Review Article

Laparoscopic cholecystectomy: from elective to urgent surgery

Neda Farhangmehr[1], Donald Menzies[2]

[1]Department of Upper GI Surgery, Castle Hill Hospital, Hull University Teaching Hospitals NHS Trust, UK; [2]Department of Upper GI Surgery, Colchester General Hospital, East Suffolk and North Essex NHS Foundation Trust, UK

Correspondence to: Neda Farhangmehr. Department of Upper GI Surgery, Castle Hill Hospital, Hull University Teaching Hospitals NHS Trust UK, Castle Rd, Cottingham HU16 5JQ, UK. Email: neda.farhangmehr@nhs.net.

Abstract: The prevalence of cholelithiasis is increasing as a result of population aging and the obesity epidemic in all age groups. Cholelithiasis-related complications account for one third of emergency surgical admissions and impose a substantial financial burden on health care systems. With the advent of laparoscopic cholecystectomy, it is now possible to treat the complications of cholelithiasis more effectively. In view of the impact of gallstone disease on the patient's well-being health care budget, national and international guidelines have established the optimal timing for laparoscopic surgery by taking into account the natural history of cholelithiasis, the risks of further admissions and surgical complications, length of stay, and economic costs. This article reviews these guidelines and assesses the merits of their implementation in both the elective and emergency settings. All guidelines recommend early laparoscopic cholecystectomy in patients with cholecystitis, mild pancreatitis, and common bile duct stones but not in those with asymptomatic gallstones. However, despite the undoubted benefits of early laparoscopic cholecystectomy in terms of outcome, their implementation has proved to be challenging because of lack of resources and/or financial constraints.

Keywords: Laparoscopic cholecystectomy (LC); cholelithiasis; cholecystitis; pancreatitis

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Introduction

Laparoscopic cholecystectomy (LC) has become a gold standard procedure since its introduction in the late 1980s and is now used worldwide as a treatment for cholelithiasis. Over time, the hospital stay after LC has decreased, day-case procedures have become commonplace, and patients have had an earlier recovery and return to work. Furthermore, the indications for LC and the age of patients undergoing this procedure has broadened over time. These are important considerations given that cholelithiasis is becoming an increasingly common pathology in the Western world, affecting an increasing number of people at a younger age and having an economic impact in health care.

Cholelithiasis is one of the most common gastrointestinal causes of hospital admission in Western countries (1,2). It accounts for one third of emergency surgery admissions and referrals (3) and has a median cost of 11,584 USD (€10,506.65) per admission in the US (2). Various guidelines have been established to determine the indication and optimal timing of surgery for cholelithiasis, taking into account the total hospital stay, the risks of surgical and gallstone-related complications, the likelihood of further admissions, and cost (3-7). This paper reviews the main guidelines in clinical use today and the extent of their implementation with special emphasis on the role of early LC in acute admissions.

Evolution of laparoscopic cholecystectomy: improved surgical outcomes

LC techniques and training methods have evolved over time. The Research Institute Against Cancer of the Digestive System recommendations for safe LC and

minimising the risk of injury to the common bile duct include exposure of Calot's triangle, careful use of energy devices, and establishment of a critical view for safety (8). Furthermore, the Society of American Gastrointestinal and Endoscopic Surgeons has convened a cholecystectomy task force to improve surgical outcomes and patient safety and to develop areas of learning and research (9).

In some countries, there are also has been a trend of sub-specialisation whereby gallbladder and common bile duct surgery is mostly performed by specialised surgeons. The NHS Institute for Innovation and Improvement has encouraged sub-specialisation in view of evidence that it decreases patient morbidity, increases surgical productivity, and reduces length of stay (10). Based on the findings of an Australian study (11), it also recommended that a surgeon should perform a minimum of 200 laparoscopic cholecystectomies over 5 years (i.e., 40 cases per year) to minimise morbidity and improve outcomes.

Prevalence of cholelithiasis

The prevalence of cholelithiasis in developed countries is 10–15%. 20% of these cases become symptomatic. The prevalence of paediatric cholelithiasis has increased by more than 10-fold since 1959 in parallel with the rising incidence of obesity in children (12). Moreover, with increasing life expectancy, the prevalence of cholelithiasis is rising in the elderly. It is estimated that there will be a 34% increase in the number of people aged 60 years or older from 1 billion in 2019 to 1.4 billion by 2030 and to 2.1 billion by 2050 (13). The multicentre MICOL study in Italy reported the cumulative incidence of gallstones to be 0.67% per year (0.66% in men and 0.81% in women) (14). Furthermore, the prevalence of gallstone disease has been reported to be 15% at 70 years of age, 24% at 90 years, and 80% in the institutionalised elderly (15).

