Common Bile Duct Injuries During Laparoscopic Cholecystectomy

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Abstract

Iatrogenic common bile duct injuries are the worst complication of laparoscopic cholecystectomy. The goal of this study is to increase awareness of the problem and educate surgeons about the consequences and proper management of these injuries. Cholecystectomy is the most common gastrointestinal operation performed. Laparoscopic cholecystectomy was first performed by Erich Muhe in 1985 in Germany. In 1987 laparoscopically complete removal of GB was performed by Mourat in Lyon, France. The widespread acceptance of laparoscopic cholecystectomy was based on anticipated reduction in postoperative pain, minimal tissue injury intraoperatively and early return to work. It has now become a gold standard for the treatment for GB stone in experience and safe hand.

Many articles source that soon after introduction, how it became clear that laparoscopic cholecystectomy was associated with unique complication of higher rate of CBD injuries compared with open cholecystectomy. Highest rates of CBD injuries where reported in early 1990s when laparoscopic cholecystectomy was introduced, suggesting a learning curve effect. In a review by Strasburg et al and Roslyl et al, the incidence of biliary injuries during open cholecystectomy was found 0.2-0.3%. The review by Strasburg et al in 1995 of more than 124000 laparoscopic cholecystectomies reported in literature found the incidence of major bile duct injuries to be 0.5%. Even as the surgeon passed through learning curve and has reached “steady-state” and there has been no significant improvement in the incidence of biliary duct injuries. The impact of major CBD injuries is staggering to both the patient and health care system.

Keywords: CBD injury, laparoscopic cholecystectomy, complication of laparoscopy.

INTRODUCTION

Article study shows that about 95% bile injuries are minor and were irrelevant to patients out come and only 5% were major and almost always required a technologically demanding and expensive operative reconstruction of biliary tree. Inspitet of proper diagnosis and treatment of major bile duct injuries mortality rate was found to be10-12%.

As noted by WHO in 1947 health is not limited to absence of disease, fulfill of physical, mental, and social well-being, therefore the extent to which a procedure and disease process impact the physical, psychologies and social aspect of patient life and filling of well-being. Therefore to truly access a patient outcome after CBD injury one must not measure the usual objective clinical outcome, but also evaluate the patients subjective health related quality of life.

In most of study it was found health related quality of life and time to returned to work among the patients who had CBD injuries during laparoscopic cholecystectomy and under went treatment at secondary and tertiary center, out comes were compared with those under went uncomplicated laparoscopic cholecystectomy.

MATERIAL AND METHOD

A literature search was performed using Google, Yahoo, Springer link, Highwire press and the following search terms were used. Iatrogenic bile duct injuries, common bileduct injuries during laparoscopic cholecystectomy, postcholecystectomy complication, long-term detrimental effect of bilmduct injuries. The 15 no of quality citations reviewed were selected for these reviews.

The criteria for selection was the following:
1. At least 40 cases should be included the study especially for complicated cases.
3. Type of procedure: Laparoscopic cholecystectomy using four port.
4. The institution were the procedure was practice (preference for those specialist for laparoscopic surgery).
5. Laparoscopic cholecystectomy practice: In all studies laparoscopy.
6. Cholecystectomy was performed with a standard technique using four ports.
7. Creation of pneumoperitoneum with CO2.
8. Insertion of port followed by diagnostic laparoscopic.
9. Holding the funduss by assistant through four ports.
10. Dissections of visceral peritoneum.
11. Dissections of Calot’s triangle and homeostasis maintain by using various type of energized instrument.
12. Clipping and division of cystic duct and artery.
13. Dissection of GB from liver bad.
14. Extraction of GB and any spilled stone.
15. Irrigation of suction of operating field.
16. Final diagnosis laparoscopy.
17. Removal of instrument with complete exist of CO2.
18. Closure of wound.
DISCUSSION

In the recent past laparoscopic cholecystectomy is the gold standard of gall stone diseases, though the impact of CBD injuries staggering to both patients and health care system. After reviewing the many articles through internet, I found the so many cases of injuries and the proper management in time can decrease the serious complication and mortality. There are many factor in laparoscopic cholecystectomy regarding increase risk of CBD injury:

1. Misinterpretation of anatomy 70%.
2. Anatomical variation of Calot’s triangle.
3. Risk factor.
4. Technical errors.
5. Surgeon operates on image rather than reality.
6. Anatomical variation and misinterpretation of anatomy.
7. GB is the organ having one of the most variable anatomy like.
8. Low union with common hepatic duct.
9. High union with common hepatic duct.
10. Adherent to common hepatic duct.
11. Cystic duct absent are very short.
12. Anterior spiral joining common hepatic duct left side.
13. Posterior spiral joining common hepatic duct left side.
14. Intrahepatic GB.
15. Aberrant cystic duct.

