Study of bile duct injuries in tertiary care centre during cholecystectomy

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Abstract— currently, about 90% of cholecystectomies are performed using the laparoscopic approach. Despite the rapid incorporation of laparoscopic cholecystectomy into current surgical practice, open cholecystectomy remains an extremely safe procedure with low morbidity and mortality.Despite the extensive experience with laparoscopic surgery, the incidence of intra-operative injury with open cholecystectomy remains about half the incidence of laparoscopic cholecystectomy. There are several reasons that the bile duct is at increased risk of injury during laparoscopic cholecystectomy compared with open cholecystectomy. It has long been argued that surgeon inexperience is a major culprit, and that with increased familiarity with the procedure, the number of injuries will decrease: the so-called 'learning curve effect'. Several authors have shown an inverse relationship between the incidence of bile duct injuries and number of cases performed. Also, large population-based reviews have documented a decline in injuries over time and some authors have noted a decline in the number of injuries referred for repair. These trends, while encouraging, have not been observed by all investigators, however. Several contemporary reports have suggested no change in the incidence of bile duct injuries over time and the number and complexity of cases referred for repair has remained static at some specialist units.Moreover, reports of major bile duct injuries inflicted by surgeons with considerable experience continue to appear. The data would therefore suggest that postcholecystectomy bile duct injuries will remain a significant problem for the forseeable future. A total of 1250 cholecystectomies were carried out and incidence of Bile duct injury was 2.4%.Majority of the bile duct injuries were seen in patients undergoing cholecystectomy for cholecystitis of > 72 hours duration. Among the 30 cases of BDI 50% were done laparoscopically and 23% were open cholecystectomies. Of the 20 cases done laparoscopically 27% were converted to open. BDI was recognized intraoperatively in 30%, in the early postoperative period (<1 wk) in 50% and only 06 case was identified in the late postoperative period. Intraoperative cholangiogram was done to define bile leakage in 9 cases only.The site of BDI was determined to be CHD in 27.6%, CBD in 48.3%, cystic duct in 20.7% and from the gall bladder bed in 3.4% of the cases.31% of the BDI were of Strasberg type A, the most common type of injury in present Study.In present study most common modality of treatment used is Hepatico-jejunostomy and ERCP with Stenting. Intra-operatively diagnosed patients required primary suturing over T-tube in most cases.

Index Terms— Open cholecystectomy, Bile duct injuries(BDI), laproscopic cholecystectomy(LC), common bile duct(CHD), Common hepatic duct(CHD)

1 INTRODUCTION

The biliary tract is a complex organ system that performs the simple though vital task of collecting, storing, and delivering bile to the gastrointestinal tract. Diseases of the biliary tract can be extremely painful, debilitating, and occasionally life threatening. The complex development of the liver and biliary system in utero can result in multiple anatomic variations. An absolute knowledge of these anatomic variations with careful dissection and identification of structures at the time of surgery is a minimal requirement for the safe performance of any hepatobiliary operation. Because of the unforgiving nature of the biliary system, errors in technique or judgement can be disastrous to the patient, resulting in lifelong disability or death. For this reason, a high premium exists on performing the correct procedure, without technical misadventure, the first time. Equally important is the ability to recognize iatrogenic injury so that prompt repair or Referral to a surgeon who has expertise in hepatobiliary surgery can be instituted. Positive outcome requires a balance between sound judgement, technical acumen, and attention to detail. Additionally, the surgeon of today must be able to integrate surgical options with the broadening array of radiologic and endoscopic treatment options available in the management of patients who have these disorders.Also because of the great frequency with which the operation is performed, cholecystectomy remains the greatest source of post-operative biliary injuries.In a review of more than 42,000 open cholecystectomies performed in the United states in 1989, the incidence of incidence of biliary injuries was documented to be 0.2%(1). Strasberg and associates reported a 0.3% incidence of injuries in aliterature review of of more than 25,000 open cholecystectomies since 1980(2). The advent and preference for laparoscopic cholecystectomy has refocused attention on this issue, however because of the significant increase in the number of Injuries. Several studies worldwide have documented a marked increase in the frequency of bile duct injuries associated with the laparoscopic approach, ranging from 0.4% to 1.3 %(3, 4, 5, 6, and 7). Also in a review of nearly 125,000 laparoscopic Cholecystectomies reported in the literature in the years 1991-1993, Strasberg and colleagues reported an overall incidence of of biliary injuries of 0.85%.Aim of present study was to analyse incidence of bile duct injuries in tertiary care centre after cholecystectomy.

