USG in Gall Bladder Disease Prediction of Difficult Laparoscopic Cholecystectomy

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Abstract: **Introduction:** Laparoscopic cholecystectomy (LC) is the gold standard for the elective treatment of symptomatic gallstones. The laparoscopic approach on the other hand, is more controversial in the setting of acute cholecystitis (AC), however, the precise role as well as the potential benefits of laparoscopic cholecystectomy in the treatment of acutely inflamed gall bladder has not been clearly established through large clinical series. This study is designed to compare the USG SCORE and Intra-operative score for difficult Laparoscopic Cholecystectomy (LC), so that conversion to open cholecystectomy can be anticipated at early stage avoiding complications. **Methods:** It is Prospective study carried out at Department of General Surgery MGM medical college and hospital Aurangabad. A total of 600 patients presenting with asymptomatic gall stone disease from June 2009 to December 2012 were included in the study. Patient was assessed preoperatively with history, clinical examination, detailed USG and Intra-operative findings scores were compared with each other (Table No: 1, 3). **Results:** Total 600 patients underwent LC, 140 patients had difficult Laparoscopic Cholecystectomy. Most common age group was 31-40 yrs followed by 41-50yrs with 68 % female population (Table no.2, 3). In USG 11.3% cases were having gall bladder wall thickening with 6-7% patients having impacted stone in Hartman's pouch and peri gall bladder fluid collection. **Conclusion:** Ultrasonography is important tool not only for diagnosis of gall bladder pathology but for anticipating difficulties preoperatively which helped to plan for intra-operative management.

Keywords: Gall Bladder; Usg; Laparoscopic Surgery; Difficult Laparoscopic Cholecystectomy; Callot’s Triangle.

Key Messages: USG can form the basis for prediction of difficult Laparoscopic cholecystectomy there changing type of laparoscopic procedure for patient benefit preventing any further complication and morbidity in patients

1. Introduction

Gallstone disease occurs in 3% to 20% of the population worldwide, the majority of whom remain asymptomatic [1]. It is well known that the management of gallstones is changing gradually over a period of time with the development of surgical science. Laparoscopic cholecystectomy (LC) is the gold standard for the elective treatment of symptomatic gallstones. The laparoscopic approach on the other hand, is more controversial in the setting of acute cholecystitis (AC), however, the precise role as well as the potential benefits of laparoscopic cholecystectomy in the treatment of acutely inflamed gall bladder has not been clearly established through large clinical series.

In difficult situation the conversion rate is still very high ranging from 0.36% to 11.5% [2]. This study is designed to compare the USG SCORE and Intra-operative score for difficult Laparoscopic Cholecystectomy, so that conversion to open cholecystectomy can be anticipated at early stage avoiding complications. At present there is no scoring system present to predict difficulty during laparoscopic cholecystectomy. We designed one such scoring system predicting degree of difficulty in laparoscopic cholecystectomy.

Table 1: Factors and Scores

<table>
<thead>
<tr>
<th>Clinical Factors</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>2</td>
</tr>
<tr>
<td>Previous GI tract surgeries</td>
<td>3</td>
</tr>
<tr>
<td>Upper GI tract surgeries</td>
<td>2</td>
</tr>
<tr>
<td>Lower GI tract surgeries</td>
<td>2</td>
</tr>
<tr>
<td>Repeated attacks of acute cholecystitis</td>
<td>2</td>
</tr>
<tr>
<td>Acute cholecystitis</td>
<td>3</td>
</tr>
<tr>
<td>Emphyema</td>
<td>3</td>
</tr>
<tr>
<td>Thick wall (more than 3 mm)</td>
<td>3</td>
</tr>
<tr>
<td>Portal hypertension with periporal cavernoma</td>
<td>5</td>
</tr>
<tr>
<td>Cirrhosis of liver</td>
<td>3</td>
</tr>
<tr>
<td>Intra-operative Factors and Scores</td>
<td></td>
</tr>
<tr>
<td>Adhesions of gall bladder</td>
<td>2</td>
</tr>
<tr>
<td>To Omentum</td>
<td>3</td>
</tr>
<tr>
<td>To viscus (intestine, colon)</td>
<td>3</td>
</tr>
<tr>
<td>Intrahepatic GB or cirrhosis</td>
<td>3</td>
</tr>
<tr>
<td>Perforation</td>
<td>3</td>
</tr>
<tr>
<td>GB mass</td>
<td>5</td>
</tr>
<tr>
<td>Mirizzi’s syndrome</td>
<td>7</td>
</tr>
<tr>
<td>Cholecysto-duodenal fistula</td>
<td>5</td>
</tr>
</tbody>
</table>

Laparoscopic surgery has certain technical limitations like loss of three-dimensional perception, a relatively limited and fixed view of operative field, indirect contact with intra abdominal structures, and limited tactile feedback during dissection and manipulation of tissues. This makes operation difficult sometimes and leads to conversion to open cholecystectomy. The definition of “difficult laparoscopic cholecystectomy (LC)” is inconsistent. The term difficult cholecystectomy refers to multiple technical intra-operative
difficulties that increases the risk complications and significantly prolongs operation time\cite{3, 4}.

