

**ROLE OF ULTRASONOGRAPHY IN EVALUATION OF BILE DUCT INJURIES**

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**ABSTRACT**

**Objective:** To ascertain the role of Ultrasonography in the evaluation of bile duct injuries. **Materials and Methods:** This prospective study was conducted in department of radiodiagnosis and imaging government medical college anantnag over a period of 2 year. Fifty patients with suspected bile duct injury as a consequence of cholecystectomy (open and laparoscopic) were examined on Ultrasonography to depict bile duct strictures, transection injury, evidence of leaks, dilated IHBR, free fluid and bilioma formation. Final diagnosis was made on the basis of findings at Magnetic Resonance Cholangiopancreatography (MRCP), surgery and on Endoscopic Retrograde Cholangiopancreatography (ERCP). **Results:** The ultrasound findings were as follows: localised Collection/ bilioma formation only (n=20), localised collection with free fluid (n=5) dilated IHBR (n=12), localised collection with dilated IHBR (n=2), stricture (n=8), collection, dilated IHBR and free fluid (n=3) **Conclusion:** Ultrasonography is a non-invasive, economical and a reasonably sensitive tool for initial evaluation and diagnosis of bile duct injuries and helps in selection of patients to be evaluated further by MRI and ERCP **Abbreviations:** BDI-Bile Duct Injury, CBD-Common Bile Duct, CHD-Common Hepatic Duct, ERCP-Endoscopic Retrograde Cholangiopancreatography, IHBR-Intrahepatic Biliary Radicles, MRCP-Magnetic Resonance Cholangiopancreatography, PTC- Percutaneous Transhepatic Cholangiography, USG-Ultrasonography.

**INTRODUCTION**

Bile duct injury is a major and potentially life threatening complication of cholecystectomy.<sup>[1-3]</sup> The Bismuth classification is based on the localisation of biliary strictures according to the distance from the biliary confluence.<sup>[15]</sup>

One of the major and potentially life threatening complication of cholecystectomy is bile duct injury.<sup>[1-5]</sup> Presently open and laparoscopic cholecystectomy are main therapeutic options for patients with gall stones.<sup>[4]</sup> latter being associated with less morbidity, shorter hospital stay, earlier return to normal activity and less postoperative pain as compared to former.<sup>[5]</sup> The incidence of bile duct injury has increased from 0.1 to

0.2% for open cholecystectomy and from 0.4% to 0.6% for laparoscopic cholecystectomy.<sup>[6-7]</sup> Bile duct injuries are classified as leak, stricture, complete transection and excision of a segment of duct and ligation of a major bile duct.<sup>[8-14]</sup> Bile duct injuries can be caused by erroneous cutting of bile ducts, accidentally misplaced clips, laceration, occlusion or peri ductal leakage due to thermal injury by electrocautery leading to fibrosis.<sup>[1-3,8-12]</sup>

Bile duct injuries are classified by Bismuth classification, based on the localisation of biliary strictures according to the distance from the biliary confluence.<sup>[15]</sup>

**Bismuth classification of IBDI**

TYPE	CRITERIA
I	Common bile duct and low common hepatic duct (CHD) > 2 cm from hepatic duct confluence;
II	Proximal CHD < 2 cm from the confluence
III	Hilar injury with no residual CHD-confluence intact
IV	Destruction of confluence: right and left hepatic ducts separated
V	Involvement of aberrant right sectoral hepatic duct alone or with concomitant injury of CHD

However, Bismuth classification does not include the entire spectrum of bile duct injury. Strasberg *et al.*,<sup>[16]</sup> made the Bismuth classification much more

comprehensive by including other types of laparoscopic extra hepatic bile duct injuries, and is described hereunder.

Type	Criteria
<b>A</b>	Leak from cystic duct or bile duct of Luschka.
<b>B</b>	Occlusion of aberrant right hepatic duct.
<b>C</b>	Transection without ligation of aberrant right hepatic duct.
<b>D</b>	Lateral injury to major bile duct.
<b>E</b>	Subdivided as per the bismuth classification into E1-E5.

