

Tailoring the Management of Nonparasitic Liver Cysts

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Objective

To determine the optimal management of symptomatic nonparasitic liver cysts.

Summary Background Data

Management options for symptomatic nonparasitic liver cysts lack substantiation through comparative studies with respect to safety and long-term effectiveness.

Methods

A retrospective review of the surgical management of patients with hepatic cysts between October 1988 and August 1997 was undertaken to determine morbidity rates and to assess long-term recurrence.

Results

Thirty-eight patients (35 women, 3 men) underwent 48 operations for symptomatic hepatic cysts of mean diameter 12 cm, with a mean follow-up of 41 months. Twenty-three patients had simple cysts, and 15 patients had polycystic liver disease

(PCLD). The symptomatic recurrence rates after laparoscopic or open deroofing for simple cysts were 8% and 29%, and for PCLD 71% and 20%, respectively. There were no symptomatic recurrences after 14 hepatic resections. There were no perisurgical deaths; however, morbidity rates were significant after laparoscopic deroofing, open deroofing, and hepatic resection (25%, 36%, and 50%, respectively).

Conclusions

Selection of patients with truly symptomatic hepatic cysts is crucial before considering interventional techniques. For simple cysts, radical laparoscopic deroofing is usually curative; open deroofing should be reserved for cysts inaccessible by laparoscopy. The latter technique is well tolerated; however, long-term symptom control is unpredictable in patients with PCLD. Hepatic resection for PCLD provides satisfactory long-term symptom control but has an appreciable morbidity rate. Although laparoscopic and open deroofing procedures are less reliable in the long term for solitary cysts, they might be useful steps before embarking on this major procedure.

The increasing use and refinement of abdominal computed tomography (CT) and ultrasonography reveal that up to 5% of the population have one or more liver cysts, with a sharp rise in incidence with age.¹ The vast majority are thought to arise as a congenital aberration of bile duct development and are termed simple cysts. The dominant cyst is usually accompanied by several other small cysts within the liver. Polycystic liver disease (PCLD) is presumed to exist when the whole organ is involved; it appears to be genetically derived² and to have a close association with polycystic kidney disease. Such benign cysts require differentiation from parasitic cysts, which are usually the result of *Echinococcus* infection, and neoplastic lesions, which may be multiple.³

Hepatic cysts are normally asymptomatic and detected incidentally during abdominal imaging. Symptomatic patients with significant pain tend to have large cysts,¹ which may be complicated by hemorrhage,⁴ rupture, torsion, or infection; pressure on related structures may lead to nausea, vomiting, early satiety, or obstructive jaundice.⁵

Recent literature in this area focuses on minimally invasive treatment in the form of percutaneous sclerosant therapy⁶ and laparoscopic deroofing⁷ of the cyst wall. Although the early results of both techniques are promising, there is a lack of long-term follow-up in most reported studies. Laparoscopic deroofing was first reported in 1991⁸ and appears to achieve good patient satisfaction compared with open surgical techniques. We sought to assess our experience in the management of symptomatic hepatic cysts during a 9-year period to determine the precise role of a laparoscopic approach and hence the optimal surgical management of this condition.

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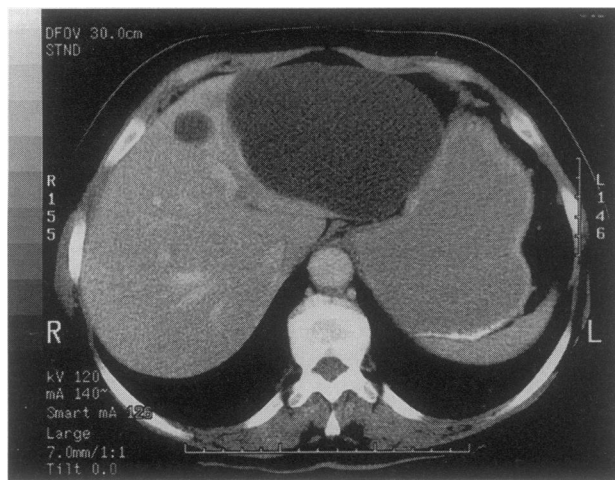


Figure 1. CT scan revealing a large simple cyst occupying most of the left hepatic lobe. The frequent occurrence of other smaller cysts is illustrated by a second cyst in segment 4. The main lesion was successfully treated by laparoscopic deroofing.

