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Review article

Iatrogenic bile duct injuries

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A B S T R A C T

Bile duct injuries can be caused by different reasons, with Iatrogenic Bile Duct Injuries (IBDI) being the most common factor. IBDI is a complex situation produced in apparently healthy patients and is associated with a high rate of morbidity and a low rate of mortality. A multidisciplinary approach between surgeons, radiologist and endoscopist offers the best chances for an initial diagnosis, therapeutic options, management and follow up of complications for the patient. The aim of this review is to describe the current medical literature with reference to IBDI, and discuss our therapeutic algorithm.

Lesiones iatrogénicas de la vía biliar

Palabras clave:
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R E S U M E N

Las lesiones de la vía biliar se pueden producir por múltiples causas, siendo las lesiones iatrogénicas de la vía biliar las más frecuentes. Son situaciones clínicas complejas producidas en pacientes aparentemente sanos que se asocian a una morbilidad importante y una mortalidad baja pero no despreciable. Un tratamiento correcto requiere un alto nivel de sospecha en el intraoperatorio y en el postoperatorio inmediato, y un abordaje multidisciplinario entre cirujanos, radiólogos y endoscopistas para ofrecer al paciente el mejor diagnóstico inicial, las mejores opciones terapéuticas y el mejor manejo y seguimiento de las complicaciones. Con esta revisión pretendemos describir la situación actual de la literatura con respecto a este tipo de lesiones y su manejo terapéutico, y hemos efectuado un algoritmo terapéutico.

Iatrogenic bile duct injuries (IBDI) are complex clinical situations usually caused by surgeons in healthy patients, and are associated with significant morbidity and low, but not negligible, mortality.[1] IBDI can result from surgery (cholecystectomy, liver transplants and other procedures) or non-surgery (tumour ablative therapies [RF], liver biopsies, TIPS or external radiation therapy).[2]

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Most IBDI occurs during cholecystectomy. Since Carl Langebuch performed the first open cholecystectomy in 1882 until now,[3,4] IBDI has been an inherent complication of this surgery due to the surgeon's perceptive error. Laparoscopic cholecystectomy (LC) has led to a decrease in postoperative pain and hospital stay, but unfortunately has increased some complications such as IBDI.[5] In a meta-analysis of more than 78 747 LCs, the IBDI incidence ranged from 0.36%-0.47%.[6]

To treat IBDI correctly, high level of scrutiny in the intraoperative and immediate postoperative phases is required,[7] and also a multidisciplinary approach between surgeons, radiologists and gastroenterologists to offer the patient the best initial diagnosis, the best treatment options and better management of complications and follow-up is needed.[8]

This review article is intended to describe the current status of the literature on this type of injury and its therapeutic management.

Classification

Different classifications of IBDI have been proposed, based on the anatomical level of the injury or the action needed to be taken, but remarkably none have assessed factors such as sepsis, the patient's haemodynamic status or comorbidities. The presence of associated vascular lesions generally in IBDI which are more proximal to the liver hilum and its clinical impact is considered in the classifications of Hannover,[9] Lau,[10] Kapoor,[11] and Stewart-Way,[12] but not in those of Strasberg,[13] Bismuth,[14] Neuhaus,[15] Csendes,[16] McMahon,[17] Siewert,[18] Frattaroli,[19] or Amsterdam.[20] In general, none of these classifications is accepted as a universal standard which reduces its clinical usefullness. The most commonly used are those of Strasberg (Figure 1) and Bismuth.

Risk factors

Age/sex: male and elderly patients have an increased risk of IBDI.[21]

Congenital malformations: partial liver agenesis has been described as a risk factor.[22]

Acute cholecystitis: IBDI is 3 times more frequent in LC due to acute cholecystitis with an incidence between 0.77%-5.0%, and is the most important predisposing factor for IBDI.[23-28]

Hidden cystic duct syndrome: When the infundibulum is dissected to identify the cystic duct (CD) in the infundibular technique, the hepatocholedochus may be confused with a falsely identified cystic duct and sectioned. This is more likely in the presence of acute or chronic inflammation, large stones impacted in the infundibulum, adhesions between the gallbladder and choledochus and intrahepatic vesicles.[29-32]

Anatomical anomalies of the biliary tract (BT). Anomalously, the CD can bind to the bile duct very near to the location of the segmental sectoral ducts. It may drain into a sectoral duct, as well as in the convergence of anterior and posterior sectoral ducts.[33] The confluence between the CD and the main BT may be angular (75%), parallel (20%) or spiral (5%). With a parallel implementation, it is possible to thermally damage the exterior of the bile duct when dissecting due to its proximity.[34]

LC perceptive error and conversion to open surgery: although the infundibulum technique is a good option for

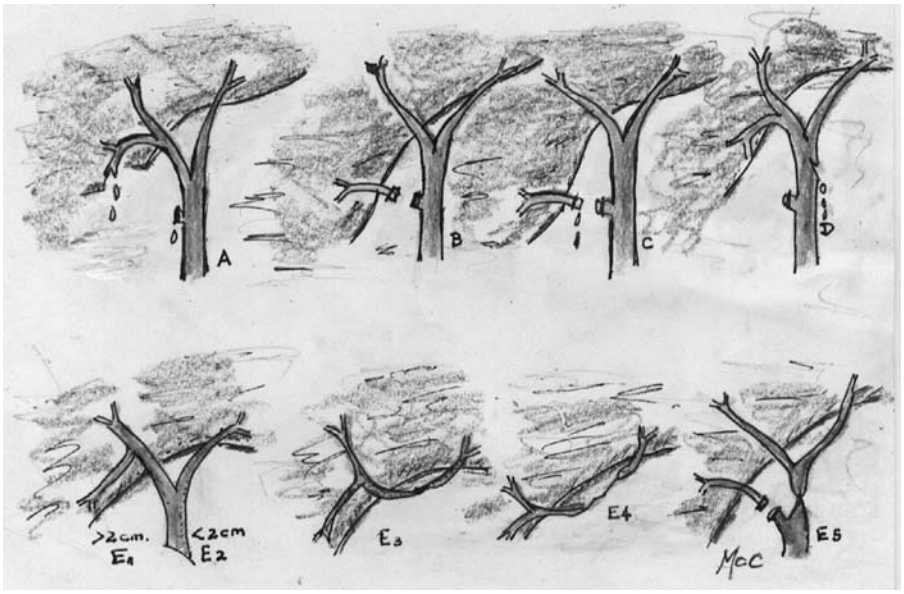

Figure 1 – Strasberg IBDI classification. A) Bile leak from cystic duct or a canaliculus in the liver bed. B) Partial occlusion of the biliary tree, almost invariably due to an aberrant right hepatic duct. C) Transection without ligation of the aberrant right hepatic duct. D) Lateral damage to a major hepatic duct. E) Subdivided according to the Bismuth classification in E1-E5.

acute cholecystitis for open surgery, when a cholecystocholedochal fistula is suspected, this technique may lead to injuring the bile duct in laparoscopic surgery.[34]

Type of approach: IBDI due to LC is more serious and complex due to its more proximal location, its frequent association with vascular injury and the associated thermal mechanism.[35-37]

Experience of the surgeon: although experience is essential to prevent high morbidity with any surgery, in LC the learning curve seems to be the most important factor for minimising IBDI figures.[38-40]

Preventive measures

There are many techniques for preventing IBDI: use of a 30 degree camera, avoiding using thermocoagulation near the main BT, meticulous dissection and conversion to open surgery when the anatomy is uncertain.[41,42]

Navigation principles have been copied to reduce IBDI. For open cholecystectomy, there is the fundus first technique. In LC, the reference point is the Groove of Rouviere[43] (Figure 2). Since the main cause of IBDI is misidentification of the main BT, or an aberrant duct like the CD, the surgeon must have a way to identify the artery and CD.[44]