2. Methods

Ethical approval for the study was obtained from the local research ethics committee. It was Prospective study carried out at Department of General Surgery MGM medical college and hospital Aurangabad in patients admitted in surgical wards. A total of 600 patients presenting with symptomatic gall stone disease from June 2009 to December 2012 were included in the study. Every patient included in the study was subjected to the following assessments which were regarded as risk factors for laparoscopic cholecystectomy patients’ characteristics, complaints, history and clinical examination and detailed USG study.

Laparoscopic cholecystectomy was performed in all these patients with standard four port method. Intra-operative findings were noted. Conversion to subtotal, partial or open cholecystectomy considered if there is difficulty in completing the procedure or possibility of any intra-operative complication. Individual patient score was calculated according to Clinical, USG and Intra-Operative finding of Gall bladder and associated factors (Table No.1) Statistical analysis was performed with Z test\cite{21}.

3. Results

<table>
<thead>
<tr>
<th>Age Group (Yrs.)</th>
<th>No. of Patient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>18</td>
<td>0.03</td>
</tr>
<tr>
<td>21-30</td>
<td>32</td>
<td>0.053</td>
</tr>
<tr>
<td>31-40</td>
<td>217</td>
<td>0.361</td>
</tr>
<tr>
<td>41-50</td>
<td>188</td>
<td>0.313</td>
</tr>
<tr>
<td>51-60</td>
<td>78</td>
<td>0.13</td>
</tr>
<tr>
<td>61-70</td>
<td>44</td>
<td>0.073</td>
</tr>
<tr>
<td>71 +</td>
<td>23</td>
<td>0.038</td>
</tr>
</tbody>
</table>

Total 600 patients underwent LC. 140 patients had difficult Laparoscopic Cholecystectomy. Most common age group was 31-40 yrs followed by 41-50yrs with 68 % female population (Table no.2, 3). In USG 11.3% cases were having gall bladder wall thickening with 6-7 % patients having impacted stone in Hartman’s pouch and peril gall bladder fluid collection. 1-2% patients were having liver cirrhosis with portal hypertension, 3-4 % patients were having dilated CBD with choledocholithiasis. Some patients were having more than one USG findings (Table no.4). During intra-operative period 11-12% patients were having thickened gall Bladder wall, in 3.6% patients Anatomy of Calloot’s triangle was obscured due to adhesions while 8% patients had impacted stones at GB neck.2-3% patients were found to have gangrene and perforation of gall bladder 11 % patients were having GB adhesions, rest 4-6 % patients had empyema and intrahepatic gall bladder (Table 6). 87% patients underwent total laparoscopic cholecystectomy (LC); Remaining 7% & 3% patient’s undergone subtotal and partial cholecystectomy along with laparoscopic CBD exploration (Table no.7). 5-6% patients had postoperative Fever. 2-3% patients developed port site infections. 0.6% patient developed post operative Jaundice which was managed by ERCP for choledocholithiasis and antibiotics. In this study we found 12 cases (2%) of perforated gall bladder. All these cases were treated by laparoscopic cholecystectomy. However few of them converted to laparoscopic subtotal cholecystectomy or laparoscopic partial cholecystectomy. None of them converted to open cholecystectomy. One patient who had perforation of gall bladder developed faecal fistula which was managed conservatively. 1- 2% patient developed biliary leak which was stopped spontaneously without any active intervention. There were no bile duct injuries or death in all the studied cases. The mean score of USG and Intra-operative period was 7.08 and 12.72 respectively. While mean score of USG was 6.2% in males and 10.23% in females. OT score was also more in Females.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ultrasonography Findings</th>
<th>Intra-operative Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thick wall gall bladder</td>
<td>68(11.3%)</td>
<td>73(12.1%)</td>
</tr>
<tr>
<td>Impacted stone in HP</td>
<td>44(7.33%)</td>
<td>47(7.83%)</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>11(1.8%)</td>
<td>13(2.16%)</td>
</tr>
<tr>
<td>Portal hypertension</td>
<td>13(2.1%)</td>
<td>13(2.1%)</td>
</tr>
<tr>
<td>Dilated CBD with stones</td>
<td>23(3.83%)</td>
<td>23(3.83%)</td>
</tr>
<tr>
<td>Peri gall bladder fluid collection</td>
<td>59(6.5%)</td>
<td>59(6.5%)</td>
</tr>
<tr>
<td>Splenomegaly</td>
<td>7(1.16%)</td>
<td>7(1.16%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor Score</th>
<th>USG</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>6.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Female</td>
<td>10.23</td>
<td>13</td>
</tr>
<tr>
<td>Mean score</td>
<td>7.08</td>
<td>12.72</td>
</tr>
</tbody>
</table>

