Outcomes of laparoscopic cholecystectomy in rural hospitals – A systematic review

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INTRODUCTION

Gallstones(cholelithiasis) that form in the gall bladder often needs surgery as the treatment.¹ Cholecystectomy is one of the common intra-abdominal surgeries performed in hospitals of India.²³ In the era of minimal invasive surgery, laparoscopic surgery has taken over the open surgery in the treatment of cholelithiasis. Now this surgery is considered to be the gold standard in the treatment of cholelithiasis.⁴

The laparoscopic surgery has an advantage of having less postoperative pain and shorter hospital stay.⁵ Further, it has good cosmetic results and faster recovery with minor complications.⁶ As far as surgeon is concerned it has less operating time.⁷ It has been believed to have economic advantage.⁶

Even though the advances in the medical technologies reach the hospitals of urban area, many hospitals of rural areas are deprived of these advancements. It may be attributed to many reasons including lack of instruments and trained specialist surgeons.⁸⁹ There are many studies on the laparoscopic cholecystectomy in rural hospitals. It is important to understand whether the advantages of the laparoscopic cholecystectomy are there in the rural hospital set up.

The present systematic review of literature aims to find the various outcomes of laparoscopic cholecystectomy in rural hospitals. The study attempts to determine the advantages and limitations of laparoscopic cholecystectomy in rural hospitals. The results of this review can help to find the lacunae and difficulties of laparoscopic cholecystectomy in rural hospitals.

ABSTRACT

There are many studies on the laparoscopic cholecystectomy in rural hospitals. It is important to understand whether the advantages of the laparoscopic cholecystectomy are there in the rural hospital set up. The present systematic review of literature aims to find the various outcomes of laparoscopic cholecystectomy in rural hospitals. The study was conducted based on PRISMA guidelines for systematic reviews. The MEDLINE and EMBASE database were used to retrieve the articles. A detailed descriptive analysis was on the various outcomes of open and laparoscopic cholecystectomy. The present systematic review has identified that the laparoscopic cholecystectomy in rural hospitals is most preferred as that of urban setting. It not only provides less hospital stay, but also provides economical option for rural patients. However, there are some limitations in many rural settings like lack of instrumental facility and trained surgeon. The outcomes of the laparoscopic cholecystectomy in some rural hospitals are comparatively same as that of urban settings.

Key words: Systematic review; laparoscopic cholecystectomy; rural hospitals; outcomes
MATERIALS AND METHODS

Study design
The present systematic review was done to access the various outcomes of open versus laparoscopic cholecystectomy in rural hospitals. The study was conducted based on PRISMA guidelines for systematic reviews.10

Inclusion criteria
1. Study conducted to assess various treatment outcomes in open and laparoscopic cholecystectomy in rural.
2. All cross-sectional, clinical trials, case control studies, cohort studies and qualitative studies.
3. Study involving rural hospitals.
4. Full length articles in English.

Exclusion criteria
Those articles not matching the inclusion criteria are excluded from the study. Review articles, case reports and letters to editor were excluded from the study.

Search methods
The MEDLINE and EMBASE database were used to retrieve the articles. For MEDLINE search, the MeSH term used were (((laparoscopic surgery) AND (cholecystectomy)) AND (open surgery)) AND (rural hospital)) The Pubmed advanced search was used. Boolean operator ‘AND’ was used in between the MeSH terms in the advanced search. For EMBASE search, Emtree thesaurus was used to retrieve the articles.

Selection of articles
The articles were analysed by authors in collaboration and the articles were selected for this study based on the inclusion and exclusion criteria. The articles were also checked for the adequacy of data and those articles which are inadequate in terms of details and data were excluded (Figure 1).

Synthesis of results
A detailed descriptive analysis was on the various outcomes of open and laparoscopic cholecystectomy. All the data were compiled in the form of tables and were explained in descriptive manner. Considering the heterogeneity of data, meta-analysis was not performed with this data.

RESULTS
The systematic review was conducted to analyse the various outcomes of Laparoscopic cholecystectomy in rural settings. On analysis of post-operative complication and post-operative hospital stay (Table 1), all the studies...
have shown that there are not many complications. A study conducted by Ji W et al., the laparoscopic surgery was converted to open surgery to manage the bleeding in some cases.\textsuperscript{13} However, the conversion rate was only 5.3\% in that study. Same has been observed in another study conducted in rural settings of Taiwan wherein they have found that there are patients at greater risk of blood loss.\textsuperscript{16} The authors have suggested that the preoperative coagulation profiles should be arranged. Vega EA et al have suggested that the overall survival rate is better in laparoscopic surgery than that of open surgery in rural settings.\textsuperscript{24}

Few studies have been conducted to explore the limitations of resources in rural hospitals with the outcome of laparoscopic surgery (Table 2). The studies have showed that the surgeons could manage to perform laparoscopic surgery without much complications. Basu S et al., have suggested that Mini-laparotomy cholecystectomy may be a good alternative to laparoscopic cholecystectomy in rural settings.\textsuperscript{24} Further, certain studies based on the lack of training among surgeons on laparoscopic surgery suggested that

