

Percutaneous aspiration and drainage with adjuvant medical therapy for treatment of hepatic hydatid cysts

Mohammed I Yasawy, Abdelrahman E Mohammed, Sammak Bassam, Mohammed A Karawi, Sohail Shariq

Mohammed I Yasawy, Department of Internal Medicine, Dammam University Hospital, Al-Khobar 31952, Saudi Arabia
Abdelrahman E Mohammed, Consultant Gastroenterologist, Riyadh Military Hospital, Riyadh 11159, Saudi Arabia
Sammak Bassam, Department of Radiology, Riyadh Military Hospital, Riyadh 11159, Saudi Arabia

Mohammed A Karawi, Department of Gastroenterology, Riyadh Military Hospital, Riyadh 11159, Saudi Arabia

Sohail Shariq, Department of Internal Medicine, King Fahd Military Medical Complex, Dhahran 31932, Saudi Arabia

Author contributions: Yasawy MI was in charge of adjuvant medical therapy and wrote the paper; Bassam S was the Senior Radiologist in charge of the radiological intervention; Mohammed AE and Karawi MA were consultants who offered and provided the cases; Shariq S was responsible for the literature search and collected the relevant references.

Correspondence to: Dr. Mohd I Yasawy, Consultant Internist/Gastroenterologist, Associate Professor, Department of Internal Medicine, Dammam University Hospital, PO Box 40143, Al-Khobar 31952, Saudi Arabia. yasawy@hotmail.com
Telephone: +966-3-8966741 Fax: +966-3-8966741

Received: July 23, 2010 Revised: November 11, 2010

Accepted: November 18, 2010

Published online: February 7, 2011

Abstract

AIM: To determine the efficacy and success of percutaneous aspiration irrigation and reaspiration (PAIR) in the management of hepatic hydatidosis.

METHODS: Twenty-six patients with 32 hepatic hydatid cysts had PAIR. Twenty-two patients received at least 2 wk of drug therapy before the procedure was carried out to reduce the risk of recurrence from spillage during the procedure. The procedure was performed under local anesthesia with a 19-gauge 20 cm long needle, the cyst was punctured, cystic content (approximately 30 mL) was aspirated by a 12-14 F pigtail catheter and aspirated fluids were sent for analysis. Once the cyst was almost empty, two-thirds of the net amount of ma-

terial aspirated was replaced by hypertonic saline and left in the cavity for about 30 min, with the catheter left in place for reaspiration of most of the fluid. When the amount of fluid drained was less than 10 mL per 24 h, the drainage catheter was removed.

RESULTS: All 32 cysts showed evidence of immediate collapse after completion of the procedure, and before discharge from hospital, ultrasound examination showed fluid reaccumulation in all cysts. Serial follow-up showed a progressive decrease in the size and change in the appearance of cysts. To confirm the sterility of these cystic cavities, seven cysts were reaspirated on average 3 mo after the procedure. Investigations revealed no viable scolices.

CONCLUSION: PAIR using hypertonic saline is very effective and safe with proper precautions.

© 2011 Baishideng. All rights reserved.

Key words: Percutaneous aspiration irrigation and reaspiration; Hepatic hydatid cyst; Adjuvant medical therapy; Treatment outcome

Peer reviewer: Marco Vivarelli, MD, Assistant Professor, Department of Surgery and Transplantation, University of Bologna, S. Orsola Hospital, Bologna 40123, Italy

Yasawy MI, Mohammed AE, Bassam S, Karawi MA, Shariq S. Percutaneous aspiration and drainage with adjuvant medical therapy for treatment of hepatic hydatid cysts. *World J Gastroenterol* 2011; 17(5): 646-650 Available from: URL: <http://www.wjgnet.com/1007-9327/full/v17/i5/646.htm> DOI: <http://dx.doi.org/10.3748/wjg.v17.i5.646>

INTRODUCTION

Until 1980, surgery was the only method of treatment for hepatic hydatidosis. Despite improved surgical techniques

and use of scolical compounds, a high incidence of hydatid cyst recurrence and dissemination is still a major problem. Spillage is known to occur at surgery^[1,2]. On the other hand, medical therapy is associated with side effects and it is effective only in some cases and need several courses to reach a response with albendazole alone^[3], but the outcome is better with combined therapy^[4]. In recent years, percutaneous drainage of hepatic hydatid cysts (HHC) has emerged as a minimally invasive, safe therapy, and a potential alternative to surgery. Different methods have been applied with variable success and healing rates^[5-7].

