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## Laparoscopic cholecystectomy as a safe and effective treatment for severe acute cholecystitis

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### Abstract

**Objective**—To evaluate the feasibility and safety of laparoscopic cholecystectomy in severe acute cholecystitis.

**Design**—Analysis of data collected prospectively from a consecutive series of 350 laparoscopic operations.

**Setting**—Two general surgical units in a teaching hospital.

**Subjects**—31 patients with a diagnosis of severe acute cholecystitis based on clinical examination, investigation results, and operative findings.

**Interventions**—Initial intravenous fluids and broad spectrum antibiotics followed by laparoscopic cholecystectomy within 72 hours of presentation.

**Main outcome measures**—Failure to complete the operation laparoscopically, length of postoperative stay in hospital, early postoperative morbidity, interval from operation to full activity, and return to work.

**Results**—Laparoscopic cholecystectomy was attempted in 19 patients with empyema of the gall bladder and 12 who had severe cholecystitis which failed to settle on medical management. A total of 29 operations were successfully completed with two conversions to open surgery. Two minor post-operative complications occurred, and one case of retained common bile duct stones with jaundice was treated by endoscopic retrograde cholangiopancreatography and papillotomy. Median post-operative hospital stay was two days, with return to normal activity in seven days and to work in two weeks. There were no deaths related to the operation.

**Conclusions**—In the presence of severe acute cholecystitis laparoscopic cholecystectomy is feasible in most patients, with minimal risk of injury to surrounding structures and considerable benefits. It is recommended that laparoscopic cholecystectomy should be attempted in these patients when appropriate surgical skill is available.

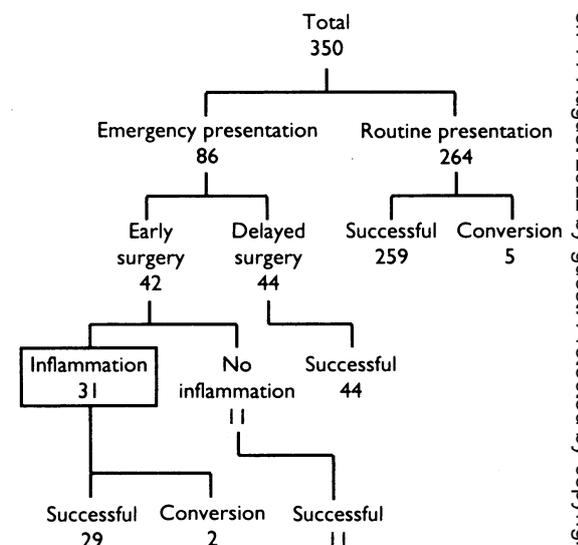
### Introduction

Laparoscopic cholecystectomy is increasingly accepted as the treatment of choice in the elective management of symptomatic cholelithiasis. The presence of empyema or severe inflammation of the gall bladder was initially regarded as a contraindication to this technique.<sup>1,2</sup> Nevertheless, laparoscopic cholecystectomy for acute cholecystitis has been reported

with a varied degree of technical success in limited series.<sup>3,5</sup> Since the introduction of laparoscopic surgery in our hospital we have attempted laparoscopic cholecystectomy in all patients presenting with symptomatic gall stones, even when acute inflammation is suspected. We describe our initial experience in those patients who presented with empyema or severe acute inflammation of the gall bladder.

### Patients and methods

Since May 1990 laparoscopic cholecystectomy has been our standard approach to surgery for symptomatic gall stone disease. Up to October 1991, 350 consecutive operations had been attempted with only seven failures. Prospective documentation was kept on all patients regarding presentation, investigations, operation, complications, and early follow up. Eighty six patients with acute pain had been admitted to this hospital as emergencies. Forty four settled on conservative treatment, were discharged, and were readmitted for interval cholecystectomy at a later date. Forty two patients were operated on during their first admission, 31 of whom had definite clinical and laparoscopic evidence of severe acute cholecystitis. This subgroup of 31 formed the basis of this study (figure). The



Details of 350 consecutive laparoscopic cholecystectomies on patients presenting with symptomatic gall stone disease, indicating the 31 patients who had definite clinical and laparoscopic evidence of severe acute cholecystitis

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remaining 11 patients had acute pain but little evidence of inflammation at operation. All emergency patients underwent laparoscopic cholecystectomy within 72 hours of admission. All patients received intravenous antibiotics before operation, and these were continued at the discretion of the surgeon. All patients received low dose, subcutaneous heparin as prophylaxis against venous thromboembolism.

Of the 31 patients in this subgroup, all had a preoperative, abdominal ultrasound examination which showed gall stones. In 25 patients the wall of the gall bladder was reported to be thickened, and in 18 stones were seen to be impacted in Hartmann's pouch. The common bile duct was dilated in seven patients. Preoperative liver function tests yielded abnormal results in 16 patients, and the white blood count on admission was raised in 19.