The following are among the methods used:

1. Tri-structure method: During LC, the CD, common hepatic duct and common bile duct must be identified.[45]
2. Fischer method: Consists of completely separating the gallbladder from the gallbladder bed from the bottom towards the infundibulum, as in open surgery, until it hangs from the artery and the CD. This is especially difficult in intrahepatic or very swollen vesicles.[46] Separating the gallbladder from the liver bed also tends to bleed more, due to it not having been previously linked to the cystic artery.
3. Infundibular technique: Consists of identifying the CD where it joins the infundibulum of gallbladder. It is currently the most widely used technique in most centres. It has the drawback of not preventing IBDI in patients with hidden cystic duct syndrome. Thus, different groups consistently recommend the use of intraoperative cholangiography (IOC) with this type of technique.[34]
4. Strasberg Critical View Technique: Consists of the dissection and removal of Calot's triangle to expose the artery and CD, thereby exposing the base of the liver. Once this view has been achieved, theses structures can only correspond to the duct and cystic artery (Figure 3).[26] For aberrant ducts or cases of very swollen vesicles, it is suggested that the inner layer of the subserosa be exposed, which optimises the critical view.[47]
5. Cholangiography: Since the Argentinian, Pablo Mirizzi, introduced the first intraoperative cholangiography to the present day,[48] its benefit for preventing IBDI has been debated. IOC can help prevent IBDI in at least 3 ways[49]:
   1. It shows the diversity of the biliary tree and its abnormalities.
   2. It helps the surgeon to identify patients at risk of IBDI due to abnormal anatomy.
   3. It allows IBDI to be identified and repaired, if it has occurred.

   IOC has proven to be cost-effective, especially if used by less experienced surgeons or if there are risk factors.[50] Other studies do not accept that IOC prevents the incidence of IBDI and highlight the increase in total surgery time.[51,52] Currently, there are no randomised trials supporting the use of IOC.[53]
6. Intraoperative laparoscopic ultrasound: its advantages in preventing IBDI were highlighted in a recent multicentre study. However, it is another method which is very expensive and often not available in hospitals. It does not completely replace IOC but has a promising future.[54]

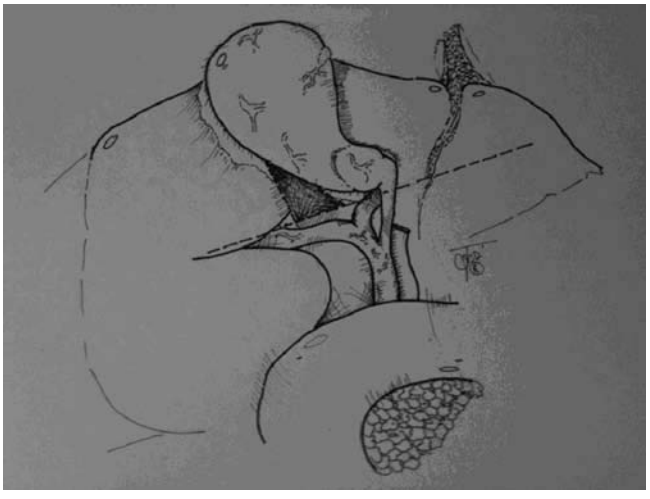

Figure 2 – Groove of Rouviere: A visible channel in up to 90% of patients, containing the right portal pedicle and identifying the sagittal plane of the main bile duct. Dissection can be started safely in a triangle before and above the plane of the groove.

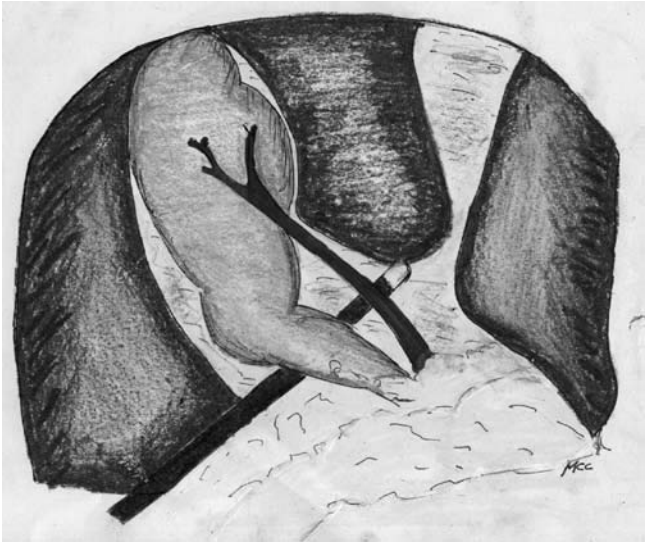

Figure 3 – Strasberg's Critical view.

Diagnosis

A high level of scrutiny must be maintained to diagnose IBDI.[55] There are three possible scenarios[56]:

1. Intraoperative diagnosis (<50%).
2. Immediate post-operative diagnosis: patients who are not clinically well during the first 48hrs after surgery, or with bile in the abdominal drainage. It may be accompanied by cholestasis.[57,58]
3. Patients diagnosed late with symptoms of cholangitis or obstructive jaundice.

Ultrasound can show fluid collections and expansion of the BT, but it does not reveal the full path of the BT or other related injuries. Computed tomography (CT) with contrast is therefore recommended as an initial diagnostic study. Taken with the information from ultrasound, it can assess the level of injury, associated vascular damage or liver atrophy-hypertrophy.[59] Scanning with iminodiacetic acid (HIDA scan) helps to diagnose bile leaks, but does not mark the limits of the injury and the biliary anatomy.[60] MR cholangiography identifies any need for ERCP due to leakage of small biliary radicals or cystic duct stump leak, and gives information on the presence or absence of choledocholithiasis.[61,62] MR cholangiography with manganese is a non-invasive method which is efficient in the diagnosis of IBDI, but requires larger series to evaluate it.[63]

The level of IBDI in the biliary tree can be seen by cholangiography using PTCA or ERCP. In cases of lesions proximal to the hilum, with transaction or presence of an aberrant, ERCP cannot draw the biliary tree correctly, requiring anterograde cholangiography by PTCA.[64]

Therapeutic approach

Treatment of IBDI is complex and multidisciplinary. The following factors need to be known: the type of injury, the patient's clinical condition, associated vascular damage, local hospital factors, etc.

Some general comments on non-surgical and surgical treatment are briefly described below, especially regarding hepaticojejunostomy (HJ). Subsequently, treatment according to the Strasberg types is defined. Endoscopic treatment for Strasberg type A injuries is also expanded upon.