In this study, we prospectively assessed the value of percutaneous drainage with adjuvant medical therapy in 26 patients with confirmed 32 HHC over an average follow-up period of 10 years.

The Armed Forces Hospital in Riyadh is a well-known tertiary center in the region and is a 1000-bed hospital with facilities for hepatobiliary and liver transplant services. Percutaneous aspiration irrigation and reaspiration (PAIR) was introduced into the hospital in 1993. Between 1985 and 1992 albendazole was used alone in the management of hydatid cysts, and in 1993 praziquantel was added to albendazole as combination therapy.

Previously we reported our first patient with percutaneous drainage of a hydatid cyst of the liver in 1994^[8], and our first patient with a lung hydatid cyst with pleural effusion in 1991^[9].

MATERIALS AND METHODS

The study involved 26 patients (14 males and 12 females; age range 13-53 years) with 32 HHC (Table 1). Eleven patients were recently diagnosed with HHC and had no previous medical or surgical intervention. Seven patients had cyst recurrence following surgical excision. Eight patients had received long-term medical treatment with albendazole and praziquantel for an average of 24 mo with only a partial response of less than 30% reduction in size of the cysts. Nineteen patients had a solitary cyst and four others had multiple liver cysts. Three patients had extra hepatic disease in the lung ($n = 2$) and spleen ($n = 1$). Twenty-six cysts were located in the right lobe of the liver, five in the left, and one in the caudate lobe. All patients were complaining of right upper quadrant pain and/or pressure symptoms and had an abdominal ultrasound (US) examination. The average diameter was 10.2 cm (range, 5.5-18.5 cm). The diagnosis was confirmed by imaging modalities and positive serology (indirect hemagglutination titer $> 1:128$) in all patients. The cysts were classified by US according to the Gharbi *et al.*^[10] classification into Type I ($n = 4$), Type II ($n = 8$), Type III ($n = 2$) and Type IV ($n = 18$) (Table 2). Two of the Type IV cysts had a thin rim at their periphery. Four patients had abnormal liver function tests, 10 had elevated erythrocyte sedimentation rate, and six had high eosinophil count. The 26 patients and their results were evaluated by all relevant staff i.e. surgeons, gastroenterologist and senior

Table 1 Location and distribution of the cysts (n)

Type of patient	Site of cyst	Multiple liver cyst or extrahepatic
Prolonged medical therapy with albendazole (8)	Right liver lobe (8)	Lung cyst (1)
	Left liver lobe (1)	
Recovered post surgery (7)	Right liver lobe (4)	Multiple cysts (2)
	Left liver lobe (1)	
	Caudate lobe (1)	
New patients (11)	Right liver lobe (8)	Multiple cysts (4) Lung cysts (1) Spleen cysts (1)
	Left liver lobe (3)	

Table 2 Gharbi classification

Cyst type	No. of cysts
I	4
II	8
III	2
IV	18

radiologist. Management options i.e. a pharmacological approach, surgical intervention and PAIR were explained and all the above patients chose PAIR. Informed consent prior to the procedure was obtained from all patients. In 22 patients, albendazole 400 mg twice daily and praziquantel 50 mg/kg daily was given orally for at least 2 wk prior to and 4 wk after the procedure to all patients to reduce the risk of possible hydatid cyst fluid spillage and dissemination into the peritoneal cavity. The patient fasted overnight. The procedure was performed under heavy sedation (midazolam 5 mg iv and pethadine 50 mg im) with close monitoring to treat any potential complication including anaphylaxis. Under aseptic conditions, a Teflon sheath needle (19 gauge, 20 cm long; Meditech) was introduced percutaneously through the biopsy port of the 3.5 MHz probe into the cyst under US guidance (Aloka SSD 680). The puncture was made through thick normal liver tissue surrounding the cyst and whenever possible the right intercostal route was used to minimize the risk of hydatid fluid spillage into the peritoneum (Figure 1A). Once the cyst is punctured, a small amount of fluid (10-30 mL) was aspirated for cyst decompression followed by insertion of a 12F or 14F (van Sonnenberg sump drainage, Meditech) catheter, the use of such a large catheter was to prevent catheter clogging by membranes and daughter cysts during aspiration. Once the cyst was almost empty, injection of contrast medium under fluoroscopic control was performed to exclude cyst communication with the biliary system. Two-thirds of the aspirated material was replaced by hypertonic saline (23.4%) and left in the cavity for 20-30 min. The fluid was then reaspirated as much as possible and the catheter was left in place to drain by gravity. Immediately after aspiration, examination of fluid to identify scolices, hooklets, pieces of laminated membranes or daughter cysts were performed in the parasitology laboratory. After the procedure, the patients were closely observed for possible com-

