Introduction

Laparoscopic cholecystectomy has become the standard treatment for symptomatic cholelithiasis in the UK since it was first carried out in 1987. The procedure is now routinely performed as a day case. For many years there has been political and public interest in reducing waiting lists for elective interventions, this has driven an increase in day case surgery. With constant pressure on NHS hospital beds, healthcare commissioners are increasingly looking to alternative providers and settings in which to deliver care. Many day-case interventions and operations are now being undertaken in new settings. This includes the Independent Sector Treatment Centres (ISTCs).

With improved surgical technique and growing experience, the conversion rate to open procedure from laparoscopic cholecystectomy has decreased. However, there remains a proportion of cases that will require conversion to an open procedure. Ideally those at high risk of conversion to open cholecystectomy should be operated on in a setting where an inpatient stay is most readily facilitated.

In 2001 Kama et al published a Risk Score for Conversion from Laparoscopic to Open cholecystectomy (RSCLO). This study identified six parameters that aspired to predict the risk of conversion.

Keywords: Laparoscopic cholecystectomy, Day-surgery, Risk-score.

Abstract

Background and Method: With the changing pattern of healthcare provision, procedures traditionally undertaken in an inpatient setting are increasingly occurring outside of conventional NHS hospital. This includes the Independent Sector Treatment Centres (ISTCs). We undertook a prospective study of 386 patients having an elective laparoscopic cholecystectomy to evaluate the effectiveness of a previously published risk-score (RSCLO, Risk Score for Conversion from Laparoscopic to Open cholecystectomy) in predicting which patients would require conversion, hence might be less suitable for treatment in an ISTC.

Results: We found no significant difference between the RSCLO scores of those requiring conversion and those completed laparoscopically, with median scores of -6 and -7 respectively. We found significantly different rates of conversion between males and females and between those with and without previous upper abdominal surgery.

Discussion and Conclusions: We found the RSCLO score to be an ineffective method of predicting which patients were at risk of conversion to an open cholecystectomy. We have devised a simple risk-score (Bradford-score), which when applied to our study population, it divided them into low-risk and high-risk groups with rates of conversion of 1.4% and 8.4% respectively (p < 0.05). This scoring system allows the identification of the patients most at risk of conversion to an open procedure, and therefore less suited to a procedure outside a major hospital setting.

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Factors included:

- male sex.
- abdominal tenderness.
- previous upper abdominal surgery.
- gallbladder thickening (greater than 4mm on ultrasound scan).
- age over 60.
- a hospital admission due to acute cholecystitis

Table 1 Risk score for conversion from laparoscopic to open cholecystectomy (RSCLO)².

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Variable</th>
<th>Score</th>
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<tbody>
<tr>
<td>Male sex</td>
<td>Male</td>
<td>+11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>Yes</td>
<td>+9</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Previous upper abdominal surgery</td>
<td>Yes</td>
<td>+8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Gallbladder wall thickened on USS (&gt;4mm)</td>
<td>Yes</td>
<td>+13</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Age  ≥60</td>
<td>Yes</td>
<td>+5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Pre-operative acute cholecystitis requiring hospital admission</td>
<td>Present</td>
<td>+15</td>
</tr>
<tr>
<td></td>
<td>Absent</td>
<td>0</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-20</td>
</tr>
<tr>
<td>Total</td>
<td></td>
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</tbody>
</table>

The RSCLO assigns a preoperative score between -20 and +32.

The study authors suggest a cut-off score of -3, below this they report a conversion rate of 1.6% and over this 11.4%. A further study to evaluate this score published in 2006 found a significant difference in the RSCLO scores of patients who required conversion compared to those who had their surgery completed laparoscopically, with mean scores of +16.2 and -5.7 respectively⁶.

A large retrospective study⁷, undertaken in an American laparoscopic centre, also identified male sex, gallbladder wall thickening and the presence of acute cholecystitis as risk factors for the conversion to open cholecystectomy, along with multiple biochemical markers. This study also found those converted to be significantly older (59.9 vs. 49.5 years). An earlier prospective study⁸ also identified male sex, gallbladder wall thickening, age, obesity and acute cholecystitis as risk factors for conversion.

All previous studies identified included patients having acute and elective cholecystectomy. Locally the majority of laparoscopic cholecystectomies are undertaken as elective operations and are intended to be completed as day cases. These are also the patients for whom an operation in an ISTC would be considered. We therefore aimed to re-evaluate this scoring system, in this setting, as a method of risk stratifying patients pre-operatively, with the intention that those at higher risk could be carried out in a conventional NHS hospital setting.

Methods

Data was collected prospectively from consecutive patients undergoing elective laparoscopic cholecystectomy at Bradford Royal Infirmary, between 1st January 2008 and 31st March 2010. Patients were scored pre-operatively whilst attending pre-assessment using the RSCLO2 scoring system and operative information was recorded by the operating surgeon (post-operatively). Surgeons recorded: whether conversion to open surgery was required, operative findings and the grade of the operating surgeon. Where there was missing data this was gained retrospectively from the patient’s medical notes (operation note and anaesthetic chart).

Pearson’s chi-squared test was used to compare proportions and a Mann-Whitney test was used to compare median scores. Statistical significance was considered to have been achieved when p < 0.05. The analysis of the data was undertaken using XLSTAT.