### Table 1: Laparoscopic cholecystectomy – Post-operative complications and post-operative stay

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Country</th>
<th>Study tool</th>
<th>Sample size</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gall CA and Chambers KJ\textsuperscript{11}</td>
<td>2002</td>
<td>Victoria</td>
<td>Retrospective study</td>
<td>28</td>
<td>Complications were not there in twenty-five of 28 patients who underwent chole-cystectomy by laparoscopic approach.</td>
</tr>
<tr>
<td>Haynes JH et al.\textsuperscript{12}</td>
<td>2004</td>
<td>LA</td>
<td>Cohort study</td>
<td>108</td>
<td>Laparoscopic surgery was safe with no deaths, no common bile duct injuries, postoperative complications, or long-term complications</td>
</tr>
<tr>
<td>Ji W et al.\textsuperscript{13}</td>
<td>2005</td>
<td>China</td>
<td>Clinical Trial</td>
<td>80</td>
<td>Laparoscopic surgery was successfully performed in 36 cases, and 2 patients were converted to open surgery for difficulty in managing bleeding under laparoscope. The conversion rate was 5.3%.</td>
</tr>
<tr>
<td>Carbonell AM et al.\textsuperscript{14}</td>
<td>2005</td>
<td>USA</td>
<td>Retrospective study</td>
<td>93,578</td>
<td>73.4% surgeries were performed laparoscopically. Length of hospital stay, charges, morbidity, and mortality were significantly less for laparoscopic cholecystectomy.</td>
</tr>
<tr>
<td>Ryan SM et al.\textsuperscript{15}</td>
<td>2009</td>
<td>New Zealand</td>
<td>Retrospective study</td>
<td>149</td>
<td>Laparoscopic cholecystectomies were performed safely and showed low complication rates.</td>
</tr>
<tr>
<td>Su HY and Lee WJ\textsuperscript{16}</td>
<td>2009</td>
<td>Taiwan</td>
<td>Prospective study</td>
<td>56</td>
<td>LC is a safe and effective treatment for older patients suffering from cholelithiasis, but these patients are at greater risk of blood loss. Preoperative coagulation profiles should be arranged.</td>
</tr>
<tr>
<td>Wichmann MW et al.\textsuperscript{17}</td>
<td>2010</td>
<td>Australia and Germany</td>
<td>Comparative study</td>
<td>359</td>
<td>Mortality rate was laparoscopic cholecystectomy 0.7% vs open cholecystectomy 3.7% (p=0.0369). Postoperative complications: 4.3% vs 5.5% (p=0.6077); Lesion of the main bile duct: 0.9% vs 1.8% (p=0.6091)</td>
</tr>
<tr>
<td>Teixeira J et al.\textsuperscript{18}</td>
<td>2014</td>
<td>Portugal</td>
<td>Critical analysis</td>
<td>520</td>
<td>In LC patients, there were rise in the levels of serum bilirubin, AST and ALT after 24 hrs of surgery and then again fall was noted (near to normal value) after 72 hrs of surgery except in that of ALP. ALP levels showed slight fall after 24 hrs of surgery and then slight rise after 72 hrs which was within the normal limit. Whereas in OC patients, there were slight variations in the liver enzymes (which were within the normal range).</td>
</tr>
<tr>
<td>Singal R et al.\textsuperscript{19}</td>
<td>2015</td>
<td>India</td>
<td>Case-matched analysis using propensity scores</td>
<td>200</td>
<td>Laparoscopic series resulted in a statistically significant lower blood loss (p=0.03), minor intraoperative blood transfusions and postoperative blood transfusions. Other outcomes like shorter length of stay (p=0.04) were also noticed.</td>
</tr>
<tr>
<td>Ratti F, et al.\textsuperscript{20}</td>
<td>2019</td>
<td>Italy</td>
<td>Case-matched analysis using propensity scores</td>
<td>104</td>
<td>30 patients were in LC and 38 patients were in open surgery. The mean operation time was 286 versus 274 min, mean blood loss was 158 versus 219 ml and mean hospital stay was 6.4 versus 9 days. The complication rate was not statistically significant (P=0.259).</td>
</tr>
<tr>
<td>Nag HH, et al.\textsuperscript{21}</td>
<td>2020</td>
<td>India</td>
<td>Retrospective study</td>
<td>68</td>
<td>Three-year overall survival rates for laparoscopic and open re-resection were 87 and 62 per cent respectively (P=0.502).</td>
</tr>
<tr>
<td>Vega EA, et al.\textsuperscript{22}</td>
<td>2020</td>
<td>USA</td>
<td>Observational study</td>
<td>255</td>
<td>Three-year overall survival rates for laparoscopic and open re-resection were 87 and 62 per cent respectively (P=0.502).</td>
</tr>
</tbody>
</table>
many surgeons of rural settings lack proper training in laparoscopic surgery (Table 3). It is also identified that the laparoscopic surgery is difficult to learn by many surgeons in rural settings.27, 28