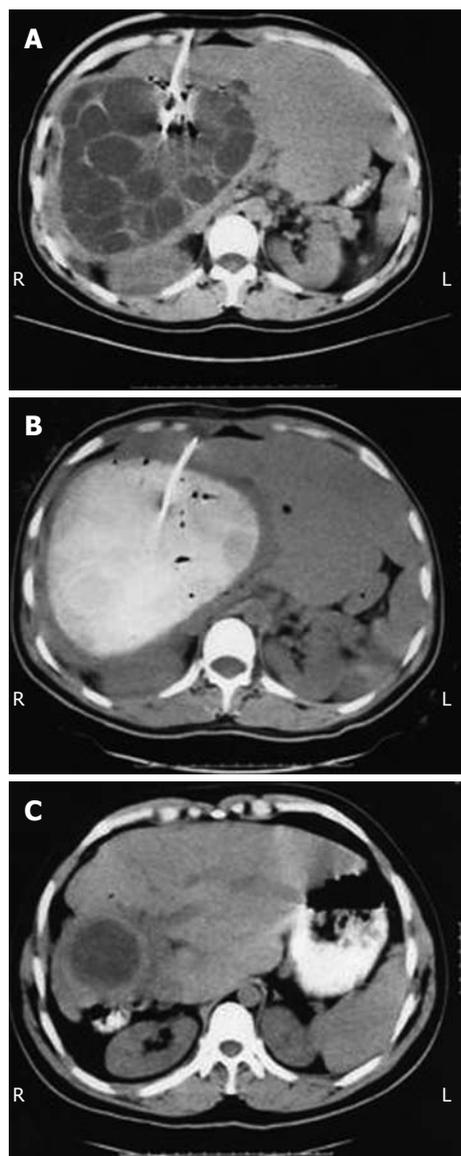


Figure 1 Ultrasound examination. A: Puncture of the hydatid cyst and insertion of a catheter; B: End of percutaneous aspiration irrigation and reaspiration procedure; C: Six months later, aspiration showed only granulation and necrotic tissue without any evidence of hydatidosis.

plications for 48 h. The drainage catheter was left in place for an average period of 3 d (range, 2-6 d) (Figure 1B) and removed when the amount of fluid drained was less than 10 mL/24 h. Follow-up examination in the form of clinical assessment, blood tests, serology and imaging examination with US and/or computed tomography (CT), were performed at 1, 2 and 3 mo after drainage for an average period of 6 mo (range, 2-11 mo), followed by 6-monthly blood tests and yearly imaging for an average period of 10 years.

RESULTS

All 32 cysts were successfully treated by PAIR, with relief of symptoms in all 26 patients with an average hospital stay of 6 d. There was collapse of all cysts immediately

Table 3 Complications post aspiration

Complications	No. of patients
Anaphylactic reaction	1
Urticarial rash	2
Hypernatremia	2
Fever	10
Pleural effusion	6
Total	21

after completion of percutaneous drainage and removal of the drainage catheter. Before discharge from hospital, US examination showed fluid reaccumulation in all cysts within an average of 2 d after catheter withdrawal reaching an average size of 59% (range, 48%-74%) compared to the size of the cysts before drainage. Serial follow-up CT and US examination showed a progressive decrease in the size and change in the appearance of the cysts. Two patterns of healing were observed, the first was a predominantly cystic cavity with detached membranes. All the cystic cavities lost their rounded contour appearance suggestive of being under less tension. The second pattern was a predominantly solid mass.

Asymptomatic fluid reaccumulation following drainage and catheter removal happened in nearly all cysts with an average size of 59% (range, 48%-74%) compared to the pre-drainage cyst size. However, on regular follow-up examinations, a progressive decrease in the residual cavity with two distinctive healing patterns was observed. A cystic residual cavity with internal membranes was predominantly seen in patients with Type I - II cysts, and a solid mass was predominantly seen in patients with Type IV cysts. The complex large Type IV HHC with a predominantly solid component showed better results following drainage, with an overall reduction in size of 51.5% compared to 29% in patients with Type I and II cysts in whom the cysts had a predominantly fluid component.

