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Original Research Article

Managing bile duct injuries sustained during cholecystectomies

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ABSTRACT

Background: Medical science is a blend of Art and Science. Technology evolved conceived presumably to improve the medical science. Increasing incidence of bile duct injury during laparoscopic cholecystectomies proved otherwise. Multiple factors e.g. cognitive psychology, laparoscopic environment and no proper algorithms to manage, factor may be responsible for these results. To understand properly the mystique, we under took this study.
Methods: This study was conducted on 200 cases which underwent laparoscopic cholecystectomies. 12 cases developed bile duct injury during laparoscopic cholecystectomies and 10 cases of bile duct injury sustained through open cholecystectomies were studied in detail results noted and analyzed.
Results: All these cases 12/200 laparoscopic cholecystectomy, 10/200 open cholecystectomies were followed up, sign and symptoms noted, USG studies, ERCP stenting, sphincterotomy studies reviewed and sequence of management underlined.
Conclusions: Early realisation of bile duct injuries remains the hall mark of she success. Even in cases detected late, conservative procedure and stenting with or without sphincterotomy given relief in number of cases. Finally, if surgery is contemplated Roux-Y-biliary enteric procedure gives much better results.

Keywords: Bile duct injuries, Bilioma and biliary fistula, Laparoscopy and open cholecystectomy

INTRODUCTION

Bile duct injuries always have been a problem to understand. Anatomical variation, aberrant duct, abnormal and deformed anatomy, misidentification proved to be the reason to this tragedy. Laparoscopy introduction has raised the hope of providing a better solution, unfortunately the incidence of bile duct injuries proved to be more in laparoscopic cholecystectomy than in open cholecystectomy, an observation accepted globally.[1]

Injuries caused are both major and minor in nature.[2] Clip slip, clip application in confusion, laparoscopic environment, inadequate biliary defaults, video view illusion added to the causation.[3] The bile duct injuries in laparoscopic cholecystectomy are more active than passive in nature.[4]

In absence of fixed algorithms to define the injuries as major or minor, active or passive, development of biliary leak and bilioma with or without jaundice and symptoms of fever, pain, sepsis, peritonitis, it is difficult to manage bile duct injuries even though USG, MRCP, CV-ITC are available investigation, but it is the Endoscopic retrograde cholangio pancreoticography has been the most dependable diagnostic and therapeutic has proved.[5-8]

Management included endoscopic and surgical or both either singularly or in combination. The endoscopic stenting and sphincteroplasty cure the majority of cases; it is only in major cases which fails to respond needed

surgery.[9] The surgical procedure hepatic jejunostomy provides the best answer so far.[10]

METHODS

During 2010-2015, 400 cases operated at Rohilkhand Medical College, Bareilly U.P., undertaken for study. 200 cases under went laparoscopic cholecystectomy (LC) and another 200 cases operated upon by open cholecystectomy.

Patients who were having fibrosis, small gall bladder, densely adhered are operated upon by open cholecystectomy. Patient having malignant gall bladder, hydrated disease was excluded firm study. The ages of the patients were among 25-50 years mean age being 37.5-year female and male ratio was 4:1, 380 females and 80 were males.

12/200 operated upon by LC, 10/200 cases of open cholecystectomy (OC) developed bile duct injuries. These results are similar to the observation made by other authors also.[11] Bilioma, biliary leak, combination of bilioma and leak were the presenting signs. In our series in laparoscopic group, 3/12 cases presented as bilioma, 7/12 bilioma and leak, 2/12 only leak. In OC group bilioma in 2 cases, leak in 6 cases, bilioma with leak 2 cases. On the basis of amount of leak and duration we tried to divide the injuries as minor or major. Wherever the leak was <300 ml per day and duration was 7-8 days we labeled it as a case of minor injuries. Whereas the leak >300ml persisting for long periods, it is labelled as major injuries. Clinically developments of pain, fever, nausea, vomiting, distention were the main symptoms developing during 1-7 days in both groups. Raised value of WBC alkaline phosphates, hyper bilirubinaemia noted in most of the patients. 3/12 cases of LC, 3/10 OC cases were also having jaundice too.[12-13] Two patients developed nausea, anorexia till one month with raised alkaline phosphates and serum bilirubin.[14]

Results of ERCP detailed in table 5 and 6. The reason assigned for these injuries are aberrant ducts, distorted anatomy due to intense fibrosis and misidentification of CBD as cystic duct, thermal burn, causing clip slip due to cautery use.[15-16]

RESULT

Patients who develop sign and symptoms after surgery underwent investigation and endoscopic study. The lesion identified and response of stenting only or with sphincterotomy are analysed. Changes in WBC, bilirubin, ALT, ALP was mildly increased in 9 out of 12 cases which resolved by stenting and sphincterotomy classified as minor injury cases. 3/12 cases where WBC count rise of bilirubin was marked, not responding to stenting and sphincterotomy were classified as major injury cases operated by laparoscopic procedure (Table 1).

