FEASIBILITY OF LAPAROSCOPIC CHOLECYSTECTOMY IN GANGRENOUS CHOLECYSTITIS IN A TERTIARY CARE CENTER
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ABSTRACT

BACKGROUND
Gangrenous cholecystitis is considered the most severe form of acute cholecystitis. It is associated with high morbidity and sometimes mortality. In the past studies laparoscopic cholecystectomy was considered an option for treatment of gangrenous cholecystitis with high conversion rates. This study investigates the feasibility of laparoscopic cholecystectomy in gangrenous cholecystitis and also factors predicting gangrenous disease in symptomatic cholelithiasis.

MATERIALS AND METHODS
We reviewed our experience in patients undergoing cholecystectomies between 2013 to 2016. In this period, 350 cholecystectomies were performed of which 37 had gangrenous cholecystitis. Acute gangrenous cholecystitis was diagnosed based on gross and microscopic appearance of gall bladder. Data analysis was done using simple statistical tools.

RESULTS
Out of 350 patients who underwent cholecystectomy during the study period, gangrenous gallbladder was found in 37 (10.7%) patients. 29 patients underwent laparoscopic cholecystectomy, 5 (13.5%) patients with gallbladder gangrene underwent open cholecystectomy and 3 (8%) patients were converted to open from lap. Risk factors for gangladder gangrene included male gender, age older than 50 years, history of cardiovascular disease and diabetes, and leukocytosis greater than 17,000 white blood cells/ml.

CONCLUSION
Laparoscopic cholecystectomy is safer in gangrenous cholecystitis with less conversion rate leading to faster recovery and decreased length of hospital stay.

KEYWORDS
Gangrenous Cholecystitis, Laparoscopic Cholecystectomy, Acute cholecystitis, Cholelithiasis.


BACKGROUND
Gangrenous cholecystitis (GC) is considered the most severe form of acute cholecystitis. GC is seen in 2% to 39% of patients with acute cholecystitis.1-2 The disease is associated with high morbidity and sometimes mortality. The role of laparoscopic cholecystectomy (LC) in gangrenous cholecystitis has remained controversial, mainly because of bile-duct injuries and other complications reported after this procedure.2 The optimal surgical treatment of gangrenous cholecystitis is controversial. Earlier studies question the role of laparoscopic cholecystectomy,3 for GC, but more recent studies show improved outcomes when the procedure is feasible especially in hemodynamically stable patients.4-5 Hence the aim of this study is to investigate the factors predicting gangrenous disease and to emphasize on the feasibility of laparoscopic cholecystectomy in gangrenous cholecystitis.

MATERIALS AND METHODS
All patients who underwent cholecystectomy at our Institution, Bangalore medical college and research institute in the Department of Surgical Gastroenterology between the study periods of 2013 to 2016 were analysed. Data of these patients was retrospectively collected from Hospital records and prospectively maintained database. The parameters

that were used for analysis included admission history, physical examination, patient demographics including age, sex, radiological data, operative findings, hospital course which included the duration of stay and any complications if patient developed. The final histopathological report of all patients was correlated to the intraoperative findings. Patients who underwent open cholecystectomy as the primary surgery for GC as a surgeon’s preference or because of associated comorbidities of the patient were excluded from the study group. Patients who had conversion from lap to open surgery were included for further data analysis. Gangrenous cholecystitis was defined by transmural necrosis of the gall bladder wall on basis of gross and microscopic features.

