The management of liver hydatid cysts by percutaneous drainage

Ersan Aygün, MD;* Mustafa Sahin, MD;* Kemal Ödev, MD;† Celalettin Vatansev, MD;* Faruk Aksoy, MD;* Yahya Paksoy, MD;† Adil Kartal, MD;* Ömer Karahan, MD*

Objective: To investigate the effect of percutaneous drainage on liver hydatid cysts. **Design:** A retrospective case study. **Setting:** Department of Surgery, Selçuk University, Konya, Turkey. **Patients:** Forty-five patients with 83 liver hydatid cysts (types I and II according to the classification of Gharbi and colleagues) followed up for a mean of 30 months (range from 14 to 36 months). **Intervention:** The cysts were drained percutaneously with ultrasonographic guidance and then irrigated with 0.05% silver nitrate solution through a fine needle. Albendazole was administered 48 hours before percutaneous drainage and for 2 months after the procedure to prevent the implantation of spilled scolices. **Main outcome measures:** Complications of the procedure, decrease in size of the cyst cavity, recurrence and dissemination of the cysts. **Results:** All the cysts were treated successfully by percutaneous drainage. Anaphylactic shock developed in 1 (2.2 %) patient, and mild allergic reactions were observed in 2 (4.4 %) patients during the interventional procedure. Follow-up ultrasonography and CT demonstrated a statistically significant ($p < 0.01$) decrease in the mean cyst size. Recurrence and dissemination were not observed during the follow-up period. **Conclusion:** Percutaneous fine-needle aspiration and drainage is effective for managing cystic liver hydatid disease in selected cases.

Objectif : Étudier l'effet du drainage percutané sur les kystes hydatiques du foie. **Conception :** Étude de cas rétrospective. **Contexte :** Département de chirurgie, Université Selçuk, Konya, Turquie. **Patients :** Quarante-cinq patients qui avaient 83 kystes hydatiques (de types I et II selon la classification de Gharbi et ses collaborateurs) suivis pendant 30 mois en moyenne (intervalle de 14 à 36 mois). **Intervention :** On a drainé les kystes par voie percutanée et par guidage échographique et on les a irrigués ensuite au moyen d'une solution de nitrate d'argent à 0,05 % injectée au moyen d'une aiguille fine. On a administré de l'albendazole 48 heures avant le drainage percutané et pendant deux mois après l'intervention pour prévenir l'implantation de scolex échappés. **Principales mesures de résultats :** Complications de l'intervention, réduction du volume de la cavité du kyste, réapparition et dissémination des kystes. **Résultats :** Tous les kystes ont été traités avec succès par drainage percutané. Un (2,2 %) des patients a été victime d'un choc anaphylactique et l'on a observé des réactions allergiques bénignes chez deux (4,4 %) des patients pendant l'intervention. L'échographie et la tomographie de suivi ont révélé une diminution significative sur le plan statistique ($p < 0,01$) du volume moyen des kystes. On n'a pas observé de réapparition ni de dissémination pendant la période de suivi. **Conclusion :** L'aspiration et le drainage percutanés par aiguille fine constituent un moyen efficace de traiter les kystes hydatiques du foie dans certain cas.

Hydatid cysts caused by the larval form of *Echinococcus granulosus* are the commonest form of liver hydatidosis.[1] Their radiographic, radioisotopic, ultrasonographic, CT and MRI appearances have been described in detail.[2–5] Clinically, liver hydatid disease is usually asymptomatic, but it may cause considerable morbidity and occasional death. Screening by abdominal ultrasonography combined with laboratory tests has revealed that appoximately 2% of the asymptomatic population is infected.[6] Although surgical evacuation remains the procedure of choice, it may be dangerous or impossible in some instances, such as in patients with recurrent cysts, multiple liver cysts, a history of multiple abdominal operations (especially of the right

*From the *Department of General Surgery and †Department of Radiology, University of Selçuk, Konya, Turkey*

Accepted for publication Sept. 27, 1999.

Correspondence to: *Dr. Mustafa Sahin, Selçuk Universitesi Tip Fakültesi Genel Cerrahi Klinigi, 42080 Meram, Konya, Turkey; fax +90 332 3232643*

upper quadrant), cysts located very close to the main vascular and biliary duct structure of the liver, severe systemic disease, multiple abdominal hydatidosis with liver cyst or cysts, pregnancy and rejection of the surgery.[6,7] Recent reports on percutaneous irrigation are encouraging.[6–8] Percutaneous needle drainage of liver hydatid cysts is becoming an effective treatment and may be an alternative for patients at risk of recurrence, high surgical risk and relapse.[6,8]

We investigated the efficacy of ultrasonographically guided percutaneous drainage as a treatment for liver hydatid cysts and studied the perioperative complications associated with the procedure.

