Minimally-invasive treatment of hepatic hydatid disease with Perforator-Grinder-Aspirator Apparatus and follow-up of 42 patients

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Abstract

Introduction : **The gold standard treatment for hydatid cyst (HC) is surgery. In surgical practice, open procedures still remain as the first option but in this minimally-invasive era, the frequency of laparoscopic procedures is increasing. The aim of this study is to evaluate the results of 42 patients with HC who underwent surgery with Perforator-Grinder-Aspirator-Apparatus (PGAA) and demonstrate the success and reliability of this technique.**

Methods : **The datas of 42 patients, who underwent laparoscopic surgery with PGAA between Jan 2010 and Feb 2016 were evaluated retrospectively. All patients diagnosed with ultrasonography and underwent computed tomography to identify the surgical anatomy, accessibility of the cyst and the relation with the other cysts. All patients had 10 mg/kg/day albendazole treatment at least 10 days before surgery and preoperative antibiotic prophylaxis was made by 1 gr ampicillin/sulbactam.**

Results : **Thirty-two patients had single cysts, 9 patients had 2 cysts and 1 patient had 3 cysts. Of the 53 cysts ; unroofing and drainage was performed to 38 cysts, unroofing-drainage and omentopexy were performed to 7 cysts and simple drainage was performed to 8 cysts. Four complications occurred after the procedure. The average duration of hospital stay was 4.73 ± 2.6 days.**

Discussion and Conclusion : **There are several treatment options in hydatid cyst and the most appropriate must be selected depending on the patient. We believe that the use of PGAA can increase the use of laparoscopy in cystic hydatidosis of liver and will achieve better results.** (Acta gastroenterol. belg., **2017**, 80, **477-480**).

Keywords : Minimally-invasive, hydatid disease, hydatid cyst, laparoscopy

Introduction

Hydatid cyst (HC) is a parasitic zoonotic infection that is endemic to certain regions, but with globalization, sporadic patients can be seen worldwide (1). HC is a benign disease with a low mortality rate but its morbidity is high (2). About 3.6 million disability-adjusted life years (DALYs) are lost globally and 1.2 million people are affected (3). The gold standard treatment is still surgery (4), but in uncomplicated cysts, other techniques such as percutaneous techniques (PTs) are increasingly replacing the role of surgery. However, PTs also have some limitations, such as, complicated cysts (*i.e.*, rupture, biliary fistula, compression of vital structures, superinfection, hemorrhage), cysts at high risk of rupture, or large cysts with many daughter vesicles (5). In surgical practice, open procedures still remain as the first option but in this minimally-invasive era, the frequency of laparoscopic procedures is increasing. Many devices and techniques for laparoscopic treatment of HC have been described in the literature (6-14). In this study, we evaluated our 6-year experience with Perforator-Grinder-Aspirator Apparatus (PGAA), which we developed and introduced previously (15).

Material and Methods

The data of 53 patients who underwent surgery because of hepatic hydatid disease between January 2010 and February 2016 were evaluated retrospectively. Of the 53 patients, 11 patients underwent laparotomy and were excluded from the study. The reasons for laparotomy without laparoscopic exploration were ; cyst(s) with difficult localization (n = = 3) and recent abdominal or hepatic operations (n = 8). Two patients underwent laparoscopic exploration but the surgery was converted to laparotomy. The reasons for conversions were difficulty in approach and advanced adhesions surrounding the liver. Forty-two patients with at least 12 months of follow-up were included into the study.

All patients' disease was diagnosed and staged using ultrasonography (US) in accordance with the criteria of Gharbi (16). Computed tomography (CT) was performed in all patients to identify the surgical anatomy, accessibility of the cyst, and their relation with other cysts. Patients with suspicious cysts underwent magnetic resonance imaging (MRI) to confirm the diagnosis.

All patients had 10 mg/kg/day albendazole treatment at least 10 days before surgery and pre-operative antibiotic prophylaxis was made with 1 gr ampicillin/sulbactam. Albendazole treatment was continued for at least 3 months in all patients.

All patients underwent surgery as described by Avtan L. (15). According to the surgeon's decision, the cavity was managed by simple drainage, unroofing or unroofing

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Submission date : 04/01/2017
Acceptance date : 08/09/2017

and omentopexy. One or more negative pressure drains were placed into all cavities in all patients.

All patients were followed up in the postoperative 1st, 3rd, 6th, 12th months and annually. Physical examination, US, and routine biochemical blood tests were performed to determine whether there was any recurrent disease, residual cyst elements or collection in the cavity. Follow-up abdominal CT was performed if there were suspicious findings in previous examinations.

Written informed consent was obtained from all patients. Ethics committee approval was not required since the study was a retrospective study.