RESULTS

During the study period of 2013 to 2016, a total of 345 patients underwent cholecystectomy for symptomatic cholelithiasis, acute cholecystitis and GC at our Institution Bangalore medical college and research institute in the Department of Surgical Gastroenterology. Out of the 345 patients 37 (10.7%) patients had gangrenous cholecystitis. The finding of GC was diagnosed based on the intraoperative findings which included transmural necrotic patches and final histopathological diagnosis of GC, of all the cholecystectomies done during the study period between 2013 to 2016. Out of the 37 patients who had gangrenous cholecystitis, 32 among them were subjected to laparoscopic cholecystectomy. Out of the 32 patients who were subjected to laparoscopic cholecystectomy only 3 (8%) patients had conversion from lap to open cholecystectomy; the remaining 29 (78.3%) patients had successful laparoscopic cholecystectomy performed in them. Open cholecystectomy was done as a primary surgery in 5 (13.5%) patients as a result of surgeon preferences because of severe associated co morbidities and hence they were excluded from study group. Figure 1 shows the flow chart of the patient distribution which gives an overview of the patients included for the study and the patients excluded from the study along with the modalities used for their treatment either laparoscopic or open cholecystectomy. Table I compares the demographic data of the patients in the two groups nongangrenous disease and gangrenous cholecystitis including sex, age, the associated comorbidities and laboratory data (Leucocyte count) of patients. From the data analysed in Table I we can conclude that patients with gangrenous disease were significantly older (54±5 vs 38±12 years of age) than patients with uncomplicated acute cholecystitis and symptomatic cholelithiasis. Incidence of right upper quadrant pain and fever was present with a preponderance to have gangrenous cholecystitis. Table II shows the Imaging modality used. The Imaging modalities used were USG, CECT and MRI in our patient group. This variation in the imaging modality used was because our institution being a referral center many a times patient is referred with a prior imaging done elsewhere. Preoperative radiological diagnosis with USG, CECT and MRI were indicative of gangrenous cholecystitis in 25 (67%) patients. The remaining 12 (32%) were not diagnosed on preoperative radiological imaging. Radiologic studies were not helpful in distinguishing between patients with gangrenous and uncomplicated acute cholecystitis or cholelithiasis in many patients. Table III is an overview of the laparoscopic outcomes and conversion rate in each of the groups. In nongangrenous group the success rate of laparoscopic cholecystectomy was 98% with only 1.9 % conversion rate to open cholecystectomy. In the gangrenous cholecystitis group the success rate of laparoscopic cholecystectomy was 92% with only 8 % conversion rate. The patients who had conversion that is in the 8% (3 patients), the conversion was mainly because of unclear anatomy (Calots) in two patients as a result of too much of an inflammatory fluid and bleeding in one patient. The major post-operative complications in the gangrenous cholecystitis group following cholecystectomy were seen in 5 patients (3.5%). The complications included bile leak seen in 2 patients (n=2, 5.4%), which were managed with ERCP and CBD stenting with a plastic J stent, the stent removal was done after an interval of 4 weeks. The other complication which was noted was intra-abdominal collection seen in 3 patients (n=3, 8.1%), managed with USG guided drainage using a 10 Fr pigtail catheter. The pig tail catheter was removed once the output was nil for three consecutive days and USG showed no collection in the GB fossa. There was no significant difference seen in the number of complications between the 2 groups. The total length of hospital stay did not show any statistical difference between the two groups (gangrenous and nongangrenous cholecystitis) undergoing laparoscopic cholecystectomy.

<table>
<thead>
<tr>
<th>Imaging</th>
<th>Total n</th>
<th>Suggestive of GC</th>
</tr>
</thead>
<tbody>
<tr>
<td>USG</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>CECT</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>MRI</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

Table II. Imaging Modality along with its Positive Percentage
Nongangrenous | Gangrenous
--- | ---
Conversion to Open cholecystectomy | 1.9% | 8%

Table III. Laparoscopic Outcomes in the Two Groups

<table>
<thead>
<tr>
<th>Study Description</th>
<th>Gangrenous N</th>
<th>Laparoscopy</th>
<th>Open</th>
<th>Lap → Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laparoscopic cholecystectomy for acute or gangrenous cholecystitis. Singer JA et al Amm. Jour 1994</td>
<td>24</td>
<td>6</td>
<td>18</td>
<td>18 (75%)</td>
</tr>
<tr>
<td>Gangrenous cholecystitis: analysis of risk factors and experience with laparoscopic cholecystectomy. Merriam Lt et al Surgery 1999.</td>
<td>27</td>
<td>15</td>
<td>4</td>
<td>8 (29%)</td>
</tr>
<tr>
<td>Role of laparoscopic cholecystectomy of gangrenous cholecystitis. Habib et al Amm jour. Surgery 2001 N-281.</td>
<td>51</td>
<td>30 of 44 (68%)</td>
<td>4</td>
<td>14 of 44 (32%)</td>
</tr>
<tr>
<td>Early laparoscopic cholecystectomy for acute gangrenous cholecystitis. Sur lap Endo percutan Tech.2007</td>
<td>30</td>
<td>16</td>
<td>10</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>Present Study</td>
<td>37</td>
<td>29 (78%)</td>
<td>3</td>
<td>3 (8%)</td>
</tr>
</tbody>
</table>