Patients and methods

Between November 1992 and December 1996, we managed 82 patients with liver hydatid cysts. All underwent a detailed physical examination, followed by ultrasonography and CT. The cysts were classified according to the ultrasonographic appearance as described by Gharbi and colleagues.[9] Included in our study were 45 patients (9 men, 36 women), ranging in age from 19 to 75 (mean 41) years: 39 had types I and II cysts, 3 had recurrent cysts, 2 had centrally located cysts in the liver and 1 had chronic obstructive pulmonary disease and was at high operative risk. The number of cysts varied from 1 to 8 per patient for a total of 83. Twenty-five (55%) of the 45 patients were symptomatic. The remaining 37 patients had cysts with a hyperechoic solid pattern or ones that had ruptured into biliary tree (types III to V). They were managed surgically during the same time period.

Informed consent for treatment was obtained for all 45 patients. The hydatid origin of the cysts seen on ultrasonography and CT was further supported serologically by the indirect hemagglutination test. The results of the test, which was carried out in 42 of the patients, was evaluated according to the method described by Wattal and colleagues.[10]

All patients were given albendazole orally (10 mg/kg daily) as a prophylactic measure 48 hours before and for 2 months after the percutaneous irrigation. Percutaneous drainage was performed under aseptic conditions. Local anesthesia was applied at the site of puncture, an antiallergic cocktail (diphenhydramine, 10 to 50 mg/mL, hydrocortisone sodium succinate, 100 mg) and midazolam or diazepam were given for premedication. Blood samples were taken for biochemical, serologic and hematologic determinations before and 1 week after the procedure and bimonthly thereafter.

Depending on the size of the cysts, 14- to 22-gauge Teflon fine needles (Secalon T; Ohmeda, Swindon, UK) were used. The interventional procedure was carried out in 3 steps:

- Step 1. A fine needle was inserted into the cystic cavity under ultrasonographic guidance. Half of the cystic fluid was aspirated and separation of the endocyst from the ectocyst was noted (Fig. l, left).
- Step 2. A scolicidal agent, in this case sterile 0.05% silver nitrate 50% to 60% of the aspirated volume of cyst fluid, was injected into the cyst (Fig. l, centre). The scolicidal agent was left in the cyst for 20 minutes.
- Step 3. The cystic content was aspirated as completely as possible and the cyst cavity was then irrigated with sterile 0.09% saline solution, and the needle was withdrawn (Fig. 1, right).

One irrigation was sufficient for small cysts less than 5 cm in diameter, but cysts larger than 5 cm in diameter needed multiple irrigations. On the following day, large cyst cavities that showed residual fluid on ultrasonography were irrigated again and drained continuously through a 14-gauge Teflon catheter needle or an 8 French pigtail catheter for 2 to 5 days (Fig. 2). Radiographs obtained just after completion of the irrigation with the injection of contrast medium into the cyst cavity showed collapsed membranes and no communication with the biliary system (Fig. 3). Aspirated material was sent for cytologic and microbiologic examination. The fluid was centrifuged and the sediment was examined for fragments of laminated membranes, hooklets and scolices. The viability of

FIG. 1. Left: separation of the endocysts from the ectocyst after aspiration of cyst fluid. Centre: anechoic appearance disappeared after the instillation of 0.05% silver nitrate solution or hypertonic saline. Right: after irrigation and aspiration, the cyst cavity has collapsed and is obliterated by echoic membranes.

scolices was assessed by observing their motility microscopically after staining with neutral eosin.[11]

The patients were kept under observation in the general surgery department for 24 to 48 hours and then discharged if the procedure had been uncomplicated. The criteria for successful treatment were as follows:[12]

- On ultrasonography — separation of germinative membrane and rupture of daughter vesicles, gradual decrease of cyst size or disappearence of the cyst, complete obliteration of the cyst cavity with a high level of echogenic material, heterogeneous echo-pattern or pseudotumour appearance.
- On CT — an increase in the density of the cyst cavity.
- On serologic and microbiologic examination: negative serologic results, disappearance of viable scolices in the cystic aspirate.
- Clinically — disappearance of the symptoms.

