

Technical Innovation

Serial Ethanol Ablation of Multiple Hepatic Cysts as an Alternative to Liver Transplantation

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Treatment of hepatic cysts may be required for symptoms of pain, infection, or mass effect causing early satiety, dyspnea, or bile duct obstruction. Recurrence rates can be high after fine-needle aspiration [1], although percutaneous ethanol ablation of isolated or of a few hepatic cysts in individual patients has been successful [2–4]. Fenestration with internal drainage, liver resection, or both are recognized surgical therapies for patients with single large cysts or a unilobar predominance of multiple symptomatic cysts, as seen in adults with polycystic liver disease [5]. Liver transplantation has been advocated for patients with polycystic liver disease who have diffuse bilobar hepatic cysts and are markedly symptomatic; less extensive surgeries and percutaneous ablation have been considered ineffective to date [5, 6]. This report describes a method to serially ablate with ethanol six symptomatic bilobar hepatic cysts in a patient with polycystic liver disease. This method proved to be a successful alternative to liver transplantation.

Subject and Methods

A 51-year-old woman with polycystic liver disease presented with chronic severe bilateral abdominal pain that was limiting her daily activities. Surgical history included fine-needle aspiration of

several symptomatic hepatic cysts under CT and sonographic guidance at other hospitals; these procedures yielded temporary pain relief of up to a few months' duration. Physical examination revealed multiple tender masses in a markedly enlarged liver, particularly at the left costal margin and right flank. Liver function tests were remarkable for a mild elevation in alkaline phosphatase. Enhanced biphasic abdominal CT showed hepatomegaly from multiple large cysts in all hepatic segments. Large exophytic cysts were present in the posterior segment near the right lateral costal margin, exerting mass effect on the upper pole of the right kidney, and in the lateral and medial segments near the left costal margin (Fig. 1A). Only three small renal cysts bilaterally were present, and no pancreatic cysts were detected.

On the basis of clinical and CT findings, an experienced hepatobiliary and transplant surgery team recommended liver transplantation as the only plausible surgical option for this patient. Although results of the liver function tests were only mildly elevated, the bilobar distribution of the symptomatic cysts that required treatment and the lack of surgical planes (anatomic or nonanatomic) that were devoid of numerous other large cysts raised the probability of insufficient liver function and large bile or cystic fluid leakage after a partial hepatectomy. Because of her reluctance for transplantation, the patient was referred for possible radiologic intervention. The patient agreed to undergo a trial of consecutive outpatient sessions to sequentially ablate the most symptomatic hepatic cysts for ongoing pain control. Treatment

sessions were scheduled initially, and thereafter whenever the patient reported a moderate level of recurring pain. Each session spanned at least two consecutive days.

On day 1 of each session, symptomatic cysts were treated by percutaneous catheter drainage and initial alcohol injection, performed largely according to published techniques [2, 3]. Directed pressure with a 3.5-MHz sonography transducer (XP 128/10; Acuson, Mountain View, CA) was used to determine which hepatic cysts to treat by reproducing the patient's area of maximal pain. After local anesthesia was administered to the patient, each cyst was punctured subcostally for drainage under sonographic guidance via the trocar technique with 5.5- to 8.3-French nonlocking pigtail catheters (Elecath; Electro-Catheter, West Orange, NJ). The volume of fluid aspirated from each cyst was recorded. Contrast material (diatrizoate meglumine [30%], Renografin-30; Bracco Diagnostics, Princeton, NJ) was injected into catheterized cysts under fluoroscopy to exclude intraperitoneal spill of contrast material and communication with the biliary tract (Fig. 1B).

After aspiration of all retrievable contrast material, 5–10 mL of lidocaine hydrochloride (2% solution) was injected, and the patient was rolled to anesthetize the cyst lining. Each initial alcohol injection was performed with 98% dehydrated ethanol with the intent of replacing 25–50% of the original volume of the cyst, but not exceeding a total patient dose of 100 mL per day. Specifically, alcohol was left in each cyst for 20–25 min, and the patient rolled intermittently to ensure the alcohol coated the cysts. After all retrievable local anes-

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Ethanol Ablation of Hepatic Cysts

thetic solution and alcohol had been aspirated, each catheter was clamped during a 4-hr observation period in our radiology unit. Then, after reaspiration and reclamping were performed, the patient was discharged overnight.

On day 2 of each session, the patient returned to the hospital, and each cyst was again aspirated through the catheter. If the volume of cystic fluid that was aspirated at the start of day 2 was less than 20% of that recorded at puncture on day 1, the catheter was removed, and the patient was observed for 2 hr before being discharged from the hospital. If more than 20% of the original volume of cystic fluid was aspirated, alcohol injection and catheter man-

agement were repeated using the same procedure as on day 1. If a cyst required an alcohol injection on day 2, the patient was discharged from the hospital and returned on day 3 and each cyst was aspirated a final time, and the catheter was removed regardless of its overnight output.

