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Delay from Symptom Onset Increases the Conversion Rate in Laparoscopic Cholecystectomy for Acute Cholecystitis

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Abstract
Background Randomized trials suggest that laparoscopic cholecystectomy should be performed on first admission for acute cholecystitis. However, this is not widely practiced, possibly because of a perceived high conversion rate. We hypothesized that delay from onset of symptoms may increase the conversion rate. Methods We performed a retrospective case note review of patients undergoing emergency cholecystectomy in a single institution between January 2002 and December 2005. We analyzed whether delay from onset of symptoms was related to the conversion rate in patients with a histopathological diagnosis of acute cholecystitis. Results Of patients who underwent emergency laparoscopic cholecystectomy in our institution, 32.4% (197/608) had acute cholecystitis on histopathology. The conversion rate of those with acute cholecystitis was considerably higher (24.4%) than for those with other pathologies (6.3%). For patients with acute cholecystitis, the conversion rates increased with duration of symptoms: 9.5%, 16.1%, 38.9%, and 38.6% for delays of 0–2 days, 3–4 days, 5–6 days, and > 6 days from symptom onset, respectively (chi-square for trend = 14.27, DF = 1, p = 0.00016). Most conversions were due to the presence of acute inflammatory adhesions. Conclusions Early intervention for acute cholecystitis (preferably within 2 days of onset of symptoms) is most likely to result in successful laparoscopic cholecystectomy; increasing delay is associated with conversion to open surgery.

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Five and a half million people in the UK (9% of the population) have gallstones [1]. Although two thirds of gallstones are asymptomatic, they may cause acute or chronic cholecystitis, biliary colic, pancreatitis, or obstructive jaundice. Acute cholecystitis is a severe form of symptomatic cholelithiasis, and 10%–30% of patients with acute disease develop life-threatening complications such as empyema, gangrene, or perforation [1].

Although there are no national guidelines on the timing of surgery for patients presenting with acute cholecystitis, there is evidence to support early operative management [2–8]. Two randomized controlled trials comparing early against delayed laparoscopic cholecystectomy in acute cholecystitis have both shown early surgery to be safe, more cost effective, and associated with a lower conversion rate than elective surgery at a later date [6, 7]. Conservative management is associated with a total hospital stay almost double that of early cholecystectomy, with the additional problem that around 25% of patients remain symptomatic, requiring readmission before definitive surgery [9, 10].

Thus, same-admission cholecystectomy should be the preferred option. However, a recent survey of UK general surgeons found that almost 90% of consultant surgeons prefer to manage patients with acute cholecystitis by initial conservative management and delayed cholecystectomy [11]. The preference to delay cholecystectomy may be due to the perceived high conversion rate of emergency cholecystectomy. A subsequent study to assess the effectiveness of this management policy showed that conservative management was successful in only 60.6% of cases, but 14.7% of patients required emergency surgery (due to empyema, gangrene, and/or perforation) and 24.8% were readmitted prior to elective surgery, with a resultant increase in total hospital stay [10].

Previous studies have investigated the optimal timing for surgery, but some have calculated the delay as the time between admission and operation [12–15] rather than from the onset of symptoms. Moreover, the definition of early operation has ranged from 2 days [16], 3 days [17], to 4

days [18] from onset of symptoms. Others suggest that a high conversion rate for emergency laparoscopic cholecystectomy is independent of the timing of surgery [19, 20].

Although converting laparoscopic cholecystectomy to open cholecystectomy may avoid complications, open surgery results in a higher incidence of respiratory complications and a longer postoperative stay [7, 13, 21]; hence there is a need to reduce the chance of conversion. The aim of this study was to compare duration of symptoms (as recalled by the patient and recorded on hospital admission) with conversion rate in patients presenting with acute cholecystitis.

Patients and methods

Patients who had cholecystectomy at Ninewells Hospital, Dundee, UK, between January 2002 and December 2005 were identified from the electronic operating room database. Of those who had their operation as an emergency, we identified the patients in whom the procedure was planned to be laparoscopic rather than open. Within this group, we reviewed the case records of patients who were proven to have acute cholecystitis on histopathology. For patients who did not have acute cholecystitis, we calculated the conversion rate but did not conduct case note reviews.