Follow-up included clinical examination and laboratory tests and ultrasonography every month for the first 6 months, then at 3-months intervals. CT was carried out in some instances. Indirect hemagglutination titres were determined bimonthly during the first 6 months and twice for later years or at the patient's convenience. The follow-up was terminated after 36 months or earlier. Mean follow-up was 30 months (range from 14 to 36 months).

Statistical analysis

Differences were analyzed by Student's *t*-test. A *p* value less than 0.05 was considered significant.

Results

All the 83 cysts were managed successfully without the need for further treatment. Anaphylactic shock occurred during the initial insertion of the fine needle into the cyst in 1 patient and the irrigation procedure was halted. After a day of antiallergic medication (diphenhydramine 50 mg / mL intravenously), the cystic contents were drained and the cyst was irrigated without any further complication. Urticaria developed in 2 patients during percutaneous drainage; they were also given antiallergic treatment before the sclerosis. No allergic complications were associated with the scolicidal agent.

The initial diameter of the cyst varied from 3 to 20 (mean 11.3) cm and the aspirated volume ranged from 10 to 2500 mL. One irrigation was sufficient in 23 small cysts, and multiple irrigations (mean 2.6, range from 1 to 7) were needed in 60 cysts larger than 5 cm in diameter, before the pigtail catheter was placed to drain the cystic fluid. Twenty-two catheters were placed in 18 patients (2 catheters in 4 patients) for external drainage. The mean duration of drainage was 2.1 days (range from 1 to 5 days).

Separation of germinative membranes from the ectocyst and the rupture of daughter vesicles were observed on ultrasonography just after the drainage procedure. Ultrasonography revealed linear echogenic floating structures and a liquid pattern in the cyst cavity. This transitional fluid collection in the evacuated cyst disappeared gradually over the month following treatment, and the cyst

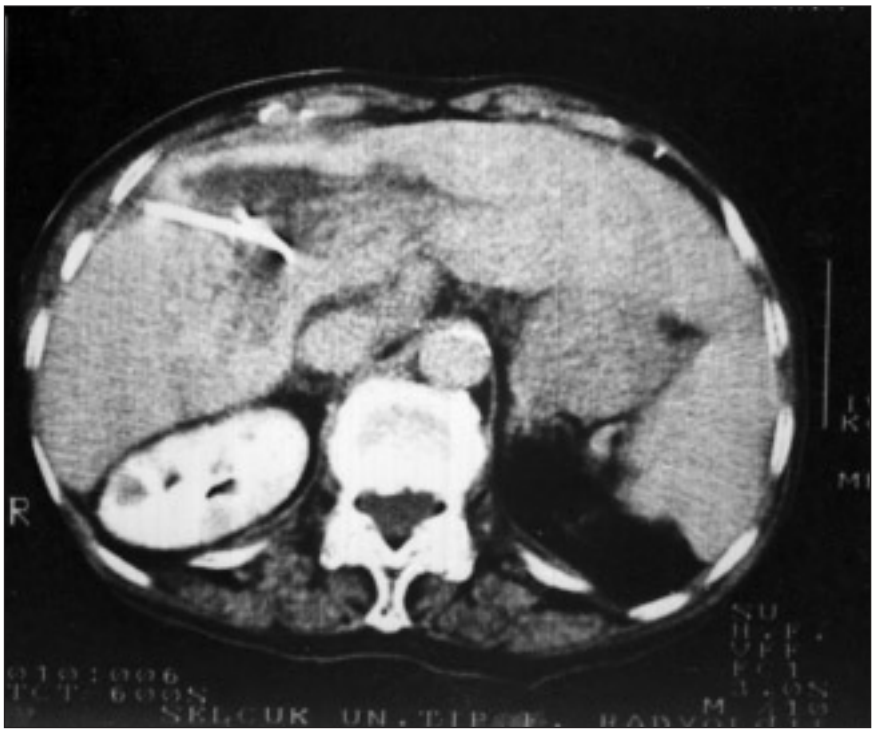

FIG. 2. A pigtail catheter was left in the cyst cavity for drainage.

FIG. 3. Radiograph with contrast medium obtained after percutaneous drainage to check the cavity for a possible connection with the biliary tree.

size started to decrease gradually, reaching a mean of 6.7 cm in diameter by the 18th month). The decrease was statistically significant ($p < 0.01$). The cyst cavity was completely obliterated by high-level internal echogenic materials (heterogeneous echo-pattern or pseudotumour appearance) (Figs. 4 and 5, top and bottom left). Follow-up CT showed an increase in density (Fig. 5, bottom right).