There were 16 women and 15 men, with a median age of 64 (range 26-85) years. The women had a median body mass index of 27 (17.4-33.2) kg/m<sup>2</sup> and the men 23.8 (19.5-29.6). One patient was suffering from acute rejection after renal transplantation and had infective endocarditis with acute aortic incompetence. Another patient had severe cardiac disease and required inotropic support and resuscitation in intensive care before operation. Fourteen had undergone previous abdominal surgery at least once: appendicectomy in two; laparoscopic sterilisation in three; hysterectomy in five; partial gastrectomy in four; and abdominoperineal excision of the rectum in one. In addition, five patients had undergone previous endoscopic retrograde cholangiopancreatography, including papillotomy in four, for common bile duct stones one month to two years before presentation.

Laparoscopic cholecystectomy was performed under general anaesthesia with placement of laparoscopy cannulas as described by Reddick and Olsen.<sup>6</sup> In patients who had undergone previous extensive abdominal surgery an alternative initial insufflation site was used, usually in the right or left upper quadrant. Dissection was performed with the cautery hook technique described by Dobois *et al*<sup>7</sup> or bluntly with a suction instrument. Operative cholangiography was not routinely used.

A detailed prospective record was completed for each patient including preoperative, operative, and postoperative data. Routine follow up took place two and six weeks after operation.

## Results

The operative findings at laparoscopy are listed in the table. In patients with perforation or local abscess formation, or both, thorough peritoneal lavage with saline was performed before dissection. A modified approach to the operation was often required. Deliberate puncture and aspiration of a tensely distended gall bladder was used to help retraction in 10 cases and retrograde dissection with removal of the gall bladder "fundus first" was used in three cases. One patient who underwent successful laparoscopic cholecystectomy had a major anatomical anomaly of the biliary tree with the cystic duct arising from the right hepatic duct. The fifth and 25th patients in the series were converted

*Principal findings at laparoscopic cholecystectomy in 31 patients with complicated acute gall bladder disease*

Finding at operation	No of patients
Abdominal adhesions	12
Empyema	19
Perforation	4
Adhesions to gall bladder	26
Localised necrosis	15
Severe inflammation	31
Anatomical anomaly	1

to open surgery because severe inflammation obscured the anatomy. At open surgery both required retrograde dissection and one required partial cholecystectomy.

The median operation time for patients having laparoscopic cholecystectomy was 90 (range 60-185) minutes. Patients were offered oral fluids as soon after operation as they felt able to drink. Postoperative intravenous infusions were required for a median of 24 hours (range 0-4 days). Antibiotics were continued in the immediate postoperative period in 26 patients but discontinued in all patients by 48 hours. There was no mortality at 30 days. Three patients had early complications, with acute urinary retention in one patient after open surgery and infection in the umbilical wound that required oral antibiotic treatment after discharge home in a patient treated laparoscopically. One patient developed jaundice six weeks after operation because of an unsuspected common bile duct stone. This was successfully treated by endoscopic retrograde cholangiopancreatography and papillotomy.

Patients undergoing successful laparoscopic cholecystectomy required a median postoperative stay of two (range 1-6) days. This excluded the patient with acute renal transplant rejection and aortic valve incompetence. Despite recovering from laparoscopic cholecystectomy, she required a prolonged stay in hospital and eventually died 72 days after laparoscopic cholecystectomy, having been considered unfit for aortic valve replacement. The patients who underwent laparoscopic cholecystectomy returned to normal activities at a median of seven (range 2-21) days after discharge from hospital. All eight employed patients had returned to work within 21 days after operation.

## Discussion

Laparoscopic cholecystectomy is clearly emerging as a safe and cost effective treatment for symptomatic gall stone disease, and its use in elective surgery is well accepted.<sup>7</sup> Early pioneers initially considered acute inflammation to be an indication for conversion to open surgery,<sup>2</sup> and this view has been endorsed by others.<sup>1,8</sup> We were encouraged by our early experience in elective cases to attempt laparoscopic cholecystectomy in the presence of acute inflammation.

Even before laparoscopic surgery, managing acute cholecystitis was controversial,<sup>9</sup> some advocating medical treatment and delayed surgery while others preferred early surgery. The advantages of the shorter hospital stay and early return to work claimed for acute surgery would be lost if inflammation were considered to be a contraindication to laparoscopic cholecystectomy. There are variations in approach to early surgery among our own surgeons but general agreement that surgery is indicated when medical measures fail. There are also logistic difficulties in accommodating emergency patients on routine operating lists, particularly when the operation is time consuming. We prefer to perform initial endoscopic retrograde cholangiopancreatography when duct stones are suspected. This presents a dilemma in acute inflammation as liver function abnormalities and dilatation of the biliary tree, both used as indicators of bile duct stones, are common. We have not used routine operative cholangiography and one patient has required postoperative endoscopic retrograde cholangiopancreatography, papillotomy, and stone extraction. This patient had both deranged liver function and ultrasound evidence of duct dilatation. Our policy regarding operative cholangiography is under review.

