Day-Case Laparoscopic Cholecystectomy in Childhood: Outcomes from a Clinical Care Pathway

Girish Jawaheer¹ Kathryn Evans¹ Ritchie Marcus²

¹Department of Pediatric Surgery, Birmingham Children’s Hospital, Birmingham, United Kingdom
²Department of Pediatric Anesthesia, Birmingham Children’s Hospital, Birmingham, United Kingdom


Abstract

Aim The aim of this study was to report clinical outcomes following the use of a pediatric day-case laparoscopic cholecystectomy (DCLC) clinical care pathway. The pathway was modified in September 2009 and we compare the clinical outcomes before and after this modification.

Methods A care pathway for DCLC was introduced in 2008 with emphasis on the day of admission, timing of surgery, choice of anesthetic agents, analgesia, postoperative feeding, mobilization, and pain scoring. Demographic and clinical data were recorded prospectively from January 2008 to January 2012. In September 2009, two modifications were made to the pathway. Induction of anesthesia was changed to total intravenous anesthesia, using propofol (target 4 to 6 µg/mL) and remifentanil (target 3 to 5 ng/mL) and the use of the gaseous anesthetic sevoflurane was eliminated with the aim of reducing the risk of postoperative nausea and vomiting (PONV). The postoperative feeding regime was changed from unrestricted to light diet for 72 hours. The rest of the pathway was unchanged. Data before (group 1) and following the modifications (group 2) were compared.

Results We admitted 25 children with symptomatic cholelithiasis for DCLC under the care of one surgeon: 12 in group 1 and 13 in group 2. There were no significant differences in age between group 1 (median 13 [range 6 to 15] years) and group 2 (median 15 [9 to 16] years) (p = 0.07). There were no intra- or postoperative complications. The day-case rate increased from 6/12 (50%) in group 1 to 12/13 (92%) in group 2 (p = 0.03). The incidence of PONV reduced from 7/12 (58%) in group 1 to 0/13 in group 2 (p = 0.002). PONV in group 1 resulted in overnight stay (n = 6) and readmission (n = 1). One patient in group 2 had an overnight stay due to poor mobilization.

Conclusions Adoption of a DCLC pathway is feasible and safe for children. Emphasis on adequate pain management and avoidance of PONV results in a high rate of day-case surgery equivalent to that achieved in adult practice.

Keywords
► cholecystectomy
► laparoscopic
► clinical care pathway
► children
► day-case

Address for correspondence and reprint requests Girish Jawaheer, Department of Pediatric Surgery, Birmingham Children’s Hospital, Steelhouse Lane, Birmingham B4 6NH, United Kingdom (e-mail: girish.jawaheer@bch.nhs.uk).
Introduction

The role of laparoscopic cholecystectomy (LC) as first line treatment for symptomatic cholelithiasis is now undisputed. A relatively recent development has been the introduction of day-case LC (DCLC) in adult practice in the 1990s and there is an abundance of reports promoting its use. DCLC is now listed on the British Association of Day Surgery15 and the Audit Commission17 list of procedures. Its adoption has led to the publication of several national and international guidelines. The role of DCLC in pediatric practice is yet to be established. There is a published guideline on DCLC from the British Association of Day Surgery in adults. There is growing evidence to suggest that clinical care pathways improve outcomes and reduce hospital stay in adults and children.23 There are presently no published guidelines or pathways on DCLC in children. The aim of this article is to address this void in the literature and to report clinical outcomes following the use of a pediatric DCLC clinical care pathway at our institution. The pathway was modified in September 2009 and we compare the clinical outcomes before and after this modification.

Patients and Methods

All LCs in the Pediatric Surgical Department are performed by a single surgeon. In December 2007, a clinical care pathway was introduced following an audit of 36 LCs performed between September 2003 and September 2007. The essential elements of the pathway are outlined in Figure 1. The changes in practice following the audit were admission on the procedure day, the cessation of blood investigations including group and save and blood cross-matching, a standardized anesthetic protocol, discontinuation of the use of routine antibiotics, minimization of the use of intravenous morphine in the postoperative period and pain scoring using the Wong and Baker Visual FACES pain rating scale. All patients were seen at the end of the procedure, an effort was made to evacuate as much CO2 from the peritoneal cavity as possible. In the postoperative period, early mobilization was encouraged as well as enteral intake of fluid and light diet. Pain was assessed by the child’s nurse and scored using the Wong and Baker FACES pain rating scale. All patients were seen at the end of the afternoon by the anesthetic team and jointly by the surgical and the nursing team and a decision was made regarding discharge. It was considered important to leave the final decision regarding discharge from hospital to be made jointly by the patients’ families and the nursing team. Criteria for discharge were normal temperature, pulse and blood pressure, tolerance of fluid and light diet, adequate pain control, comfortable mobilization, and patient/carer satisfaction with discharge. The carers were provided with the ward contact details and encouraged to have a low threshold for calling for advice. The following day, the carers were telephoned by the surgeon and a pain score was obtained.