There were no meaningful changes in biochemical and hematologic measurements after the procedure. Liver function and plasma electrolytes were not affected by the scolicidal agent or the irrigation procedure. We investigated the long-term viability of the cyst contents during follow-up. At different times after percutaneous drainage (3 to 6 months), ultrasonographically-guided fine-needle puncture of the cyst cavity was repeated in 20 cysts. Aspirated material contained necrotic debris and nonviable scolices.

The indirect hemagglutination test gave positive results in 31 (74%) of 42 patients. The antibody titres decreased in 25 (81%) of them and results were negative in 5 of these patients. In the remaining 6 patients, the titres were unchanged. Chest radiography, ultrasonography and total body CT revealed no secondary vesicles or growth of exogenous vesicles. The mean hospital stay was 1.6 days.

Discussion

At present, regardless of etiology, percutaneous drainage is the treatment of choice for the majority of intra-abdominal abscesses and fluid collections. This procedure is safer than surgery.[12–14] Simple hepatic cysts are aspirated for both diagnostic and therapeutic purposes. Leakage of cystic contents during percutaneous drainage has not been reported.[14,15]

Surgery is still the treatment of choice for hydatid disease. However, surgical removal of the cysts is sometimes difficult or impossible and is not carried out without morbidity or dissemination of viable scolices, or both, in the liver or peritoneal cavity.[16–21] Moreover, the location of the cyst near major biliary or vascular structures may discourage surgical intervention with complete pericystectomy. Many surgical techniques have been described for the treatment of liver hydatid cysts. Partial cystectomy plus internal drainage or external marsupialization have only historical value because of the associated high morbidity. Resection of the attached liver segment or lobe can be used for alveolar hydatid cysts, but this procedure has been considered an extended surgical procedure for a benign disease and has a limited value for the treatment of liver hydatid cysts. Partial cystectomy plus omentoplasty or open drainage to the peritoneal cavity are commonly used techniques associated with low morbidity.[22] Introflexion and overlapping techniques are very similar; they aim to obliterate the cystic cavity.[23] However, all the surgical techniques place the patient at risk of recurrence due to spillage of scolices during the operation, and the operation itself is a major trauma for the patients.[24,25] The role of antihelminthic drugs in managing hydatid disease is still unclear, although it has been reported that these drugs may cause a gradual reduction in cyst size.[26]

Previously, hydatid cyst puncture was contraindicated because of the risk of anaphylactic shock due to the strongly allergic character of the cyst fluid and spillage of daughter vesicles into the peritoneum.[27–29] Schiller[30] and Lewall and McCorkell[31] have reported that an anaphylactic reaction rarely develops following cyst rupture in the peritoneal cavity.

We performed percutaneous drainage of 83 hydatid cysts in 45 patients with a success rate of 100% and a morbidity rate of 6.6%. In addition to percutaneous drainage the patients received albendazole and did not need any further intervention. Percutaneous drainage of the echinococcal cysts may cause major (e.g., anaphylactic shock, biliary fistula) and minor (e.g., pruritis) complications.[6,32,33] Giorgio and associates[7] and

