The operative management of gallstone ileus

REENA RAVIKUMAR, J GRAHAM WILLIAMS

Surgical Department, New Cross Hospital, Royal Wolverhampton Hospitals NHS Trust, Wolverhampton, UK

ABSTRACT

INTRODUCTION Gallstone ileus is an uncommon entity, which accounts for 1–4% of all presentations to hospital with small bowel obstruction and for up to 25% of all cases in patients over 65 years of age. Despite medical advances over the last 350 years, gallstone ileus is still associated with high rates of morbidity and mortality. The management of gallstone ileus remains controversial. Whilst open surgery has been the mainstay of treatment, more recently other approaches have been employed, including laparoscopic surgery and lithotripsy. However, controversy persists primarily in relation to the extent of surgery performed.

MATERIALS AND METHODS A literature review was performed in an attempt to discover the optimal surgical treatment of gallstone ileus, particularly the timing of biliary surgery. Published articles were identified from the medical literature by electronic searches of Pubmed and Ovid Medline databases, using the search terms 'gallstone ileus', 'gallstone/intestinal obstruction' and 'gallstone/bowel obstruction'. The related articles function of the search engines was also used to maximise the number of articles identified. Relevant articles were retrieved and additional articles were identified from the references cited in these articles.

RESULTS AND CONCLUSIONS The literature on gallstone ileus is composed entirely of retrospective analysis of small numbers of patients accumulated over many years. The question as to whether one stage or interval biliary surgery should be performed remains unanswered and it is unlikely that further case series will help decision making in the management of gallstone ileus. Whilst many authors conclude that enterolithotomy alone is the best option in most patients, a one-stage procedure should be considered for low-risk patients.

KEYWORDS

Gallstone ileus – Intestinal obstruction – Bowel obstruction – Enterolithotomy

Accepted 30-3-10. Online publication May 2010.

CORRESPONDENCE TO

Reena Ravikumar, Department of Surgery, Queen Elizabeth Hospital, University Hospital Birmingham, Edgbaston, Birmingham B15 2TT, UK
E: Reena.Ravikumar@nhs.net

The phenomenon of gallstone ileus was first described in 1654 by Dr Erasmus Bartholin, a Danish physician and mathematician, on a patient he examined at autopsy.¹ The pathogenesis of gallstone ileus involves adhesions forming between the inflamed gallbladder and an adjacent part of the gastrointestinal tract. Subsequently, large stones within the gallbladder cause pressure necrosis, resulting in formation of a cholecyst–enteric fistula, which allows gallstones direct access to the gut.² Most fistulas involve the duodenum, but fistulas to the stomach and colon have been described.³ In the last 350 years, gallstone ileus has remained an uncommon, but intriguing, entity. Whilst resolving the obstruction can usually be achieved by simple enterotomy and gallstone removal, the dilemma of how to deal with the fistula from the gallbladder to the intestine is less easy to resolve. Standard surgical texts have conflicting advice: The New Aird's surgical textbook advocates a one-stage procedure consisting of an enterotomy, closed transversely, and man-

aging the fistula by either stapling or suturing across it, followed by cholecystectomy.² However, it also states that in the presence of severe inflammation and adhesions, simply relieving obstruction by removal of the stone and leaving the fistula and gallbladder untouched may be more appropriate, particularly in an elderly patient.² Similarly, Sabiston's textbook of surgery suggests a one-stage procedure to prevent attacks of recurrent cholecystitis and cholangitis, but also suggests that, in the event of a severe inflammatory process in the right upper quadrant and in an unstable patient, a second laparotomy should be performed to deal with the fistula.⁴

This short review looks at the evidence available on which to base surgical planning.

Materials and Methods

Published articles were identified from the medical literature

by electronic searches of Pubmed and Ovid Medline databases, using the search terms 'gallstone ileus', 'gallstone/intestinal obstruction' and 'gallstone/bowel obstruction'. The related articles function of the search engines was also used to maximise the number of articles identified. Relevant articles were retrieved and additional articles were identified from the references cited in these articles.