All LCs performed between January 2008 and October 2011 were entered on an electronic database, and demographic and clinical data including operative details and outcomes and intra- and postoperative complications were recorded prospectively. Patients were placed in two groups: group 1 included patients from pathway introduction in January 2008 to September 2009 when the pathway was modified and group 2 comprised patients postpathway modification from...
September 2009 to October 2011. All patients were followed up in the outpatient clinic 6 weeks following discharge.

Statistical analyses were performed using the t test to compare age and weight and the Fisher exact test to compare the rate of PONV and the rate of day-case surgery. Results were considered to be significant at $p \leq 0.05$.

The introduction of the clinical care pathway was in line with our institutional policies. The fundamental elements of the pathway were based on the outcome of an audit registered with our Governance Department. Ethics approval was not required as the pathway contained treatment modalities which are well established within clinical practice.

**Results**

Clinical outcomes are reported in 25 children: 12 in group 1 and 13 in group 2. Between January 2008 and April 2009, out of 13 children having LC as the sole procedure, 12 (92%)
Table 1 Exclusion criteria for DCLC

<table>
<thead>
<tr>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sickle cell disease</td>
</tr>
<tr>
<td>Abnormal liver function</td>
</tr>
<tr>
<td>Presence of comorbidty</td>
</tr>
<tr>
<td>Performance of other operations under the same anesthetic</td>
</tr>
<tr>
<td>Presence of adverse social conditions at home</td>
</tr>
<tr>
<td>Long distance from hospital</td>
</tr>
</tbody>
</table>

Abbreviation: DCLC, day-case laparoscopic cholecystectomy.

children (7 girls and 5 boys) met the criteria to undergo DCLC (group 1). Median age was 13 (range 6 to 15) years and median weight was 51 (range 18 to 104) kg. Indications for surgery were biliary colic (n = 9) and gallstone pancreatitis (n = 3). One child was excluded due to the presence of comorbidity (sickle cell anemia). Between September 2009 and October 2011, out of 16 children having solely LC, 13 (81%) children (10 girls and 3 boys) met the criteria for DCLC (group 2). Median age was 15 (9 to 16) years and median weight was 55.9 (range 27.2 to 77.5) kg. There were no significant differences in age or weight between the two groups (p = 0.07 and p = 0.52, respectively). Indications for surgery were biliary colic (n = 10) and gallstone pancreatitis (n = 3). Three children were excluded due to the presence of comorbidity (nephrotic syndrome, n = 1) and living a long distance away from the hospital (n = 2). Liver function tests were normal in all patients at the time of surgery. The diagnosis of cholelithiasis was confirmed by ultrasonography in all patients before admission. Median operating time was 90 (range 70 to 150) minutes. Intraoperative cholangiography excluded the presence of common bile duct stones or obstruction in all the patients. Seven (58%) children in group 1 had a dilated biliary system, with a median common bile duct diameter of 5.6 (range 4 to 18) mm. Three children in group 2 had a dilated biliary system with a median CBD diameter 9 mm (range 6 to 10 mm). There were no intra- or postoperative minor or major complications and there were no conversions to open procedure. There was no intraoperative bleeding which required a blood transfusion. Six (50%) children in group 1 were discharged on the day of surgery. In this group, median pain score was 3/10 (range 0 to 3) before discharge and 3 (range 2 to 4) on the day after the procedure. Five children had an overnight stay and one child had a two-night stay. Reasons for the delay in discharge were PONV in all the six cases. There was no delay in discharge secondary to pain. One of the six patients discharged on the day of surgery was readmitted 2 days later with PONV. In group 2, 12 (92%) of the patients were discharged on the day of surgery. In this group, median pain score was 2/10 (range 0 to 4) on the day of discharge and 1/10 (range 0 to 4) on the day after the procedure. The postdischarge pain scores were significantly less in group 2 (p = 0.04). The incidence of PONV reduced from 7/12 (58%) in group 1 to 0/13 in group 2 (p = 0.002) following pathway modification. One patient in group 2 had an overnight stay due to poor mobilization. Comparisons between groups 1 and 2 are summarized in Table 2. All patients were seen in the outpatient clinic 6 weeks following discharge. There was universal patient and carer satisfaction with the patient journey through the pathway.

Discussion

This is the first report of DCLC in childhood to be based on a clear, detailed, and reproducible clinical care pathway. It is of interest that 50% of the patients in group 1 admitted for DCLC were discharged on the procedure day and this increased significantly to 92% in group 2 (p = 0.003) following our pathway modification. This compares favorably with adult practice where early experience with DCLC achieved same-day discharge rate of 56%28 and the rate has since risen to 65 to 94%.28,4-6,19,29,30

The success of a DCLC service is dependent on four crucial factors: a multidisciplinary team approach, rigorous patient selection, adequate pain management, and avoidance of PONV. Each one of these factors will now be discussed in more detail.

