



Original article

Patients awaiting laparoscopic cholecystectomy – can pre-operative complications be predicted?

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Aims: To determine the nature and incidence of gallstone-related complications arising in patients awaiting laparoscopic cholecystectomy and to formulate a strategy to detect those most in need of urgent intervention.

Patients and Methods: A retrospective analysis of the case notes of 337 consecutive patients undergoing laparoscopic cholecystectomy under a single surgeon in a district general hospital between 1995 and 1999.

Results: Of patients awaiting laparoscopic cholecystectomy, 65 (19.3%) were documented as suffering significant on-going symptoms, of whom 19 (5.6%) required hospital admission or urgent surgical review at median 8.9 weeks (range 0.1–32.3 weeks) after being placed on the waiting list. Factors predictive of symptom recurrence included: (i) initial acute presentation; (ii) diagnoses of jaundice, pancreatitis, or acute cholecystitis; (iii) elevation of amylase or liver function tests; and (iv) small stones on ultrasonography examination.

Conclusions: A significant proportion of patients awaiting laparoscopic cholecystectomy experience stone-related complications requiring hospital admission. We feel it is possible to reduce this number by selecting those most at risk on the basis of their history and pre-operative investigations for more urgent intervention.

Key words: Laparoscopic cholecystectomy – Pre-operative complications – Elective surgery – Risk assessment

Cholelithiasis has a prevalence of 5–20% in Europe,¹ women being affected 3 times more commonly than men. In the majority of these cases, the stones remain quiescent; however, 10–20% of affected individuals will suffer symptoms attributable to their gallstones.¹ In patients with recurrent symptoms, multiple primary care consultations, repeated prescription of antibiotics/analgesics, and absence from work result in significant financial cost to patient, employer, and the NHS. Laparoscopic cholecystectomy is now the operative treatment of choice for symptomatic gallstone disease. Demand for this procedure may exceed the

capacity of current resources and result in prolonged waiting time for definitive treatment. The longer patients wait for cholecystectomy, the more likely they are to develop acute complications of cholelithiasis requiring admission, and emergency cholecystectomy.² Emergency surgery, demanded by clinical condition or peritonitis, is associated with prolonged hospital stay, operative time, and higher rates of intra-operative blood loss.²

We believe patients most at risk of further pre-operative complications to be those presenting with stones within the common bile duct. Our policy is to

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identify such patients by performing pre-operative endoscopic retrograde cholangiopancreatography (ERCP) selectively on patients with diagnoses of jaundice, cholangitis or pancreatitis, those with persistently elevated liver function tests or with a dilated common bile duct on ultrasonography. Where common bile duct stones are identified, patients have endoscopic sphincterotomy/stone extraction to reduce the risk of complications due to retained common bile duct stones.

The aims of this study were to investigate the nature and incidence of gallstone-related complications arising whilst patients await definitive surgery, and to identify any features that may allow us to predict those most at risk of complications, so enabling their prioritisation for early intervention.

Patients and Methods

We performed a retrospective review of the case notes of 337 consecutive patients undergoing laparoscopic cholecystectomy (acute or elective) under the care of a single consultant general surgeon at York District Hospital between 1995 and 1999. Data collected on all patients included demographic details, information regarding referral, clinic review, pre-operative investigation and treatment. Their surgical treatment and postoperative hospital stay were recorded in addition to follow-up. Patients suffering recurrent uncontrolled pre-operative symptoms attributable to their gallstones were identified through evidence of unplanned hospital admission, clinic review, or correspondence from the referring physician in the period between listing and surgery.

Data were compared between those patients requiring unplanned admission, review, or expedition of their surgery due to symptom recurrence, and those having an uncomplicated pre-operative period following listing. Chi-square statistical analysis and relative risk were calculated to identify factors predictive of symptom recurrence/complications whilst on the waiting list.

Table 2 Relative risk of complication

	Patients with complications (n = 19)	Patients without complications (n = 318)	Relative risk (significance)
Admission on first review (n = 54)	7	47	RR = 3.06 ($\chi^2 = 6.485$; $P = 0.011$)
Clinic (n = 283)	12	271	
Diagnosis of jaundice, pancreatitis, or cholecystitis (n = 72)	8	64	RR = 2.68 ($\chi^2 = 5.155$; $P = 0.023$)
Other diagnosis (n = 265)	11	254	
Elevated ALP and ALT (n = 51)	8	43	RR = 3.91 ($\chi^2 = 10.64$; $P = 0.001$)
Other result (n = 274)	11	263	
Elevated amylase (n = 12)	2	10	RR = 5.5
Other result (n = 33)	1	32	
Small gallstones on ultrasonography (n = 191)	14	177	RR = 2.08
Other result (n = 142)	5	137	

Table 1 Comparison of demographic details

	Patients with complications (n = 19)	Patients without complications (n = 318)
Age (years)		
Mean	55.4	54.8
Median	58	56
Range	28-78	14-93
Sex		
Male (n = 94)	7 (7.4%)	87 (92.6%)
Female (n = 243)	12 (4.9%)	231 (95.1%)

Results

Overall, 337 patients were included in the study, 19 (5.6%) of whom suffered recurrent symptoms attributable to gallstones requiring unplanned review whilst awaiting surgery, at median 8.9 weeks following listing. The median waiting time for definitive surgery for the entire sample population was 17.4 weeks.