Table 1: Data of 12 patients managed by Endoscopy and USG and surgery.

Age and sex	Presentation	Interval between surgery and ERCP	WBC	Bilirubin	ALT IU/L	ALP IU/L	ERCP	Treatment
38 M	Leak P	22 days	8500	5	215	136	LBL	Resolved
32 M	Bilioma pain and J	21 days	12000	12	420	132	CBD	R-Y
40 F	Bilioma pain and J	21 days	9000	18	415	136	RHD	R-Y
42 M	Biliary leak with P	21 days	9200	3.8	315	152	Retained stone	Resolved
40 F	Leak	21 days	7800	3.8	248	162	Aberrant	Resolved
43 F	Leak P	20 days	7200	4	238	142	LBL	Resolved
45 F	Bilioma pain and J	20 days	14000	15	385	134	CBD	R-Y
45 M	Biliary leak with P	20 days	8700	4.2	218	160	Retained stone	Resolved
48 F	Bilioma	20 days	8400	4.00	320	172		
42 M	Leak	20 days	8200	4.8	235	156	Aberrant	Resolved
42 F	Bilioma with leak	20 days	8600	4.2	245	172	Aberrant	Resolved
52 M	Bilioma	18 days	12000	5.2	415	182	Stricture	Resolved

Table 2: Clinical presentation - biliary duct injury cases.

Laparoscopic cholecystectomies (12 cases)		Open cholecystectomies (10 cases)	
Bilioma 3 cases >300ml/day for 7 days		Bilioma 3 cases (2)	
Bilioma with leak <300ml/day for 7 days		Bilioma with leak 2 cases (3)	
Leak only 2 cases <300ml/day for 7 days		Leak only 3 cases >300 ml/day for 7 days	
Bilioma 3 cases and bilioma with leak (7)	=10	Bilioma 2 cases and bilioma with leak (2)	=04
Leak	= 2	Leak	=06
Total	= 12 cases	Total	= 10 cases

Comparative studies of clinical presentation of patients developing bile duct injuries after Laparoscopic cholecystectomies and open cholecystectomies. The amount of leak with duration, bilioma 3 cases + bilioma with leak 7 cases whereas two cases presented with leak only in Laparoscopic cholecystectomies. Bilioma with leak 2 cases, bilioma 2 cases, only leak 6 cases presented in cases where open cholecystectomies were performed. Cases done by Laparoscopic cholecystectomy developed bilioma in 3 cases where amount of leak >300ml/day for 7 days classified as major injury cases. The cases operated by open cholecystectomy, development of bilioma with leak in 2 cases and 1 case of leak only amounting >300 ml/day for 7 days classified as major injury cases (Table 2).

Table 3: Presentation comparison - laparoscopic v/s open cholecystectomies.

	Peritonitis	Fever	Sepsis	Alk PO_4 IU/ml	Bilirubin	SGOT	SGPT
Bilioma							
3 LC	+++	+++	+++	450-750	6.8-12.9	45.60	42.50
2 OC	++	++	++	450-750	4.0-10.2	45.50	40.50
Bilioma with leak							
7 LC	++	++	+++	350-400	3.4-4.2	45	60
2 OC	++	++	+++	380-460	3.2-4.8	48	70
Leak only							
2 LC	++	+	++	280-350	3.6-5.2	52	85
6 OC	+	+	++	280-350	2.8-3.6	44	52

Clinical presentation along with relative pathological changes, reflected in WBC and LFT changes. It revealed that in bilioma cases (3-LC), 2 OC. WBC and LFT value were raised more than cases developed in bilioma with leak and leak only cases (Table 3).

Table 4: Post ERCP results of bile duct injuries.

Laparoscopic cholecystectomy		
Presentation	Stenting and Sphincteroplasty	Final
Bilioma (3)	Not improved	Major duct injuries
Bilioma with leak (3)	Improved	Minor duct injuries
Leak only (6)	Improved	Minor duct injuries
Open cholecystectomy		
Bilioma with leak (2)	Not improved	Major duct injuries
Only leak	Not improved	Minor duct injuries
Only leak (5)	Improved	Minor duct injuries
Leak (T tube) (1)	Improved	Minor duct injuries
Leak (subtotal) (1)	Improved	Minor duct injuries

Cases not improved with stenting and sphincterotomy 3/12 cases revealing major duct injuries whereas 9/12 cases improved with stenting and Sphincterotomy classified as major duct injuries (Table 4).

ERCP based analysis revealing the injuries not improved with stenting and Sphincterotomy 3/10 cases termed as major injuries whereas 7/10 cases improved with stenting and Sphincterotomy classified as minor injuries cases in Open cholecystectomy (Table 4).

