greater technical difficulties, and consequent increase in hospitalization times and risks for the patient's life. We believe that the recognition of the intraoperatively lesion requires an immediate treatment, especially for the most favorable anatomical situation. In lesions diagnosed in the postoperative period, we prefer the earliest possible interventions to avoid the serious metabolic and septic damages resulting from the type of injury. All possible precautions must be considered in order to avoid the possibility of damaging the biliary tree. The technique developed by the operating surgeon should always be the same, because the change of operative mode can increase the risk of injury. The possibility of performing an anterograde cholecystectomy, when the position of the elements at the hilum makes it difficult to recognize, certainly offers greater safety.

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