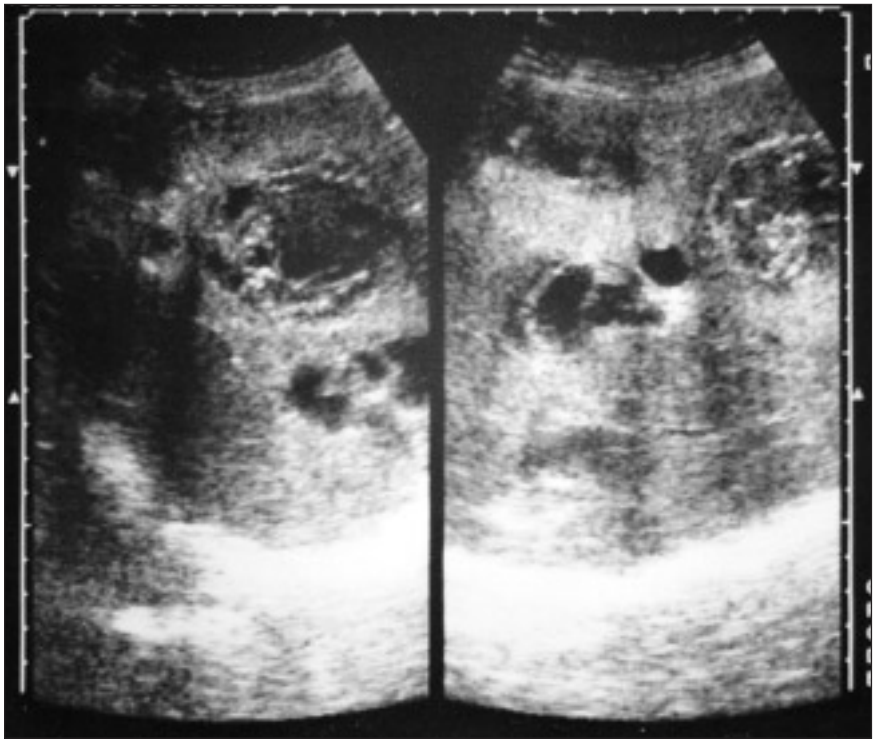

FIG. 4. One month after percutaneous drainage, the cyst cavity is filled with echoic material.

Khuroo and associates[34] described a communication from the cyst to the biliary tree after percutaneous drainage. Superinfection has been described by Khuroo and colleagues,[8] who have successfully treated 30 patients by percutaneous drainage. Gargouri and associates[6] reported that allergic reactions can be easily controlled by an antiallergic cocktail. High-dose antihelminthic drug therapy, started before the procedure and continuing afterwards may prevent some leakage of hydatid antigens and the spread of daughter vesicles that may occur at the time of cyst puncture.[7,8,32,35] In our series, all the cysts were punctured and aspirated successfully. Minor complications occurred in 2 cases and a major complication in 1.

The conventional approach to prevent the recurrence of hydatid disease after surgery is to inject scolicidal agents into the unopened cysts or instill such agents into the pericystic cavity.[36] Commonly used scolicidal solutions include 1% to 2% formalin, 5% cetrimide, 10% to 20% hypertonic saline, 95% alcohol, 0.05% silver nitrate, iodine and hydrogen peroxide.[6,8,34,36,37] It has been reported that corrosive scolicidal agents produce an inflammatory reaction in the biliary system.[36] Some authors have suggested that aspiration and injection of alcohol is contraindicated in the treatment of parasitic and neoplastic hepatic cysts and in patients who have a communication of the cyst with the biliary tree or extravasation into the peritoneal cavity.[13,38–40] We used 0.05% silver nitrate as the scolicidal agent to irrigate the cyst cavity. In an invitro study, Arikoglu[41] showed that 0.05% silver nitrate was the most effective scolicidal agent. It did not affect organ function or electrolyte blood levels. Our patients had no allergic complications associated with the use of albendazole, the scolicidal agent used in this study. However, 1 patient suffered anaphylactic shock and 2 patients had maculopapular rashes, with an initial leakage of cystic content before the injection