To confirm the sterility of the residual cystic cavities, seven out of 32 cysts were reaspirated, three at an average of 3 mo after drainage, and four at an average of 6 mo after drainage. All reaspirated cyst cultures for microorganisms were negative, and microscopy revealed debris of hydatid membranes and hooklets in some cases but no viable scolices (Figure 1C). Serial follow-up serological examination showed a 2-fold elevation in the indirect hemagglutination titer following drainage in 18 patients compared to the titer level before drainage, and it remained elevated at an average follow-up period of 16 mo. No major complications developed during or after the procedure except for a mild anaphylactic reaction which responded very well to immediate treatment (Table 3). Two patients developed urticarial reactions 8 h following drainage, but responded well to antihistamines and steroids. Fever occurred in 10 patients but was mild and transient, and cultures of fluid from the drainage catheters were negative. Minimal right pleural effusion occurred in six patients. The liver cysts in these six patients were rela-

tively large and reached the right hemidiaphragm. However, the pleural effusion was small and resolved completely before the patients were discharged. Two patients developed transient hypernatremia and one patient showed an anaphylactic reaction during the procedure but responded to immediate management. No radiological evidence of reactivation of aspirated cysts was seen during the average of follow-up of 10 years.

DISCUSSION

Surgery is considered as the standard treatment for HHC. However, surgery is not without risks and there is a high incidence of dissemination, infection and recurrence of 2% to 25%, with morbidity of 0.5% to 4%^[11-16]. Furthermore, surgery is not advisable in elderly patients with cardiac or pulmonary disease, nor in recurrent cases. Medical treatment alone in the form of mebendazole, and recently albendazole and praziquantel, have been used as an alternative therapy to surgery, but the success rate in terms of a reduction in size of HHC and the change in echotexture has been variable^[17-19]. Another prospective randomized study compared albendazole, percutaneous drainage and both modalities combined. These studies showed that cyst size reduction was best achieved by the combined therapy when compared to albendazole or percutaneous drainage alone^[20,21]. Percutaneous drainage of HHC was started by Mueller *et al.*^[22], and since then several series of percutaneous drainage have been published with no single fatality related to the procedure has been reported^[23,24]. Reversible anaphylactic shocks, mild to severe allergic reactions, and pleural effusions have been reported in the recent literature^[25,26], and any other complications were minor and infrequent. The reason for the pleural effusion is probably due to diaphragmatic irritation by the sudden collapse of the cyst following drainage and/or catheter manipulation during the procedure. However, pleural effusion was discovered incidentally during follow-up and in US examination, and was small and resolved completely before the patients were discharged. Fever was also a common complication, occurring in 10 patients, but was mild and transient, and cultures of fluid from the draining catheter were negative. Two patients developed an urticarial reaction hours following drainage but the patients responded well to antihistamines and steroid therapy. Only one patient developed an anaphylactic reaction which required immediate intubation and management, but there was a full recovery.

Drainage of complex Type IV cysts have been attempted before. Eighteen cysts in our series belonged to this group, including two patients with a partially calcified wall with multiple daughter cysts, in whom active disease was confirmed by serology and clinical assessment prior to the procedure and microscopy following drainage. It should be remembered that a calcified cyst does not mean always mean an inactive cyst. In our study, a 12F or 14F catheter was used to drain all types of HHC. Such large caliber catheters have not been used before in percutaneous drainage. We used a large catheter in order to

minimize clogging of the catheters by membranes and daughter cysts, and to ensure that all the cyst cavities were completely evacuated, though finer catheters might be safer, despite frequent clogging. Future studies will clarify this and many other issues. Follow-up indirect hemagglutination tests were performed in all patients. There was slight elevation of the indirect hemagglutination titer in 18 patients after the procedure and it remained elevated in comparison to the pre-drainage value during an average follow-up period of 16 mo. This observation has been reported by others^[27,28], and we believe that a longer follow-up period is needed for the indirect hemagglutination titer to start decreasing.

Our results have shown that percutaneous drainage of all types of HHC with adjuvant medical therapy is minimally invasive, safe and effective therapy with proper precautions. It can be used as an alternative to surgery, and in some cases is superior to surgery. Further evaluation by means of organized multicenter studies and long-term evaluation will answer questions regarding the use of a larger caliber or fine catheter, types of sedation or anesthesia, duration and requirement of adjuvant medical therapy, possible recurrence and many other unanswered questions.

