

## An 'early interval' (Delayed Urgent) laparoscopic cholecystectomy for acute cholecystitis: evidence to support a safe surgical procedure.

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### Summary :

**Background:** Delayed interval cholecystectomy can be performed to overcome the logistical difficulties in performing 'early urgent' laparoscopic cholecystectomy (LC) within 72 hours of admission with acute cholecystitis (AC), and to avoid earlier re-admission with recurrent AC in patients waiting 'delayed interval' cholecystectomy.

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**Objectives:** To evaluate the safety and feasibility of 'delayed urgent' LC performed beyond 72 hours.

**Methods:** Patients admitted with AC were scheduled for urgent LC. Patients who underwent 'early urgent' LC were compared with those who had 'delayed urgent' surgery.

**Results:** Fifty consecutive patients underwent urgent LC for AC within 2 weeks of admission. There were no conversions and no bile duct injuries. Delayed surgery ( $n=36$ ) neither prolonged operating time (90 vs. 85 minutes) nor increased operative morbidity (9.7% vs. 7.7%) or mortality (2.4% vs. 7.7%) compared with early surgery ( $n=14$ ). Although delayed surgery was associated with shorter postoperative hospital stay (1 vs. 2 days,  $p=0.029$ ), it prolonged total hospital stay (9 vs. 5 days,  $p<0.0001$ ).

**Conclusions:** Delay of LC beyond 72 hours neither increases operative difficulty nor prolongs recovery. It might be more cost effective to schedule patients who could not undergo 'early urgent' LC but are responding to conservative treatment for an 'early interval' LC within 2 weeks of presentation with AC.

**Key words:** lap.cholecystectomy.acute cholecystitis.interval cholecystectomy

### Introduction:

Acute cholecystitis (AC) is encountered in approximately one-fifth of all admissions with gallbladder disease<sup>1</sup>. Urgent open cholecystectomy has proved to be beneficial for the management of AC in terms of reducing the morbidity rate and shortening the hospital stay compared with conventional conservative treatment with subsequent interval open cholecystectomy<sup>2,3</sup>. However, initial reports of urgent laparoscopic cholecystectomy (LC) for AC often showed greater morbidity rates, prolonged operation time and higher conversion rates to open surgery compared with elective LC<sup>4,5</sup>. Therefore, AC was considered to be a relative contraindication to urgent LC, and conservative management followed by a 'delayed interval' LC (6-12 weeks after acute attack) was the accepted practice in the early 1990s<sup>6</sup>.

The management of AC has evolved with the increase in laparoscopic experience<sup>7,8</sup>. Urgent LC for AC can now be performed safely with low rates of morbidity and conversion to open surgery<sup>9,10</sup>, and with significantly shorter postoperative hospital stay compared with open surgery<sup>11</sup>. A number of randomized controlled trials that evaluated the role of 'early urgent' LC (performed within 72-96 hour of onset of symptoms) in comparison with 'delayed

interval' LC have demonstrated the safety and feasibility of the 'early urgent' approach with its added benefit of shorter hospital stay<sup>12,13,14</sup>. Despite this, 'early urgent' LC for AC is often difficult to implement due to logistical reasons related to the availability of emergency theatre and accessibility to an experienced surgeon. In addition, a proportion of surgeons may be deterred by possible increase in technical difficulty and operative risk, thus preferring to adopt the approach of 'delayed interval' LC.

However, the policy of 'delayed interval' LC for acute cholecystitis suffers from drawbacks. Up to 26% of patients<sup>11</sup> may not respond to the initial conservative treatment and require urgent cholecystectomy. Furthermore, 23-29% of patients scheduled for 'delayed interval' LC require earlier re-admission with recurrent AC<sup>15,16,17</sup>. This policy clearly prolongs the overall hospital stay and increases costs.