The initial treatment of these patients depends on the type of injury and the time of its recognition. Therefore, it is essential to determine the morphological details of the injury and define the anatomy of proximal biliary tree; this would determine strategy for biliary reconstruction and significantly affect the long term prognosis.<sup>[9,18-19]</sup> Radiological imaging is extremely useful and is the preferred way to evaluate bile duct injury. Abdominal ultrasound is the initial radiological imaging technique for evaluating bile duct injury. Various modalities used in the diagnosis of bile duct injuries are ultrasonography, Percutaneous Transhepatic Cholangiography (PTC), Endoscopic Retrograde Cholangiopancreatography (ERCP), direct cholangiography, and Magnetic Resonance Cholangiopancreatography (MRCP). cholangiography PTC remains the gold standard for evaluating bile duct injuries however Of all modalities USG is cheap, safe, non invasive, rapid and readily available.

## MATERIALS AND METHODS

over a period of two years, a total of 50 patients with suspected postoperative bile duct injury were subjected to a prospective study with USG.all patients were evaluated by two radiologists one with four and another with twelve years of radiology experience .patients included 8 men and 42 women, the average age was 38.96 years, range (18-70 years). The highest number of cases (60%) occurred in 31- 40 years of age. Women were more affected (84%). Patients most commonly presented with icterus (n=30), pain abdomen (n=26) and fever (n=24).

### Technique

Abdominal US examination was performed in first post operative week in 2 patient, 7-15 days in 16 patients ,within 16-21 days in 10 patients within 16-21 days in 22 patients .We used a convex transducer with frequency of 3.5 to 5 MHz and a linear array transducer with a frequency of 7 to 12 MHz o (GE; Logic P5, GE; Sonolayer, Toshiba)

## RESULTS

In our study, out of 50 patients localised Collection/ Bilioma formation was seen in 20 patients, localised Collection with free fluid in 5 patients, dilated IHBR in 24 patients, Collection with dilated IHBR in 2 patients,

Stricture in 8 patients Collection, dilated IHBR and free fluid in 3 patients.



Fig. 1A: USG image of Bismuth type II biliary injury.

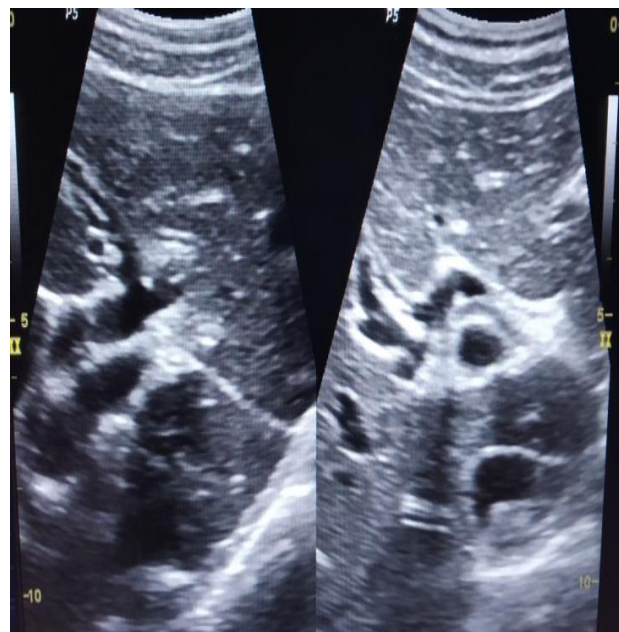
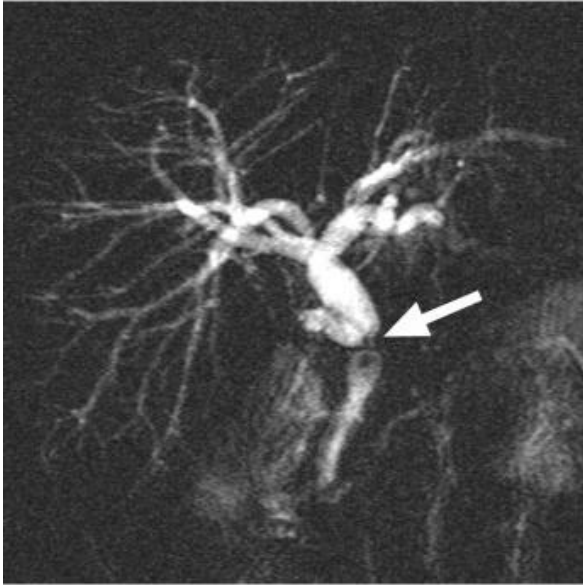
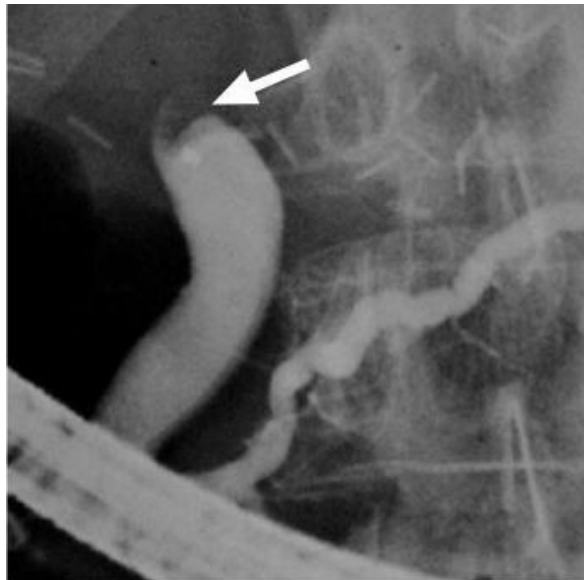