The obesity epidemic and associated metabolic syndrome is also playing a major role in the increasing rates of gallstone disease (16). According to the most recent World Health Organisation estimates for European countries, 30–70% of adults are overweight and 10–30% are obese while one in three 11-year-old is overweight or obese (17).

Asymptomatic gallstones

Eighty percent of cases of gallstones are asymptomatic. The risk of developing biliary colic is 2–3% per year and 10% after 5 years while the incidence of other gallstone-related complications is 0.1–0.3% per year (6,18). Asymptomatic gallstones are managed conservatively because the risks of surgery outweigh the likelihood of complications (3-7). LC is not recommended in patients with asymptomatic gallstones who are undergoing abdominal surgery for another reason (6). Other causes of elective LC are gallbladder polyps >1 cm (19), porcelain gallbladder (low evidence), and hereditary spherocytosis or sickle cell disease (low evidence) (6).

Conclusion: There is no indication for LC in asymptomatic patients. The risks outweigh the therapeutic benefits and there is no economic advantage.

Symptomatic gallstones

Biliary colic

After an initial episode of biliary colic, the risk of a recurrence is 50% in the following year (20) and the risk of complicated gallstone disease (e.g., cholecystitis, choledocholithiasis, cholangitis, or pancreatitis) is 1–2% per year (6). The general consensus is that elective surgery should be offered in patients with symptomatic gallstones, provided that they are fit enough to undergo surgery in view of the risk of complications (3-6).

The cost of conservative non-surgical management of gallstone disease is estimated to be 110,281 GBP (€12,821); this estimate takes into account the lifetime risk of admission and potential need for endoscopic retrograde cholangiopancreatography (ERCP). The estimated cost of elective day case LC is 2,534 GBP (€2,946), and this figure increases to 2,932 GBP (€3,408) if the surgery is performed on an inpatient basis (21).

Conclusion: Elective LC should be performed in patients with biliary colic. The therapeutic benefits outweigh the risks, and the costs of elective surgery are less than those of treating complications secondary to gallstone disease.

Cholecystitis

As expected, emergency admissions increase the costs of LC. The daily cost of a hospital admission in the UK is presently 383 GBP (€454.17). However, this figure does not include the costs of imaging (ultrasonography, computed tomography, magnetic resonance cholangiopancreatography), interventional procedures (ERCP, cholecystostomy, drainage of a collection, surgery), or admission to the intensive care unit.

The annual incidence of gallstone-related events after an episode of acute cholecystitis is approximately 30%; in turn, 30% of these cases are secondary to obstructive jaundice and pancreatitis (22). All guidelines agree that LC should be performed early in patients with acute cholecystitis (3-7). While many surgeons perceive early LC for cholecystitis more difficult, Cochrane review of six trials in 2014, there were no differences in the rates of complications, common bile duct injury, or need for conversion to open surgery between early and delayed LC, and the hospital stay was 4 days less on average in patients who underwent early LC (23). Hence, the guidelines recommend that early LC is preferable to delayed LC in patients with acute calculous cholecystitis. However, what is considered early cholecystectomy varies from guideline to guideline in that some guidelines recommend early cholecystectomy within 72 hours (3,6,7) and others recommend it be performed within 7–10 days of symptom onset (4,5). Moreover, some guidelines define the timing of cholecystectomy according to the time since admission to hospital rather than the time since symptom onset. The recommendation is to delay cholecystectomy for 45 days in people who have had symptoms for more than 10 days in view of the increased risk of operative complications and need for an extended hospital stay (5).

Cost-wise, conservative management of acute cholecystitis would incur a daily bed cost of approximately 383 GBP (€445) (21) as well as the additional costs of readmission if the problem is not resolved in the acute phase. In contrast, cholecystectomy performed at an early stage reduces the overall length of stay and costs. Cholecystectomy is preferred because it reduces the likelihood of subsequent admissions and there is no evidence of an increased complication rate. The estimated cost of an early LC is 2,728 GBP (€3,171) and that of a delayed LC is 3,686 GBP (€4,285) (21).

Conclusion: Early LC reduces the risk of recurrent complications in patients with acute cholecystitis. While it is perceived as a more difficult operation there is no evidence of an increased surgical complication rate and there is an economic benefit.