All CT scans were obtained on a HiLight or HiSpeed Advantage scanner (General Electric Medical Systems, Milwaukee, WI). CT scans of the liver were obtained immediately before (on the same morning as) every third ethanol ablative session or before any session if more than 1 year had elapsed since the preceding CT examination. A follow-up CT examination was performed 2 years

after the final ablation session. IV contrast material was withheld for these examinations because the diagnosis of polycystic liver disease had been clearly established; complications, such as abscess or bile duct stricture, were not suspected, and the intervention could begin sooner in the workday without the technical delay necessary to administer contrast material. Recently, when the patient's alkaline phosphatase level was mildly elevated, my colleagues and I performed biphasic contrast-enhanced CT. Once she discontinued a newly prescribed antiinflammatory medication, the level of alkaline phosphatase normalized, enabling 52- to 82-month follow-up for all treated cysts.

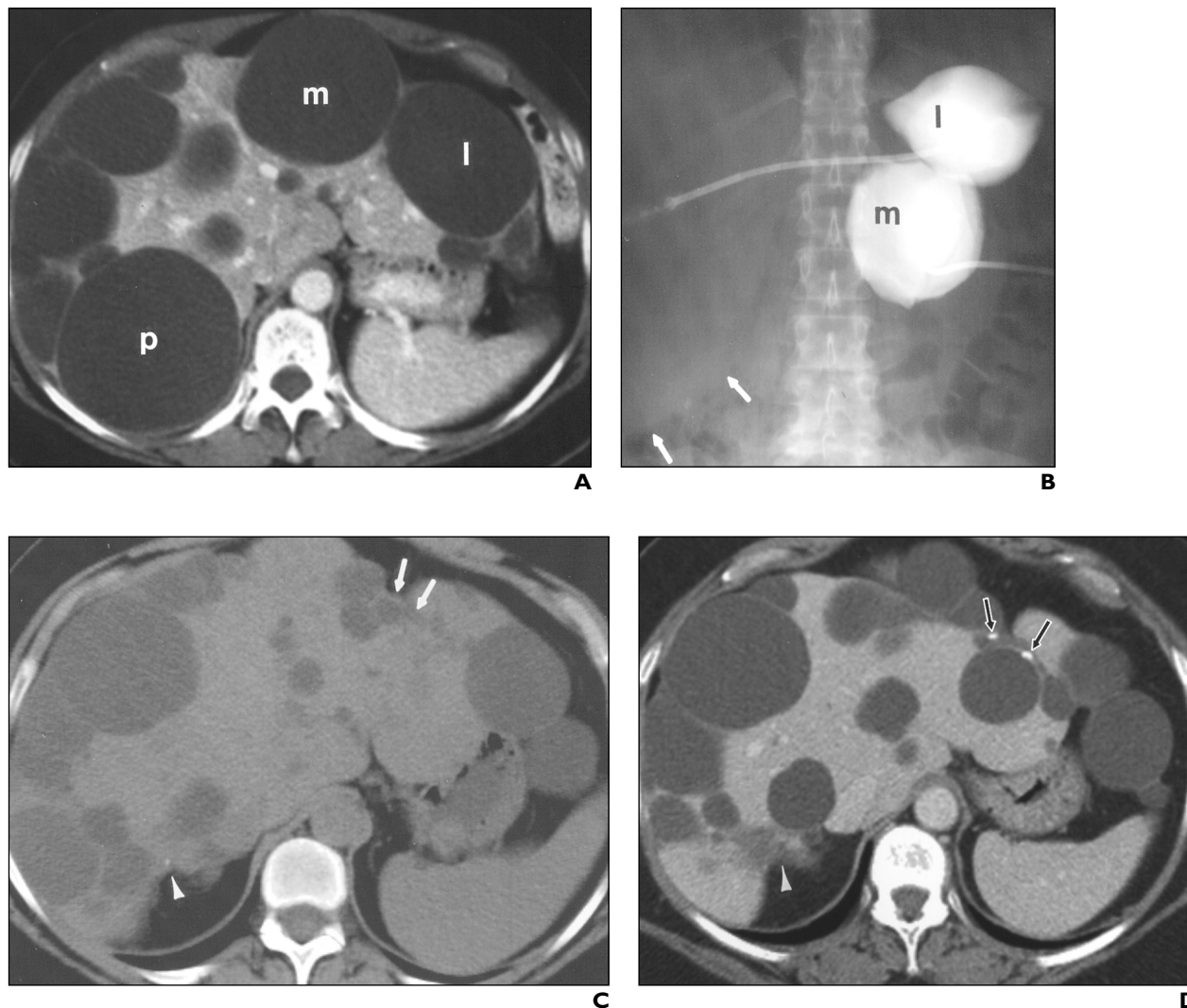


Fig. 1.—51-year-old woman with painful hepatomegaly from polycystic liver disease.

A, At initial evaluation, CT scan obtained during portal venous phase shows innumerable bilobar hepatic cysts, precluding feasible surgical plane. Cysts in lateral (l), medial (m), and posterior (p) segments of liver were eventually ablated with alcohol to alleviate pain at costal margins and right flank.