1. Non-surgical treatment (endoscopic and interventional radiology)
   The multimodal treatment of IBDI includes endoscopic treatment and interventional radiology. Percutaneous interventional radiology techniques require bilioenteric continuity. They are less invasive and may be more appropriate in patients who are not candidates for surgery, or in those whose anatomy makes it technically very difficult to use endoscopic instrumentation.[65] The development of covered self-expanding stents, specifically designed to be removed later, may soon change the management of benign strictures.[66]
2. Surgical treatment
   There are 3 independent prognostic parameters for surgical treatment of IBDI which involve poor postoperative outcome and a higher rate of complications[67]:
   1. Proximal IBDI: technically much more complex to repair and usually associated with vascular injury.[68]
   2. Repair in the acute phase: For acute IBDI, immediate repair is the best option if the patient's haemodynamic status and septic conditions allow it.[69] There is no evidence to support early or deferred repair when IBDI is identified days after the injury.[70]
   3. Late referral to a tertiary centre: biliary reconstruction in a reference centre by an experienced surgeon in IBDI has a better success rate as well as shorter hospital stay, morbidity and mortality. The moment of referral to a tertiary centre can drastically affect biliary reconstruction surgery when this is performed.[67]

Surgical technique

The bilioenteric anastomosis which offers the best results is Roux-en-Y HJ. The defunctionalised loop guarantees the absence of intestinal reflux into the BT, and prevents ascending cholangitis. The hepatoduodenal anastomosis has an increased anastomotic tension, a macroscopic reflux of food at the biliary tree level and the possibility of developing a high debit biliary fistula.[71] The most common errors related to repair failures and bilioenteric anastomosis are the lack of complete mucosal apposition between the BT and the intestine and the use of poorly absorbable suture material.[72]

The use of a transanastomotic stent is not universal. Placing it proximally so as not go through the repair has been suggested.[73,74] Using a redundant proximal loop attached to the wall to make it easier to perform percutaneous radiological monitoring has also been suggested.[75-77]

There are experimental animal studies for IBDI using ringed Gore-Tex vascular prostheses,[78] magnetic stents,[79] fibrin glue products,[80] and vesicular flaps for biliary reconstruction.[81]

There are 2 complications that require liver transplants (LT): IBDI associated with repeat episodes of cholangitis and chronic cholestasis with secondary biliary cirrhosis and lesions of the hepatic hilar vessels, especially the hepatic artery, which leads to a fulminant hepatic failure.[82] There are few articles on LT secondary to IBDI.[83-88] In general, a transplant in these patients is technically more complex for the following reasons: intra-abdominal adhesions, sclerosis of the hepatic pedicle, severe portal hypertension and associated coagulopathy.[89] The higher incidence of IBDI due to LC suggests that the indication of LT will increase in the future.[90]

Techniques according to the Strasberg IBDI classification

Type A: Endoscopic treatment (papillotomy+prosthesis) for CD bile leakage is very efficient. However, if the leakage is more proximal, the percentage of clinical resolution is

lower.[91] The differences in the basal pressure or intraductal pressure , the CD length and BT diameter may explain the differences in outcomes.[92] There are no comparative data to define the optimal number of stents, their size, configuration (straight or pigtail), length and withdrawal time.[93] There is no difference between the use of stents passing through the leak (leak bridging) or reductions that only decompress and reduce the transpapillary pressure gradient.[94] Although in some centres these lesions are addressed in the immediate postoperative period through exploratory laparoscopy and repositioning of clips or Luschka duct suturing, there is currently no comparative study to compare the endoscopic and laparoscopic approaches in this scenario (Figure 4).

Type B: (Figure 5).

Type C: (Figure 5) there is no continuity with the main BT so the use of a prosthesis would not be effective. If the duct is small, it can be linked, developing into atrophy,[95] or leading to cholangitis episodes. If there is a duct of greater calibre (2 or more segments), it should be reconstructed by HJ. Biliary reconstruction in an aberrant right sectorial with respect to the main BT has greater occurrences of stenosis and long-term cholangitis.[96] Liver resection should be reserved for the failure of a previous HJ or if symptoms are persistent.[97]

Type D: (Figure 5) Can be addressed as follows:

- Primary closure with absorbable suture and a subhepatic drain. The placement of a T tube has been associated with an increased amount of late stenosis in transplanted patients.[98] It therefore seems prudent to avoid placing a foreign body in a non-dilated BT.[53]
- End-end anastomosis: This depends on a number of factors, such as the presence of intact proximal and distal ends, similarity in diameter between the ends, lesions less than 1 cm in length and no excessive tension or signs of infection or inflammation. The advantages are its simplicity and the preservation of the length of the BT, however, approximately half is stenotic during follow-up. A reinforcement has been described using a patch from the umbilical vein and round ligament adipose tissue.[99-101]
- Hepaticojejunostomy: this is the most used and safest method. Bilioenteric anastomosis with side-to-side anastomosis is better as it preserves the blood supply better and minimises the dissection behind the ducts.[102] It is recommended to perform HJ on the extrahepatic portion of the left hepatic duct (LHD) at the base of segment IV, with side-to-side anastomosis between the LHD and Roux-en-Y jejunum. This technique was described by Hepp and is called the Hepp-Coinaud technique in reference to the extrahepatic anatomical description of the LHD described by Coinaud.[103]

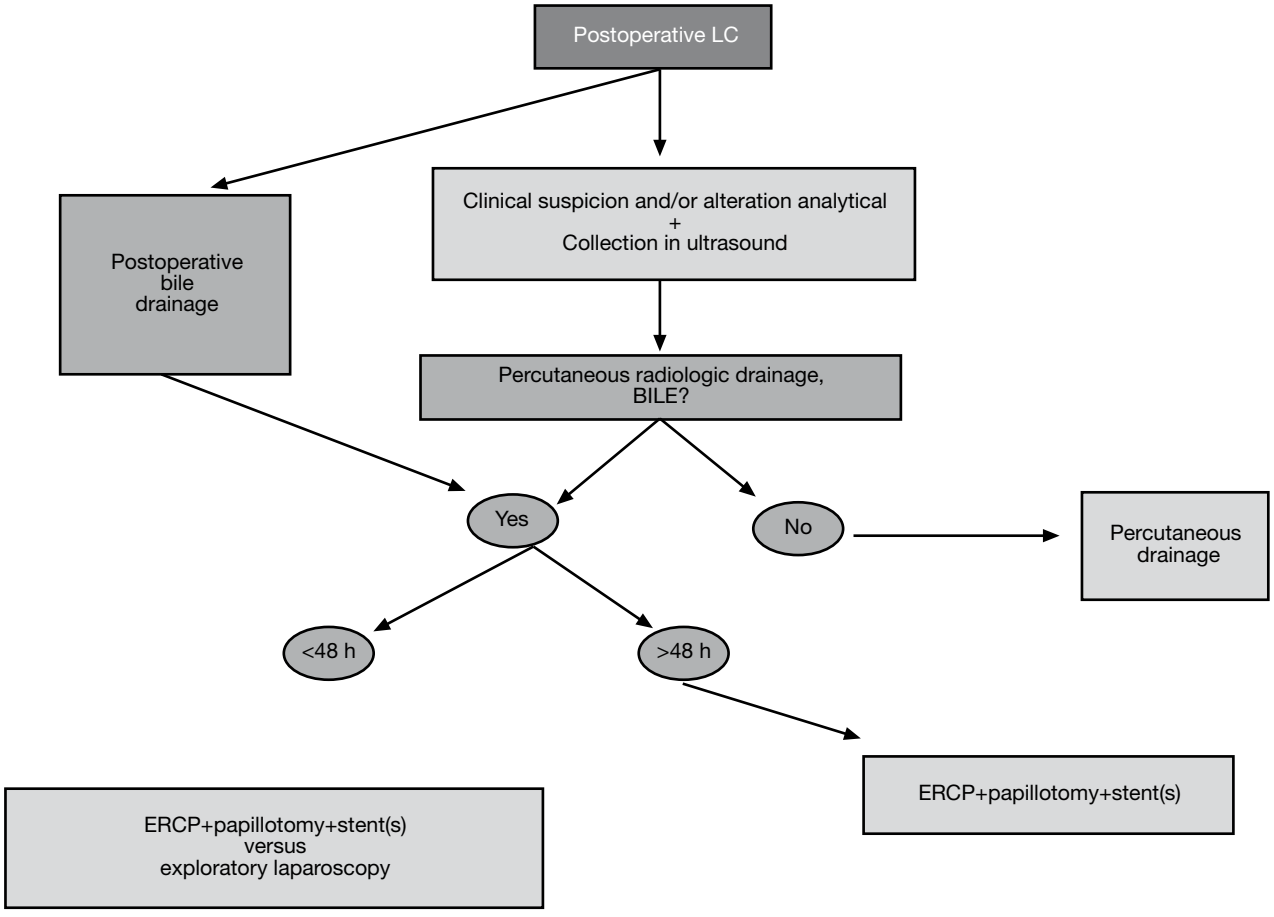

Figure 4 – Strasberg IBDI management A. LC indicates laparoscopic cholecystectomy.