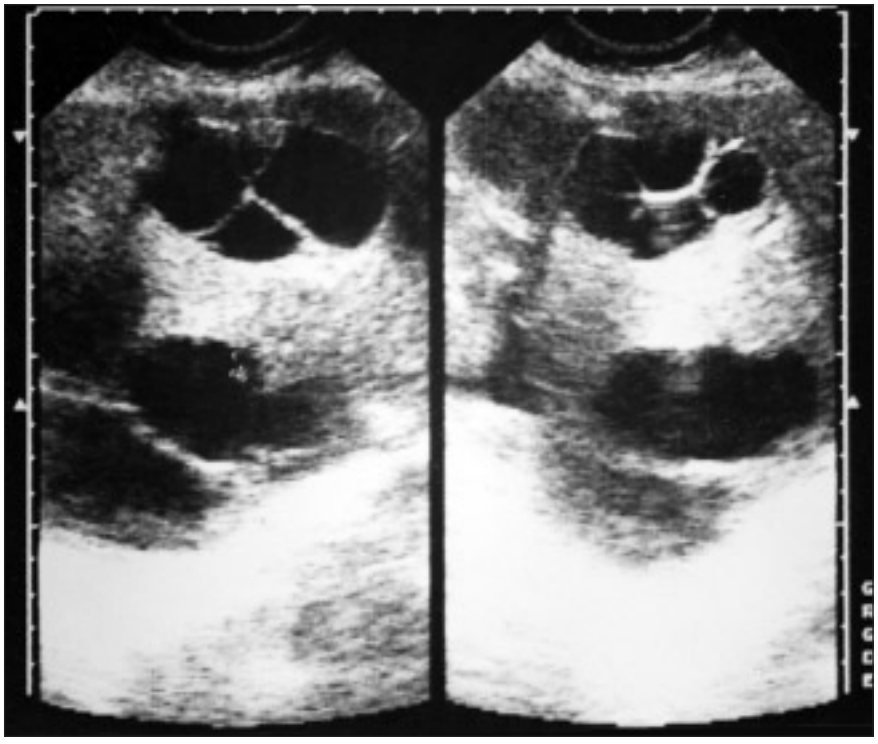

FIG. 5. Progress of healing in one patient. Top: 3 months after percutaneous drainage, the cyst cavities have decreased in size and are obliterated by echoic membranes. Bottom left: 36 months after percutaneous drainage, the lesions show a solid echoic pattern. Bottom right: CT showing separation of the germinative membrane and increasing cyst density.

of the scolicidal agent. An inflammatory reaction due to scolicidal agents can occur depending on the nature of scolicidal agent used.[36] Pekrü[42] studied different scolicidal agents and found that 0.05% silver nitrate was less harmful than other agents to the biliary ducts in rabbits.

Percutaneous drainage as experienced by others[7,8,32,33,43] is a safe and effective interventional alternative to surgery. It is successful for both univesicular and multiple solitary cysts. It is the most appropriate interventional procedure when surgery is contraindicated or for recurrent hydatid disease as in 6 of our cases. The potential risk for intraperitoneal leakage and dissemination of cystic content during percutaneous drainage is also valid for surgical intervention.[18]

Over the 4 years of the study, excluding patients who terminated their follow-up, there were no recurrences after percutaneous drainage. The positivity of serologic tests during follow-up may have been due to retained germinative membrane.[6]

The morbidity and its associated costs are considerably reduced by percutaneous drainage when compared with those associated with surgery. Patients spend only 1 to 2 days in hospital to ensure that there are no complications. Surgical treatment usually requires about 2 weeks' hospitalization. We believe that starting prophylactic administration of albendazole 48 hours before the percutaneous drainage procedure and giving an antiallergic cocktail during the procedure produces safer and more effective treatment.

In conclusion, the long-term 100% success rate in this series suggests that percutaneous drainage and sclerosis may be considered a first-line therapy in type I and type II liver hydatid cysts.