Taking into consideration the logistical difficulties and the 'common' surgeons' apprehensions towards 'early urgent' LC (i.e. Within 72 hours), and in an attempt to overcome the drawback of the 'delayed interval' LC approach (i.e. 6-8 weeks later) it would seem reasonable to explore the potential applicability of an 'early interval' LC (i.e. Within 2 weeks of the acute attacks). As we have not yet adopted this latter proposed approach, this study

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Methods

aimed to evaluate the safety and feasibility of LC for AC performed beyond 72 hours and within 2 weeks during the acute admission, i.e. A 'delayed urgent' LC.

**Patients:** Patients were included in this retrospective study if they had undergone urgent LC during an acute admission to hospital for suspected AC, where AC was confirmed intraoperatively and by histological examination of the excised gallbladder. The indications for urgent LC were based on clinical features suggestive of AC which included symptoms and signs of local inflammation (acute upper abdominal pain with tenderness under the right costal margin) and systemic toxicity (fever above 37.5 °C, leukocytosis of greater than 11x10<sup>9</sup>/L)<sup>18</sup>. The diagnosis of AC is usually confirmed by ultrasonographic evidence such as the presence of a thickened and edematous gallbladder wall in association with cholecystolithiasis, ultrasonographic Murphy's sign and pericholecystic fluid collection<sup>19</sup>. Patients who underwent surgery within 72 hours of admission ('early urgent' LC) were compared to those who had surgery within the same acute admission after 72 hours and within 2 weeks ('delayed urgent' LC). Patients who underwent LC during their acute admission more than 2 weeks after hospitalization with AC were excluded. Patients who at surgery or on histological evaluation were found to have a non-acutely inflamed gallbladder, were also excluded from this analysis.

**Operative technique:** Surgery was performed by one Consultant Surgeon, who sub-specializes in laparoscopic hepatobiliary and pancreatic surgery or by higher surgical trainees under his direct supervision. The operative technique of LC involved retraction of the liver in a cephalad direction<sup>21</sup>. Additional caudal retraction of the transverse colon, greater omentum and duodenum may be necessary particularly in the obese patient, and can be accomplished with the manipulation of patient position. Adherent greater omentum and colon can be carefully released by using a 5-mm suction device at the beginning of the procedure. A tense and distended gallbladder limits handling and pushes the distended Hartmann's pouch into the foramen of Winslow behind the common bile duct rendering dissection for the unwary rather hazardous. To overcome these difficulties we routinely decompressed a tense gallbladder at the start of dissection through the use of a 5-mm aspirating needle or by advancing the 5-mm port in the right midclavicular point with its trocar into the distended gallbladder and replacing the trocar with suction. A large stone impacted at the Hartmann's pouch limits the surgeon's ability to handle the gallbladder, obliterates Calot's triangle and falsely shortens the cystic duct; to overcome this difficulty we would attempt to dislodge the stone into the gallbladder using two grasping forceps, or would incise Hartmann's pouch and release of the stone into the

subhepatic space prior to placing it into a tissue retrieval bag. Curved forceps, 5-mm suction device and gauze pledgets were used to effectively expose the structures in the Calot's triangle; diathermy was used sparingly. Retrograde LC was used very infrequently as we have not found it useful as the associated bleeding from the liver bed further obscures the anatomy of Calot's triangle. In the acute-on-chronically inflamed gallbladder, dissection of the gallbladder from its liver bed can be difficult and can be overcome by dissection in the submucosal plane.

#### **Results:**

Between 2005 and 2010, 105 consecutive patients underwent urgent LC during acute admission with symptoms or complications of gallstone disease. All patients (n=43) with persistent biliary colic, choledocholithiasis or biliary pancreatitis were excluded from this analysis. Amongst 62 patients who underwent urgent LC for suspected AC, twelve were excluded from this study (seven patients were found intraoperatively or on histology to have a non-inflamed gallbladder, and five patients underwent LC more than 2 weeks after admission with AC). The remaining 50 patients (32 female) with a median age of 61 (range 19-89) years underwent urgent LC during the same admission for operatively and histologically confirmed AC, and these constitute the study population.