Surgeons operate on image rather than reality. Visual psychological studies show that laparoscopic surgeon works on snap interpretation by brain, and success or disasters depend on whether snaps are right or wrong. Snap interpretation will be wrong if there is eye ball degradation. Lack of initial identification and memory of the structure to the points of absolute certainty, i.e. relative anatomy. Though recall the anatomical variation of Calot’s triangle but it is more important to remember the relative anatomy to minimize the risk of CBD injury. Though so many articles published regarding preoperative cholangiography regarding the CBD injury like: David R Flum, Thomas Koepsell, Patrik Hegarty, et al. Arch Surg 2001:136:1287-92 claiming some decrease risk of CBD injury but in my opinion it is not much helpful because surgeon works on relative anatomy rather than absolute anatomy. A little bit advantage of cholangiographic is compensated by the injury to cystic duct during processor and increase operative time of processor and little risk of injury during procedure itself. Though preoperative cholangiography is helpful in diagnosis of stones in biliary duct and to treat them in same time.Therefore now, days it is matter of choice from center to center to do the intraoperative cholangiography. In the same way the high resolution ultrasound preoperatively is not much helpful because it is not of much help in interpreting the biliary channel. It can only interpretate bile duct dilatation and any stone or debris in spite of cost and speciality involving.

After the introduction of laparoscopic cholecystectomy in the late decade of 1980, the field of general surgery was revolutionized. After the study of the many articles about laparoscopic cholecystectomy and bile duct injuries, it was found that laparoscopic cholecystectomy had many benefits to patient’s like less pain, less blood loss during operation, decreased hospital stay and earlier return to normal activities. Inspite of these benefits unfortunately the data of many studies show a higher incidence of CBD injuries when compared with open cholecystectomy (atleast 0.4 to 0.5% vs 0.1 to 0.2% respectively). After review of many articles about CBD injuries regarding risk factor of injuries their proper management and long-term detrimental effect of bile duct injury on health and quality of life, it is still a gold standard for treatment of symptomatic gallstone disease uncomplicated gallbladder diseases like mucocoele, empyma, cholesterosis, porcelain GB, adenomatous polyp of GB.

RISK FACTOR

Many studies show that the risk factor increases the chance of CBD injury. Many studies like a/population base study of 152776 cholestomoty in sweet disk by Anne Waugh, MD, PhD, Magnus Nilsson, MD, PhD, show that old age, male sex, increase the risk of CBD injuries. In the same group the injuries were three times more, when performed in acute cholecystitis compared to elective and even more risk in acute to chronic cholecystic when GB is inflamed and fibrosed.

TECHNICAL ERRORS

All the articles like Strasbarg et al in 1995 of more than 124000 Laparoscopic cholecystotomies reported that high rate of biliary injury was due in part of learning curve effect, as surgeon passed through learning curve have reached, steady-state, there has been no significant in the improvement of incident of biliary duct injuries. Major associations have established specific guide lines to avoid this dreaded complication in 1991 Hunter noted that bill duct injury in laparoscopic cholecystectomy appear to more common in US (0.5 to 2.7%) than in Europe 0.33%. He observed that American teaching stressed cephalic (towards the right shoulder) traction of the infundibulum in GB tenting the CBD in risking its miss identification. European teaching stressed the lateral retraction places the cystic duct at right angle to CBD reducing the likely hood of miss identification.

After studying many articles regarding CBD injury in recommendation of guide line for clinical application in laparoscopy cholecystectomy by many associations like society of American gastrointestinal endoscopic surgeons, it is found that:

1. Try to memorize the initial anatomy of Calot’s triangle surgeon should concern more about relative anatomy than initial anatomy.
2. Surgeon must clearly identify the cystic duct at its junction with GB.
3. A large distended GB should be aspirated and lifted rather than grasped.
4. The surgeon should retract the GB in foundibulum laterally rather than in cephalic direction and avoid force fully pulling up of GB can cause tenting of CBD.
5. The surgeon should meticulously dissect the cyst duct and cyst artery.
6. The surgeon should limit the use of all energy sources and prefer pledged dissection near the CBD and recognized that they can cause occult injury.
7. Use suction and irrigation frequently.
8. The surgeon should not hesitate to convert to an open operation for technical difficulties, anatomy uncertainties or anatomical anomalies.
9. The surgeon need to see all structure clearly before dividing any ductal structure.
10. Peroperative cholangiography may be a little helpful to avoid bile duct injury, but it is quite helpful to diagnose bill duct injury at the same time allowing first appropriate treatment at the same time.
11. Surgeon should prefer extracorporeal knotting as mass legation just below the GB.
12. Neck in cases of difficult dissection of cyst duct and artery.