Nature of injuries caused to biliary tract and result of stenting and sphincterotomy. There may be overlapping of causes of injuries in some of the cases. Nature of injuries in caused to biliary tract and result of stenting and sphincterotomy during laparoscopic cholecystectomies. It is appreciated that the cautery inflicted injuries in both minor in 3 cases and major cases two, too. There may be overlapping of causes of injuries in some of the cases (Table 5).

Table 5: Analysis based on ERCP finding in bile duct injuries cases laparoscopic.

Improved with stenting and sphincteroplasty				
Retain stone in CBD (2)	Cystic duct leak	Clip slip		Improved
Cystic duct clip (3)	Cystic duct leak	Clip slip	Cautery	Improved
Liver bed leak (3)	Aberrant duct		Cautery	Improved
Liver bed leak (1)	Accessory duct		Cautery	Improved
Not improved with stenting and sphincteroplasty				
CBD injury (1)	Clip on CBD	Mistaken as cystic duct		Not improved
CBD injury (1)	Clip on CBD	Mistaken as cystic duct	Cautery Lateral wall of CBD	Not improved
Right hepatic duct (1)	Clip on right hepatic duct	Mistaken as cystic duct	Cautery at liver bed	Not improved

Table 6: Analysis based on ERCP finding in bile duct injuries cases.

Improved with stenting and sphincteroplasty				
Liver bed leak	Aberrant accessory duct	6	Cautery	Improved
Thermal burn		5		
Cystic duct leak		3		
T-tube k	Not known	1		Improved
Not improved with stenting and sphincteroplasty				
Segmental stricture CBD	Cystic duct leak	-	Cautery	Not improved
CBD ligated and fibrosed (2)	Mistaken as cystic duct	2	Cautery	Not improved
Right hepatic duct ligated (1)	Mistaken as cystic duct	1	Cautery	Not improved

Causation of the injuries based on ERCP procedure, response of stenting and sphincterotomy in bile duct injuries during open cholecystectomies. Thermal burn 5 cases liver bed leak as a result of excessive dissection and cauterization stands the maximum number of injuries in open cholecystectomies. Some of the cases were having more than one factor responsible for injury seen (Table 6).

DISCUSSION

Laparoscopic surgery considered to be latest and safe technique in hepatobiliary surgeries, but reports are confirming the fact that incidence of bile duct injuries has increased from pre-lap period.[17] 80 injuries in LC were noted in cholecystitis than in cholelithiasis or in other condition.

The development of fever paid sepsis distention and tenderness with raised WBC, alkaline phosphates and bilirubin in serum noted in 70% of cases but clinical presence of jaundice noted only in 30%, 3/12 cases. Obvious more in cases operated by laparoscopy than by open method, our observation matches with others.[18]

Development of biliary fistula 10/12 LC cases and 8/10 in OC is a most common feature whereas bilioma 3/12 LC and 2/10 in OC is signified the major injuries.[19]

Author relied more on ERCP than cholangiography. Cholangiography, for not only being accepted universally but technically difficult procedure also, hence it is avoided. ERCP followed by stenting and sphincteroplasty were done and results analysed. We have seen that low output fistula where leak was <300ml/day 7-10, has improved with procedure hence they are classified as cases of minor injuries.[20] The cases who have not improved by the procedure were having leak >500ml/day and more than 10 days, they were classified as cases of major injuries and undergone surgery i.e. R-Y anastomosis.

ERCP study revealed leak from cystic duct in 41% cases, leak from liver bed in 33% cases and leak from slip of clip 26% of cases. Cystic duct leak is caused by mainly as a result of cautery burn at dissection sight. In 2 cases where the leak was caused by back pressure due to stone in CBD not detected before operation.[21] Leak from liver bed resulted in patients who underwent deep dissection and excessive use of cautery, because of fibrosis, adhesion and to stop bleeding. ERCP showed the presence of aberrant duct, accessory or sectoral duct as noted elsewhere by Strasberg et al, and depicted as type ABC injuries.[22] These types of injuries were not recognized under bismuth classification.[23]

Clamp application was another big factor in causing the incidence of injuries. The complexity such as mirrizi syndrome, fibrosis adhesions, vascular bleeding which distorted anatomy so much that it leads to clamp application on CBD in disguise of cystic duct.[24] This has happened more in cases of simple cholecystitis than in cholelithiasis.[25]

Finally, we can say that it's not only oblivious but distorted anatomy are responsible for bile duct injuries and also the laparoscopic environment fixed restricted view of laparoscope and excess cautery use are the causes of increasing number of injuries in laparoscopic era than pre-laparoscopic era.

CONCLUSION

We tried to establish the stepwise proceedings to reach conclusively as the injury is minor or major in nature and how best it can be managed without much complication. We go with opinion expressed by Roslyn et al, that number of series shown in the past the excellent long-term results in the management of the bile duct injuries before laparoscopy, but the result will be transferred to lap cholecystectomies has to be seen (Kei-D. Lille Moe).

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