Previous authors have reported trials of laparoscopic cholecystectomy in complicated acute cholecystitis with success varying from 11 out of 12<sup>1</sup> and 10 out of

15.<sup>4</sup> A further study reported success in 51 of 55 patients considered by the surgeon to have acute inflammation, although only nine patients had severe disease.<sup>5</sup> In our series, conversion to open surgery was required in two patients out of 31 (6%) comparing favourably with the conversion rates in series of elective surgery.<sup>10,11</sup> We have shown that laparoscopic surgery may be performed safely in severe complicated cholecystitis with minimal morbidity when surgeons have sufficient experience. Patients recover rapidly from the procedure, usually with dramatic resolution of symptoms, and seem to enjoy the same benefits as those undergoing elective surgery.

In our experience, about 10% of patients with symptomatic gall stones required emergency surgery for acute cholecystitis which fails to settle on conservative management. As many as a quarter of patients with symptomatic gall stone disease present acutely, and this trend may be increasing.<sup>12</sup> Acute cholecystitis constitutes an important and increasing proportion of the surgical workload. We think that these patients should not be denied the benefits of

laparoscopic cholecystectomy in centres with appropriate experience.

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## Asthma and open cast mining

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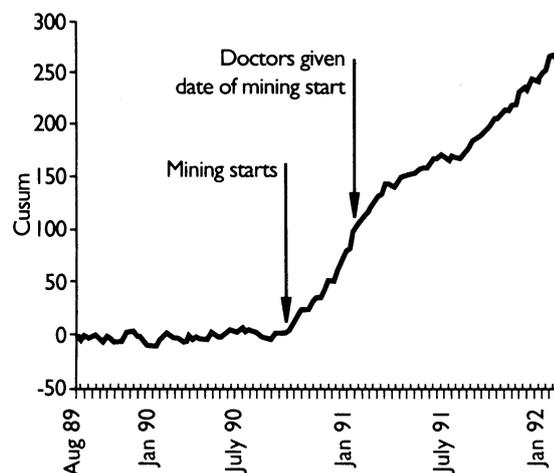
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Following Welsh Office concern about apparently excessive prescribing for asthma in 1983, the Glynneath practice started to audit its treatment of new asthma episodes. The method chosen was to check the treatment of a sample of such episodes. For this the practice requires a complete record of the asthmatic attacks it treats. As a consequence of this audit the practice became concerned that local industry was aggravating its patients' asthma. These fears were voiced at a public inquiry into proposals to open cast mine an area to the north of the town. When the secretary of state granted permission to start the mine a natural experiment began to test the hypothesis that the weekly number of new episodes of asthma treated by the town's general practitioners would increase when the new mine started.

### Methods and results

The Glynneath practice has recorded new episodes of asthma (using a standard definition) on a computer database since late 1989. As a result the practice is well placed to note changes in the weekly number of new episodes of asthma presenting.

The graphical cusum technique is widely used in



Cumulative sum (cusum) of weekly new episodes of asthma

quality control and has recently been described by Williams *et al* in this respect.<sup>1</sup> It is also suited to surveillance studies as any change in frequency of an illness presenting (compared with the reference level) is shown as a sustained change in gradient. A sudden change is indicated by a discontinuity in the graph at the time of the change. Thus the time of a change can be identified and possible causes investigated. In this case the mean weekly number of new episodes of asthma for the initial 25 weeks of the computerised database was used as the reference value. The cusum method was chosen because (a) the start of the new mining operations was withheld from the investigators so as to avoid bias; (b) if any indicated time of change coincided with the start of mining, then this would lend support to the hypothesis; (c) it is an elegant method that is arithmetically simple, visually attractive, and intuitively understandable.

To confirm that any change noted was unlikely to be due to chance the 95% confidence intervals of the mean weekly new episodes of asthma before and after mining were calculated and significance of the difference tested.

Weekly new episodes of asthma were recorded by using a standard Wednesday to Tuesday week for the period 30 September 1989 to 14 January 1992. The gradient of the cusum graph showed a sustained and sudden change from the week beginning 3 October 1990 (fig). The new mine started excavation on 29 September 1990. Thus the average number of new episodes of asthma rose at about the time the mine started. The doctors learnt of the date mining started on 31 January 1991. There were no changes in practice personnel during the period of the investigation.

Before mining operations the mean weekly number of new episodes of asthma was 4.4 (95% confidence interval 3.6 to 5.2), and after mining began it was 7.9 (7.0 to 8.6). The 95% confidence interval for the change in mean was 2.3 to 4.6 weekly new episodes of asthma. A test of the hypothesis of equality of the means was rejected with a z statistic of 6.04 ( $p < 0.001$ ).

### Comment

There is widespread concern that environmental degradation is causing ill health. European law requires that any major industrial development is assessed for its likely effect on human health.<sup>2</sup> There are few studies of the effect of industries on the general community.<sup>3,4</sup> However, Kirn reported concern that one cause of the