Pancreatitis

Approximately 4–8% of patients with gallstones develop pancreatitis. The risk of complications in patients with gallstone disease who are discharged without cholecystectomy is 18%, and 43.85% of the complications are recurrent pancreatitis (24). Patients who undergo ERCP on admission have a reduced risk of recurrent pancreatitis but are still at risk of developing other gallstone-related complications. All the guidelines are in agreement that cholecystectomy should ideally be performed during the same admission in patients with mild pancreatitis (6,7,25). However, the guidelines published by the Association of Upper Gastrointestinal Surgeons of Great Britain and Ireland give the option of performing cholecystectomy or ERCP and sphincterectomy within 7 days (3). On the other side, those published by the British Society of Gastroenterology recommend that mild pancreatitis should be treated during the same admission unless a clear plan has been made for definitive treatment within the next 2 weeks (4). In the multicentre PONCHO study performed in The Netherlands, early cholecystectomy in patients with mild pancreatitis not only reduced the risk of further complications secondary to gallstones but also proved to be more cost-effective by reducing the likelihood of readmission and the number of missed work hours (26). In patients with severe pancreatitis, the International Association of Pancreatitis/American Pancreatic Association guideline recommends that cholecystectomy be delayed until the collections have resolved or until 6 weeks have elapsed (25). The main reason for the delay is to allow time for the inflammatory response to improve but with the caveat of a risk of infection in existing collections.

Conclusion: LC should be performed during the same admission or within 2 weeks in patients with mild pancreatitis to decrease the risk of complications, the likelihood of readmission, and health care expenditure. Although ERCP with sphincterectomy is an option to reduce the risk of recurrent episodes of pancreatitis, there is still a risk of gallstone-related complications. In patients with severe pancreatitis, cholecystectomy should be delayed until resolution of any collections or for 6 weeks if they persist.

Common bile duct stones

According to the guidelines published by the Association of Upper Gastrointestinal Surgeons of Great Britain and Ireland, the risk of common bile duct stones in patients with gallstone disease and abnormal liver function tests is no more than 15% if there is no evidence of bile duct dilation on an ultrasound scan, frank jaundice, or cholangitis. Therefore, the recommendation is to proceed to LC with or without common bile duct exploration or postoperative

ERCP in patients with mild derangement of liver function tests (3). A magnetic resonance cholangiopancreatography (MRCP) can be considered in this situation. Patients with symptomatic common bile duct stones should undergo exploration of the common bile duct or ERCP followed by LC. A one-stage procedure combining LC and common bile duct exploration decreases the admission time, length of stay, and health care expenditure, and is a better use of resources. However, the feasibility of performing these procedures in the same session depends on the resources of the individual hospital and local surgical expertise. It is estimated that the cost of performing an ERCP is 2,471 GBP (2,872 €) if non-elective and 1,042 GBP (€1,211) if elective (21).

Conclusion: Common bile duct stones should be treated early at the same time as cholecystectomy. LC and exploration of the bile duct in the same procedure would be the most cost-effective method if feasible.

Challenges of laparoscopic cholecystectomy in an acute admission

One of the most challenging aspects of performing non-elective LC is the availability of the necessary resources for emergency admissions. In the UK, one of the ways of implementing the standard of care indicated in the guidelines has been to assign patients who require emergency LC on the same admission to a dedicated ("hot") gallbladder list. However, this strategy requires a considerable initial investment in terms of theatre space and nursing, surgical, and anaesthetic manpower on a background of already pressured services. Many NHS trusts in the UK have implemented a hot gallbladder list (Chole-QuIC) (27) either on their own initiative or with the help of the Royal College of Surgeons. Unfortunately, despite the availability of this benchmark strategy, it is not well implemented and not all eligible patients will receive early LC because of short-sighted financial constraints that do not recognise the ability of early LC to shorten the hospital stay, reduce the risk of recurrent complications, increase the number of quality-adjusted life years, and decrease health care expenditure on gallstone disease in the long term (28).

Conclusion

Since its advent in 1985, LC has become the gold standard surgical treatment for cholelithiasis and is now in widespread use. Technical refinements over time have increased the safety of this surgical approach, and the trend of subspecialisation in surgery has helped to improve the quality of treatment provided. These are helpful tools at a time when the incidence of gallstone disease is rapidly increasing and affecting the health of a growing proportion of the population. Optimal timing of surgery is crucial to reduce the risk of complications of gallstone disease, which are potentially severe and life-threatening, and to alleviate the financial burden of the disease worldwide. Despite international guidelines advocating early LC for these reasons, many patients are not benefiting from early surgery due to the logistical constraints of the health care system that they have access to.

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Footnote

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/ls-20-46). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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