From the case notes we extracted the duration of symptoms as recalled by the patient, date and time of admission, and the details of the operation including whether it was converted or not and the reason for conversion. The interval between the onset of symptoms to surgery was calculated by adding the duration of symptoms (in hours) as documented in the history clerking sheet to the interval between admission time and surgery start time as recorded in our electronic operating room database. Patients were ranked according to the delay in hours from the onset of symptoms to operation.

We related the conversion rate to the duration of symptoms. Using 2-day periods as relevant to hospital practice, the patients were grouped (0–2, 3–4, 5–6, and 6+ days), and conversion rates (ratio of number of intra-group conversions to total conversions, expressed as a percentage) were plotted against delay. Next, the odds of conversion to surgery were calculated (the ratio of intra-group conversions to intra-group total, expressed as a percentage), and plotted against delay. The relationship between duration of symptoms and conversion (laparoscopic to open) was assessed, and $p < 0.05$ was taken as statistically significant using the chi-square test.

All analyses were performed using Microsoft Excel 2002 SP3 (Microsoft Corporation) and Minitab Release 14.13 (Minitab Inc.).

Results

Over 4 years (January 2002 to December 2005), 1,385 patients underwent cholecystectomy (Fig. 1). Among the 685 emergency cholecystectomy operations, 77 (11.3%) were planned open, and 608 (88.8%) planned laparoscopic, of which 74 (12.2%) were converted to open. This conversion rate for emergency surgery was higher than the 5.4% conversion rate for elective laparoscopic cholecystectomy (chi-square = 17.156, DF = 1, $p < 0.0001$) in the same institution.

Of the planned emergency laparoscopic cholecystectomy group, 197 (32.4%) had acute cholecystitis on subsequent histopathology, for which 184 case notes (93.4%) were available for further analysis. The median age was 53 years (range: 17–91 years) and 70% (138/197) were women. The conversion rate for the patients with confirmed acute cholecystitis was 24.4% (48/197), compared with 6.3% (26/411) for the non-acute cholecystitis group, which in turn was similar to that of the elective group. The final diagnosis in the non-acute cholecysitis group was biliary colic, acute pancreatitis, and/or obstructive jaundice.

The mean delay from symptom onset for the laparoscopically completed group (69.8 hours, 95% confidence intervals: 79.2 h and 61.8 h) was less than for the converted group (117.1 h, 95% confidence intervals: 145.7 h and 94.2 h). The conversion rate rose with increasing delay and was 9.5% (4/42), 16.1% (10/62), 38.9% (14/36), and 38.6% (17/ 44) with symptom duration of 0–2 days, 3–4 days, 5–6 days, and more than 6 days, respectively (Fig. 2). The chi-square for linear trend was 14.2 ($p = 0.00016$). Most conversions in acute cholecystitis were due to the presence of acute inflammatory adhesions (Table 1). Suspected bile duct injuries that led to conversion were 3/45 (6.6%), one in each of the first three groups. The conversion rate in procedures performed by consultant surgeons was 19/79 (24.05%) compared to 29/105 (27.61%) for non-consultants (chi-square = 0.141, DF = 1, $p = 0.7069$).

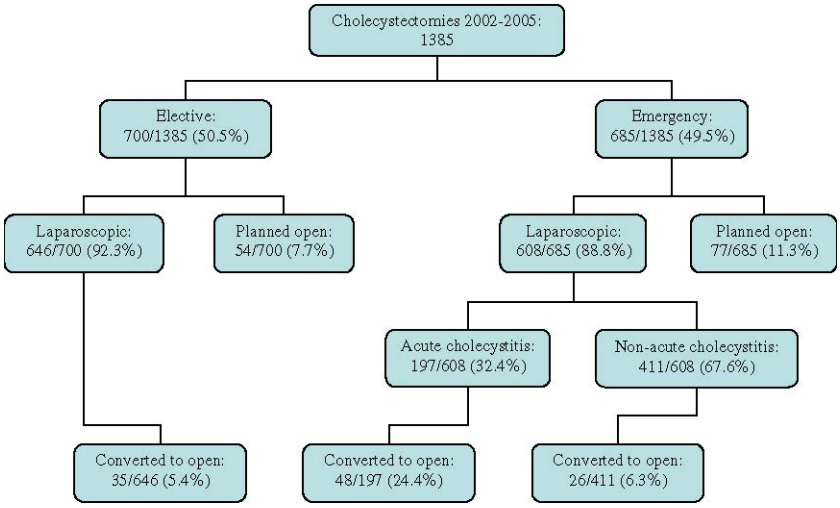

Fig. 1 Conversion rate comparison between elective and emergency laparoscopic cholecystectomy 2002–2005