LC was introduced in our department in 2003 and a policy was instituted for all LCs to be performed by a single surgeon. The latter initially worked in close conjunction with a single consultant pediatric anesthetist. This set-up led to ~10 LCs being performed by a single team and invaluable experience was accumulated in a relatively short space of time. This accounted for the absence of minor or major complications and conversions to open in this series which compares favorably with adult series where a minor complication

Table 2 Comparison of demographic and clinical data in groups 1 and 2

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (range) years</td>
<td>13 (6–15)</td>
<td>15 (9–16)</td>
<td>0.07</td>
</tr>
<tr>
<td>Weight, median (range) kg</td>
<td>51 (18–104)</td>
<td>55.9 (27.2–77.5)</td>
<td>0.52</td>
</tr>
<tr>
<td>Pain score predischarge</td>
<td>3 (0–3)</td>
<td>2 (0–4)</td>
<td>0.34</td>
</tr>
<tr>
<td>Pain score postdischarge</td>
<td>3 (2–4)</td>
<td>1 (0–4)</td>
<td>0.04</td>
</tr>
<tr>
<td>PONV</td>
<td>7 (58%)</td>
<td>0</td>
<td>0.002</td>
</tr>
<tr>
<td>Day-case rate</td>
<td>6/12 (50%)</td>
<td>12/13 (92%)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Abbreviation: PONV, postoperative nausea and vomiting.
rate of 2% and a major complication rate of 5%\textsuperscript{1} and a conversion rate of 2\textsuperscript{6} have been reported. Data relating to the cases were collected prospectively and clinical outcomes were audited. The most significant lessons to be learnt by the audit were that admission on the day before the procedure was unnecessary, that explanation of the procedure and discharge policy to the families in the outpatient setting was extremely important in shaping their expectations and influencing their acceptance of having a major procedure performed in an ambulatory setting, and that the use of intravenous opioids, as patient-controlled analgesia (PCA), in the postoperative setting introduced significant delays to discharge. The role of the nursing team in achieving one’s goals should not be underestimated. The postoperative nursing management of children having DCLC requires a major shift away from a traditional conservative approach with regard to introduction of enteral feeds, mobilization, and pain management. In our experience, an important role of the nurse is to introduce an element of balance to the decision regarding patient discharge. It is conceivable that if the decision regarding discharge is made solely by the surgeon, some patients may be discharged prematurely to bolster their same-day discharge rates in spite of high levels of pain or difficulties with mobilization or nausea. To eliminate this bias, the final decision for discharge was made by the nurse caring for the patient in close conjunction with the family. There were several instances in group 1 where the patients had an overnight stay purely because the nurses were not comfortable with same-day discharge. It is not known whether these patients could have been managed successfully at home.

Rigorous patient selection is a prerequisite for the success of DCLC. All the patients in our series were teenagers except for those who were aged 6 and two who were 9 years old. Of these three children, only one of the 9 years old achieved same-day discharge. This series is too small for one to be comfortable with same-day discharge. Patients with sickle cell disease were excluded based on the day before the procedure was unnecessary, that explanation of the procedure and discharge policy to the families in the outpatient setting was extremely important in shaping their expectations and influencing their acceptance of having a major procedure performed in an ambulatory setting, and that the use of intravenous opioids, as patient-controlled analgesia (PCA), in the postoperative setting introduced significant delays to discharge. The role of the nursing team in achieving one’s goals should not be underestimated. The postoperative nursing management of children having DCLC requires a major shift away from a traditional conservative approach with regard to introduction of enteral feeds, mobilization, and pain management. In our experience, an important role of the nurse is to introduce an element of balance to the decision regarding patient discharge. It is conceivable that if the decision regarding discharge is made solely by the surgeon, some patients may be discharged prematurely to bolster their same-day discharge rates in spite of high levels of pain or difficulties with mobilization or nausea. To eliminate this bias, the final decision for discharge was made by the nurse caring for the patient in close conjunction with the family. There were several instances in group 1 where the patients had an overnight stay purely because the nurses were not comfortable with same-day discharge. It is not known whether these patients could have been managed successfully at home.

The data provided in this report demonstrate that DCLC in children is feasible in the majority of patients requiring cholecystectomy as a sole procedure and can be performed with excellent results without compromising patient safety. A multidisciplinary team approach and the adoption of a clinical care pathway focusing on adequate pain management and avoidance of PONV are a prerequisite for success.
Conflict of Interest
None

References
7 Metcalfe MS, Mullin EJ, Maddern GJ. Relaxation of the criteria for day surgery laparoscopic cholecystectomy. ANZ J Surg 2006;76(3):142–144