Towards Zero Bile Duct Injuries during Laparoscopic Cholecystectomy

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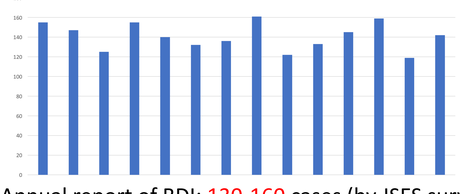
Background

As laparoscopic cholecystectomy (LC) has become more widely performed, bile duct injury (BDI) is known to occur in a certain proportion of cases, and the prognoses of patients who suffer BDI in particular has been poor.

Bile duct injury （BDI） in Japan [1)]



Annual report of BDI: 130-160 cases (by JSES survey)
Incidence of BDI: 0.4-0.6％

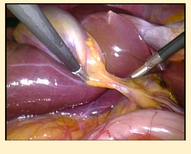
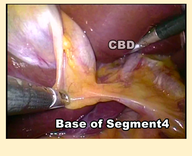
BDI during LC occurs for two main reasons, namely, misidentification by the surgeon and surgical difficulty due to severe inflammation. In extreme BDI cases, a liver resection or even liver transplantation is required[2,3)]. BDI is not only associated with increased medical costs but also an increased mortality rate, which can be as high as 21% [4,5)].

We have been implementing two preventive measures as shown on the right→

Two Major Reasons for BDI and Our strategies to Prevent Bile Duct Injury during Laparoscopic Cholecystectomy

Misidentification by the surgeon

✓To check for anomalous bile ducts before surgery
✓To identify anatomical landmarks[6)] ; these identifications are performed by surgical team members.

With this aim, the base of Segment 4 and the roof of Rouvière's sulcus should be used as anatomical landmarks, and the procedures should be performed within the ventral side of the line between them.

✓To achieve critical view of safety (CVS) and evaluate the CVS score[7)] .

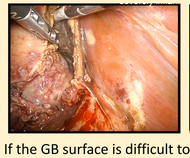
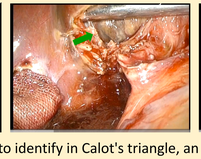
Two structures connected to the gallbladder	
2 points	Two structures can immediately and clearly be seen connecting to the gallbladder.
1 point	Two structures can be seen connecting to the gallbladder, but there is some overlap of duct and artery or a technical feature, such as poor lighting or lack of color contrast, that interferes with clarity of determination. Photograph requires study to make assessment.
0 points	Due to overlap or technical issues 2 separated cystic structures cannot be seen.
Cystic plate	
2 points	Cystic plate is immediately clearly visible to approximately its bottom one third.
1 point	Cystic plate is visible but overlapped by other structures so that it is not optimally seen or an insufficient amount of the plate is shown. Photograph requires study to make assessment.
0 points	Cystic plate not visible due to positioning, light, obstruction of view by instruments, or coverage with clot.
Clearance of hepatocystic triangle	
2 points	Hepatocystic triangle is cleared of tissue so that visibility of cystic structures and plate are completely unimpeded, but also so that viewer can be immediately certain than no other structures are in the triangle.
1 point	Somewhat less than the whole triangle can be clearly seen or technical issues reduce ability to see optimally. Photograph requires study to make assessment.
0 points	Tissue in triangle obscures view of cystic structures cystic plate and does not allow conclusion that that there are no other structures in triangle. Or technical issues prevent determination of how well cleared the triangle is.

Quoted from ref 7

✓To perform timeout before clipping and cutting of the cystic duct and artery.

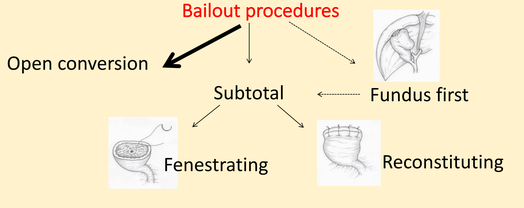
Severe inflammation

✓To evaluate surgical difficulty[8)] at the beginning of the operation
✓To follow the standardized safe steps in LC for acute cholecystitis (Tokyo Guideline 2018[9)]).
✓To maintain the plane of dissection within the gallbladder surface throughout LC.

If the GB surface is difficult to identify in Calot's triangle, an attempt should first be made to identify the GB surface from the dorsal side of the neck of the GB (Green arrow). To avoid BDI, the hilar plate should not be exposed during this process.

✓Do not use the fundus-first approach, when possible.
✓To consider intraoperative cholangiography
✓To consider bail-out procedures[9)]



Subtotal LC, fenestration, and open conversion have been reported to reduce BDI incidence.
Quoted from ref 9

Results

As a result of these preventive measures, there have been no experiences of BDI due to misidentification in our institution, and only one minor BDI due to a difficult gallbladder has been occurred. In that case, the injury was repaired laparoscopically during the operation.

Conclusions

Zero BDI can be achieved by these preventive measures.

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