No significant difference was noted (Table 1) between patients experiencing such complications and those not, in terms of age and sex ($\chi^2 = 0.80$; $P = 0.37$). Believing complications arise more often in the presence of common bile duct stones, we looked at surgical diagnosis at clinic review, biochemical and radiological investigations. We identified diagnoses of jaundice and pancreatitis, persistent elevation of liver function tests and/or amylase, and the identification of small stones on ultrasonography to identify patients particularly at risk.

Other significant differences between the groups included the type of first surgical review (acute admission or elective clinic), and a diagnosis of acute cholecystitis, both being more likely to require further pre-operative unplanned review (Fig. 1 and Table 2). Used in isolation, these predictive factors are insufficiently specific resulting in a false positive rate (220 patients) too high to perform early surgery.

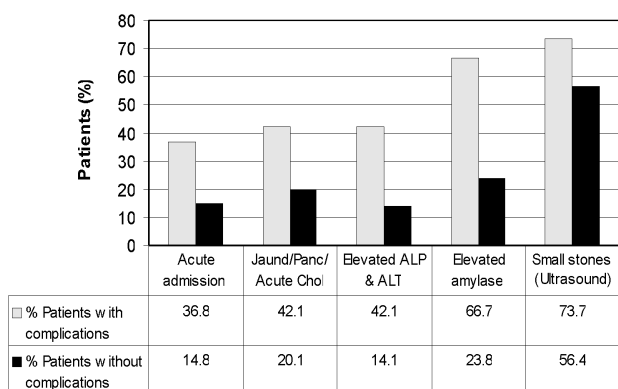


Figure 1 Comparison of predictive factors.

Scoring the sum of predictive factors for individual patients, we have a screening tool to try and identify patients at greater risk of further pre-operative symptoms/complications (Fig. 2). A threshold score of 2 or more predictive factors was chosen as it offered the best combination of sensitivity (12/19 = 0.63) and specificity (239/318 = 0.75) enabling prioritisation of a manageable proportion of patients (91/337 = 27%; Table 3). Patients scoring 2 or more had a significantly greater risk of further symptoms requiring unplanned pre-operative review ($\chi^2 = 13.35$; $P = 0.0002$; Fig. 3).

Of 337 patients undergoing laparoscopic cholecystectomy, 7 (2.1%) required conversion to open cholecystectomy due to technical difficulties (5 cases), or retained duct stones (2 cases). Fourteen (4.2%) suffered complications postoperatively, mean follow-up 93 weeks. Complications included wound haematomas (4), wound infections (2), port-site herniae (2), pancreatitis (2), myocardial infarction (2), cholangitis (1), and a cystic duct leak. One patient died

Table 3 Patient sum of predictive factors

Minimum number of predictive factors	Patients with complications (n = 19)	Patients without complications (n = 318)	Sensitivity and specificity
≥ 0	19	318	Sensitivity 1 Specificity 0
≥ 1	18	220	Sensitivity 0.95 Specificity 0.31
≥ 2	12	79	Sensitivity 0.63 Specificity 0.75
≥ 3	6	26	Sensitivity 0.32 Specificity 0.92
≥ 4	3	9	Sensitivity 0.16 Specificity 0.97
5	0	4	

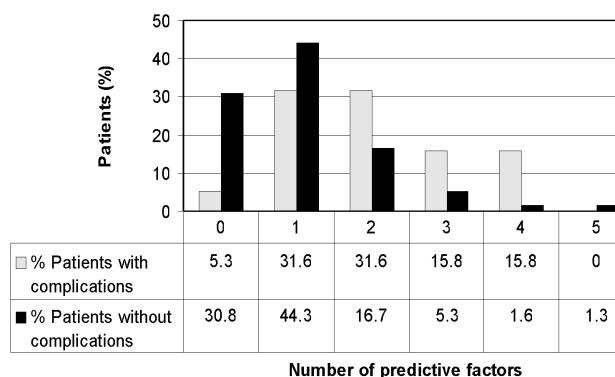


Figure 2 Frequency of predictive factors.