METHODS AND SURGICAL TECHNIQUES

Retrospective review of discharge summaries and surgical records revealed 38 patients who underwent surgery for a histologically proven nonparasitic liver cyst at the Royal Infirmary of Edinburgh from October 1988 to July 1997. The patients' age; sex; presurgical symptoms; serum levels of hemoglobin, sodium, potassium, urea, creatinine, and albumin; and liver function tests (bilirubin, alanine aminotransferase [ALT], gamma-glutamyl transferase [GGT], and alkaline phosphatase) were recorded. Only patients with significant symptoms thought to be related to the presence of hepatic cysts were considered for surgical intervention. Contrast-enhanced CT scans were undertaken to plan the surgical approach and to assess the presence of renal involvement.

All symptomatic patients were considered for extensive deroofing of cysts at open surgery, but from 1991 patients with dominant cysts were considered for laparoscopic deroofing (Fig. 1). The principles of laparoscopic and open deroofing were to remove as much of the cyst roof as possible by dividing tissue at the common cyst–liver boundary. At laparoscopy, access to the peritoneal cavity was achieved by insertion of a 10- to 11-mm port at the umbilicus by cutdown technique. Placement of further ports was determined by the precise location of the dominant hepatic cyst. For right-lobe cysts, for example, a second 10- to 11-mm port was placed to the left of the midline in the epigastrium and a 5-mm port was positioned in the right anterior axillary line beneath the costal margin. Decompression of the cyst and aspiration of its contents were normally required to provide adequate access to the superior aspect of the cyst wall and to facilitate mobilization and radical excision of its roof. Although laser dissection appeared to minimize smoke

generation and provide more precise dissection than diathermy coagulation early in our experience,⁸ the more recent use of ultrasonic coagulating shears (Harmonic scalpel, Ethicon Endosurgery, Edinburgh, United Kingdom)⁴ has enabled more radical resection of the cyst roof and improved coagulation of the common cyst–liver boundary, with minimal fogging of the laparoscope during the procedure. Any resected cyst wall was delivered through the epigastric port.

Hepatic resection was undertaken in patients with multiple, diffuse liver involvement or recurrence after open or laparoscopic deroofing (Fig. 2). Hepatic resection was undertaken through a bilateral “rooftop” incision using conventional techniques, minimizing blood loss by preliminary dissection of the portal and arterial inflow.⁹ Resection of liver parenchyma and open deroofing of associated liver cysts in the residual liver were undertaken using a Cavitron ultrasonic surgical aspiration device (CUSA, Valleylab, Boulder, CO). Sonography was used during both laparoscopic and open surgery to assess and locate the cyst and its surrounding structures. Drains were used selectively to detect drainage of blood or bile in the postsurgical period. Antisecretory agents were not routinely given, but pulmonary thromboembolism prophylaxis with subcutaneous heparin was prescribed. Patients were followed as outpatients until relief of symptoms was confirmed, and all patients were interviewed by telephone or letter to confirm current symptomatology.

RESULTS

Symptoms and Presurgical Investigations

Thirty-eight patients (35 women, 3 men) with a median age of 58 years (range 33 to 84 years) underwent hepatic

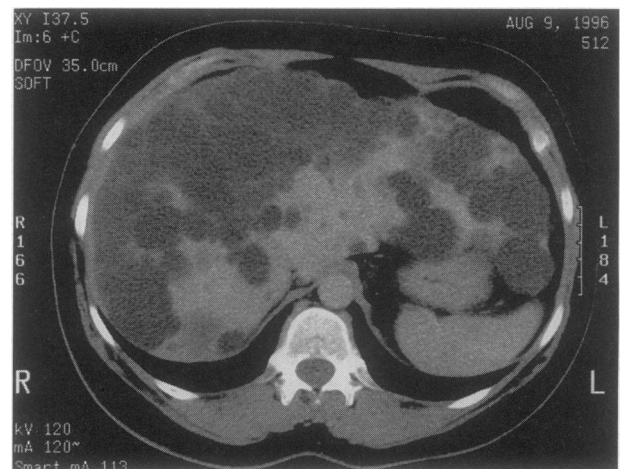


Figure 2. A patient with PCLD. CT scan reveals cysts throughout the whole liver and an absence of renal cysts. A right-sided hepatectomy and deroofing of the residual cysts resulted in a satisfactory outcome.