Despite our endeavors, only 14 patients (25%) underwent surgery within 72 hours of admission ('early urgent' group). The remainder 36 patients who underwent LC after 72 hours represented the 'delayed urgent' group. The patient characteristics and the time interval between admission and surgery in each group are shown in Table 1. The two groups were comparable for age, sex, ASA score, frequency of previous abdominal surgery, the frequency of empyema of gallbladder and the severity of inflammatory adhesions to the gallbladder (Table 1). In this series of 50 patients, none of the patients required a common bile duct exploration. There were no conversions to open surgery and no bile duct injuries. None of the patients required Intraoperative or postoperative blood transfusion. 'Delayed urgent' surgery did not result in prolongation of operating time and did not increase operative morbidity or mortality compared with 'early urgent' surgery (Table 2).

In the 'early urgent' group, one patient with chronic pulmonary disease developed respiratory failure and died 27 days post-surgery. In the 'delayed urgent' group, one patient developed bile leak from the stump of the cystic duct that was treated successfully with endoscopic stenting, another experienced transient hepatocellular jaundice that resolved spontaneously and had a normal biliary tree on endoscopic imaging, while a third patient developed acute necrotizing pancreatitis after the LC and died four days post-surgery.

Although 'delayed urgent' LC that was performed during the acute admission with AC was associated with a shorter postoperative hospital stay, it significantly prolonged the total hospital stay compared with 'early urgent' surgery (Table 2).

#### Discussion:

This study has shown that 'delayed urgent' LC for AC could be accomplished safely with low morbidity and very low conversion rate, and that the delay in performing urgent LC beyond 72 hours after acute admission does not increase operative difficulty, duration of surgery or postoperative hospital stay compared with 'early urgent' surgery; however this delay significantly prolongs the total hospital stay. In a meta-analysis of four randomized and quasi-randomized clinical trials that included 504 patients, urgent LC was of comparable safety and efficacy to 'delayed interval' LC for AC with no difference in operation time, conversion rate, overall complication rate, incidence of bile leakage, and intra-abdominal collections<sup>22</sup>. Furthermore urgent surgery benefited from significantly shorter total hospital stay, avoided a 23% rate of failure of conservative treatment with the need for an emergency LC in the 'delayed interval' group, and was therefore judged to be more cost effective<sup>22</sup>. In addition, waiting for elective surgery has been objectively shown to detract from the patients' health-related quality of life<sup>23</sup>.

However, when considering urgent LC for AC, most surgeons would rather avoid surgery beyond 72-96 hours after onset of acute attack due to concerns for an increased operative difficulty and time<sup>12,13,24</sup>, and higher conversion rate<sup>24,25</sup>. Our data however argues that –in experienced hands– these concerns appear unsupported as the previously observed differences in outcomes between 'early urgent' and 'delayed urgent' LC for AC in favor of the former approach<sup>24,25</sup> rather disappeared. In our comparative non-randomized study, the delay in performing urgent LC beyond 72 hours did not increase operative time or postoperative morbidity, and surgery was accomplished without conversions and with no bile duct injuries. Furthermore, 'delayed urgent' LC was associated with a significantly shorter postoperative hospital stay compared with 'early urgent' surgery (1 vs. 2 days); this difference might be the result of further resolution of the severity of acute inflammation with conservative therapy in the majority of patients while awaiting surgery. In another non-randomized comparative study, Chandler *et al*<sup>25</sup> reported absence of difference in postoperative morbidity and hospital stay between these two approaches. Others have shown a decrease in conversion rate of LC for AC with increase in experience<sup>26</sup>.

We have described in the operative section earlier the key points that we adopt to facilitate a difficult LC for AC. It is our opinion that persevering with the laparoscopic approach as long –as the patient's

general condition allows– is worthwhile as conversion to open surgery considerably increases morbidity and postoperative hospital stay<sup>8</sup>. Furthermore, we have previously shown that the duration of laparoscopic surgery does not have an impact on the duration of postoperative hospital stay<sup>27</sup>. Clearly conversion to open cholecystectomy may be unavoidable if the anatomy remains unclear, though with perseverance this situation has not arisen in our hands.