Table IV. Comparison with other Studies the Conversion Rates

**Figure 1. Patient Distribution**

**DISCUSSION**

One of the sequel of gall stone disease is acute gangrenous cholecystitis. Acute gangrenous cholecystitis is a severe complication of gallstone disease, and the morbidity and mortality of this disorder greatly exceed that of uncomplicated acute cholecystitis. The incidence of acute gangrenous cholecystitis being between 2-29%.4,6 In our study the incidence of acute gangrenous cholecystitis was 10.7%. The morbidity and mortality of this disorder greatly exceed that of uncomplicated acute cholecystitis with increasing age of the patient. Elderly and critically ill patients have particularly high risk for this problem and for its sequelae.3,7 In our study, 70% of patients with gangrenous cholecystitis were older than 50 years of age, whereas in the patients with nongangrenous acute cholecystitis, only 30% of patients were older than 50 years of age. This observation has been consistently noted in the literature. Likewise, medical histories of cardiovascular disease 42% (coronary artery disease, cerebrovascular accident) and diabetes 45% were more often present in patients with gangrenous
disease, these similar observations that are also supported by previous studies. Reasons for an association with acute gangrenous cholecystitis in patients who have cardiovascular diseases and diabetes are uncertain and may involve an interaction between the acute inflammatory response in the gallbladder wall and preexisting microvascular atherosclerotic disease. The pathologic progression from acute inflammation to gangrene involves vascular compromise and gallbladder wall ischemia that eventually result in gallbladder wall necrosis and perforation. Laboratory data have proved equally unrevealing to diagnose gangrenous cholecystitis. Data gathered in retrospective reviews found leukocytosis (greater than 15,000 white blood cells (WBC)/mL) to be the only consistent indicator of gangrenous disease. In our study group seventy eight percent of patients with leukocytosis equal to or greater than 17,000 WBC/ml had gallbladder gangrene at operation. Hence with the available literature backup and the finding from our study leukocytosis greater than 17,000 WBC/ml can be considered as a consistent laboratory finding associated with gangrenous cholecystitis. Traditionally, gallstone disease is primarily thought to be a disease of middle-aged women; the old age of being female, fat, fertile, and 40 still has validity. To the contrary gender-specific analysis of our patients showed that men were more likely to develop acute gangrenous cholecystitis then women. Although such a trend has been suggested in previous work, the significance of this finding has not been specifically addressed. These findings suggest that men with acute cholecystitis present with clinically similar yet pathologically more severe disease than women. The incidence of gangrenous cholecystitis in men is more than female. Our overall laparoscopic success rate in the entire group of patients with acute cholecystitis and symptomatic cholelithiasis was 98% with an overall conversion rate of 2% consistent with the literature. Success rate of laparoscopic cholecystectomy in gangrenous cholecystitis was 92% with only 8% conversion rate because of difficult anatomy and bleeding in our study. The comparison with the other studies and the conversion rate in each of them is explained in table IV. These results emphasize that laparoscopic cholecystectomy is a safe and effective option for patients with gangrenous cholecystitis with the increase in the expertise and advancement in the knowledge of laparoscopic surgical skills there is a decrease in the conversion rates also over the years. Considering that decrease in hospital length of stay, time to complete recovery, and low complication rates are outcomes of laparoscopic cholecystectomy, holds good for even patients who have undergone laparoscopic cholecystectomy in gangrenous cholecystitis similar to outcomes of laparoscopic cholecystectomy for uncomplicated acute cholecystitis. We think that an attempt at laparoscopic cholecystectomy is justified in all patients who are hemodynamically stable, with low conversion rates as in our present study even in patients with gangrenous cholecystitis. However the surgeon should have a low threshold for conversion to open cholecystectomy when severe inflammation, unclear anatomy is encountered.

CONCLUSION
Gangrenous cholecystitis remains a disease that carries high morbidity and mortality. A high index of suspicion is essential for the possibility of gangrenous cholecystitis when managing a patient with acute cholecystitis, especially in a diabetic and elderly patient. Men are more commonly affected. Radiological investigations may not conclusively demonstrate gangrenous cholecystitis. Laparoscopic cholecystectomy can be safely performed in most patients with gangrenous cholecystitis with lower conversion rates and thus leading to shorter hospital stay and speedy recovery. We conclude that laparoscopic cholecystectomy in patients with gangrenous cholecystitis is technically demanding, but in experienced hands a safe and effective treatment. Laparoscopy should be the initial approach in the treatment of most patients with gangrenous cholecystitis who are hemodynamically stable.

REFERENCES