Results

Data was collected on 386 consecutive patients undergoing elective laparoscopic cholecystectomy. 97% (373) were completed laparoscopically, 3% (12) converted to an open procedure. Data was missing from one patient.

RSCLO score

The median RSCLO score for those operations completed laparoscopically was -7 [range -20 to +32] and -6 [range -12 to +13] for those converted to open. The difference between these medians was not significant (Mann-Whitney test, p = 0.2).

When a cut-off score of -3, as described by Kama et al⁹, was applied a conversion rate of 3.0% was observed for those scoring less than -3 and 3.4% in those scoring -3 or higher, this difference was not statistically significant (Pearson Chi-square test, p=0.8).

Individual risk factors

All six risk factors were evaluated individually for the risk of conversion to open cholecystectomy [Table 2].

Gender

The conversion rate in the male patients was 7% compared to 2% in the female patients, this difference achieved statistical significance [Pearson Chi-square test, p= 0.04].
Abdominal tenderness
Only 2 patients (0.5%) were recorded as having abdominal tenderness, both were completed laparoscopically.

Previous upper abdominal surgery
Previous upper abdominal surgery was a risk factor in 6.5% of the study population. Those with previous upper abdominal surgery had a 12.0% rate of conversion compared to 2.5% in those who had not had upper abdominal surgery, this achieved statistical significance (Pearson Chi-square test, p=0.006).

Gallbladder wall thickening
Gallbladder wall thickening (identified on USS) was present in 22.8% of the study population. There was no significant difference in the rate of conversion in those with and without a thickened gallbladder, with 3.4% and 3.0% converted respectively.

Age
22.0% of the study group were aged >60 at the time of operation. There was no significant difference in the rate of conversion, 3.5% being converted in those over 60 and 3% of those under 60.

Previous admission with cholecystitis
41.7% of the study population had had a previous admission to hospital with acute cholecystitis. There was no difference in the rates of conversion, with 3.1% converted in both those with and without this risk factor.

Discussion
The primary objective of this study was to evaluate whether the previously reported RSCLO score could be used to risk-stratify patients, and therefore minimise the risk of conversion in a non-inpatient setting. We carried out a two-fold evaluation of the RSCLO score, firstly we compared the median scores for those completed laparoscopically with those converted, these were -7 and -6 (this difference was not statistically significant). Secondly we applied the cut-off value of -3 [as described by Kama et al], we observed similar rates of conversion for these two groups, 3% for those with a score less than -3 and 3.4% for those with a score of -3 of greater (this difference was not statistically significant). This is in contrast to the significantly different conversion rates of 1.6% and 11.4% observed by Kama et al.
Our evaluation has shown the RSCLO score to be an ineffective method of risk stratifying our patient population and therefore not helpful in selecting patients to be operated on in a day-case only setting. The difference between this study and previous studies, is that we have only included patients undergoing elective operations. On review of the previous studies it is not clear what proportion of patients had their operation during an episode of acute cholecystitis. Kama et al group previous and current admission with cholecystitis together and consider them as the same risk factor: no differentiation is made. Locally, the management of acute cholecystitis is predominantly conservative with a typical delay to surgery of 6 to 8 weeks. This may also explain why gallbladder wall thickening (>4mm) is not a significant risk factor, the majority of preoperative ultrasound scans in our study occurred prior to the patient being listed: therefore at least 6 to 8 weeks prior to operation. Previous studies do not report the time at which this scan occurred, however if this time-frame is shorter it is likely to have greater effect on risk of conversion.

When evaluating the risk factors in our patient population we found that just two had significantly different rates of conversion. Conversion rate in the male patients was 7% compared to 2% in the female patients (p=0.04). Those patients with upper abdominal surgery had a conversion rate of 12% compared to 2.5% in those without (p=0.006).

Given we had shown the RSCLO score to be an ineffective method of risk-stratifying our patient population, we explored using the two risk factors which we had shown to have a statistically significant effect on the rate of conversion, male gender and previous upper abdominal surgery. We therefore propose a simplified scoring system which we have termed the ‘Bradford-score’. This scoring system identifies the quarter of the population most likely to require conversion to an open cholecystectomy. The ‘high-risk’ group identified by the Bradford-score had an 8.4% risk of conversion compared to 1.4% for the ‘low-risk’ group. We believe this scoring system will be simple to implement and will help minimise the risk of conversion in a non-hospital setting.

We therefore advocate the use of this simple method of risk-stratifying patients. This score has several advantages; firstly, it does not require any laboratory or radiological investigations and the information could easily be gained during the patient’s pre-assessment appointment. Secondly, this score would only excludes approximately 25% of patients from having their operation in a non-hospital setting (ISTC) so is unlikely to have a negative effect on waiting times.

**Conclusion**

We have undertaken a two-fold evaluation of the RSCLO score and found this to be an ineffective method of risk stratifying our patient population. We therefore conclude that this is not a suitable method for selecting patients to undergo their surgery in a non-hospital setting. We did find significantly different rates of conversion for two risk factors: male gender and previous upper abdominal surgery. We have proposed a simple method of risk stratifying patients, the Bradford-score. This scoring system identifies the quarter of the population most likely to require conversion to an open cholecystectomy. The ‘high-risk’ group identified by the Bradford-score had an 8.4% risk of conversion compared to 1.4% for the ‘low-risk’ group. We believe this scoring system will be simple to implement and will help minimise the risk of conversion in a non-hospital setting.

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**References**