Results

Gallstone ileus is more common in women and accounts for 1–4% of all presentations to hospital with small bowel obstruction; however, it is a more common cause of small bowel obstruction in older patients, accounting for up to 25% of all cases in patients over 65 years of age.^{5,6} Because of this, patients with gallstone ileus often have a multitude of co-morbid conditions, which contribute to the high morbidity and mortality rates associated with this condition. Courvoisier published the first large series of 131 cases of gallstone ileus in 1890, with a mortality of 44% from 125 operations.^{7,8} More recently, reported mortality associated with gallstone ileus varies from 12–27%.⁹ In comparison, the mortality rate for small bowel obstruction secondary to adhesions ranges from 7–10%¹⁰ and the mortality rate for colonic obstruction ranges from 3–17%.¹¹

The term gallstone ileus is a misnomer, as the condition is a mechanical obstruction of the gut and not a true ileus. It is a rare complication of cholelithiasis, occurring in 0.3–0.5% of all patients with gallstones.¹² The clinical signs and symptoms of gallstone ileus are usually non-specific, contributing to a delay in diagnosis. However, the common symptoms of intestinal obstruction, such as abdominal pain, nausea, vomiting and constipation predominate, usually intermittently as the stone travels through the bowel.³ Only 50% of all patients presenting with gallstone ileus have a history of biliary disease, and biliary symptoms directly preceding the presentation are rare.⁹ Plain abdominal radiographs may show features of gallstone ileus: pneumobilia, the presence of an aberrant gallstone and enteric obstruction (Rigler's triad).¹³ However, the sensitivity of plain radiographs alone in diagnosing gallstone ileus is poor, ranging from 40–70%.¹⁴ More recently, ultrasound has been used in conjunction with plain X-rays, although combined imaging only increases sensitivity to 74%.¹⁴ Computed tomography (CT) scanning has been reported to offer prompt and rapid pre-operative diagnosis of gallstone ileus with a sensitivity of 93%.¹⁵ However, gallstone ileus is more typically diagnosed at laparotomy in a patient undergoing surgery for unexplained small bowel obstruction.

The management of gallstone ileus remains controversial. Whilst open surgery has been the mainstay of treatment, more recently other approaches have been employed, including laparoscopic surgery and lithotripsy, although too few cases have been reported to come to any conclusion as to the role of these newer approaches.^{16–18} The main controversy surrounding

surgical treatment concerns the extent and timing of surgery performed. Enterotomy and stone extraction will resolve the intestinal obstruction, but leave the patient at risk of further obstruction if there are residual stones within the gallbladder, persistent symptoms from an inflamed gallbladder and a possible increased risk of developing gallbladder cancer. For these reasons, alternative approaches include enterolithotomy, cholecystectomy and fistula repair as a one-stage procedure, or enterolithotomy and interval cholecystectomy with fistula repair when the patient has recovered from the acute episode.

In 1929, Holz¹⁹ and later Fraser (1954)²⁰ and Welch (1957)²¹ described a one-stage procedure with cholecystectomy, closure of the cholecysto-enteric fistula and enterolithotomy to prevent future recurrence of gallstone ileus or gallbladder cancer. The largest review article to date of 1001 reported cases of gallstone ileus demonstrated a mortality of 16.9% with a one-stage procedure, versus 11.7% following enterolithotomy, although this difference did not reach statistical significance ($P < 0.17$).⁵ Enterolithotomy alone was performed in 80% of patients whilst 11% underwent a one-stage procedure.⁵ Recurrent gallstone ileus occurred in only 6% of patients undergoing an enterolithotomy alone, with an overall rate of 4.7%.⁵ This is not dissimilar to the 6 of 113 patients who experienced recurrent gallstone ileus after a one-stage procedure as a result of residual common bile stones or unrecognised enteric stones.⁵ Although this study included a large number of patients, this series was collated by pooling patients from 70 published series spanning 40 years, with widely differing lengths of follow-up and evolving surgical technique during this time period. Furthermore, none of these studies were randomised and the reasons for selecting one operative strategy over another are not detailed but are likely to be influenced by surgical bias.