AIMS AND OBJECTIVES

The objective of the current study is-

1. To analyse surgical incidence of bile duct injuries.

2. To identify and analyse risk factors (pre op and intra op) responsible for bile duct injuries.
3. To study nature, size, extent of bile duct injuries with respect to standard classification (Bismuth's, Strassberg's classification).
4. To study associated injury in addition to bile duct injury.
5. To study the various intra-op modalities of treatment employed for immediately recognized bile duct injuries.
6. To study the various post-op modalities of management employed for post operatively recognized bile duct injuries (<7days).
7. To study the various intra-op modalities of management employed for delayed recognized bile duct injuries.
8. To study various modalities of presenting treatment employed for bile duct strictures as a consequences of bile duct injuries.
9. To study the complications arising out of intra operative, delayed (1-7 day) and late (7-21days) of bile duct injuries.
10. To study the mortality and morbidity associated with bile duct injuries

The present study includes patients with bile duct injuries following cholecystectomy admitted in tertiary care centre from 2011 to 2013.

INCLUSION CRITERIA:

1. Patient's >12 years of age group.
2. Patient's willing for study.
3. All patient's with bile duct injuries.
4. Blunt abdominal trauma.

EXCLUSION CRITERIA:

1. Patient's< 12 years of age group.
2. Patients not willing to participate in study group.
3. Pregnant women.

RESULTS AND DISCUSSION

A total of 1250 cholecystectomies were carried out in the study period. The incidence Of Bile duct injury was 2.4 %(30 patients). The mean age was 41.03yrs with a standard deviationof 10.9 and a range of 30-50 yrs.70% of the patients were female. 21 patients (70%) underwent cholecystectomy 72 hours after onset of symptoms and 9 patients (30%) within 72 hours of onset of symptoms. Patient distribution with type of cholecystectomy is shown in table 1.Majority of the bile duct injuries were seen in patients undergoing cholecystectomy for cholecystitis of > 72 hours duration. Among the 30 cases of BDI 50% were done laparoscopically and 23% were open cholecystectomies. Of the 20 cases done laparoscopically 27% were converted to open. (TABLE 1)

Among the 30 cases of BDI, 9 were cases of documented BDI referred to our hospital for further management. BDI was recognized intraoperatively in 30%, in the early postoperative period(<1 wk) in 50% and only 06 case was identified in the late postoperative period.(table 2). Intraoperative cholangiogram was done to define bile leakage in 9 cases only.

In the patients with BDI, one (30%) had cholangitis, another (4%) had pancreatitis and two patients (8%) had choledocholithiasis. Three of the patients (12%) with BDI had cholecystitis of <72 hours duration. 28% of bile duct injuries were noted in patients with the above risk factors. Majority of the patients who did not undergo any definitive surgery for the bile duct injury immediately in the same setting were evaluated postoperatively with an ultrasound abdomen and pelvis (60%), further evaluation to detect the site of injury was done with a CT abdomen (17%), ERCP (64%) and PTBD (12%).

31% of the BDI were of Strasberg type A, the most common type of injury in ourstudy. 20.7% were Strasberg E1, 24.1% each of Strasberg D and E2, 20.7% of Strasberg E3 type(TABLE 2). Nine of the thirty cases of BDI were identified intraoperatively. Four were sutured with absorbable materials in an interrupted fashion with t-tube; two of these underwent intraoperative cholangiogram to define the site of injury. One case required the cystic duct stump to be clipped additionally; one of the lower CBD injuries required a choledochoduodenostomy, in another case T-tube drainage was later followed up by hepaticojejunostomy. Two of the cases required postoperative ERCP with stenting of the lower CBD and percutaneous drainage.

Fifteen cases of BDI were identified within a week of undergoing cholecystectomy.Five of these underwent hepaticojejunostomy,one required A choledochoduodenostomy, three were managed with percutaneous drainage postoperatively, two cases were managed with end to end ductal closure with a stent in place. Six cases of BDI was recognized in the late postoperative period and was managed with a hepaticojejunostomy.The site of BDI was determined to be CHD in 27.6%, CBD in 48.3%, cystic duct in 20.7% and from the gall bladder bed in 3.4% of the cases.

