Cholecystectomy in sickle cell disease patients: Is there more acute chest syndrome after laparoscopy? A case controlled study

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Abstract

Laparoscopy is increasingly being recommended in order to reduce postoperative complications among sickle cell disease patients undergoing cholecystectomy. Acute chest syndrome is the most deadly of these complications. The purpose of this study was to assess if laparoscopic approach reduces postoperative complications related to sickle cell disease after cholecystectomy. A retrospective study of records of sickle cell patients who underwent cholecystectomy for cholelithiasis, from January 1990 to December 2005 was conducted. 136 sickle cell patients underwent surgery: 47 (34.5%) by laparoscopy and 89 (63.5%) by laparotomy. The mean operative time was 71.4 ± 18.9 min in the laparoscopy group and 61.2 ± 15.3 min in the laparotomy group (non-significant difference). The mortality was not significantly different between the two groups: one patient died in the open cholecystectomy group but no death occurred in the laparoscopic one. The morbidity related to the sickle cell disease was significantly higher in the laparoscopy group [n = 5 (10.5%)] than in the laparotomy group [n = 4 (4.5%)] (p = 0.04). This difference was associated with a higher rate of acute chest syndrome in the laparoscopy group [n = 4 (8.5%)] compared to that in the laparotomy group [n = 1 (1.1%)] (p = 0.01). There were more complications related to sickle cell disease in the laparoscopy group due to acute chest syndrome. Thus, these data should be confirmed in further randomized studies which must be undertaken.

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1. Introduction

Cholelithiasis is a frequent complication of sickle cell disease. Prevalence rate ranges from 30% to 70%. Three quarter of these patients become symptomatic, needing cholecystectomy. For patients free of sickle cell disease, laparoscopic approach is considered as the gold standard of cholecystectomy. For sickle cell patients, some studies have shown that laparoscopic cholecystectomy was feasible. But patients with sickle cell disease who undergo cholecystectomy are generally considered
to be at greater risk for perioperative complications than patients without sickle cell disease. The most dangerous complication is the acute chest syndrome because of its high mortality rate.

Although improvements have been made in perioperative management of sickle cell disease patients who undergo open cholecystectomy (oxygen therapy, hydration, and transfusion), the effect of laparoscopy in promoting acute chest syndrome has not been well studied. In fact, the insufflated CO₂ is absorbed and can lead to a metabolic acidosis which is a major cause of the red blood cells’ falciformation. Moreover, the increase of the intra-abdominal pressure during the laparoscopy can equally cause hypoventilation by reducing the diaphragm elevation. So, these two facts could combine and increase the risk of evolving an acute chest syndrome after laparoscopic cholecystectomy.

The aim of our study was to compare the outcome of open surgery versus laparoscopic approach in sickle cell disease patients with symptomatic cholelithiasis who underwent cholecystectomy.

2. Patients and methods

We reviewed the records of all sickle cell disease patients who underwent cholecystectomy for cholelithiasis from October 1990 to September 2005. The data were analysed by Epi Info⁶. A cholecystectomy was performed in sickle cell patients with symptomatic cholelithiasis whether for biliary colic, gallbladder sludge, microlithiasis or acute cholelithiasis.

Sickle cell patients were patients who were homozygous with haemoglobin S detected by electrophoresis. With regard to the type of haemolysis, these patients were divided into two groups: those who experienced chronic haemolysis (phenotype SSFA2 and SFA2) and others who experienced acute haemolysis (phenotype SC and SAFA2). Patients with chronic haemolysis and anaemia (SSFA2 and SFA2) are considered to have more severe sickle cell disease symptoms than those with few acute haemolysis (SSFA2 and SFA2). Patients with haemoglobin AA or AS and patients with concomitant cholecystotomy or bilo-intestinal diversion during cholecystectomy (n = 4) were excluded from the study. Records with incomplete data were also excluded (n = 13). Sickle cell disease-related morbidity was defined as postoperative complications directly linked to sickle cell disease. Other postoperative complications were defined as general morbidity. The choice of the approach of cholecystectomy (laparoscopy versus open cholecystectomy) was made based on discussion between the surgeon and the patient. Laparoscopy was performed with four trocars (a periumbilical trocar and three additional trocars in epigastric, right and left hypochondriac region) after creating a 12-mm Hg blinded pneumoperitoneum with a Veress needle. Each patient has had the same perioperative management, in order to avoid vaso-occlusion crisis: hyperhydration, oxygen therapy, warming up, pain control and transfusion if needed.

Acute chest syndrome was defined as the onset of a new low-bar infiltration on chest X-ray, excluding atelectasis, accompanied by fever greater than 38.5 °C, cough, dyspnoea and commonly pleuritic pain. Statistical analysis has compared two groups: sickle cell patients operated by laparoscopic cholecystectomy and those operated by open cholecystectomy. We first compared the epidemiological, clinical and therapeutic data to assess whether the two groups were comparable. Then, we compared the general and sickle cell disease–related morbidity and the mortality rate to assess the outcomes according to the cholecystectomy approach. This analysis was performed using the Epi Info6 software, using the χ², Student and Fisher non-parametric test.