A Croatian series of 30 patients reported morbidity of 27.3% in patients undergoing enterolithotomy alone and 61.1% for a one-stage procedure: mortality was 9% following enterolithotomy and 10.5% after a one-stage procedure.²² ASA scores were similar between the two groups but operating times were significantly longer for the one-stage procedure. Logistic regression analysis showed that only urgent fistula repair was significantly associated with postoperative complications.²² The authors concluded that enterolithotomy is the procedure of choice, with a one-stage procedure reserved for patients with acute cholecystitis, gallbladder gangrene or residual stones.²² However, the study was not randomised and the selection process for each operative approach was not detailed; it is likely that there was selection bias for the two operative approaches. Similar findings were reported by Rodriguez-Sanjuan *et al.*⁶ in a series of 25 patients. Morbidity after enterolithotomy was 50% compared to 66% following a one-stage procedure. Mortality was 19% after an enterolithotomy alone and 33% in patients undergoing a one-stage procedure.⁶ Again, the surgical approach was selected by the surgeon at the time of operation without randomisation. Follow-up varied widely from 4 months to 8 years.

Clavien *et al.*⁹ advocated a one-stage procedure where feasible. In their study of 37 patients, there was a 17% incidence of recurrent gallstone ileus in the 23 patients treated with enterolithotomy alone, higher than the 5–10% reported in other series.⁹ However, as with all similar studies, patients were not randomised and selection for each type of surgery was at the discretion of the surgeon. Clavien *et al.*⁹ further cited Bossart *et al.*²³ as reporting an incidence of gallbladder cancer of 15% in patients undergoing surgery for a fistula between the gallbladder and the gut, lending support to their advocacy of a one-stage procedure.⁹ This figure for the incidence of gallbladder cancer is much higher than that recognised by most surgeons and review of the Bossart *et al.*²³ manuscript reveals a reported incidence of cancer of only 0.82% in patients undergoing surgery for gallstones and no mention of the incidence in patients with an enteric fistula to the gallbladder. Thus, the relevance of the risk of cancer developing appears to have been overstated, particularly in what is usually an elderly population.

Few studies have reported on two-stage procedures. Reissner and Cohen⁵ reported symptomatic biliary disease in 15% of their series of patients (127 out of 850), of which 10% of patients went on to have surgery. Proponents of enterotomy alone believe that relieving the obstruction is all that is required in this group of patients who have an associated high mortality rate.^{5,6,8} The reported rate of recurrent gallstone ileus is between 5–9% in those patients treated by enterolithotomy alone.^{3,5} In addition, only 10% of patients require re-operation for persistent biliary symptoms.^{5,24} Furthermore, it is thought that fistulas can and do close spontaneously once the distal obstruction has resolved and complications related to persistent fistulae are few and far between.¹ Autopsy findings and findings at re-operations have demonstrated that, in the absence of persistent cholelithiasis, biliary–enteric fistulas will close spontaneously.^{1,5} Also, fistulas are not easy to find intra-operatively which might lead to intra-operative complications and increased operative time.

Discussion and Conclusions

The literature on gallstone ileus is composed entirely of retrospective analysis of small numbers of patients accumulated over many years. Whilst most conclude that enterolithotomy alone is the best option for most patients, a one-stage procedure should be considered for low-risk patients. However, the question as to whether interval biliary surgery should be performed remains unanswered, as has the question of follow-up for patients with residual stones within their gallbladder. It is unlikely that further case series will help decision making in the management of gallstone ileus, but may confirm the safety and efficacy of a laparoscopic approach. Similarly, it is unlikely that a trial of enterolithotomy versus one-stage surgery could be performed for what is an unusual diagnosis in high-risk patients, often not

made prior to surgery. As is sometimes the case in surgery, there will be questions that will remain unanswered and surgeons will continue to have to exercise their clinical judgement when dealing with this interesting condition.

