Surgical Treatment of Iatrogenic Biliary Injuries – Early Complications

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The aim of the study was the analysis of early complications following different methods of surgical treatment for iatrogenic biliary injury (IBI).

Material and methods. From January 1990 to March 2005, 138 patients with iatrogenic biliary injuries were operated on in the Department of Gastrointestinal Surgery of Silesian Medical University in Katowice. The most frequent iatrogenic biliary injuries were caused by open and laparoscopic cholecystectomy. Clinical symptoms in patients included the following: pain, jaundice, pruritus, nausea, vomiting and cholangitis signs. The following diagnostic examinations were performed before surgical procedures: laboratory investigations and radiological examinations – including ultrasonography of the abdominal cavity, cholangiography, endoscopic retrograde cholangiopancreatography, computed tomography and magnetic resonance-cholangiography. The level of biliary injury was classified according to Bismuth.

The following reconstruction methods were performed: Roux-Y hepaticojejunostomy in 49 patients, end-to-end ductal anastomosis in 45 patients, jejunal interposition hepaticoduodenostomy in 27 patients, bile duct plastic reconstruction in 6 patients, choledochoduodenostomy in 2 patients and other methods in 8 patients.

Results. The mean duration of hospitalization was 31 days. The mean duration of operation was 4.5 hours. Early complications were observed in 22 (16%) patients. The following early complications were noted: bile collection in 11 patients, intra-abdominal abscess in 4, wound infection in 13, peritonitis in 2, cholangitis in 2, eventeration in 1, pneumonia in 7 and acute circulatory insufficiency in 3 patients. Seven (5%) early re-operations were performed: 2 due to biliary-enteric anastomosis dehiscence, 1 due to eventeration, and 4 due to bile collection or intra-abdominal abscess. Three (2%) hospital deaths were noted: 1 due to due acute circulatory insufficiency, 1 due to liver necrosis and acute respiratory and circulatory insufficiency, and 1 due to biliary-enteric anastomosis dehiscence, bile collection, peritonitis, and acute circulatory and respiratory insufficiency.

Conclusions. Surgical reconstructions of iatrogenic biliary injuries are procedures that require maximal precision and knowledge of different methods of reconstruction of biliary tract continuity. The choice of the method depends on the situation in the operation area. In treatment centers experienced in iatrogenic biliary injuries, early complications occur in 16% of surgical patients. Mortality does not exceed 2% of surgical patients.

Key words: iatrogenic biliary injury

Treatment of iatrogenic biliary injuries (IBIs) is an important surgical problem. The most frequently IBIs are caused by cholecystectomy. Iatrogenic biliary injury may also occur during operations performed within hepatoduodenal ligament, liver resection, pancreatic resection and gastric resection. The endoscopic procedures performed within the biliary tract may also cause IBI. At the beginning of IBI treatment, conservative techniqu-
es, such as endoscopic dilatation and prosthesis insertion, are used. When they are not effective, surgical treatment is used.

There are many publications that compare different methods of biliary tract reconstruction. They are not only used in the treatment of iatrogenic injuries, but also during liver transplantation in biliary anastomosis. There are contradictory reports considering the effectiveness of reconstruction methods in iatrogenic injuries.

The aim of this paper was the analysis of different methods of biliary tract reconstruction used in the Department of Gastrointestinal Surgery in Silesian Medical University in Katowice.

MATERIALS AND METHODS

From January 1990 to March 2005, 138 patients with iatrogenic biliary injuries were operated on in the Department of Gastrointestinal Surgery in Silesian Medical University in Katowice. There were 37 (26.8%) men and 101 (73.2%) women analyzed in the group of patients. The mean age was 52.9±15.02 (18-85) years. A medical history was taken from all patients, including the occurrence and duration of the following clinical symptoms: abdominal pain, jaundice, fever, pruritus, nausea, vomitus and cause of biliary injury. The patients were qualified for operation based on laboratory and radiological examinations.