References

1. Reeder MM, Hamilton LC. Radiologic diagnosis of tropical disease of the gastrointestinal tract. *Radiol Clin North Am* 1969;7:57-81.
2. Beggs I. The radiologic appearance of hydatid disease of the liver. *Clin Radiol* 1983;34:555-63.
3. Czerniak P, Bank H, Pauzner Y. Radioisotopic scanning in liver echinococcus. *Radiology* 1964;83:690-6.
4. Kircher LP, Ferris RA, Mero JH, Moss ML. Hydatid disease of the liver evaluated by computed tomography. *J Comput Assist Tomog* 1978; 2:229-30.
5. von Sinner W, te Strake L, Clark D, Sharif H. MR imaging in hydatid disease. *AJR Am J Roentgenol* 1991; 157(4):741-5.
6. Gargouri M, Ben Arnor N, Ben Chedida F, Hammou A, Gharbi HS, Ben Cheikh M, et al. Percutaneous treatment of hydatid cysts (*Echinococcus granulosus*). *Cardiovasc Intervent Radiol* 1990;13:169-73.
7. Giorgio A, Tarantino L, Francica G, Mariniello N, Aloisio T, Soscia E, et al. Unilocular hydatid liver cysts: treatment with US-guided, double percutaneous aspiration and alcohol injection. *Radiology* 1992;184(3): 705-10.
8. Khuroo MS, Dar MY, Yattoo GN, Zargar SA, Javaid G, Khan BA, et al. Percutaneous drainage versus albendazole therapy in hepatic hydatidosis: a prospective, randomized study. *Gastroenterology* 1993;104 (5):1452-9.
9. Gharbi HA, Hassine W, Brauner MW, Dupuch K. Ultrasound examination of the hydatic liver. *Radiology* 1981;139(2): 459-63.
10. Wattal C, Malla N, Khan IA, Agarwal SC. Comparative evaluation of enzyme-linked immunoabsorbent assay for the diagnosis of pulmonary echinococcosis. *J Clin Microbiol* 1986; 24(1):41-6.
11. Smyth JD, Barret NS. Procedures for testing the viability of human hydatid cysts following surgical removal especially after chemotherapy. *Trans R Soc Trop Med Hyg* 1980;74:649-52.
12. Mueller PR, vanSonnenberg E, Ferrucci JT Jr. Percutaneous drainage of 250 abdominal abscesses and fluid collections. Part II: current procedural concepts. *Radiology* 1984;151(2):343-7.
13. Leinoren A, Siniluoto T, Palvansalo M, Karttunen A, Kairaluoma MI, Suramo I. Percutaneous aspiration and ethanol sclerotherapy of symptomatic hepatic cysts. *Eur Radiol* 1993; 3:213-8.
14. vanSonnenberg E, Wroblicka JT, D'Agostino HB, Mathieson JR, Casola G, O'Laoide R, et al. Symptomatic hepatic cysts: percutaneous drainage and sclerosis. *Radiology* 1994;190(2):387-92.
15. vanSonnenberg E, Mueller PR, Ferrucci JT Jr. Percutaneous drainage of 250 abdominal abscesses and fluid collections: Part I: results, failures and complications. *Radiology* 1984;151(2): 37-41.
16. Ariogul O, Emre A, Alper A, Uras A. Introflexion as a method of surgical treatment for hydatid disease. *Surg Gynecol Obstet* 1989;169:356-8.
17. Bilge A, Sözüer EM. Diagnosis and surgical treatment of hepatic hydatid disease. *HPB Surg* 1992;6:57-64.
18. Langer JC, Rose DB, Keystone JS. Diagnosis and management of the hydatid disease of the liver: a 15 year North American experience. *Ann Surg 1*984;199:412-7.
19. Magistrelli P, Masetti R, Coppola R, Messia A, Nuzzo G, Picciocchi A. Surgical treatment of hydatid disease of hydatid disease of the liver. A 20- year experience. *Arch Surg* 1991;126:518-23.
20. Men S, Hekimoglu B, Edgüer T, Soylu S Ö. Karaciger hidatid Kistlerinin Perkütan Tedavisi. *T Klin J Radiol* 1997;1:159-66.
21. Safioleas M, Misiakos E, Manti C, Katsikas D, Skalkeas G. Diagnostic evaluation and surgical management of hydatid disease of the liver. *World J Surg* 1994;18:859-65.
22. Yol S, Kartal A, Tavli S, Sahin M, Vatansev C, Karahan Ö, et al. Open drainage versus overlapping method in the treatment of hepatic hydatid cyst cavities. *Int Surg* 1999;84:139-43.
23. Kartal A, Sahin M, Yol S, Belviranli M, Karahan Ö, Vatansev C, et al. The management of hepatic hydatid cyst cavity by overlapping. *Ann Saudi Med* 1998;18:82-3.
24. Balaregeram M, Kong LF. Surgical treatment of hydatid disease of the liver. *Trop Gastroenterol* 1982;3:194-200.
25. Leese T, Bismuth H. Surgical management of space occupying lesions of the liver: hydatid disease. In: Davis M, editor. *Bailliere's clinical gastroenterology. Vol 3, therapy of liver disease*. London (UK): W.B. Saunders; 1989. p. 272-3.
26. Bezzi M, Teggi A, De Rosa F, Capozzi A, Tucci G, Bonifacino A, et al. Abdominal hydatid disease: US findings during medical treatment. *Radiology* 1987;162(1 Pt 1):91-5.
27. Belli L, Lel Favero E, Marni A, Romani F. Resection versus pericystectomy in the treatment of hydatidosis of the liver. *Am J Surg* 1983;145:239-42.
28. Hankins J, Werner D, Kobout E. Surgical treatment of ruptured and unruptured hydatid cysts of the lungs. *Ann Surg* 1968; 167:336-41.
29. Livraghi T, Basoni A, Giordana F, Lai N, Vettori C. Diagnosis of hydatid cyst by percutaneous aspiration: value of electrolyte determination. *J Clin Ultrasound* 1985;13:330-7.
30. Schiller C. Complications of echinococcus cyst rupture. *JAMA* 1966;195:220-2.
31. Lewall DB, McCorkell SJ. Rupture of echinococcal cysts: diagnosis, classification, and clinical implications. *AJR Am J Roentgenol* 1986;146(2):391-4.
32. Filice C, Di Perri G, Stroselli M, Pirola F,