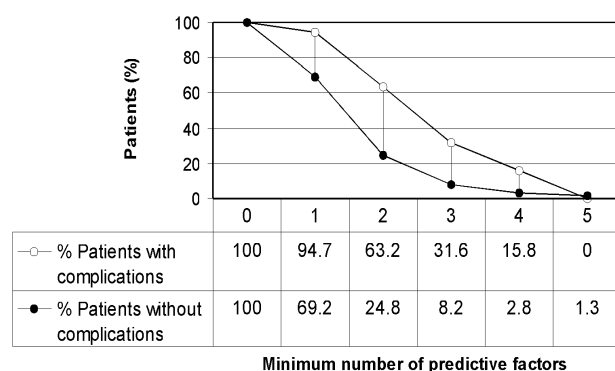


Figure 3 Cumulative frequency of predictive factors.

on the second postoperative day following a myocardial infarction (mortality rate 0.3%). The port-site herniae were repaired surgically, the cystic duct leak settled with insertion of a biliary stent and the remaining complications settled with conservative treatment.

Discussion

A significant proportion of patients awaiting laparoscopic cholecystectomy experience further stone-related symptoms prior to surgery.³ In our study, 19 patients (5.6%) required either admission or urgent surgical review whilst waiting, and in a further 46 cases (12.2%) the referring physician requested that the operation be expedited. Our figures are unlikely to represent all cases of symptom recurrence as we have not included patients who self-medicated or those treated solely by the primary care team.

The longer the delay prior to surgery, the greater the risk of complications pre-operatively.² Our waiting time for surgery (median 17.4 weeks) was double that of the time of unplanned review (median 8.9 weeks) following placement

on the waiting list. Therefore, we can assume that some patients' complications could have been avoided by earlier surgery. Sadly, theatre capacity does not allow laparoscopic cholecystectomy during the first presentation of gallstone disease for all patients, but necessitates triage and prioritisation of those most at risk.

Data comparison between those requiring unplanned surgical review and those not found the type of first surgical review to be important – acute hospital admission predicting a significantly greater risk of further pre-operative complications ($P = 0.011$) when compared with clinic review.

In patients with symptomatic cholelithiasis, stones pass into the common bile duct in an estimated 10–15% of cases,^{4,5} where they can cause obstructive jaundice, acute cholangitis and pancreatitis. We found diagnoses of jaundice, and elevated ALP and ALT, previously identified markers for common bile duct stones,⁶ to be factors predictive of future complications. Other factors previously implicated in the identification of common bile duct stones include > 10 stones on ultrasound, age > 55 years, and male sex.^{5,7} Age and sex were not found to have any statistically significant effect on the chances of pre-operative complications. Our radiology department documents size rather than number of stones on ultrasonography reports. As small stones are more likely to migrate into the duct than larger ones, we were not surprised to find small stones in a higher proportion of patients experiencing complications, although duct dilatation implying previous biliary obstruction was less prevalent in this group.

Although the migration of stones into the common bile duct is a recognised cause of acute pancreatitis and hyperamylasaemia, ERCP studies have shown hyperamylasaemia and a diagnosis of acute pancreatitis to be inversely related to the presence of duct stones at ERCP,^{7,8} implying recent stone migration across the sphincter of Oddi. Despite this, they were found to be positive predictive factors of further complications in patients awaiting surgery.

Adequate resuscitation followed by urgent laparoscopic cholecystectomy on the first available operating list is preferred over delayed surgery in cases of acute cholecystitis as it results in lower complication rates and reduced hospital stay.⁹ Our results confirm that diagnosis of acute cholecystitis predisposes patients to complications pre-operatively. Of patients with acute cholecystitis, 20% subsequently require emergency surgery⁹ with its higher complication rate,² due to gangrenous cholecystitis or peritonitis secondary to gallbladder perforation.

Although our chosen risk factors – acute first presentation ($P = 0.011$), diagnoses of jaundice, acute

pancreatitis, or acute cholecystitis ($P = 0.023$), and elevated ALP and ALT ($P = 0.001$) – show statistically significant differences between our 2 groups, used in isolation, they do not provide sufficient sensitivity or specificity as a screening tool to predict pre-operative complications.

In combination with hyperamylasaemia and small stones on ultrasonography, the presence of 2 or more predictive factors gives a sensitivity of 0.63, and specificity of 0.75, in the identification of patients at risk of further pre-operative complications requiring unplanned surgical review ($P = 0.0002$). This allows the identification of the majority of patients at risk enabling their prioritisation for early surgery, whilst restricting the number of false positive patients prioritised to a minimum.

Conclusions

Although it is well recognised that the longer patients wait for cholecystectomy the greater the likelihood of complications requiring admission or emergency surgery, the resources of the NHS do not stretch to acute cholecystectomy for all patients presenting with gallstones. Through the use of a screening tool, it may be possible to reduce the number of serious complications encountered pre-operatively by the identification of those most at risk and their subsequent prioritisation for surgery.

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