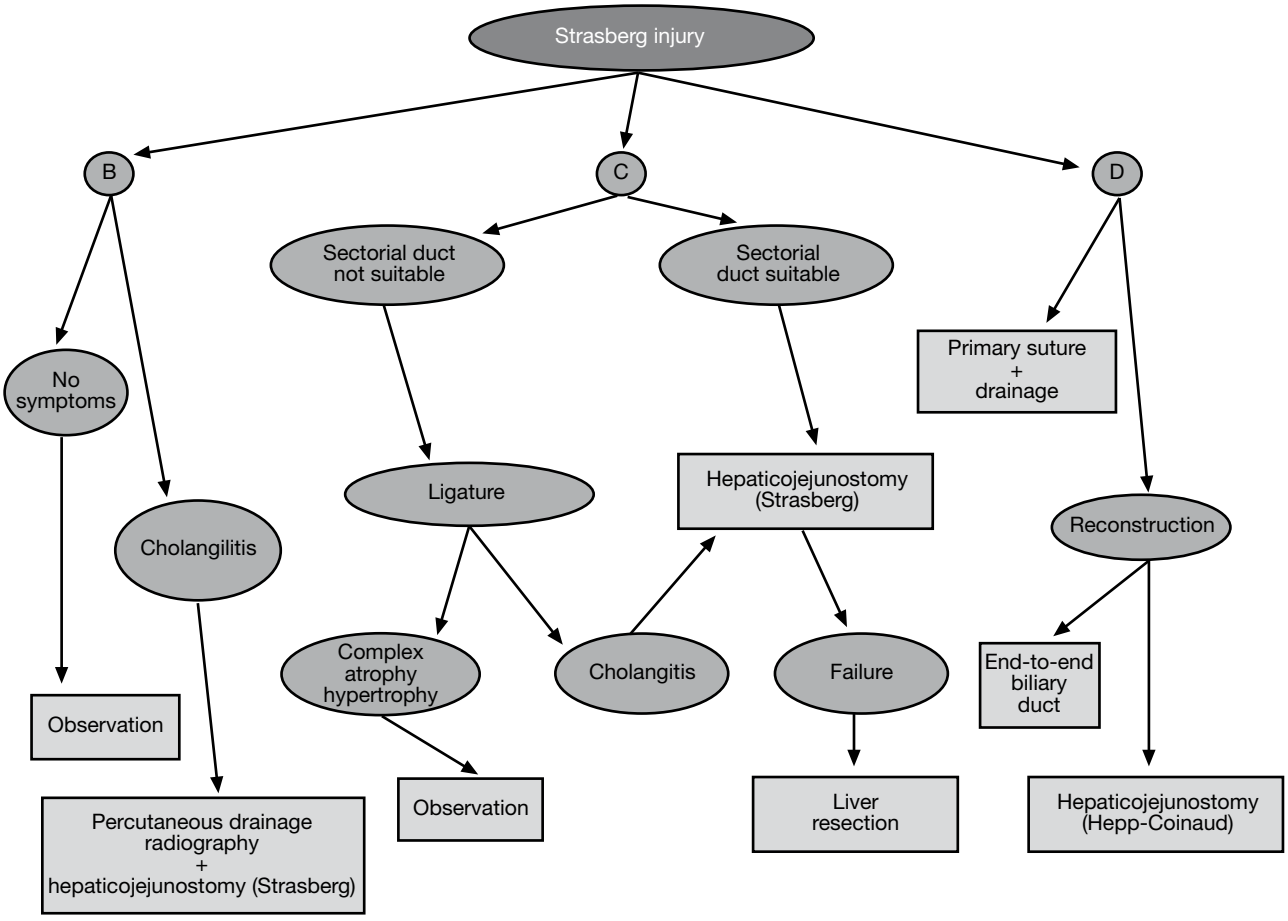

Figure 5 – Strasberg B, C and D injuries.

Type E: the HJ described for type D lesions is the ideal technique for injuries E1, E2 and E3. Those lesions located above the bifurcation (E4) or that may affect the sectoral branches of the right side (E5, B and C) cannot be repaired, as only the left hepatic duct system can drain.

- E1 and E2: another technique applied for these patients was described 23 years ago and renamed as the bile duct growing factor by Mercado et al.,[104,105] in honour of the term coined by Starzl in vascular anastomosis.[106] It consists of the anastomosis of the anterior face of the CHD and LHD into a jejunal loop. It is an alternative technique for the reconstruction of a thin CHD, less than 4 mm, provided that the hepatic confluence is preserved.
- E4 and E5: in these cases, the anastomosis is technically more demanding, especially where there is a wide break between the CHD and LHD and the stenosis extends longitudinally to a sectorial duct. It is generally associated with vascular damage, liver atrophy, cholangitis from repetition and previous attempts at repair. In this context, hepatectomy is recommended before a transplant.[107] Strasberg et al. described the extra-Glissonian approach for these lesions, based on intrahepatic dissection of the right and left pedicle confluence; the descent of so-called the "hilar plate".[108] The surgeon has to puncture both pedicles with a fine needle until finding the BT, make an opening as wide as possible and perform side-to-side anastomosis. Exposure of an adequate length of the posterior sectoral duct may be limited by the position of the right anterior sectorial portal vein. It is also important not to devascularise the anterior right hepatic artery.[102,109] Partial resection of segments IV and V has also been described to allow a better anastomosis in the CHD,[110] although other groups believe that the mobilisation of the hilar plate is enough to repair it.[106,111]

Late IBDI complications

1. *Biliary strictures:*
   Early strictures are usually related to aspects of the surgical procedure. Late strictures are related to inflammatory phenomena and fibrosis due to biliary leaks or secondary to ischaemia due to associated vascular injury (AVI). Treatment usually begins by PTCA and transhepatic drainage to resolve cholangitis. The "rendez-vous" technique can facilitate therapeutic management for these patients.[116-118] If intervention fails, performing a new HJ is the solution. Vascular injury is associated with

61% of primary biliary-enteric repair failures, and this is more frequent with increased stenosis.[112]
Stenosis after HJ anastomosis is between 9%-25%.[113,114] Interventional radiology treatment has similar results to surgery, but with less morbidity and mortality.[115]