In present study most common modality of treatment used is Hepatico-jejunostomy and ERCP with Stenting. Most of the intra-op diagnosed patients required primary suturing over T-tube. Other patients required Percuteneous drainage; Usg guided drain, Clipping of cystic duct for stump blow out. For Intra-op diagnosed patients four were managed with primary suturing with T-tube, in two we kept stents, one patient required Choledocho-jejunostomy and in one patient we applied clip . In immediately post operatively diagnosed bile duct injuries most commonly used modality is ERCP with Stenting.Those patients who were diagnosed late (7-21days) were managed with Hepatico-jejunostomy. (FIGURE 1)

In September 1985, Erich Muhe20 performed the first LC. Although at the time the surgical community was skeptical of his new operation, by the early 1990s, "minimally invasive surgery," including LC, was prevalent in clinical practice
Surgeons around the world were beginning to perform the operation, report case series, and implement guidelines for the procedure. The widespread acceptance and application of LC brought not only the obvious benefits of decreased postoperative pain and length of hospital stay but was associated with a

troublesome increase in certain complications and, specifically, BDI. Over the last decade, BDI following LC has become recognized as a major health problem, as evidenced by studies evaluating the postoperative management and long-term quality-of-life outcomes of patients.

Despite expectations that the rate of BDI would decrease over time as the "learning curve" of LC flattened, the rates appear to have reached a plateau, as evidenced by a recent review of nearly 1.6 million cholecystectomies performed among Medicare beneficiaries. These studies revealed a steady 0.5% incidence of BDI from 1992 to1999. Unfortunately, BDI appears to be a complication that may continue to exist at Rates greater than in the pre-LC era.Despite improvements in technology, BDI continues to pose a significant clinical challenge. Proper diagnosis and appropriate treatment of BDI are paramount in preventing life-threatening complications of Cholangitis, biliary cirrhosis, portal hypertension, end-stage liver disease, and death.

Although the mechanisms of bile duct injury during laparoscopic cholecystectomy are varied, the common denominator is failure to recognize the anatomy of the triangle of Calot. This failure can be attributed to anatomic risk factors, factors inherent in the laparoscopic technique, or inadequate training. Anatomic risk factors may include acute or severe chronic inflammation, morbid obesity, bleeding, and the presence of Anatomic anomalies. Factors inherent in the laparoscopic technique include the lack of depth perception, differences in the lines of traction of the gallbladder, the difficulty of performing antegrade cholecystectomy, and the use of the electrocautery or laser in a limited field that can be easily obscured by blood or bile.

The current study illustrates the magnitude of the problem resulting from BDI. Most of the injuries were noted in the fourth and fifth decades of life with a slight female preponderance. The rate of BDI in our study is higher being 2.31% when compared to other studies where the rate of BDI after laparoscopic cholecystectomy was noted between 0.4% to 0.6 %(8, 9, 10, and 11). This could be attributable to the learning curve for laparoscopic surgery in our institution. 30% of the BDI were noted in patients undergoing cholecystectomy for cholecystitis of <72 hours duration. This underlies the difficulties in performing a safe surgery in situations where the anatomy of the Calot's triangle is unclear. No aberrant vascular or ductal anatomy was encountered in this study.Fifty percent of the injuries occurred during laparoscopic cholecystectomy. Thirty percent of these were converted to open procedure.

While less than a third of the bile duct injuries are recognized intraoperatively. In our study this rate was 30% Majority of these were managed at the same time immediately after recognition during cholecystectomy. Multidisciplinary approach involving surgeons, hepatobiliary surgeon and interventional radiologists in management of complications is essential. The most frequent investigation used to determine BDI postoperatively was ultrasound of the abdomen and pelvis. ERCP, PTC, PTBD were used to further delineate the bile duct anatomy and site of injury.

In our study the most common site of BDI was found to be the common hepatic duct. Strasberg type A was the most common BDI encounterd in our study. This is in agreement with the findings in another study by Strasberg et al. Most of the cases of BDI were managed by a definitive repair; these were assisted with radiological interventions in the form of ERCP and stenting, PTBD. A minority were managed by stenting only and did not require any surgical intervention. Most of the BDI recognized intraoperatively belonged to Strasberg type A and 54% of these were managed with primary suturing or additional clipping of the cystic duct leak. For the injuries discovered postoperatively the most common surgery done was the Roux-en-Y hepaticojejunostomy. Of the thirty BDI profiled, five were referred from other hospitals/surgeons for further management. Most of these cases were managed With a Roux-en-Y hepaticojejunostomy while one patient expired.

There are several factors associated with an increased risk of bile duct injury at cholecystectomy, some of which are general and some unique to the laparoscopic approach .Ultimately, however, the final common pathway of most injuries is either atechnical error or misinterpretation of the anatomy.Thus it is essential for young budding surgeons to be aware of the all the above factors and abberant anatomy to perform safe cholecystectomy. Finally, failure to perform laproscopically does not mean complete failure of surgery. A good surgeon must always be willing to convert to open cholecystectomy when in doubt.