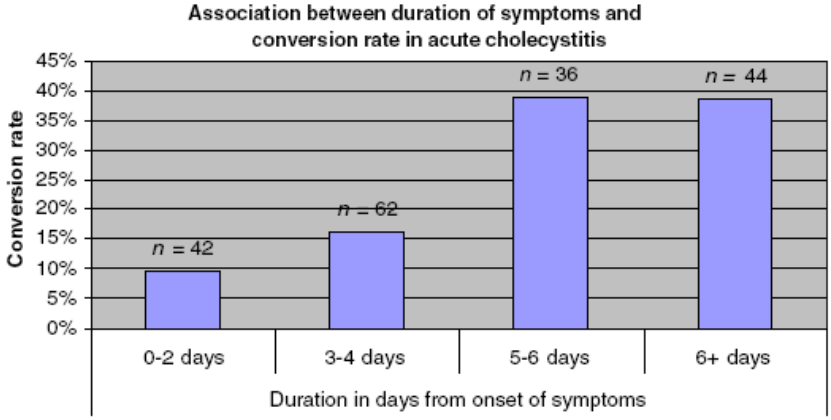

Fig. 2 Association between duration of symptoms and conversion rate in acute cholecystitis

Table 1 Reasons for conversion to open from laparoscopic cholecystectomy

Reasons for conversion	No. of patients
Adhesions	32
Bile duct injury (or suspected)	3
Empyema/gangrenous gallbladder	4
Unclear anatomy	2
Uncontrolled bleeding	1
Common bile duct stone(s)	0
No reason given	3
Total	45

Discussion

This study demonstrated that for patients with acute cholecystitis the rate of conversion from laparoscopic to open surgery increased with the duration of symptoms. It appears that the earlier the operation is performed, the lower the risk of conversion. Four days after the onset of symptoms, the chances of conversion rises steeply to levels above that of cholecystectomy delayed to a second elective admission, in keeping with the higher conversion rate for more severe and complicated cholecystitis [22]. For patients with symptoms and signs of acute cholecystitis, it appears that laparoscopic cholecystectomy performed as soon as possible (within at least 4 days and preferably within 2 days) from the onset of symptoms will minimize conversion rates to levels approaching elective practice.

However, with delayed presentation, these data can be used in conjunction with patient co-morbidity to consider whether to proceed with laparoscopic cholecystectomy. As the risk of complications for delayed cholecystectomy can be 20%–30% [1], a conversion rate up to 16.1% may be achievable when an operation is performed within 4 days. After that the risk of conversion may outweigh the risk of waiting for several weeks and planning an elective delayed cholecystectomy when the inflammatory process has settled. Of course, there will always be some patients who do not respond to conservative treatment and need an

emergency operation for complications such as empyema, gangrene, or perforation of the gallbladder [1].

As for any retrospective case note review, the availability of notes and the quality of records are potential confounding variables. However, patients are likely to recall the onset of pain as a memorable event, and medical and nursing record proformas retrieved for 93.4% of patients with acute cholecystitis encourage accurate recording of such symptoms. Our study indicates the results of randomized trials [6, 7] in the community setting. We have clarified the importance of duration of symptoms and hence delay to operation that may have skewed the perception that emergency laparoscopic cholecystectomy is undesirable. A prospective study measuring all other possible confounding factors such as clinical and laboratory indicators of inflammatory response may allow us to create a mathematical model that could preoperatively quantify the risk of conversion, or more importantly of significant operative morbidity, in an individual patient. Meanwhile, surgical decisions about the ''early to operation'' approach can now be more refined. Patients with suspected acute cholecystitis should be offered laparoscopic cholecystectomy at hospital presentation, and certainly up to 4 days from symptom onset. Thereafter, a balance between increased conversion rates, potential complications, and comorbidity requires astute clinical management in deciding whether a patient should proceed to surgery.

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