Fig. 1B: Dilated central IHBR.



**Fig. 2: MRCP images of same case.**



**Fig. 3: ERCP image of same case.**

## DISCUSSION

The results of this study showed that Ultrasonography is a versatile initial diagnostic technique in the identification of postoperative bile duct injuries. These iatrogenic injuries can be devastating, increasing the morbidity and medical cost and post operative mortality.<sup>[20]</sup> These bile duct injuries may be recognized intra operatively, can present in the immediate postoperative period or may manifest later. Our study revealed that ultrasonography is a very useful, cheap, portable and readily available initial investigation for evaluation and proper management of patients with iatrogenic bile duct injuries. In our study, USG was seen to be highly effective in diagnosing bile duct injuries, being able to visualize the supra and infrastenotic zones as well as the stenotic area. In our study the incidence of bile duct injury was more with open

cholecystectomy as compared with laparoscopic cholecystectomy which was not in accordance with the study conducted by **Roslyn JJ.**<sup>[6]</sup> and **Adamsen S.**<sup>[7]</sup> This was due to the fact that most of the cases (n=38) underwent open cholecystectomy and only 12 cases underwent laparoscopic cholecystectomy. Moreover, all cases of open cholecystectomy were done in rural areas where operative skills for cholecystectomy is less as compared to urban area. As USG is not a functional study, it does not show bile duct leak directly. To demonstrate leakage IV administration of microbubble contrast agent is needed.

The advantages of USG over ERCP and MRCP are that it is readily available, portable and economical. The technique is also able to detect perihepatic biliomas, degree of stenosis and even allow exact measurements of the supra and infra stenotic tract for the planning of reparatory surgery. We believe that USG plays an important role in these iatrogenic biliary tract injuries, providing diagnostic information helping in selection of patients to be evaluated further with MRCP and EPCR and contributing to decide the best therapeutic approach (conservative, endoscopic-radiologic or reparative surgery). USG would thus make it possible to avoid exclusively diagnostic ERCP.

## CONCLUSION

Ultrasonography is a non invasive, economical and readily available imaging technique for initial assessment of iatrogenic biliary tree injury and helps in planning management

## Limitations of the study

Low proportion of patients is a limitation of our study.

## Conflicts of interest

Both the authors declare that they have no conflict of interest in this research.

## Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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