2. *Portal hypertension:*
The incidence of biliary stricture and portal hypertension in patients with IBDI is between 15%-20%.[119,120] The surgical mortality rate in these cases reaches 23%-46%.[121] Portal hypertension in IBDI may be due to prolonged biliary obstruction, portal injury during cholecystectomy, inflammatory portal vein thrombosis or coexistence with previous liver disease (cirrhosis).[122] The most accepted treatment is balloon dilatation, and use of a stent.[37] If this fails, a venovenous bypass and a new HJ is performed.[123] LT is the best option in patients with cirrhosis.
3. *Secondary biliary cirrhosis (SBC):*
The incidence of portal hypertension and SBC in IBDI is approximately 8%.[124] The presence of cirrhosis during repair leads to increased morbidity and mortality.[125] SBC needs 7.1 years to develop with a benign stenosis, 4.6 years with choledocholithiasis and 0.8 years in malignant stenosis.[126]
4. *Associated vascular injury/Vasculobiliary injury:*
A differentiation must be made between vasculobiliary injuries and vascular damage. Vasculobiliary injuries damage the main portal pedicle or its branches, causing infarction of all or part of the liver and/or BT, requiring a partial or total removal of the liver.[34] Associated vascular injury means being associated with IBDI generally more proximal to the porta hepatis. It may be clinically silent and remain asymptomatic, as the portal flow is sufficient for the recovery of the liver parenchyma without arterial blood supply or with limited supply.
Univariate and multivariate analyses have shown that associated vascular injury is a risk factor for the development of postoperative biliary complications.[127-130] The extrahepatic BT and the main intrahepatic BT have arterial blood flow only. There are 2 vascular plexus in the BT, one on the surface of the bile duct, connecting the right hepatic artery with the posterior superior pancreaticoduodenal and the other in the hilar plate between the branches of the right and left hepatic artery.[131,132]
In type E injuries, there is a deprivation of blood flow from the gastroduodenal and pancreatodudoenal artery, with the flow depending on the hepatic artery only.[133]
If the diagnosis is intraoperative, vascular reconstruction can be performed with an end-to-end anastomosis or inferior mesenteric artery plasty.[37] Postoperatively, the portal flow and retrograde flow to the lesion must be studied by angiography.

Quality of life

To date there have been only 4 studies in the literature on the quality of life after IBDI with varying results.[134-137] The most recent claims that quality of life is not affected in patients who survive IBDI.[138]

Legal responsibility

In the context of IBDI, the cornerstone of medical negligence rests on whether the standards of care have been met. A surgeon who does not use or misuses the accepted identification methods within this context will be legally less protected.[44]

National Surgical Societies should hold consensus conferences to define LC standards. In November 2006, the Dutch Laparoscopic Society prepared and implemented a protocol recommending the analogue or digital recording of the critical safety view before the transection of the duct and cystic artery. These images are of great interest in the postoperative period and for the treatment of possible complications.[139] It would be interesting if the surgeons and the *Asociación Española de Cirujanos* (Spanish Association of Surgeons) could develop a similar project.

Conflict of interest

The authors affirm that they have no conflicts of interest.

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REFERENCES

1. Mercado MA, Chan C, Orozco H, Tielve M, Hinojosa CA. Acute bile duct injury. The need for a high repair. Surg Endosc. 2003;17:1351-5.
2. Shah JN. Bile duct injuries. The clinician's guide to pancreatobiliary disorder. Thorafore, NJ: SLACK Incorporated; 2006:69-90.
3. Traverso LW. Carl Langenbuch and the first cholecystectomy. Am J Surg. 1976;132:81-2.
4. Mühe E. Laparoscopic cholecystectomy–late results. Langenbecks Arch Chir Suppl Kongressbd. 1991;416-23.
5. Sicklick JK, Camp MS, Lillemoe KD, Melton GB, Yeo CJ, Campbell KA, et al. Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. Ann Surg. 2005;241:786-92.
6. Shea JA, Healey MJ, Berlin JA, Clarke JR, Malet PF, Staroscik RN, et al. Mortality and complications associated with laparoscopic cholecystectomy. A meta-analysis. Ann Surg. 1996;224:609-20.
7. Lillemoe KD. Evaluation of suspected bile duct injuries. Surg Endosc. 2006;20:1638-43.
8. Nuzzo G, Giuliante F, Giovannini I, Murazio M, D'Acapito F, Ardito F, et al. Advantages of multidisciplinary management of bile duct injuries occurring during cholecystectomy. Am J Surg. 2008;195:763-9.
9. Bektas H, Schrem H, Winny M, Klempnauer J. Surgical treatment and outcome of iatrogenic bile duct lesions after cholecystectomy and the impact of different clinical classification systems. Br J Surg. 2007;94:1119-27.