COMMENTS

Background

Human hydatid disease (Echinococcosis) was recognized by Hippocrates over 2000 years ago. Al Razi and Avicenna made references in 900 AD and 11 200 respectively and was described as liver cysts filled with water. However, it is still seen all over the world and is endemic and common in many countries i.e. Africa, central Asia, the Mediterranean, South America and Middle East and remains a problem for the World Health Organization. It is a slow growing cyst and may produce no symptoms for up to 10 years. In the most common form of the disease (Echinococcosis granulosis) dogs are the definitive host. Humans and sheep are the intermediate victims. Therefore, human hygiene and dogs' sanitation (removing the tapeworm from the dog) are essential issues in the prevention of this disease.

Research frontiers

Any organ and any part of the body could be affected but the most common sites are the liver and lungs. Over the recent decades substantial improvement has been made in the diagnosis and management of hydatid disease, through diagnostic tools such as imaging procedures including ultrasound (US), computed tomography (CT), magnetic resonance imaging and endoscopic retrograde cholangiopancreatography.

Innovations and breakthroughs

Concerning treatment, until recently the only definitive treatment for hydatid disease had been surgery. Different surgical techniques and procedures have been carried out and even in some cases, a liver transplant has been required. Advances in drug therapy has been influenced by the introduction of albendazole and accelerated by addition of praziquantel, but this requires a long period of treatment i.e. up to a year or more, and is not effective for everyone.

Applications

Percutaneous aspiration irrigation and reaspiration (PAIR) under direct US or CT guidance is a real achievement in the management of hydatid disease. The procedure was associated with reversible complications, no mortality, very short hospitalization and minimal cost. All 32 cysts showed evidence of immediate collapse after completion of the procedure. Serial follow-up showed progressive decrease in the size and change in the appearance of the cysts. At 10 years follow-up, the longest follow-up in the literature, there was no evidence of recurrence. Therefore, the authors confirm and believe that PAIR using hypertonic saline with adjuvant medical therapy has encouraging results and, with appropriate precautions, is very safe.

Peer review

The authors retrospectively analyzed a series of 26 patients whose hydatid liver cysts were treated with percutaneous aspiration and hypertonic solution injection. Albendazole was given prophylactically and after the procedure. The study might provide some confirmation of the efficacy of a non-surgical approach to the treatment of liver hydatidosis.

