

New Classification of Bile Duct Injuries Based on Clinical Scenarios.

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ABSTRACT

A new classification of the iatrogenic bile duct injuries based on clinical scenario is presented. It is actually clinical scenario which determines the type and time of intervention required. From the initial classification published by Bismuth, there have been many classifications of common bile duct injury. The article reviews the various classification systems.

Keywords: Classification, Clinical scenario, Iatrogenic injury, Laparoscopic cholecystectomy.

INTRODUCTION

The first classification of bile duct injury is authored by H. Bismuth in 1982.^[1] Up to now, a number of classifications have been proposed by different authors. None of the classification systems is universally accepted as each has its own limitation. Almost all the classification systems have

emphasized either on the anatomical details or on the mechanism of injury. None of these classification systems is based on the clinical scenarios in which patients with bile duct injuries present. Actually it's the clinical scenario which determines the type and time of intervention required. The two most frequent clinical presentations are bile leak and bile duct obstruction.

CLASSIFICATION OF BILE DUCT INJURY

Table 1: Bismuth's classification, 1982^[1]

Type	Criteria
1	Low CHD stricture, with a length of the common hepatic duct stump of >2 cm
2	Proximal CHD stricture-hepatic duct stump <2 cm
3	Hilar stricture, no residual CHD, but the hepatic ductal confluence is preserved
4	Hilar stricture, with involvement of confluence and loss of communication between right and left hepatic duct
5	Involvement of aberrant right sectorial hepatic duct alone or with concomitant stricture of the CHD

Bile leak is easily recognized during either intra-operatively or in the first postoperative week. Constant bile effusion is documented through surgical drains, surgical wounds or laparoscopic ports. Patients usually complain of diffuse abdominal

and mixed hyper-bilirubinemia may be part of the clinical setting.^[2,3] An obstructive pattern in liver function tests accompanied by jaundice is frequent in the biliary obstruction. Patients have an insidious evolution with relapsing abdominal pain, cholangitis, pruritus, general weakness and intermittent alteration of liver function tests. We have devised a classification system based on these two broad clinical scenarios. In this article we have tried to present a precise system of classification to have a better clinical and statistical understanding of bile duct.

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pain, nausea, fever and impaired intestinal motility. In addition, bile collections, peritonitis, leukocytosis

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Table 2. Proposed definition of major and minor bile duct injuries by McMahon et al, 1995^[4]

Type of injury	Criteria
Major bile duct injury (At least one of the following present)	Laceration >25% of bile duct diameter Transection of CHD or CBD Development of post-operative bile duct stricture
Minor bile duct injury	Laceration of CBD <25% of diameter Laceration of cystic-CBD junction ("buttonhole tear")

Table 3: Strasberg's classification, 1995^[5]

Type	Criteria
A	Cystic duct leaks or leaks from small ducts in the liver bed
B	Occlusion of a part of the biliary tree, almost invariably the aberrant right hepatic ducts
C	Transection without ligation of the aberrant right hepatic ducts
D	Lateral injuries to major bile ducts
E	Subdivided as per Bismuth's classification into E1 to E5

Table 4: Amsterdam Academic Medical Center's Classification, 1996^[6]

Type	Criteria
A	Cystic duct leaks or leakage from aberrant or peripheral hepatic radicles
B	Major bile duct leaks with or without concomitant biliary strictures
C	Bile duct strictures without bile leakage
D	Complete transection of the duct with or without excision of some portion of the biliary tree

Table 5: Csendes' Classification, 2001^[7]

Type	Criteria
I	A small tear of the hepatic duct or right hepatic branch caused by dissection with the hook or scissors during the dissection of Calot's triangle.
II	Lesions of the cystico-choledochal junction due to excessive traction, the use of a Dormia catheter, section of the cystic duct very close or at the junction with the CBD, or to a burning of the cystico-choledochal junction by electrocautery.
III	A partial or complete section of the CBD.
IV	Resection of more than 10 mm of the CBD.