4. Discussion

LC is considered as a gold standard for the treatment of symptomatic gallstones, but the procedure is technically more demanding than the classical OC especially in difficult cholecystectomy\cite{2, 3}. The main aim of this study was to evaluate preoperative factors, which can reliably predict the chances of conversion to the open procedure and the complications during LC. Several studies have evaluated risk factors for difficult laparoscopic cholecystectomy on the basis of clinical preoperative findings, Ultrasonography and peri-operative findings\cite{5, 6, 7}. A laparoscopic cholecystectomy was attempted in all patients. Intra-operative technical difficulties were encountered in 140 out of 600 patients. They were due to two main reasons, either...
obsured anatomy of the Callot’s triangle or absence of a
dissection plane due to adhesions impacted stones, thickened
patients reported Age >65, increased gall bladder wall
thickness, repeated episodes of cholecystitis, obesity and
male gender as risk factors of conversion to open cholecystectomy.
Authors found a good correlation between USG score and
OT score in accordance with reports in other studies[4,
5](Table No.9). Stone impaction at the Hartman’s pouch
causd difficulty in holding the gallbladder during
dissection. The thickened and contracted gallbladder was
difficult to dissect because it had dense adhesions with the
surrounding structures and in Callot’s triangle. Hutchinson
thickness to be the most important USG risk factor of
conversion to open cholecystectomy. We can anticipate all
these difficulty prior to operative procedure with help of
USG and can plan for the type of operative procedure to be
performed for technically difficult gall bladder. USG is a
very useful imaging modality in determining the intra
operative technical difficulties in patients scheduled for
laparoscopic cholecystectomy [15]. Gall bladder functions
(by calculating the ejection fraction), gall bladder wall
thickness and the presence of sludge, which can be
determined by this method, are the most valuable parameters
directing and deciding the outcome of laparoscopic surgery.
In addition, USG examination has additional advantages,
such as lack of ionizing radiation, no requirement of contrast
material, easy applicability, and low cost [14, 15, 16].
Simpolous et al [18] in his retrospective analysis reported
conversion rate to open cholecystectomy in 5.2%, of which
2.8% had no inflammation and 2.77% had acute
inflammation of gall bladder also LC is effective and safe in
patients with morbid obesity. He concluded that none of risk
factors were contra indication to laparoscopic cholecystectomy. Morbid obesity was not associated with
difficult surgery and increased risk for conversion as
reported in other studies [12, 17, 18].
Laparoscopic subtotal and partial cholecystectomy helped to
prevent open conversion and also avoided common bile duct
injuries. LC could be considered in cirrhotic patients,
provided that the operation is thought to be easily performed
judging from the degree of development of collateral
circulation around the hepatoduodenal ligament [20].
Inability to obtain adequate exposure of callot’s triangle,
bleeding that cannot be controlled laparoscopically and
extensive inraperitoneal adhesions are considered to be
factors for conversion to open cholecystectomy. No common
bile duct injury was occurred or detected during this study
period.

Table 4: Procedure Performed & complications

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>522</td>
<td>87%</td>
</tr>
<tr>
<td>Subtotal</td>
<td>42</td>
<td>7%</td>
</tr>
<tr>
<td>Partial</td>
<td>18</td>
<td>3%</td>
</tr>
</tbody>
</table>
| Lap CBD Exploration &
  cholecystectomy              | 18        | 3%         |
| Conversion to open
  cholecystectomy              | 0         | 0%         |

Table 5: Statistical analysis

<table>
<thead>
<tr>
<th>Score mean +/- SD</th>
<th>Score mean +/- SD</th>
<th>Score mean +/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean score USG</td>
<td>7.08 +/- 1.34</td>
<td>12.12 +/- 1.8</td>
</tr>
<tr>
<td>Z-value</td>
<td>62.01</td>
<td>30.11</td>
</tr>
<tr>
<td>P-value</td>
<td>P=0.0000</td>
<td>P=0.0000</td>
</tr>
</tbody>
</table>

5. Conclusion
Preoperative USG examination of the GB is a good predictor
difficult cholecystectomy in majority of cases and should
be used pre-operatively as a routine screening tool to
delineate biliary tree anatomy and pathology. Preoperative
risk factors can help to predict difficult gallbladder and
conversion to other types of cholecystectomy. Laparoscopic
subtotal and partial cholecystectomy for difficult gall
bladder offers a simple and safe solution that prevents bile
duct and other organ injuries and decreases the rate of
conversion in anatomically difficult situations and allows
removal of a difficult gallbladder without the need for
conversion to open procedure in the majority of patients.

6. Acknowledgement
We acknowledge Dr. Dase Rajesh K., Assistant professor,
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analysis for this study.

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