B, Cyst catheter sinogram shows opacification of two cysts in lateral (l) and medial (m) segments of liver (arrows at liver margin). Neither contrast material extravasation nor communication to biliary tract that would contraindicate subsequent alcohol ablation can be seen.

C, Unenhanced CT image shows extensive capsular retraction and negligible fluid recurrence in treated cysts at 22 months (arrows) and at 36 months (arrowhead) after last alcohol treatment.

D, CT image obtained during portal venous phase shows persistent lack of reaccumulation in treated cysts at 52 months (arrows denote calcifications) and 66 months (arrowhead) after last ethanol ablation.

Results

A total of five outpatient ethanol ablation sessions were used to treat six symptomatic hepatic cysts in a patient with polycystic liver disease. Sessions were performed initially and then on moderate pain recurrence at successive 3-, 6-, 7-, and 14-month intervals, with the first and last sessions occurring 82 and 52 months ago, respectively. Single cysts were treated during the first and last sessions, and two cysts were treated in each of the second through fourth sessions. Two lateral, two medial, and two posterior segment cysts measuring 6.3–9.0 cm in maximum dimension were aspirated and yielded 75–340 mL of thin fluid per cyst. The fluid was clear to greenish brown. After ethanol treatment, reaccumulation percentages of 5% or less were measured for each treated cyst from the 22-month follow-up CT examination (Fig. 1C) and were insignificantly changed on the most recent CT scan obtained 52–82 months after the final ablation of each cyst (Fig. 1D). All six treated cysts showed retractive scarring and eventual foci of calcification.

Four cysts required catheterization and only one alcohol injection each. Two cysts were treated simultaneously during a first treatment session by initial and 24-hr alcohol injections. Pain recurred 7 months later, and CT showed reaccumulation of fluid in both cysts to their original volumes. A second session of repeated catheterization and alcohol ablation (one injection) of both cysts was performed with negligible recurrence seen at follow-up CT 66 months later.

Targeted alcohol doses ranging from 25% to 47% of original cyst volume were initially injected into three cysts, one of which required additional doses. Because of progressive clot formation in one cyst and because the patient experienced severe pain during the injection of two cysts, doses were limited to 11–17% of the original cyst volume in three cysts, only one of which required additional alcohol injections.

The patient reported moderate abdominal pain and cramping that lasted 3–5 days after each session, although she showed stable vital signs. No evidence of perihepatic hematoma, ascites, or pleural effusion was detected on

sonography 24 hr after any of the alcohol injections. Admission to the hospital was not required. Results from liver function tests normalized before the third treatment session and have remained normal annually until a recent elevation in alkaline phosphatase, which resolved after discontinuing a new-generation arthritis medication. The patient reported no abdominal pain at 52 months after her last treatment session.

Discussion

Previous reports about hepatic cyst ablation techniques describe various thresholds that have been used to determine when more than one alcohol dose is needed to provide effective therapy. Second alcohol injections have been advocated if 10–15 mL per day of continued drainage from a cyst catheter is present during the 2–3 days after the first alcohol dose [3]. Because completely aspirating a hepatic cyst and retrieving all the injected contrast material, lidocaine, and alcohol used during ablation can be difficult, at least 10–15 mL of these fluids may remain in a cyst after aspirating the cyst through the catheter at the termination of a first alcohol injection. Resorption rates may vary among different patients over the next 48–72 hr. Therefore, this second-dose threshold may be too stringent for some patients, prompting unnecessary alcohol injections and prolonged catheter placement. Authors of the largest available series to date ($n = 25$) hospitalized patients and injected smaller cysts (≤ 100 mL) twice and larger cysts (> 100 mL) three times and removed cyst catheters immediately after the last alcohol injection [4]. Using this method, these researchers achieved only partial or no clinical success in up to 44% of these patients.

The second-dose threshold reported here is clearly more conservative than those used in either of the series [3, 4] mentioned earlier. In this patient, larger overnight catheter outputs were tolerated before second alcohol injections were administered. The need for second injections was based on these outputs rather than on a predetermined criterion. Single ethanol doses were usually therapeutic in this patient, and the repetitive nature of the

treatment protocol allowed ample opportunity to treat refractory cysts again at a later date if necessary so that ongoing design modifications were not required.

Although percutaneous ethanol ablative therapy and various surgical procedures on the native liver can limit the clinical course of polycystic liver disease, only liver transplantation can be curative. However, the morbidity, mortality, and financial cost associated with organ replacement and life-long immunosuppression are many times greater than those associated with ethanol ablation. The ongoing shortage of available cadaveric livers for orthotopic transplantation, and the risk to healthy adults donating a single hepatic lobe or segment for living donor liver transplantation necessitate a search for alternative therapies in patients with polycystic and end-stage liver diseases.

Because most patients with polycystic liver disease maintain adequate liver function, controlling their symptoms is usually more critical than eradicating the disease and, as shown in this patient, can be staged over several months to years. For patients with polycystic liver disease who also have diffuse bilobar disease and are symptomatic, serial alcohol ablation of multiple hepatic cysts should be considered a possible alternative to liver transplantation and can be performed safely on an outpatient basis.

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