References

- Deckoff SL. Gallstone ileus: a report of 12 cases. *Ann Surg* 1955; **142**: 52–65.
- Windsor A, Heriot A. The small intestine. In: Burnand KG, Young AE, Lucas J. (eds) *The New Aird's Companion in Surgical Studies*, 3rd edn. Amsterdam: Elsevier, 2005; 623–44.
- Masanat Y, Massanat Y, Shatnawel A. Gallstone ileus: a review. *Mt Sinai J Med* 2006; **73**: 1132–4.
- Evers BM. Small intestine. In: Townsend C, Beauchamp RD, Evers BM, Mattox KL. (eds) *Sabiston Textbook of Surgery*, 8th edn. Philadelphia, PA: Saunders Elsevier, 2008; 1728–33.
- Reisner RM, Cohen JR. Gallstone ileus: a review of 1001 reported cases. *Am Surg* 1994; **60**: 441–6.
- Rodriguez-Sanjuan JC, Casado F, Fernandez MJ, Morales DJ, Naranjo A. Cholecystectomy and fistula closure versus entero-lithotomy alone in gallstone ileus. *Br J Surg* 1997; **84**: 634–7.
- Courvoisier LT. Case studies and statistics of pathology and surgery of the bile ducts. F.C.W. Vogel 1890. *Surg Clin North Am* 1982; **62**: 247.
- Syme R. Management of gallstone ileus. *Can J Surg* 1989; **32**: 61–4.
- Clavien PA, Richon J, Burgan S, Rohner A. Gallstone ileus. *Br J Surg* 1990; **77**: 737–42.
- Margenthaler JA, Longo WE, Virgo KS, Johnson FE, Grossmann EM, Schiffthner TL *et al.* Risk factors for adverse outcomes following surgery for small bowel obstruction. *Ann Surg* 2006; **243**: 456–64.
- Yoo P, Mulkeen A, Frattini J, Longo W, Cha A. Assessing risk factors for adverse outcomes in emergent colorectal surgery. *Surg Oncol* 2006; **15**: 85–9.
- Kasahara Y, Umemura H, Shiraha S, Kuyama T, Sakata K, Kubota H. Gallstone ileus. Review of 112 patients in the Japanese literature. *Am J Surg* 1980; **140**: 437–40.
- Rigler LJ, Borman CN, Noble JF. Gallstone obstruction. Pathogenesis and roentgen manifestations. *JAMA* 1941; **117**: 1753–9.
- Rippolles T, Miguel-Dasit A, Errando J, Morote V, Gomeix-Abril SA, Richart J. Gallstone ileus: increased diagnostic sensitivity by combining plain film and ultrasound. *Abdom Imaging* 2001; **26**: 401–5.
- Yu CY, Lin CC, Shyu RY, Hsieh CB, Wu HS, Tyan YS *et al.* Value of CT in the diagnosis and management of gallstone ileus. *World J Gastroenterol* 2005; **11**: 2142–7.
- Sackmann M, Holl J, Haerlin M, Sauerbruch T, Hoermann R, Heinkelein J *et al.* Gallstone ileus successfully treated by shockwave lithotripsy. *Dig Dis Sci* 1991; **36**: 1794–5.
- Soto D, Evan SJ, Kavic MS. Laparoscopic management of gallstone ileus. *J Soc Laparosc Surg* 2001; **5**: 279–85.
- Franklin Jr ME, Dorman JP, Schuessler WW. Laparoscopic treatment of gallstone ileus: a case report and review of the literature. *J Laparoendosc Surg* 1994; **4**: 265–72.
- Warshaw AL, Bartlett MK. Choice of operation for gallstone intestinal obstruction. *Ann Surg* 1966; **164**: 1051–5.
- Fraser WJ. Intestinal obstruction by gallstone. *Br J Surg* 1954; **42**: 210.
- Welch JS, Huizenga KA, Roberts SE. Recurrent intestinal obstruction due to gallstones. *Proc Staff Meet Mayo Clinic* 1957; **32**: 628.
- Doko M, Zovak N, Kopljak M, Glavan E, Ljubicic N, Hochstädter H. Comparison of surgical treatments of gallstone ileus: a preliminary report. *World J Surg* 2003; **27**: 400–4.
- Bossart PA, Patterson AH, Zintel HA. Carcinoma of the gallbladder. A report of seventy-six cases. *Am J Surg* 1962; **103**: 366–9.
- Zaliekas J, Munson JL. Complications of gallstones: the Mirizzi syndrome, gallstone ileus, gallstone pancreatitis, complications of 'lost' gallstones. *Surg Clin North Am* 2008; **88**: 1345–68.