**BILIARY TREE**

Biliary tree is the whole network of various size ducts branching through liver path is as follows:

- Bilecaluli – Canals of hering – Interlobular bile duct – Intra-hepatic bile duct – Right and left hepatic bile duct merge to form
- Common hepatic duct and join cystic duct form – Common bile duct (join pancreatic duct) form ampulla of vater and enters the second part of duodenum.

The Bismuth classification for bile duct injury is:

Type I – CHD stump > 2 cm.
Type II – CHD stump < 2 cm.
Type III – Hilar right and left duct injury with confluence intact.
Type IV – Hilar separation of right and left duct.
Type V – Injury to aberrant right duct ± CBD injury.

In 1995 Strasberg and Soper modified the Bismuth classification of bile duct injury.

1. Type A – Bile leak from a minor duct still in continuity with the common bile duct. These leaks occur at the cystic duct or from the liver bed.
2. Type B – Occlusion of part of the biliary tree. Usually the result of an injury to an aberrant right hepatic duct. In 2% of patients, the cystic duct enters a right hepatic duct rather than the common bile duct–Common hepatic duct junction. The aberrant duct may be a segmental duct, a sectoral duct (the right anterior or posterior duct), or even
3. Type C – Bile leak from duct not in communication with common bile duct. Usually diagnosed in early postoperative period as an intraperitoneal bile collection.
4. Type D – Lateral injury to extrahepatic bile ducts. May involve the common bile duct, common hepatic duct, or the right or left bile duct.
5. Type E – Circumferential injury of major bile ducts. This type of injury causes separation of hepatic parenchyma from the lower ducts and duodenum. May be treated by

**CLASSIFICATION OF BILIARY DUCT INJURIES**

If complication recognized intraoperatively:

1. For high complete transaction Roux-en-y hepatojejunostomy.
2. For lower complete injuries – Primary suture repair over T tube.
3. Long end of T-Tube most not be exteriorized from same side for partial injuries insertion of T-tube and Roux-en-y serosal patch.

Strategy to handle complication recognized postoperatively Ultrasound + ERCP + MRCP + PTC.

After the detecting the injury or other complication due to bile duct injury, after resuscitation the patient, is treated with fluid + electrolytes + systemic antibiotic.

Patient should be referred to appropriate center like: secondary or tertiary center for further management accordingly The principal of treatment is to re-establish a pressure gradient that will favour the follow of bile into the duodenum not outside the leak side like:

1. Conservative treatment and biliary drainage for 6 weeks by ERCP stent- insertion. Or PTBD if endoscopic stent application is not possible.
2. Some times internal stenting with or without sphincterotomy is effective in treatment of small leaks.
3. A retrospective study by De Palana, et al in 2002 showed that sphincterotomy alone was highly effective in producing closure of bile fistulas by reducing endobiliary pressure.
4. After several weeks, reconstative surgery like Roux-en-y cholecystectomy or hepato jejunostomy should be performed if necessary.

**CONCLUSION**

The principal difference form surgeon’s perspective between laparoscopy and open cholecystectomy is the lack of three dimensional views of structures to be manipulated. During laparoscopy procedure a surgeon is guided by a two dimensional image seen on a television and screen depth perception is affected. That required higher level of coordination and patience. After diagnosing the CBD injury during operation it should be repaired with appropriate method either open or laparoscopically. If diagnosed in postoperative period then it should be always managed in secondary or tertiarycenter with the operate methods with fully skilled surgeon. Inspite of a little more risk of bile duct injury. Laparoscopic cholecystectomy is still the gold standard of method for GB stone diseases due to other benefits over open cholecystectomy. After taking care of possibilities of CBD injury, early diagnosis and proper management, laparoscopic cholecystectomy is still the gold standard for GB stone diseases.
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