Table 1: Shows method for cholecystectomy chosen in study group

Route	N	%
Laproscopic cholecystectomy	15	50.0
Laproscopic converted open cholecystectomy	8	26.7
Open cholecystectomy	7	23.3

Tabe 2: site of bie duct injuries

Site of BDI (n-29)	N	%
CBD(common bile duct)	14	48.3
CHD(commonhepatic duct)	8	27.6
Cystic Duct	6	20.7
Sectoral Duct	1	3.4

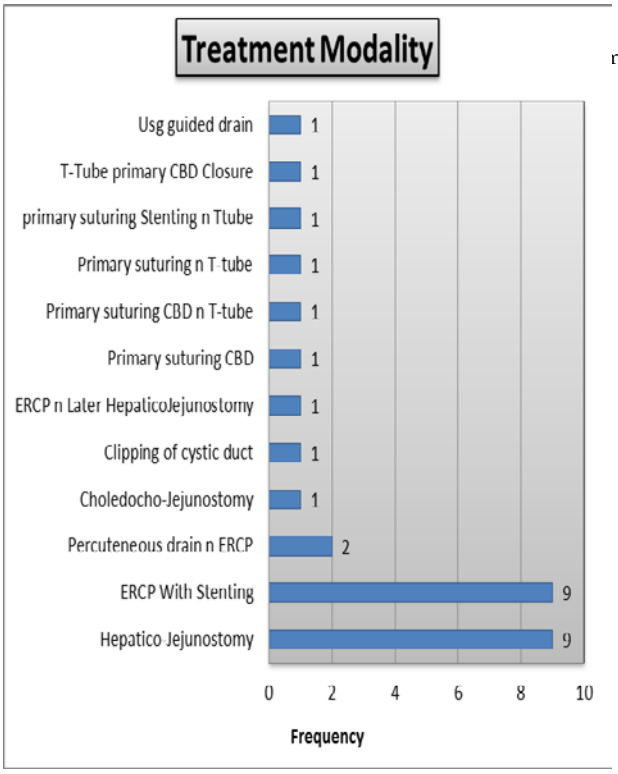

Fig 1: Treatment modality in study group

CONCLUSION

Bile duct injury remains a dreaded complication in all cases of cholecystectomy. The incidence would naturally be higher in teaching institutes.Incidence of BDI at our institution is higher in comparision to similar studies. Factors such as acute cholecystitis, cholangitis, pancreatitis, and choledocholithiasis are Contributory to occurrence of BDI and help of senior colleagues should be sought in cases with such co-morbidities.Detailed investigations to determine the site of injury is a must prior to any definitive repair.

REFERENCES

1. Roslyn JJ, et al, 1993: Open cholecystectomy: a contemporary analysis of 42,474 patients. Ann Surg 218:129-137.
2. Strasberg SM, et al, 1995: An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg 180:101-125.
3. Adamsen S, et al, 1997: Bile duct injury during laparoscopic cholecystectomy: a prospective nationwide series. . J Am Coll Surg 184:571-578.
4. Deziel DJ,et al, 1993: Complications of laparoscopic cholecystectomy: a national survey of 4,292 hospitals and an analysis of 77,604 cases. J Am Coll Surg 165:9-14.
5. MacFadyen JB, et al, 1998: Bile duct injury after laparoscopic cholecystectomy: the United States experience. Surg Endosc 12:315-321.
6. Richardson MC,et al, 1996: Incidence and nature of bile duct injuries following laparoscopic cholecystectomy: an audit of 5913 cases. West of Scotland Laparoscopic Cholecystectomy Audit Group. Br J Surg 83:1356-1360.
7. Wherry DC,et al, 1996: An external audit of laparoscopic cholecystectomy in the steady state performed in medical treatment facilities of the department of defense. Ann Surg 224:145-154.
8. Flum DR, Cheadle A, Prela C,et al. Bile duct injury during cholecystectomy and survival in Medicare beneficiaries. JAMA 2003;290(16):2168-73.
9. Ooi LL, Goh YC, Chew SP, 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(12):844-6.
10. 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(12):1207-13.
11. Sicklick JK, Camp MS, Lillemoe KD, et al: Surgical management of bile duct injuries sustained during laparoscopic cholecysyectomy: perioperative results in 200 patients. Ann Surg 2005:241(5):786-792.