The present systematic review also done to find the success of laparoscopic surgery in co-morbid cases (Table 4). A study has found that the surgeons prefer open surgeries in case of type 2 diabetes mellitus than laparoscopic surgeries.29 In a similar study, open surgery was preferred in suspected gall bladder carcinoma.29 In another study, laparoscopic surgery was preferred in place of open surgery in pregnant women.30

DISCUSSION

Providing surgical care in rural settings to patients has significant challenges especially with the surgical technique like laparoscopy. A rural setting typically has limited number of populations with moderate to low-income group people. Further they have limited technological resources and the practicing surgeon will have limited contacts with other specialists to get expert consultation in case of any post-surgical complications.32

It is not just the limitations of facilities but also the mindset of a surgeon to practice in rural area poses a great challenge in providing health care facilities in rural settings. However, the present systematic review on various outcomes of the laparoscopic cholecystectomy in rural hospitals had shown that the laparoscopic surgery has been performed successfully in many patients with less complications.

The studies had shown that there is shortage of surgeons in rural areas because of various difficulties faced by the

| Table 2: Laparoscopic surgery in resource limited settings of rural area hospital |
|---------------------------------|--------|----------------|-------------------|-----------------|
| Author (s)                      | Year   | Country        | Study tool         | Sample size | Results                                                                 |
| Basu S, et al.23                | 2006   | India          | Prospective study  | 32           | Mini-laparotomy cholecystectomy may be a good alternative to laparoscopic cholecystectomy in rural settings of developing countries, where resources are limited and waiting lists are long. There was no significant difference in intraoperative or postoperative complications between hospitals. The study suggested that basic laparoscopic procedures could be offered safely to resource-poor rural population. |
| Straub CM, et al.24             | 2011   | Mongolia       | Observational Study| 410          |                                                                                   |
| Ekundayo PO and Nwobe O25       | 2014   | Nigeria        | Retrospective study| 100          | The rate of conversion to open cholecystectomy was 6.9%. Post-operative complications were less. There was no mortality in the study. Hence laparoscopic cholecystectomy is a safe, reliable and a promising option even in the rural peripheral set up. |
| Shrestha AL, et al.26           | 2015   | Nepal          | Retrospective study| 348          |                                                                                   |

| Table 3: Laparoscopic surgery-need for training in rural settings |
|---------------------------------|--------|----------------|-------------------|-----------------|
| Author (s)                      | Year   | Country        | Study tool         | Sample size | Results                                                                 |
| Subramonian et al.27            | 2004   | UK             | Observational Study| 13           | The study group perceived that laparoscopy was more difficult to learn than open surgery even after the training. Lack of formal training in laparoscopy was identified in 57% of surgeons. Lack of government funds to implement a laparoscopic program was noted by 71% of surgeons. Lack of sufficient laparoscopic equipment was identified by 71% of surgeons. The majority of surgeons preferred to perform LC if these problems could be addressed. |
| Imran JB, et al.28              | 2019   | Guatemala      | Retrospective study| 9402         |                                                                                   |

| Table 4: Laparoscopic surgery in co-morbid cases in rural settings |
|---------------------------------|--------|----------------|-------------------|-----------------|
| Author (s)                      | Year   | Country        | Study tool         | Sample size | Results                                                                 |
| Lundberg O and Kristoffersson A29| 2001   | Sweden         | Comparative study  | 270          | Open surgery was recommended in cases of known or suspected gallbladder carcinoma since laparoscopic cholecystectomy has an increased risk of disseminating tumor cells. Urgent laparoscopic operations can be carried out successfully in pregnant patients throughout their pregnancy however the surgeon must be skilled in surgical obstetrics and in advanced laparoscopic techniques. The rates of open cholecystectomies were 3-fold higher in patients with T2DM than in those without T2DM, while the laparoscopic cholecystectomies rate was almost 2-fold higher. |
| Buser KB30                      | 2002   | Nebraska       | Retrospective study| 11           |                                                                                   |
| de Miguel-Yanes JM, et al.31    | 2016   | Spain          | Observational Study| 611533       |                                                                                   |
The major issues faced by the rural surgeon are diverse case mix, professional isolation, frequent call coverage and life style concerns.4 There are situations wherein the anesthetist may not be available for surgery and in emergency situations surgeons himself has to perform anesthesia for the patients.35 In this scenario, the surgeons prefer the laparoscopic surgery than the open surgery taking into consideration of the less post-operative complication and hospital stay. Thus, in rural settings, the laparoscopic surgeries are preferred by many surgeons. Udwaldia36 has advocated that the developing world should adhere to the concept of 5 A’s viz., availability, affordability, accessibility, acceptability along with the selection of appropriate surgery for the progress of advancements in rural surgery. Further, it has been ascertained that the rural surgeon with skill of laparoscopic surgery form a vital back-up for other clinicians in specialities like critical care and emergency services and thus provide great financial value to the rural community.37

CONCLUSION

The present systematic review has identified that the laparoscopic cholecystectomy in rural hospitals is most preferred as that of urban setting. It not only provides less hospital stay, but also provides economical option for rural patients. However, there are some limitations in many rural settings like lack of instrumental facility and trained surgeon. The outcomes of the laparoscopic cholecystectomy in some rural hospitals are comparatively same as that of urban settings.

REFERENCES


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