10. Lau WY, Lai EC. Classification of iatrogenic bile duct injury. Hepatobiliary Pancreat Dis Int. 2007;6:459-63.
11. Kapoor VK. New classification of acute bile duct injuries. Hepatobiliary Pancreat Dis Int. 2008;7:555-6.
12. Stewart L, Robinson TN, Lee CM, Liu K, Whang K, Way W. Right hepatic artery injury associated with laparoscopic bile duct injury: incidence, mechanism, and consequences. J Gastrointest Surg. 2004;8:523-30.
13. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg. 1995;180:101-25.
14. Bismuth H. Postoperative strictures of the bile ducts. In: Blumgart LH, editor. The Biliary Tract V. New York, NY: Churchill-Livingstone; 1982. p. 209-8.
15. Neuhaus P, Schmidt SC, Hintze RE, Adler A, Veltzke W, Raakow R, et al. Classification and treatment of bile duct injuries after laparoscopic cholecystectomy. Chirurg. 2000;71:166-73.
16. Csendes A, Navarrete C, Burdiles P, Yarmuch J. Treatment of common bile duct injuries during laparoscopic cholecystectomy: endoscopic and surgical management. World J Surg. 2001;25:134651.
17. McMahon AJ, Fullarton G, Baxter JN, O'Dwyer PJ. Bile duct injury and bile leakage in laparoscopic cholecystectomy. Br J Surg. 1995;82:307-13.
18. Siewert JR, Ungeheuer A, Feussner H. Bile duct lesions in laparoscopic cholecystectomy. Chirurg. 1994;65:748-57.
19. Frattaroli FM, Reggio D, Guadalaxara A, Illomei G, Pappalardo G. Benign biliary strictures: a review of 21 years of experience. J Am Coll Surg. 1996;183:506-13.
20. Bergman JJ, Van den Brink GR, Rauws EA, De Wit L, Obertop H, Huibregtse K, et al. Treatment of bile duct lesions after laparoscopic cholecystectomy. Gut. 1996;38:141-7.
21. Waage A, Nilsson M. Iatrogenic bile duct injury: a population-based study of 152 776 cholecystectomies in the Swedish Inpatient Registry. Arch Surg. 2006;141:1207-13.
22. Fields RC, Heiken JP, Strasberg SM. Biliary injury after laparoscopic cholecystectomy in a patient with right liver agenesis: case report and review of the literature. J Gastrointest Surg. 2008;12:1577-81.
23. Kerin MJ, Gorey TF. Biliary injuries in the laparoscopic era. Eur J Surg. 1994;160:195-201.
24. Ooi LL, Goh YC, Chew SP, Tay KH, Foo E, Low CH, et al. Bile duct injuries during laparoscopic cholecystectomy: a collective experience of four teaching hospitals and results of repair. Aust N Z J Surg. 1999;69:844-6.
25. Adamsen S, Hansen OH, Funch-Jensen P, Schulze S, Stage JG, Wara P. Bile duct injury during laparoscopic cholecystectomy: a prospective nationwide series. J Am Coll Surg. 1997;184:571-8.
26. Strasberg SM. Avoidance of biliary injury during laparoscopic cholecystectomy. J Hepatobiliary Pancreat Surg. 2002;9:543-7.
27. Russell JC, Walsh SJ, Mattie AS, Lynch JT. Bile duct injuries, 1989-1993. A statewide experience. Connecticut Laparoscopic Cholecystectomy Registry. Arch Surg. 1996;131:382-8.
28. Kitano S, Matsumoto T, Aramaki M, Kawano K. Laparoscopic cholecystectomy for acute cholecystitis. J Hepatobiliary Pancreat Surg. 2002;9:534-7.
29. Strasberg SM, Eagon CJ, Drebin JA. The "hidden cystic duct" syndrome and the infundibular technique of laparoscopic cholecystectomy–the danger of the false infundibulum. J Am Coll Surg. 2000;191:661-7.
30. Chapman WC, Abecassis M, Jarnagin W, Mulvihill S, Strasberg SM. Bile duct injuries 12 years after the introduction of laparoscopic cholecystectomy. J Gastrointest Surg. 2003;7:412-6.
31. Davidoff AM, Pappas TN, Murray EA, Hilleren DJ, Johnson RD, Baker ME, et al. Mechanisms of major biliary injury during laparoscopic cholecystectomy. Ann Surg 1992; 215:196-202.
32. Martin RF, Rossi RL. Bile duct injuries. Spectrum, mechanisms of injury, and their prevention. Surg Clin North Am. 1994;74:781-803.
33. Colovic RB. Isolated segmental, sectoral and right hepatic bile duct injuries. World J Gastroenterol. 2009;15:1415-9.
34. Strasberg SM. Error traps and vasculo-biliary injury in laparoscopic and open cholecystectomy. J Hepatobiliary Pancreat Surg. 2008;15:284-92.
35. Fletcher DR, Hobbs MS, Tan P, Valinsky LJ, Hockey RL, Pikora TJ, et al. Complications of cholecystectomy: risks of the laparoscopic approach and protective effects of operative cholangiography: a population-based study. Ann Surg. 1999;229:449-57.
36. Targarona EM, Marco C, Balagué C, Rodriguez J, Cugat E, Hoyuela C, et al. How, when, and why bile duct injury occurs. A comparison between open and laparoscopic cholecystectomy. Surg Endosc. 1998;12:322-6.
37. De Santibáñes E, Ardiles V, Pekolj J. Complex bile duct injuries: management. HPB (Oxford). 2008;10:4-12.
38. Woods MS, Traverso LW, Kozarek RA, Tsao J, Rossi RL, Gough D, et al. Characteristics of biliary tract complications during laparoscopic cholecystectomy: a multi-institutional study. Am J Surg. 1994;167:27-33.
39. Calvete J, Sabater L, Camps B, Verdú A, Gomez-Portilla A, Martín J, et al. Bile duct injury during laparoscopic cholecystectomy: myth or reality of the learning curve? Surg Endosc. 2000;14:608-11.
40. Archer SB, Brown DW, Smith CD, Branum GD, Hunter JG. Bile duct injury during laparoscopic cholecystectomy: results of a national survey. Ann Surg. 2001;234:549-58.
41. Hunter JG. Laser or electrocautery for laparoscopic cholecystectomy? Am J Surg. 1991;161:345-9.
42. Troidl H. Disasters of endoscopic surgery and how to avoid them: error analysis. World J Surg. 1999;23:846-55.
43. Hugh TB. New strategies to prevent laparoscopic bile duct injury–surgeons can learn from pilots. Surgery. 2002;132: 826-35.
44. Strasberg SM. Biliary injury in laparoscopic surgery: part 1. Processes used in determination of standard of care in misidentification injuries. J Am Coll Surg. 2005;201:598-603.
45. Wang DC, Dong YH, Chen Z, Wu SS, Bi XG, DI WD, et al. Value of identification of cystic duct, common bile duct, and common hepatic duct in prevention of bile duct injury during laparoscopic cholecystectomy. Zhonghua Yi Xue Za Zhi. 2009;89:406-8.
46. Fischer JE. Is damage to the common bile duct during laparoscopic cholecystectomy an inherent risk of the operation? Am J Surg. 2009;197:829-32.
47. Honda G, Iwanaga T, Kurata M, Watanabe F, Satoh H, Iwasaki K. The critical view of safety in laparoscopic cholecystectomy is optimized by exposing the inner layer of the subserosal layer. J Hepatobiliary Pancreat Surg. 2009;16:445-9.
48. Mirrizzi PL. La cholangiografía durante las operaciones de las vías biliares. Bol Soc Cir Buenos Aires. 1932;16:1133.
49. Traverso LW. Intraoperative cholangiography lowers the risk of bile duct injury during cholecystectomy. Surg Endosc. 2006;20:1659-61.
50. Flum DR, Flowers C, Veenstra DL. A cost-effectiveness analysis of intraoperative cholangiography in the prevention of bile duct injury during laparoscopic cholecystectomy. J Am Coll Surg. 2003;196:385-93.
51. Hugh TB. New strategies to prevent laparoscopic bile duct injury–surgeons can learn from pilots. Surgery. 2002;132: 826-35.