Table 1. CLINICAL FEATURES OF PATIENTS WITH SYMPTOMATIC HEPATIC CYSTS

Clinical Features	Simple Cysts	Polycystic Liver Disease
Number of patients	23	15
Age* (range)	63 yr (33–84)	49 yr (39–79)
Sex (male:female)	2:21	1:14
Pain	22 (96%)	13 (87%)
Nausea, vomiting, early satiety	8 (35%)	8 (53%)
Fatigue, dyspnoea	6 (26%)	2 (13%)
Raised LFT (1 or more)	12 (52%)	5 (33%)
Dominant cyst diameter*	14 cm (8–24 cm)	12 cm (6–16 cm)
Polycystic kidney disease	0	7 (47%)

* Median values (range).

cyst surgery (Table 1). All patients were symptomatic, and the principal presenting features were pain (92%), fullness (45%), nausea, vomiting, and early satiety (42%), or fatigue and dyspnea (21%). Liver function test results were higher than normal in 17 patients (45%) before surgery (bilirubin 2, GGT 14, ALT 1, alkaline phosphatase 10), with 6 patients having an isolated GGT elevation. Abnormal results of liver function tests were most common in patients with simple cysts. Of three patients with an increased creatinine level, two had PCLD with polycystic kidney disease and one had a simple hepatic cyst. Three patients had a hemoglobin level lower than normal (two simple cysts, one PCLD).

Twenty-three patients were shown by CT scanning to have simple cysts and 15 patients had PCLD, 7 of whom had polycystic kidney disease (47%). The mean diameter of the dominant cyst was 12 cm (range 6 to 20 cm); 14 of 23 patients with simple cysts (61%) had two or more smaller

hepatic cysts detected by CT scan or surgical ultrasonography.

Prereferral Treatment

Thirteen patients (seven PCLD, six simple cysts) underwent 24 percutaneous cyst aspirations (five with alcohol) a median of 8 months (range 2 to 48 months) before surgical referral without satisfactory relief of symptoms. Both PCLD patients who underwent five episodes of percutaneous alcohol sclerotherapy developed recurrent symptoms 2 and 7 months later. One patient required acute surgical management secondary to cyst rupture immediately after cyst aspiration.

Surgical Treatment

The total number and type of surgical procedures performed, surgical time, blood loss, postsurgical stay, and morbidity rate according to cyst morphology are shown in Table 2. Four patients with simple cysts underwent synchronous cholecystectomy during laparoscopic (three) or open (one) cyst deroofing. Three of these patients had an elevation of one or more liver function test results before surgery but had no evidence of common duct stones during surgical cholangiography. The 14 hepatic resections included 2 left lobectomies and 12 hepatectomies (right 9, left 2, extended left 1).

Significant postsurgical complications occurred in 5 of 20 patients (25%) after laparoscopic deroofing: deep vein thrombosis with pulmonary embolism in 1 patient, myocardial infarction in a second (both occurring 2 weeks after hospital discharge), chest infection in 2 patients, and a bile leak lasting 5 days in the remaining patient. Complications in all 5 of the 14 patients (36%) undergoing open deroofing were the result of chest infection. Complications after hepatic resection (50%) included chest infection (two), pleural

Table 2. OPERATIONS UNDERTAKEN FOR SYMPTOMATIC NONPARASITIC HEPATIC CYSTS

Operative Procedure	Number	Operation Time* (Min)	Blood Loss* (Milliliters)	Postop Stay* (Days)	Morbidity (%)
Simple cyst					
Laparoscopic deroof	13	60 (45–155)	10 (10–200)	3 (1–10)	3 (23)
Open deroof	8	88 (40–120)	229 (10–520)	8 (5–11)	3 (38)
Hepatic resection	5	90 (85–120)	170 (100–500)	8 (2–8)	1 (20)
PCLD					
Laparoscopic deroof	7	120 (75–180)	10 (10–50)	3 (1–7)	2 (29)
Open deroof	6	100 (80–150)	20 (10–1800)	8 (5–19)	2 (40)
Hepatic resection	9	120 (74–240)	150 (100–1700)	12 (10–30)	6 (67)
Total	48	110 (40–240)	80 (10–1800)	5 (1–30)	19 (40)

PCLD = polycystic liver disease.

* Median values (range).