In laboratory investigations, cholestasis markers (bilirubin, alkaline phosphatase, gamma-glutamyltransferase), liver function parameters (alanine and asparagine aminotransferases) and general morphological and biochemical parameters (blood morphology, electrolytes, protein, albumines, creatinine and coagulation parameters) were examined.

The following radiological examinations were performed before surgical procedure: ultrasonography of the abdominal cavity, cholangiography, endoscopic retrograde cholangiopancreatography, computed tomography and magnetic resonance-cholangiography. The level of injury was classified according to Bismuth.

The following reconstruction methods were performed: Roux-Y hepaticojejunostomy in 49 patients, end-to-end ductal anastomosis in 45 patients, jejunal interposition hepaticoduodenostomy in 27 patients, bile duct plastic reconstruction in 6 patients, choledochoduodenostomy in 2 patients and others in 8 patients.

Analysis of the following factors was performed: primary cause of biliary injury, interval from the injury to the repair procedure, duration of hospitalization, kind and duration of clinical symptoms, kind of biliary injury according to Bismuth, duration of surgical procedure and early postoperative complications following the reconstruction procedure.

RESULTS

The most frequent biliary injury was caused by cholecystectomy. The noted initial trauma procedures were the following: open cholecystectomy in 110 (79.7%) patients, laparoscopic cholecystectomy in 26 patients (18.8%), choledochotomy in 53 (38.4%) patients, partial gastric resection by Reyhe-Polya in 1 (0.7%) patient. Ineffective biliary-enteric anastomoses had been performed earlier in 42 (30.4%) patients. Choledochoduodenostomy had been performed earlier in 24 (17.4%) patients. Hepaticojejunostomy had been performed earlier in 18 (13%) patients. The mean interval between initial trauma and the repair procedure in the department was 74.96±94.52 (0.3-443.1) months.

The clinical symptoms in patients included the following: jaundice in 78 (56.5%) patients, epigastric pain in 63 (45.6%) patients, pruritus in 13 (9.4%) patients, cholestasis in 9 (6.5%) patients and nausea and vomitus in 13 (9.4%) patients. Acute cholangitis symptoms occurred in 69 (50%) patients. Biliary fistula was noted in 16 (11.6%) patients. The mean duration of clinical symptoms was 22.94±51.36 (0.1-332) months.

The biliary ducts had been drained endoscopically or surgically before the repair procedure in 35 (25.4%) patients. Biliary protheis was noted in 27 (19.6%) patients before surgical procedure. The surgical biliary drainage by Kehr was noted in 8 (5.8%) patients before surgical procedures.

The mean duration of hospitalization was 31.31±25.34 (8-225) days. The mean duration of operation was 4.49±1.76 (2-10) hours.

The level of the biliary injury was classified according to the Bismuth scale. The following injury types were noted: I for 78 (56.5%) patients, II for 34 (24.6%) patients, III for 14...
The biliary ducts were drained after surgical procedures in 109 (79%) patients. The biliary ducts were not drained in 29 (21%) patients. The following biliary drainage methods were used: external Kehr drainage in 50 (36.2%) patients, internal drainage conducted to the duodenum according to Górka in 31 (22.5%) patients, Rodney-Smith drainage in 19 (13.8%) patients and other in 9 (6.5%) patients.

Early postoperative complications were observed in 22 (16%) patients. The following early complications were noted in patients: bile collection in 11 (8%), intra-abdominal abscess in 4 (2.9%), wound infection in 13 (9.4%), peritonitis in 2 (1.4%), cholangitis in 2 (1.4%), eventration in 1 (0.7%), pneumonia in 7 (5%) and acute circulatory insufficiency in 3 (2.2%).

Seven (5%) early re-operations were performed: 2 (1.4%) due to biliary-enteric anastomosis dehiscence, 1 (0.7%) due to eventration and 4 (2.9%) due to bile collection or intra-abdominal abscess.

Three (2%) hospital deaths were noted: 1 due to acute circulatory insufficiency, 1 due to liver necrosis and acute respiratory and circulatory insufficiency and 1 due to biliary-enteric anastomosis dehiscence, bile collection, peritonitis and acute circulatory and respiratory insufficiency.