52. Wright KD, Wellwood JM. Bile duct injury during laparoscopic cholecystectomy without operative cholangiography. Br J Surg. 1998;85:191-4.
53. Connor S, Garden OJ. Bile duct injury in the era of laparoscopic cholecystectomy. Br J Surg. 2006;93:158-68.
54. Machi J, Johnson JO, Deziel DJ, Soper NJ, Berber E, Siperstein A, et al. The routine use of laparoscopic ultrasound decreases bile duct injury: a multicenter study. Surg Endosc. 2009;23:384-8.
55. De Wit LT, Rauws EA, Gouma DJ. Surgical management of iatrogenic bile duct injury. Scand J Gastroenterol Suppl. 1999;230:89-94.
56. Mercado MA, Chan C, Orozco H, Tielve M, Hinojosa CA. Acute bile duct injury. The need for a high repair. Surg Endosc. 2003;17:1351-5.
57. Lillemoe KD. Evaluation of suspected bile duct injuries. Surg Endosc. 2006;20:1638-43.
58. Andrei VE, Schein M, Margolis M, Rucinski JC, Wise L. Liver enzymes are commonly elevated following laparoscopic cholecystectomy: is elevated intra-abdominal pressure the cause? Dig Surg. 1998;15:256-9.
59. Blumgart LH. Hilar and intrahepatic biliary enteric anastomosis. Surg Clin North Am. 1994;74:845-63.
60. McPartland KJ, Pomposelli JJ. Iatrogenic biliary injuries: classification, identification, and management. Surg Clin North Am. 2008;88:1329-43.
61. Khalid TR, Casillas VJ, Montalvo BM, Centeno R, Levi JU. Using MR cholangiopancreatography to evaluate iatrogenic bile duct injury. AJR Am J Roentgenol. 2001;177:1347-52.
62. Yeh TS, Jan YY, Tseng JH, Hwang TL, Jeng LB, Chen MF. Value of magnetic resonance cholangiopancreatography in demonstrating major bile duct injuries following laparoscopic cholecystectomy. Br J Surg. 1999;86:181-4.
63. Hirano Y, Tatsuzawa Y, Shimizu J, Kinoshita S, Kawaura Y, Takahashi S. Efficacy of multi-slice computed tomography cholangiography before laparoscopic cholecystectomy. ANZ J Surg. 2006;76:693-5.
64. Pawa S, Al-Kawas FH. ERCP in the management of biliary complications after cholecystectomy. Curr Gastroenterol Rep. 2009;11:160-6.
65. Misra S, Melton GB, Geschwind JF, Venbrux AC, Cameron JL, Lillemoe KD. Percutaneous management of bile duct strictures and injuries associated with laparoscopic cholecystectomy: a decade of experience. J Am Coll Surg. 2004;198:218-26.
66. Ramos-De la Medina A, Misra S, Leroy AJ, Sarr MG. Management of benign biliary strictures by percutaneous interventional radiologic techniques (PIRT). HPB (Oxford). 2008;10:428-32.
67. De Reuver PR, Grossmann I, Busch OR, Obertop H, Van Gulik TM, Gouma DJ. Referral pattern and timing of repair are risk factors for complications after reconstructive surgery for bile duct injury. Ann Surg. 2007;245:763-70.
68. Bilge O, Bozkiran S, Ozden I, Tekant Y, Acarli K, Alper A, et al. The effect of concomitant vascular disruption in patients with iatrogenic biliary injuries. Langenbecks Arch Surg. 2003;388:265-9.
69. Mercado MA, Chan C, Orozco H, Tielve M, Hinojosa CA. Acute bile duct injury. The need for a high repair. Surg Endosc. 2003;17:1351-5.
70. Mercado MA. Early versus late repair of bile duct injuries. Surg Endosc. 2006;20:1644-7.
71. Mercado MA, Chan C, Salgado-Nesme N, López-Rosales F. Intrahepatic repair of bile duct injuries. A comparative study. J Gastrointest Surg. 2008;12:364-8.
72. Frilling A, Li J, Weber F, Frühauf NR, Engel J, Beckebaum S, et al. Major bile duct injuries after laparoscopic cholecystectomy: a tertiary center experience. J Gastrointest Surg. 2004;8: 679-85.
73. Sutherland F, Launois B, Stanescu M, Campion JP, Spiliopoulos Y, Stasik C. A refined approach to the repair of postcholecystectomy bile duct strictures. Arch Surg. 1999;134:299-302.
74. Mercado MA, Chan C, Orozco H, Cano-Gutiérrez G, Chaparro JM, Galindo E, et al. To stent or not to stent bilioenteric anastomosis after iatrogenic injury: a dilemma not answered? Arch Surg. 2002;137:60-3.
75. Al-Ghnaniem R, Benjamin IS. Long-term outcome of hepaticojejunostomy with routine access loop formation following iatrogenic bile duct injury. Br J Surg. 2002;89: 1118-24.
76. Gibson RN, Collier NA, Speer TG, Sherson ND. Percutaneous transjejunal biliary intervention: 10-year experience with access via Roux-en-Y loops. Radiology. 1998;206:883-4.
77. Barrow PJ, Siriwardena AK. Outcome of hepaticojejunostomy without access loop for repair of iatrogenic bile duct injury at laparoscopic cholecystectomy. J Hepatobiliary Pancreat Surg. 2007;14:374-6.
78. Gómez NA, Alvarez LR, Mite A, Andrade JP, Alvarez JR, Vargas PE, et al. Repair of bile duct injuries with Gore-Tex vascular grafts: experimental study in dogs. J Gastrointest Surg. 2002; 6:116-20.
79. Li J, Lü Y, Qu B, Zhang Z, Liu C, Shi Y, et al. Application of a new type of sutureless magnetic biliary-enteric anastomosis stent for one-stage reconstruction of the biliary-enteric continuity after acute bile duct injury: an experimental study. J Surg Res. 2008;148:136-42.
80. Kram HB, Garces MA, Klein SR, Shoemaker WC. Common bile duct anastomosis using fibrin glue. Arch Surg. 1985;120: 1250-6.
81. Mortensen FV, Ishibashi T, Hojo N, Yasuda Y. A gallbladder flap for reconstruction of the common bile duct. An experimental study on pigs. J Hepatobiliary Pancreat Surg. 2004;11:112-5.
82. Fernández JA, Robles R, Marín C, Sánchez-Bueno F, Ramírez P, Parrilla P. Laparoscopic iatrogeny of the hepatic hilum as an indication for liver transplantation. Liver Transpl. 2004;10:147-52.
83. Loinaz C, González EM, Jiménez C, García I, Gómez R, González-Pinto I, et al. Long-term biliary complications after liver surgery leading to liver transplantation. World J Surg. 2001;25:1260-3.
84. Oncel D, Ozden I, Bilge O, Tekant Y, Acarli K, Alper A, et al. Bile duct injury during cholecystectomy requiring delayed liver transplantation: a case report and literature review. Tohoku J Exp Med. 2006;209:355-9.
85. Schmidt SC, Langrehr JM, Hintze RE, Neuhaus P. Long-term results and risk factors influencing outcome of major bile duct injuries following cholecystectomy. Br J Surg. 2005;92:76-82.
86. Nordin A, Mäkisalo H, Isoniemi H, Halme L, Lindgren L, Höckerstedt K. Iatrogenic lesion at cholecystectomy resulting in liver transplantation. Transplant Proc. 2001;33:2499-500.
87. Robertson AJ, Rela M, Karani J, Steger AC, Benjamin IS, Heaton ND. Laparoscopic cholecystectomy injury: an unusual indication for liver transplantation. Transpl Int. 1998;11: 449-51.
88. De Santibañes E, Ardiles V, Gadano A, Palavecino M, Pekolj J, Ciardullo M. Liver transplantation: the last measure in the treatment of bile duct injuries. World J Surg. 2008;32: 1714-21.