Table 3. REOPERATIONS FOR RECURRENT SYMPTOMS FROM HEPATIC CYSTS

Initial Operation	Reoperation Rate (%)	Interval to Reoperation (Months)	Reoperation	Mean Follow-up (Months)
Simple cyst				
Laparoscopic	1 of 13 (8)	7	Hepatic resection (1)	25 (2–80)
Open deroof	2 of 7 (29)	6,16	Open deroof (1) Hepatic resection (1)	56 (3–104)
Hepatic resection	0 of 3			19 (7–35)
PCLD:				
Laparoscopic	5 of 7 (71)	8,10,12,36,40	Open deroof (1)* Hepatic resection (5)	37 (1–67)
Open deroof	1 of 5 (20)	12	Hepatic resection (1)	96 (43–144)
Hepatic resection	0 of 3			9 (2–13)
Total	9 of 38 (24)		10	41 (1–144)

* One patient required open deroofting at 12 months followed by hepatic resection 21 months later.

effusion (two), prolonged drainage of ascitic fluid (three), wound infection (one), persistent drainage of bile for 8 days (one), subphrenic hematoma (one), postsurgical mild pancreatitis (one), and an obstructing duodenal ulcer, which resolved with conservative management. The persistent bile leak necessitated endoscopic retrograde cholangiography and stent insertion; the subphrenic hematoma was managed successfully with percutaneous drainage. There have been no postoperative or late deaths on follow-up to date.

Outcome

Forty-eight surgical procedures were undertaken in 38 patients, who were followed for a mean of 41 months (range 3 to 124 months). There have been 10 symptomatic recurrences. Nine patients required a repeat procedure, but all are currently free of symptoms after the last surgical procedure. One patient with two hepatic cysts underwent two attempts at percutaneous aspiration with alcohol instillation, with subsequent relief of symptoms, of a left-sided 9-cm cyst 21 months after laparoscopic deroofting of a right-sided 11-cm cyst. Of the nine patients undergoing a repeat procedure (three simple cysts, six PCLD), one patient required a third surgical intervention. There were no repeat procedures or symptomatic recurrences after hepatic resection (Table 3).

The three recurrences after surgery for simple cysts occurred in patients in whom radical deroofting was not performed. In the first instance, the cyst was central and deep-seated. In the second instance, a 20-cm cyst in hepatic segments 6 and 7 that was adherent to the diaphragm provided difficult access. In the third instance, recurrence of a 13-cm cyst in hepatic segments 2 and 3 necessitated a curative left lobectomy. Recurrent symptoms in the PCLD group were associated with large recurrent cysts at the sites of previous dominant cyst deroofting in two patients (technical failure) and elsewhere in the liver in four patients (progressive cyst growth). All three patients in the PCLD group with symptomatic recurrences within 12 months of

surgery underwent deroofting of dominant cysts, without deroofting of all available cysts. Since the last operative procedure, all PCLD patients had residual liver cysts noted on CT; however, cysts ≥ 5 cm were seen in only 3 of 15 patients with PCLD (20%) and 3 of the 23 patients with simple cysts (13%).

DISCUSSION

Our experience supports the previous observation that symptomatic hepatic cysts occur 10 times more commonly in women, usually at age 50 to 60 years, with pain as the predominant symptom.¹⁰ Although it is easy to attribute patient symptoms to the presence of a large hepatic cyst, the possibility of coexisting pathology must be excluded before intervention.^{7,11} It may well be that one patient with PCLD in our series had symptoms related to ulcer disease, which declared itself with obvious gastric outlet obstruction 10 days after left-sided hepatectomy. The symptoms of patients with hepatic cysts are not uniform, but most appear to be the result of pressure effects, with pain predominating in both simple cyst and PCLD groups. The displaced liver or enlarged cyst may compress the stomach and duodenum, causing nausea, vomiting, and early satiety, as demonstrated in 35% of patients with simple cysts and 53% of patients with PCLD in our experience. Gigot et al.⁷ advocated percutaneous aspiration of cysts as a diagnostic test for relief of symptoms if there was doubt about the significance of symptoms, although this is not without risk.

Despite improved imaging techniques, the presence of neoplasia is still difficult to determine before and during surgery. Our experience reveals that surgical ultrasound commonly detects internal acoustic shadows within these cysts, usually the result of previous hemorrhage, confirmed on opening the cyst.^{4,12} The presence of obvious cyst wall nodules or solid components, however, must be considered neoplastic and treated as such. On opening the cyst roof, close inspection of the interior for fleshy neoplastic compo-

nents is mandatory, with a biopsy sample taken for frozen-section histopathology if suspicion remains regarding underlying malignancy.