Brunetti E, Dughetti S, et al. Parasitologic findings in percutaneous drainage of human hydatid liver. *J Infect Dis* 1990;161:1290-5.
33. Mueller PR, Dawson SL, Ferrucci JT Jr, Nardi GL. Hepatic echinococcal cyst: successful percutaneous drainage. *Radiology* 1985;155:627-8.
34. Khuroo MS, Zargar SA, Mahajan R. *Echinococcus granulosus* cysts in the liver: management with percutaneous drainage. *Radiology* 1991;180(1):141-5.
35. Sayek I, Çakmakçi M. Prophylactic effect of albendazole in experimental peritoneal hydatidosis. *Hepatogastroenterology* 1992; 39:424-6.
36. Abbasi A, Shadmehr B, Ghaffarinejat MH, Shishineh P, Saidi F. Scolicidal agents can cause sclerosing cholangitis [abstract]. *London J Hepatic Pancreatic Biliary Surgery* 1990;2(Suppl): 157.
37. Brett PM, Fond A, Bretagnolle M, Valette PJ, Thiesse PH, Lambert R, et al. Percutaneous aspiration and drainage of hydatid cysts in the liver. *Radiology* 1988;168: 617-20.
38. Bean WJ, Rodan BA. Hepatic cysts: treatment with alcohol. *AJR* 1985;144:237-41.
39. Jones WL, Mountain JC, Warren KW. Symptomatic nonparasitic cysts of the liver. *Br J Surg* 1974;61:118-23.
40. Trinki W, Sassaris M, Hunten FM. Nonsurgical treatment for symptomatic nonparasitic liver cyst. *Am J Gastroenterol* 1985;8:907-11.
41. Arikoglu H. [Histologic evaluation of the efficacy of different scolicidal agents on the viability of scolices: an in vitro study.] Postgraduate thesis. Selçuk Üniversity, Konya, Turkey. 1996. p. 53.
42. Pekrü ˙. [Experimental sclerosing cholangitis due to scolicidal agents in rabbits.] Postgraduate thesis. Erciyes Ünversitesy, Konya, Turkey. 1992. p. 35-77.
43. Acunas B, Rozanes I, Çelik L, Minareci Ö, Acunas G, Alper A, et al. Purely cystic hydatid disease of the liver: treatment with percutaneous aspiration and injection of hypertonic saline. *Radiology* 1992;182:541-3.

SESAP Critique
Critique SESAP

Category 6, Items 30 and 31

Knowing priorities is key for optimal management of multiple trauma patients. A patient who is hemodynamically labile in the trauma setting has hemorrhagic shock until proven otherwise. With the exception of brisk bleeding from an open wound, three body cavities in which blood loss can result in hemodynamic lability are the chest, abdomen, and pelvis. Although this patient has several major problems, including a blown left pupil, a widened mediastinum, an unstable pelvic fracture, and a possible spinal cord injury, a systematic approach is imperative.

This patient has been intubated and breath sounds are equal bilaterally, which is not consistent with a tension pneumothorax or massive hemothorax. The primary survey should emphasize the patient's circulatory status to determine the cause of his hemodynamic lability. With the chest cavity essentially ruled out for containing any significant blood loss, a diagnostic peritoneal tap / lavage (open, supraumbilical approach) would be the most expeditious method to determine the site of blood loss. The aspiration of nonclotting blood would be diagnostic for intra-abdominal bleeding and would dictate that the patient be taken to the operating suite for exploration. However, if the patient does not have gross blood on diagnostic peritoneal aspiration, angiography to identify the probably active arterial bleeding from the pelvic fracture should be considered. Embolization plays a pivotal role in the management of arterial bleeding from a pelvic fracture.

In the hemodynamically labile patient, computed tomographic (CT) scan has no role in the evaluation of suspected abdominal injury. Immediate operation would be inappropriate unless there is confirmation of active intra-abdominal bleeding. This patient's clinical presentation is highly suggestive of an intracranial injury. Although he has a blown pupil, his hypotension should not be attributed to his head injury. Traumatic aortic disruption causes exsanguination and death, not hypotension. Although a cervical fracture could result in spinal cord injury and subsequent neurogenic shock, initial management to rule out a hemorrhagic source is still required.

30 D 31 C

Reference

1. Berger JJ, Britt LD: Pelvic fractures and hemorrhage: current strategies in diagnosis and management. Surg Annu 27:107-112, 1995