Table 6: Neuhaus' classification, 2000^[8]

Type	Criteria
A	Peripheral bile leak (in communication with the CBD)
A1	Cystic duct leak
A2	Bile leak from the liver bed
B	Occlusion of the CBD (or right respectively left hepatic duct, i.e. clip, ligation)
B1	Incomplete
B2	Complete
C	Lateral injury of the CBD
C1	Small lesion (<5 mm)
C2	Extended lesion (>5 mm)
D	Transection of the CBD (or right hepatic duct not in communication with the CBD)
D1	Without structural defect
D2	With structural defect
E	Stenosis of the CBD
E1	CBD with short stenosis (<5 mm)
E2	CBD with long stenosis (>5 mm)
E3	Confluence

Table 7: Stewart-Way's classification of laparoscopic bile duct injuries, 2004^[9]

Class	Criteria
I	CBD mistaken for cystic duct, but recognized
	Cholangiogram incision in cystic duct extend
II	Bleeding, poor visibility
	Multiple clips placed on CBD/CHD
III	CBD mistaken for cystic duct, not recognized
	CBD, CHD, or right or left hepatic ducts transected and/or resected
IV	Right hepatic duct (or right sectorial duct) mistaken for cystic duct
	Right hepatic artery mistaken for cystic artery.
	Right hepatic duct (or right sectorial duct) and right hepatic artery transected.

Among so many classification systems [Table 1-3], Bismuth's classification and Strasberg's classification are most commonly used by clinicians.^[10]

Traditionally, biliary injuries have been classified using the Bismuth's classification. This classification, which originated from the era of open surgery^[1] does not encompass the whole spectrum of injuries that are possible with open and laparoscopic cholecystectomy^[10] Bile duct injury during laparoscopic cholecystectomy tends to be more severe than those with open cholecystectomy.^[11,12] The Strasberg classification is a modification of the Bismuth classification and describes injuries performed during laparoscopic cholecystectomy as type A to E. The major disadvantage of the Strasberg classification is that it does not describe additional vascular involvement et al^[13]. In order to complement the Bismuth's classification, Bergman et al^[10] Neuhaus et al^[8], Csendes et al^[7], and Stewart et al^[9] have also proposed other classification systems to cover the whole spectrum of possible lesions [Tables 4-7].

Our Classification of Bile Duct Injuries.

Type 1: Leaking Injury.

Type 1a: Endoscopic treatment possible.

Type1b: Extra hepatic or hilar injury requiring single anastomosis.

Type 1c: Hilar or intrahepatic requiring liver resection or more than one anastomosis.

Type 2: Non- Leaking Injury

Type 2a: Endoscopic treatment possible.

Type2b: Extra hepatic or hilar injury requiring single anastomosis.

Type 2c: Hilar or intrahepatic injury requiring liver resection or more than one anastomosis.

Our classification system designates the two main presentations of bile duct injuries as type 1 and type 2. Type 1 injuries includes all sorts of injuries which have breach or discontinuity of biliary system leading to leak of bile into or outside peritoneal cavity. Immediate repair should be done for on table injuries

or those who present early within 48- 72 hours. For all other type 1 injuries it is must to exteriorize all the leaking bile and wait for 6-8 weeks to let the inflammation settle down. Type 1a include injuries which have a patent biliary system like Strasberg type A(Cystic duct leak) and type D (Lateral injuries).These are amenable to endoscopic intervention in the form of stenting and or sphincterotomy. Type 1b and type 1c include those injuries which have no continuity of biliary system. These type of injuries require surgical intervention like single hepatico-enteric anastomosis for type1b or complex procedures for type1c.

Other class of injuries is non leaking bile duct injuries labeled as type 2 in our classification system. These type of injuries usually have delayed presentation. They usually occur due to complete or partial clipping of biliary ducts, cautery burn or vascular injuries leading to stricture formation later on. Type2a include those non leaking injuries which have partial strictures and can be treated with endoscopic dilatation or stenting. Type2b are those which have extra hepatic distal strictures or obstruction requiring single anastomosis. While type 2c have proximal or intra hepatic obstruction requiring complex procedures in the form of liver resection or multiple anastomosis.

The advantages of our classification system are: (i) It is simple and comprehensive, (ii) It is the only system which is based on clinical scenario, (iii) The sub classes are based on the type of procedures done. It is basically the type of procedure which determines severity of the injury and final outcome of repair. Those classification systems which describe the mechanism of injuries even though they teach us various preventive measures but they do not make us wise in terms of the type of procedures to be done. While those classification systems which classify on the basis of anatomical details do not specify the type of procedure needed for particular class of injury. For example type of surgical procedure required for type

1, 2 or 3 of Bismuth classification is almost always same, i.e biliary-enteric anastomosis for all three types.

CONCLUSION

Bile duct injuries result in a wide spectrum of clinical settings. They usually occur in healthy young people and are complex health problem affecting quality of life and overall survival substantially. The description and classification of iatrogenic bile duct injuries after cholecystectomy should always include all clinically relevant data on each injury pattern and clinical scenario which will have an impact on surgical treatment and outcome.

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