DISCUSSION

Iatrogenic biliary injuries are a result of medical activity. They are also called „biliary invalidation”. This term was coined by Mantefell-Szoege, who performed the first effective biliary repair procedure in Poland (1). The most frequent biliary injuries are caused by cholecystectomy. The injuries caused by cholecystectomy represent 95.5% of the iatrogenic biliary injuries (2). According to most authors, iatrogenic biliary injuries caused by laparoscopic cholecystectomy are 2-4 times more frequent than iatrogenic biliary injuries caused by open cholecystectomy. The number of iatrogenic biliary injuries has recently risen two fold, and is associated with the spread of laparoscopic cholecystectomy. Actually, the frequency of biliary injuries is 0.2% during laparoscopic cholecystectomy and is 0.1% during open cholecystectomy (3-6). The cholecystectomy was also the most frequent cause of iatrogenic biliary injuries in the presented material. Iatrogenic biliary injury may be also caused by operations performed within hepatoduodenal ligament, liver resection, pancreatic resection and gastric resection. The endoscopic procedures performed within the biliary tract may also be the cause of iatrogenic biliary injuries (7).

Iatrogenic biliary injuries are the result of different mechanisms. The kind of mechanism of the biliary injury depends mainly on the kind of the primary trauma procedure. The mechanisms responsible for the biliary injury during laparoscopic cholecystectomy are numerous. The most frequent is complete or incomplete occlusion by clips of the common bile or common hepatic duct. Other mechanisms include tearing, contusion, cauterization, laceration, transsection, partial or total distraction and interruption of the common bile or common hepatic duct continuity. Numerous classifications of laparoscopic cholecystectomy-induced iatrogenic injuries take into account the variability of biliary injury. There are classifications according to Strasberg, Mattox, Steward and Way, Schmidt, Hannover. During open cholecystectomy, the most frequent interruption of the biliary tract does not occur. The main mechanism of biliary injury during open cholecystectomy is the biliary stricture. Biliary strictures are the result of iatrogenic biliary injuries occurring during open cholecystectomy. The vascular injuries during procedures within the hepatoduodenal ligament influence the stricture occurrence. The blood supply disturbances may be caused by injuries of the 3 o’clock and 9 o’clock axial arteries, which are the source of extrahepatic biliary tract vascularization. Injuries of the proper hepatic artery within the hepatoduodenal ligament also may be the cause of the biliary stricture (8, 9).

The symptoms of interruption of common bile or hepatic duct continuity usually appear within several days following the trauma procedure. The symptoms of interruption of common bile or hepatic duct continuity usually appear within several days following the trauma procedure. The symptoms of interruption of common bile or hepatic duct continuity usually appear within several days following the trauma procedure. In the presented material, strictures of the common bile or hepatic duct occurred in most patients as the iatrogenic biliary injury mechanism. Therefore, the mean interval between the primary trauma and the repair procedure was several years. It is significant that, in most cases, the strictures were
operated on many years after forming, which made the procedure more difficult. In 30% of patients, the performed reconstruction followed an ineffective previous biliary-enteric anastomoses. In this group, the intra-operative conditions were especially difficult due to fibrosis, inflammation, collateral circulation and intraperitoneal adhesions after previous surgical procedures.

The most frequently observed clinical symptoms of the iatrogenic biliary injuries are following: jaundice, fever, chills, epigastric pain and pruritus (11, 15). Jaundice was the most frequent clinical symptom in the presented material. Untreated or improperly treated biliary injuries may lead to serious complications, such as liver cirrhosis and its insufficiency and death as consequence (15, 16). Therefore, early surgical or endoscopic treatment of this complication is very important.

At the beginning, conservative techniques such as endoscopic dilatation and prosthesis insertion are used in the treatment of the iatrogenic biliary injuries. When they are not effective, surgical treatment is used. The main aim of surgical treatment is the reconstruction of proper flow of bile to the alimentary tract. The following operations are performed in biliary injuries surgical treatment: Roux-Y hepaticojejunostomy, end-to-end ductal biliary anastomosis with T drainage or endoprothesis conducted into the duodenum according to Górka, choledochoduodenostomy, Lahey hepaticojejunostomy, jejunal interposition hepaticoduodenostomy, Blumgart (Hepp) anastomosis, Heinecke-Mikulicz biliary plastic reconstruction and Smith mucosal graft (17-29).