REFERENCES

- 1 Acunas B, Rozanes I, Celik L, Minareci O, Acunas G, Alper A, Ariogul O, Gökmen E. Purely cystic hydatid disease of the liver: treatment with percutaneous aspiration and injection of hypertonic saline. *Radiology* 1992; **182**: 541-543
- 2 Giorgio A, Tarantino L, Francica G, Mariniello N, Aloisio T, Soscia E, Pierri G. Unilocular hydatid liver cysts: treatment with US-guided, double percutaneous aspiration and alcohol injection. *Radiology* 1992; **184**: 705-710
- 3 Yasawy MI, Mohamed AR, Al-Karawi MA. Albendazole in hydatid disease: Results in 22 patients. *Ann Saudi Med* 1992; **12**: 152-156
- 4 Mohamed AE, Yasawy MI, Al Karawi MA. Combined albendazole and praziquantel versus albendazole alone in the treatment of hydatid disease. *Hepatogastroenterology* 1998; **45**: 1690-1694
- 5 Gargouri M, Ben Amor N, Ben Chehida F, Hammou A, Gharbi HA, Ben Cheikh M, Kchouk H, Ayachi K, Golvan JY. Percutaneous treatment of hydatid cysts (*Echinococcus granulosus*). *Cardiovasc Intervent Radiol* 1990; **13**: 169-173
- 6 Filice C, Pirola F, Brunetti E, Dughetti S, Strosselli M, Foglieni CS. A new therapeutic approach for hydatid liver cysts. Aspiration and alcohol injection under sonographic guidance. *Gastroenterology* 1990; **98**: 1366-1368
- 7 Khuroo MS, Zargar SA, Mahajan R. *Echinococcus granulosus* cysts in the liver: management with percutaneous drainage. *Radiology* 1991; **180**: 141-145
- 8 Al Karawi MA, Ossa Eidyen, Mohamed Y, et al. Percutaneous management of liver hydatid cyst causing obstructive jaundice. *Saudi Med J* 1994; **15**: 389-391
- 9 al Karawi MA, Mohamed AR, el Tayeb BO, Yasawy MI. Unintentional percutaneous aspiration of a pleural hydatid cyst. *Thorax* 1991; **46**: 859-860
- 10 Gharbi HA, Hassine W, Brauner MW, Dupuch K. Ultrasound examination of the hydatid liver. *Radiology* 1981; **139**: 459-463
- 11 Balasegaram M, Kong LF. Surgical treatment of hydatid disease of the liver. *Trop Gastroenterol* 1982; **3**: 194-200
- 12 Karavias DD, Vagianos CE, Bouboulis N, Rathosis S, Androulakis J. Improved techniques in the surgical treatment of hepatic hydatidosis. *Surg Gynecol Obstet* 1992; **174**: 176-180
- 13 Sayek I, Yalin R, Sanaç Y. Surgical treatment of hydatid disease of the liver. *Arch Surg* 1980; **115**: 847-850
- 14 Ekrami Y. Surgical treatment of hydatid disease of the liver. *Arch Surg* 1976; **111**: 1350-1352
- 15 Ammori BJ, Jenkins BL, Lim PC, Prasad KR, Pollard SG, Lodge JP. Surgical strategy for cystic diseases of the liver in a western hepatobiliary center. *World J Surg* 2002; **26**: 462-469
- 16 Langer JC, Rose DB, Keystone JS, Taylor BR, Langer B. Diagnosis and management of hydatid disease of the liver. A 15-year North American experience. *Ann Surg* 1984; **199**: 412-417
- 17 Teggi A, Di Vico B, Farinelli S, Lastilla M, Traditi F, De Rosa F. Trattamento medico della idatidiosi umana: La nostra esperienza con derivati imidazolici. In: De Rosa F, editor. Proceedings of the 1st International Congress of Imaging Diagnosis of Infectious Diseases. Rome: Monteporzio Cantone, 1990: 318-324
- 18 al Karawi MA, el-Shiekh Mohamed AR, Yasawy MI. Advances in diagnosis and management of hydatid disease. *Hepatogastroenterology* 1990; **37**: 327-331
- 19 Yasawy MI, Alkarawi MA, Mohammed AR. Prospects in medical management of *Echinococcus granulosus*. *Hepatogastroenterology* 2001; **48**: 1467-1470
- 20 Khuroo MS, Dar MY, Yattoo GN, Zargar SA, Javaid G, Khan BA, Boda MI. Percutaneous drainage versus albendazole therapy in hepatic hydatidosis: a prospective, randomized study. *Gastroenterology* 1993; **104**: 1452-1459
- 21 Smego RA Jr, Bhatti S, Khaliq AA, Beg MA. Percutaneous aspiration-injection-reaspiration drainage plus albendazole or mebendazole for hepatic cystic echinococcosis: a meta-analysis. *Clin Infect Dis* 2003; **37**: 1073-1083
- 22 Mueller PR, Dawson SL, Ferrucci JT Jr, Nardi GL. Hepatic echinococcal cyst: successful percutaneous drainage. *Radiology* 1985; **155**: 627-628
- 23 Khuroo MS. Percutaneous drainage of hydatid cysts. *N Engl J Med* 1998; **392**: 391-393
- 24 Filice C, Brunetti E, Bruno R, Crippa FG. Percutaneous drainage of echinococcal cysts (PAIR--puncture, aspiration, injection, reaspiration): results of a worldwide survey for assessment of its safety and efficacy. WHO-Informal Working Group on Echinococcosis-Pair Network. *Gut* 2000; **47**: 156-157
- 25 Aygün E, Sahin M, Odev K, Vatansav C, Aksoy F, Paksoy Y, Kartal A, Karahan O. The management of liver hydatid cysts by percutaneous drainage. *Can J Surg* 2001; **44**: 203-209
- 26 Khuroo MS. Hydatid disease: current status and recent advances. *Ann Saudi Med* 2002; **22**: 56-64
- 27 Filice C, Di Perri G, Strosselli M, Pirola F, Brunetti E, Dughetti S, Concia E. Parasitologic findings in percutaneous drainage of human hydatid liver cysts. *J Infect Dis* 1990; **161**: 1290-1295
- 28 Khuroo MS, Wani NA, Javid G, Khan BA, Yattoo GN, Shah AH, Jeelani SG. Percutaneous drainage compared with surgery for hepatic hydatid cysts. *N Engl J Med* 1997; **337**: 881-887

S- Editor Sun H L- Editor Cant MR E- Editor Zheng XM