However, 'delayed urgent' surgery during the acute admission significantly prolonged the total hospital stay due to the increase in waiting times for surgery for various logistical reasons. This finding was also supported by others<sup>25</sup>. Logistical difficulties such as lack of availability of emergency theatre, experienced surgeons, and access to radiological investigations are the main reasons cited by UK surgeons to explain the finding of a recent national survey that only 11% of surgeons routinely performed urgent LC for AC<sup>28</sup>.

Whilst safe, the delay in performing urgent LC during the emergency admission with AC and subsequent prolongation of hospital stay might abolish the cost effectiveness of 'early urgent' surgery in comparison with 'delayed interval' surgery. To retain some of the benefits of urgent surgery for AC, we suggest that patients who are still awaiting urgent LC after 3 days of admission – but whose symptoms and signs of acute inflammation are resolving– are allowed home at that stage with a plan for re-admission within two weeks for LC in the elective theatre (i.e. An 'early interval' LC). Such a schedule reduces the total hospital stay compared with that of a 'delayed urgent' LC, avoids readmission with recurrent AC that might otherwise be observed in one-quarter of patients awaiting 'delayed interval' LC<sup>17,28,29</sup>, reduces overall cost<sup>29</sup>, and spares patients the frustrations of uncertainty of timing of, and repeated fasting for, an urgent LC. Clearly, a randomized trial to compare the two approaches of 'delayed urgent' and 'early interval' LC in patients with AC who could not get to theatre for an 'early urgent' LC is warranted to confirm these observations. When discussing the timing of LC for AC, one has to acknowledge the role of percutaneous drainage of an acutely inflamed gallbladder in the small minority of very ill and high-risk patients as a temporizing measure that should be followed whenever possible with a LC<sup>30</sup>.

The delay of urgent LC for AC beyond 72 hours does not appear to increase operative difficulty or prolong recovery and can be performed safely with low conversion rate. It might be more cost effective to schedule patients responding to conservative treatment for an interval LC within 2 weeks of presentation with AC than to continue to await an urgent LC.

**Table 1. Characteristics of patients**

	'Early urgent' LC (n=14)	'Delayed urgent' LC (n=36)	P value
Median age (year)*	59 (56-78)	62 (40-76)	0.315
Female sex: No. (%)	9 (64%)	23 (64%)	1.000
ASA score (3-4): No. (%)	3 (21%)	8 (22%)	1.000
Previous acute admissions with biliary disease: No. Of patients (%)	4 (29%)	12 (33%)	1.000
In-hospital interval before surgery (days)*	2.5 (1-3)	7 (5-10)	<0.0001
Previous upper abdominal surgery: No. (%)	5 (36%)	11 (31%)	0.746
Severity of adhesions to the gallbladder♣	2 (1.5-2)	2 (1-3)	0.804
Empyema of gallbladder: No. (%)	10 (71%)	17 (47%)	0.206

LC: laparoscopic cholecystectomy, ASA score: American Society of Anesthesiology score (range 1-4), \*Data shown represent medians (interquartile ranges), ♣The severity of adhesions to the gallbladder was scored by the operating surgeon as no adhesions=0, mild adhesions=1, moderate adhesions=2, severe adhesions=3

**Table 2. Results**

	'Early urgent' LC (n=14)	'Delayed urgent' LC (n=36)	P value
Duration of surgery (min)*	92.5 (60-120)	90 (60-145)	0.729
Conversion	0	0	NS
Bile duct injury	0	0	NS
Morbidity: No. (%)	1 (7.1)	3 (8.3)	1.000
Mortality: No. (%)	1 (7.1)	1 (2.8)	0.486
Postoperative hospital stay (days)*	2 (1 - 4)	1 (1 - 2)	0.029
Total hospital stay (days)*	5 (4 -5.25)	9 (7 -11)	<0.0001

LC: laparoscopic cholecystectomy, \*Data shown represent median (interquartile range), NS: not significant

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