The end-to-end ductal anastomoses and hepaticojejunostomies are preferable methods in Poland. They are used not only in iatrogenic injury treatment, but also in liver transplantation in biliary anastomosis. There are contradictory reports on effectiveness of different biliary iatrogenic injury reconstruction methods (30-47). Most authors prefer hepaticojejunostomy because of fewer postoperative anastomosis strictures (15, 19, 30-35). But after this method, the bile flow into the alimentary tract is not physiological because the duodenum is excluded from the bile passage. As a result of duodenal exclusion from the bile passage, physiological conditions within the upper alimentary tract are changed. Disturbances within the hormonal axis of the alimentary tract, such as prolonged after-meal hyperinsulinemia and hypergastrynemia, which leads to a rise in the production of gastric juice and pH change; digestive gastric and duodenal ulcerations are also more frequently reported as a consequence during the postoperative period. Other authors prefer end-to-end ductal anastomosis because it guarantees the most physiological bile flow into the duodenum and allows the anastomosis endoscopic control (36-49). The hepaticojejunostomies (49 patients) and end-to-end ductal anastomoses (45 patients) were the most frequently performed methods in the presented material.

The other biliary reconstruction methods are preferred but used less frequently. The choledochoduodenostomy is actually a rarely performed operation recommended by some authors only in cases of injury within the distal portion of the common bile duct. It guarantees physiological bile flow into duodenum and anastomosis endoscopic control, and it is easier technically. It is recommended in some cases of distal strictures, when use of the jejunal loop due to numerous adhesions is impossible. It should be performed on the large common bile duct (>15 mm diameter) because the postoperative strictures are more frequent within the narrow duct (20, 24, 50, 51).

The jejunal interposition hepaticoduodenostomy, using 25-35 cm of the jejunal loop, is performed in some surgical centers. The advantage of this method is reconstruction of physiological bile flow into the duodenum, which prevents duodenal ulcer caused by changes in the neurohormonal axis within the upper alimentary tract (23, 24, 52, 53).

The early complications were noted in 16% of patients in presented material. The most frequent complication was the postoperative wound infection observed in 9.4% patients. Obtained data are confirmed by the literature. Following repair procedures complications occur in 20-30% of cases (16, 54, 55). The wound suppuration is described in 8-17.7% (56, 57, 58). Other complications reported in the literature and noted in the presented material are the following: bile collection, intra-abdominal abscess, biliary-enteric anastomosis dehiscence, biliary fistula, cholangitis, peritonitis, evertation and general complications (pneumonia, circulatory insufficiency). There are other described complications in the literature that were not noted in the presented group of patients:
intra-abdominal bleeding, sepsis, infection of the urinary tract, pneumothorax, acute pancreatitis, thrombosis and embolic complications, diarrhea, ileus and multi-organ insufficiency (35, 54, 57, 59). Mortality was observed in the presented material in 2.2% of patients, which is confirmed by data from the literature 0-2 (3)% (4, 16, 54, 55, 60, 61).

It is significant that previous ineffective repair procedures had been performed in other medical centers in 30% of patients with biliary injury treated in our department. Based on these data, the repair procedures of the iatrogenic biliary injuries should be performed at experienced surgical centers because it prevents many unnecessary surgical procedures and allows permanent recovery.

RESULTS

1. Surgical reconstructions of iatrogenic biliary injuries are procedures that require maximal precision and knowledge of different methods for reconstruction of biliary tract continuity. Choice of the method depends on the situation in the operation area.

2. In treatment centers experienced in iatrogenic biliary injuries, early complications occurred in 16% of surgical patients. Mortality did not exceed 2% of surgical patients.

REFERENCES


Received: 29.11.2007 r.
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