Percutaneous aspiration of symptomatic hepatic cysts is a simple option, but recurrence is invariable. Guglieli et al.¹³ also noted the development of recurrent symptoms in all 20 patients with simple cysts within 2 years after aspiration. There is also a significant risk of introducing infection, which may be life-threatening.¹⁴ The technique may be best reserved as a diagnostic procedure in patients with questionable symptoms. Percutaneous instillation of the sclerosing agents ethanol,^{6,13} Pantopaque,¹⁵ or minocycline hydrochloride¹⁶ appears to reduce the rate of symptomatic and radiologic cyst recurrence significantly. Montorsi et al.⁶ noted symptom relief in all 21 patients after alcohol sclerotherapy for simple cysts after a mean follow-up of 18 months. In our experience, both patients with PCLD who underwent five episodes of percutaneous alcohol sclerotherapy developed recurrent symptoms within 7 months, but a single patient with a solitary cyst had resolution of symptoms after two episodes of alcohol instillation. Nonetheless, despite a relatively small experience in the literature and a paucity of long-term results, sclerotherapy may prove to be a useful alternative to surgical intervention for patients with symptomatic simple hepatic cysts. The presence of bile in the cyst or a suspicion of *Echinococcus* infection or neoplasia is a contraindication to this procedure.^{6,13}

The open technique of cyst deroofing, also referred to as fenestration, was first described by Lin et al. in 1968¹⁷ and has been advocated by several groups.^{18,19} Recurrence may be expected even if meticulous and radical fenestration of all available cysts is performed, as illustrated by five cases in our experience. It appears that destruction of the fluid-producing epithelial lining with diathermy or laser at surgery may be advantageous,²⁰ although other workers have advocated total cystectomy,⁵ hepatic resection,^{21,22} and liver transplantation²³ to reduce cyst recurrence, at the expense of an appreciable morbidity rate.

Laparoscopic deroofing of hepatic cysts was first described in 1991.⁸ Subsequent developments in the laparoscopic arena—improved surgical confidence, the ability to demonstrate the segmental anatomy with laparoscopic contact sonography, and the achievement of satisfactory hemostasis in a relatively smoke-free environment with parenchymal liver dissection (ultrasonic coagulating shears)—have broadened our indications for this approach.⁴ Initially reserved for superficial lesions, even posteriorly and centrally located cysts may be tackled with caution,²⁴ although radical excision of the cyst roof may not be possible. In a recent comprehensive review of laparoscopic management of hepatic cysts by Klingler et al.,²⁵ 21 papers reported 61 laparoscopic deroofing procedures with six perisurgical complications (10% overall morbidity rate) during a limited follow-up period. This apparently favorable experience is tempered by our experience of 20 laparoscopic procedures—a morbidity rate of 25%, with a symptomatic recur-

rence rate of 8% for simple cysts and 71% for PCLD after a mean interval of 29 months. Laparoscopic deroofing in patients with PCLD is unlikely to be successful when only the largest cysts are dealt with. Others have taken a more radical approach in managing this group²² and have suggested that hepatic resection is preferable to prolonged attempts at extensive deroofing of smaller cysts. Our experience with the 14 patients so treated has suggested that this may be a more appropriate approach, even though it has a high morbidity rate.

Although selectivity of cases may lead to an unfair comparison, we noted that a laparoscopic technique was associated with a reduced morbidity rate (25%) and a shorter hospital stay (3 days) compared with open deroofing (36% and 8 days). With respect to recurrence, it appears that radical deroofing by whatever means is the key issue; increasing experience might reveal that most large simple cysts, even in posterolateral positions, are amenable to radical laparoscopic deroofing. Large central cysts with a small superficial component appear to have a high risk of recurrence with techniques lesser than hepatic resection or cystectomy.⁵ Patients with symptomatic PCLD present the greatest challenge, although extensive and radical deroofing of all available cysts appears to achieve the best long-term symptom-free results short of hepatic resection or liver transplantation. An experienced laparoscopic enthusiast should attempt to achieve the same objectives as with the open procedure and should convert to a conventional approach if this is not possible. The outcome may depend on the surgeon's laparoscopic skills and the liver cyst morphology. Formal anatomic hepatic resection provides the best outcome in terms of symptom recurrence; however, the morbidity rate is high and patient acceptability is low compared with a laparoscopic approach. A compromise must be reached between surgical radicality and patient acceptability, but the eventual surgical approach may be determined by the patient's needs, the cyst morphology, and the surgeon's skills.

Selection of patients with truly symptomatic hepatic cysts is crucial before considering any intervention. For simple cysts, radical laparoscopic deroofing is usually curative; open fenestration should be reserved for cysts inaccessible to the laparoscope. The latter technique is well tolerated, but long-term symptom control is unpredictable in patients with PCLD. Hepatic resection for this disease provides reliable symptom control but has an appreciable morbidity rate. Although laparoscopic or open deroofing is less predictable in the long term, it might be a useful step before embarking on this major procedure.

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