89. De Santibañes E, Pekolj J, McCormack L, Nefa J, Mattera J, Sivori J, et al. Liver transplantation for the sequelae of intraoperative bile duct injury. HPB. 2002;4:111-5.
90. De Santibañes E, Sívori J, Pekolj J, Ciardullo M, Sendin R, Beveraggi E. Lesiones de vía biliar, secundarias a colecistectomía laparoscópica. Rev Arg Cir. 1996;70:208-18.
91. Weber A, Feussner H, Winkelmann F, Siewert JR, Schmid RM, Prinz C. Long-term outcome of endoscopic therapy in patients with bile duct injury after cholecystectomy. J Gastroenterol Hepatol. 2009;24:762-9.
92. Marks JM, Ponsky JL, Shillingstad RB, Singh J. Biliary stenting is more effective than sphincterotomy in the resolution of biliary leaks. Surg Endosc. 1998;12:327-30.
93. Rauws EA, Gouma DJ. Endoscopic and surgical management of bile duct injury after laparoscopic cholecystectomy. Best Pract Res Clin Gastroenterol. 2004;18:829-46.
94. Bjorkman DJ, Carr-Locke DL, Lichtenstein DR, Ferrari AP, Slivka A, Van Dam J, et al. Postsurgical bile leaks: endoscopic obliteration of the transpapillary pressure gradient is enough. Am J Gastroenterol. 1995;90:2128-33.
95. Pottakkat B, Vijayahari R, Prasad KV, Sikora SS, Behari A, Singh RK, et al. Surgical management of patients with postcholecystectomy benign biliary stricture complicated by atrophy-hypertrophy complex of the liver. HPB (Oxford). 2009;11:125-9.
96. Chapman WC, Halevy A, Blumgart LH, Benjamin IS. Postcholecystectomy bile duct strictures. Management and outcome in 130 patients. Arch Surg. 1995;130:597-602.
97. Nishio H, Kamiya J, Nagino M, Uesaka K, Kanai M, Sano T, et al. Right hepatic lobectomy for bile duct injury associated with major vascular occlusion after laparoscopic cholecystectomy. J Hepatobiliary Pancreat Surg. 1999;6:427-30.
98. Thethy S, Thomson BNJ, Pleass H, Wigmore SJ, Madhavan K, Akyol M, et al. Management of biliary tract complications after orthotopic liver transplantation. Clin Transplant. 2004;18:647-53.
99. Watanabe M, Yamazaki K, Tsuchiya M. i wsp: Use of an opened umbilical vein patch for the reconstruction of the injured biliary tract. J Hepatobiliay Pancreat Surg. 2007;14:270-5.
100. Cai JX, Liu FX, Ying DJ. Pedicle umbilical vein flap for repairing the bile duct (in Chinese). J Pract Surg. 1990; 10:663-4.
101. Ying D.J., Ho G.T., Cai J.X. Anatomic bases of the vascularized hepatic teres ligament flap. Surg Radiol Anat. 1997;19:293-4.
102. Winslow ER, Fialkowski EA, Linehan DC, Hawkins WG, Picus DD, Strasberg SM. "Sideways": results of repair of biliary injuries using a policy of side-to-side hepatico-jejunostomy. Ann Surg. 2009;249:426-34.
103. Hepp J. Hepaticojejunostomy using the left biliary trunk for iatrogenic biliary lesions: the French connection. World J Surg. 1985;9:507-11.
104. Machado MC, Da Cunha JE, Bacchella T. A modified technique for surgical repair of cicatricial stenosis of the bile duct. Surg Gynecol Obstet. 1986;162:282-4.
105. Mercado MA, Orozco H, Chan C, Quezada C, Barajas-Olivas A, Borja-Cacho D, et al. Bile duct growing factor: an alternate technique for reconstruction of thin bile ducts after iatrogenic injury. J Gastrointest Surg. 2006;10:1164-9.
106. Starzl TC, Iwatsuki S, Shaw BW. A growth factor in fine vascular anastomoses. Surg Gynecol Obstet. 1984;159:164-5.
107. Laurent A, Sauvanet A, Farges O, Watrin T, Rivkine E, Belghiti J. Major hepatectomy for the treatment of complex bile duct injury. Ann Surg. 2008;248:77-83.
108. Strasberg SM, Picus DD, Drebin JA. Results of a new strategy for reconstruction of biliary injuries having an isolated right-sided component. J Gastrointest Surg. 2001;5:266-74.
109. Mercado MA, Chan C, Salgado-Nesme N, López-Rosales F. Intrahepatic repair of bile duct injuries. A comparative study. J Gastrointest Surg. 2008;12:364-8.
110. Mercado MA, Chan C, Orozco H, Villalta JM, Barajas-Olivas A, Eraña J, et al. Long-term evaluation of biliary reconstruction after partial resection of segments IV and V in iatrogenic injuries. J Gastrointest Surg. 2006;10:77-82.
111. Thomson BN, Parks RW, Madhavan KK, Garden OJ. Liver resection and transplantation in the management of iatrogenic biliary injury. World J Surg. 2007;31:2363-9.
112. Koffron A, Ferrario M, Parsons W, Nemcek A, Saker M, Abecassis M. Failed primary management of iatrogenic biliary injury: incidence and significance of concomitant hepatic arterial disruption. Surgery. 2001;130:722-8.
113. Lillemoe KD, Melton GB, Cameron JL, Pitt HA, Campbell KA, Talamini MA, et al. Postoperative bile duct strictures: management and outcome in the 1990s. Ann Surg. 2000;232:430-41.
114. Costamagna G, Pandolfi M, Mutignani M, Spada C, Perri V. Long-term results of endoscopic management of postoperative bile duct strictures with increasing numbers of stents. Gastrointest Endosc. 2001;54:162-8.
115. Vitale GC, Tran TC, Davis BR, Vitale M, Vitale D, Larson G. Endoscopic management of postcholecystectomy bile duct strictures. J Am Coll Surg. 2008;206:918-23.
116. Grönroos JM. Unsuccessful endoscopic stenting in iatrogenic bile duct injury: remember rendezvous procedure. Surg Laparosc Endosc Percutan Tech. 2007;17:186-9.
117. Shlansky-Goldberg RD, Ginsberg GG, Cope C. Percutaneous puncture of the common bile duct as a rendezvous procedure to cross a difficult biliary obstruction. J Vasc Interv Radiol. 1995;6:943-6.
118. Calvo MM, Bujanda L, Heras I, Cabriada JL, Bernal A, Orive V, et al. The rendezvous technique for the treatment of choledocholithiasis. Gastrointest Endosc. 2001;54:511-3.
119. Blumgart LH, Kelley CJ, Benjamin IS. Benign bile duct stricture following cholecystectomy: critical factors in management. Br J Surg. 1984;71:836-43.
120. Chapman WC, Halevy A, Blumgart LH, Benjamin IS. Postcholecystectomy bile duct strictures: Management and outcome in 130 patients. Arch Surg. 1995;130:597-604.
121. Kelley CJ, Benjamin IS, Blumgart LH. Portal hypertension and post-cholecystectomy biliary strictures. Dig Surg. 1986;3:292-6.
122. Agarwal AK, Gupta V, Singh S, Agarwal S, Sakhuja P. Management of patients of postcholecystectomy benign biliary stricture complicated by portal hypertension. Am J Surg. 2008;195:421-6.
123. Chaudhary A, Dhar P, Sarin SK, Sachdev A, Agarwal AK, Vij JC, et al. Bile duct obstruction due to portal biliopathy in extrahepatic portal hypertension: surgical management. Br J Surg. 1998;85:326-9.
124. Braasch JW, Bolton JS, Rossi RL. A technique of biliary tract reconstruction with complete follow-up in 44 consecutive cases. Ann Surg. 1981;194:635-8.
125. Röthlin MA, Löpfe M, Schlumpf R, Largiadèr F. Long-term results of hepaticojejunostomy for benign lesions of the bile ducts. Am J Surg. 1998;175:22-6.
126. Scobie BA, Summerskill WH. Hepatic cirrhosis secondary to obstruction of the biliary system. Am J Dig Dis. 1965;10:135-46.
127. Gupta N, Solomon H, Fairchild R, Kaminski DL. Management and outcome of patients with combined bile duct and hepatic artery injuries. Arch Surg. 1998;133:176-81.
128. Bachellier P, Nakano H, Weber JC, Lemarque P, Oussoultzoglou E, Candau C, et al. Surgical repair after bile duct and vascular injuries during laparoscopic cholecystectomy: when and how? World J Surg. 2001;25:1335-45.

129. Majno PE, Prêtre R, Mentha G, Morel P. Operative injury to the hepatic artery. Consequences of a biliary-enteric anastomosis and principles for rational management. Arch Surg. 1996;131:211-5.
130. Buell JF, Cronin DC, Funaki B, Koffron A, Yoshida A, Lo A, et al. Devastating and fatal complications associated with combined vascular and bile duct injuries during cholecystectomy. Arch Surg. 2002;137:703-8.
131. Stapleton GN, Hickman R, Terblanche J. Blood supply of the right and left hepatic ducts. Br J Surg. 1998;85:202-7.
132. Vellar ID. The blood supply of the biliary ductal system and its relevance to vasculobiliary injuries following cholecystectomy. Aust N Z J Surg. 1999;69:816-20.
133. Testa G, Malagò M, Broelseh CE. Complications of biliary tract in liver transplantation. World J Surg. 2001;25:1296-9.
134. Boerma D, Rauws EA, Keulemans YC, Bergman JJ, Obertop H, Huibregtse K, et al. Impaired quality of life 5 years after bile duct injury during laparoscopic cholecystectomy: a prospective analysis. Ann Surg. 2001;234:750-7.
135. Moore DE, Feurer ID, Holzman MD, Wudel LJ, Strickland C, Gorden DL, et al. Long-term detrimental effect of bile duct injury on health-related quality of life. Arch Surg. 2004;139:476-81.
136. Sarmiento JM, Farnell MB, Nagorney DM, Hodge DO, Harrington JR. Quality-of-life assessment of surgical reconstruction after laparoscopic cholecystectomy-induced bile duct injuries: what happens at 5 years and beyond? Arch Surg. 2004;139:483-8.
137. Melton GB, Lillemoe KD, Cameron JL, Sauter PA, Coleman J, Yeo CJ. Major bile duct injuries associated with laparoscopic cholecystectomy: effect of surgical repair on quality of life. Ann Surg. 2002;235:888-95.
138. Hogan AM, Hoti E, Winter DC, Ridgway PF, Maguire D, Geoghegan JG, et al. Quality of life after iatrogenic bile duct injury: a case control study. Ann Surg. 2009;249:292-5.
139. Wauben LS, Goossens RH, Van Eijk DJ, Lange JF. Evaluation of protocol uniformity concerning laparoscopic cholecystectomy in the Netherlands. World J Surg. 2008;32:613-20.