3. Results

136 sickle cell patients with symptomatic cholelithiasis underwent cholecystectomy: 47 (34.5%) by laparoscopy and 89 (65.5%) by open surgery. The distribution of biological characteristics predictive of sickle cell disease severity (chronic haemolysis phenotypes and acute haemolysis phenotypes) was homogenous between laparoscopy group and open cholecystectomy group: 56.6% (n = 28) and 40.4% (n = 19) versus 67.4% (n = 60) and 32.6% (n = 29) [non-significant difference] (Table 1). The difference in clinical and paraclinical characteristic between the two groups was not significant (Table 2). So, the two groups were similar. The mean operating time was 71 ± 17 min in laparoscopy group and 62 ± 12 min in open cholecystectomy group. The mean hospital stay was, respectively, 7.7 ± 1.7 days and 6.2 ± 2.1 days. There was no death in laparoscopy group but one patient died in the other one [non-significant difference]. The death occurred after an acute haemolysis crisis. The morbidity rate non-related to the sickle cell disease was not significantly different between the laparoscopy group 27.6% (n = 14) and the other one 22.5% (n = 20) [Table 3]. But there was more sickle cell–related complications in the laparoscopy group compared to open cholecystectomy group [14.9% versus 4.5% (p = 0.04)] (Table 4).

4. Discussion

For sickle cell disease-free patients, laparoscopic approach is widely admitted to be the gold standard of cholecystectomy. Among sickle cell patients, the feasibility has been demonstrated by numerous studies for children and adult. They suggested that the outcomes of the two approaches were similar. Moreover, some of these studies reported that laparoscopic cholecystectomy for sickle cell disease

Table 1 – Characteristics of severity of the sickle cell disease

<table>
<thead>
<tr>
<th>Haemoglobin type</th>
<th>LC (n = 47)</th>
<th>OC (n = 89)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSFA2</td>
<td>55.3% (n = 26)</td>
<td>61.8% (n = 55)</td>
</tr>
<tr>
<td>SFA2</td>
<td>4.3% (n = 2)</td>
<td>5.6% (n = 5)</td>
</tr>
<tr>
<td>SAFA2</td>
<td>12.8% (n = 6)</td>
<td>10.1% (n = 9)</td>
</tr>
<tr>
<td>SC</td>
<td>27.6% (n = 13)</td>
<td>22.5% (n = 20)</td>
</tr>
</tbody>
</table>

LC, laparoscopy cholecystectomy; OC, open cholecystectomy.
Non-significant difference.
is the lung. Despite vigorous intraoperative hyperventilation, sons of all the symptoms and perioperative complication such as mortality. The effect of pneumoperitoneum in pro-

acute chest syndrome. To decrease the rate of postoperative complications related to sickle cell disease, many improvements have been made in the preoperative management. Currently, this management includes pre-emptive erythrocyte transfusion, aggressive hydration, and avoidance of hypoxia, pain, hypothermia and acidosis. These precautions decrease morbidity and mortality rates according to Haberkern et al.1 Despite these precautions, acute chest syndrome occurs in 50% of postoperative conditions. It is due to perioperative stress, hypothermia, hypoxia, acidosis and pain, which cause erythrocyte to sickle. In our series, we did not observe any deaths from acute chest syndrome, probably because of prompt treatment by transfusion and oxygen, antibiotics, effective analgesia and chest physiology. It is probably the best treatment of acute chest syndrome as reported by other authors. 

patients remain hyperbaric and acidic, which cause sickle erythrocytes, thereby precipitating vaso-occlusion and acute chest syndrome. In contrast to other vascular beds, the lung vasculature constrict with hypoxia, by the role of free radicals. In an underventilated lung, sickle cells remain deoxygenated, that led to perioperative hypoxia, hypoperfusion and acidosis: areas of ischemia/reperfusion develop, increasing production of oxidizing molecules such as O2, H2O2, OH radical and ONOO-, leading to further inflammation, subsequent infarction and acute chest syndrome. Fat embolism from bone marrow infarction during a pain crisis or infection may produce an acute chest syndrome.

5. Conclusion

Compared to the open approach, laparoscopy can lead to more acute chest syndrome which is the most lethal postoperative complication after abdominal surgery. These findings must be confirmed by further prospective randomized studies. As a result, in the meantime, when laparoscopy is performed, great care must be taken, such as: operating with low pressure (8–11 mm Hg), extending the hospital stay beyond 3 days because acute chest syndrome is detected typically after day 2 or day 3. Patients must also have early mobilization, effective pain control and intensive spirometry in order to prevent lung complication.

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Conflict of interest statement
None to declare.
REFERENCES