Results

The mean age of the patients was 47.7 ± 13.47 years and the female-to-male ratio was 24/18. Thirty-three patients had single cysts, 9 had 2 cysts and 1 patient had 3 cysts. Of the 53 cysts ; 31 were stage III, 15 were stage IV, and 7 were stage II. The average size of the cysts was 8.2 cm (range, 3-16 cm)

Unroofing and drainage was performed to 38 cysts, unroofing-drainage and omentopexy was performed to 7 cysts, and simple drainage was performed to 8 cysts.

Complications

Minor bile duct injury : In three cases, the cavity was messed with bile perioperatively. In the cavity exploration with laparoscope, origin of bile leakage was found and repaired with 4/0 PDS sutures and omentopexy was performed after unroofing and drainage. Two patients recovered uneventfully but the other patient had a bile fistula with high-output (600cc/day). In the first week after the operation, the patient underwent magnetic resonance cholangiography (MRCP), which revealed a minor bile duct communication with the cavity (Figure 1). The patient underwent endoscopic retrograde cholangiography (ERCP) (Figure 2). After papillotomy and stent application (10 Fr-6 cm Tannenbaum stent) under ERCP, the flow of the fistula decreased to 200 cc/day on the second day and stopped on the 8th day. The drain was removed on the 11th postoperative day and the patient was discharged uneventfully. Patients are now in their 14th, 27th and 36th months of follow-up, respectively, and they have no recurrent disease or any other complications related to their recent surgery.

Cavity infection : A woman aged 68 years with a 7-cm diameter stage III cyst who underwent unroofing was discharged on a postoperative day 4 after her drain was removed. On the 7th day of discharge, she was admitted to the emergency room (ER) with fever and epigastric pain. Blood tests revealed leukocytosis and mildly elevated liver enzymes. A US examination revealed liquid compatible with an abscess. After percutaneous drainage and 10 days of antibiotic treatment, she was discharged uneventfully. She is now in her 30th month of follow-up and has no complaints.

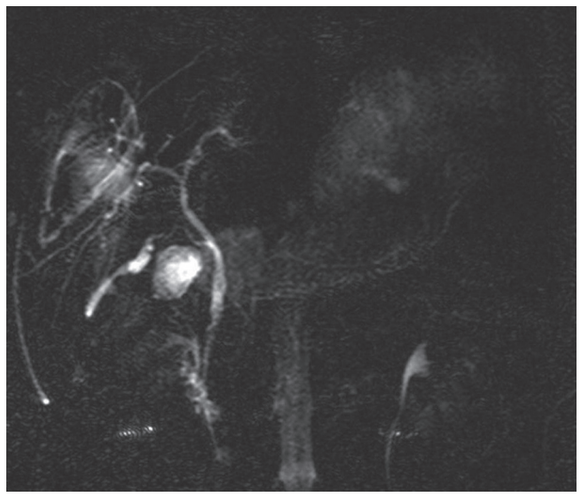

Fig. 1. — MRCP image of a patient with bile duct fistula.

Fig. 2. — ERCP image of a patient with bile duct fistula.

Cavity infection and bile duct fistula : A man aged 57 years who was diabetic presented with a 6-cm stage III cyst and underwent simple drainage and was discharged on the 3rd postoperative day. He was admitted to another hospital's ER with fever and abdominal discomfort on the 10th day of discharge. The patient was referred to our hospital after 2 days of antibiotic treatment (ampicillin/sulbactam, 4 x 1 gr/day) without drainage. The patient had onset sepsis ; percutaneous drainage and broad-spectrum antibiotic treatment were started immediately. On the second day of percutaneous drainage, the drain was stained with bile, and on day 4 bile drainage was evident. Five days later, the bile fistula stopped without any intervention. The drain was removed and the patient was discharged uneventfully. He is now at 40th month of follow-up and has no complaints.

Port-site hernia : A woman aged 55 years had a port-site infection (camera port) and port-site hernia. She underwent surgery and a primary hernia repair was performed.

No patient developed anaphylaxis and there was no mortality in the perioperative period.

The mean duration of surgery was 67.5 ± 26.78 minutes (range, 30-127 min), the median duration of drainage was 3.7 days (range, 1-11 days). No major blood loss or major bile leakage was observed during operations.

Postoperative findings : The average duration of hospital stay was 4.73 ± 2.6 days (range, 3-20 days). The mean follow-up was 44.09 ± 27.6 months (range, 12-72 months).

Discussion

Despite the progress in percutaneous techniques and chemotherapy, surgery is still the gold standard treatment of HC, especially in complicated cysts but there is no 'best treatment' option for HC. The main treatment modalities are chemotherapy, percutaneous techniques, the 'watch and wait' approach, and surgery (17). Chemotherapeutic agents should be used to prevent recurrence after surgery or PAIR (puncture, aspiration, injection and re-aspiration) and in inoperable patients, peritoneal disease, and multiple cysts in multiple organs (18,19). Albendazole, as a benzimidazole (BMZ) compound, is the first step chemotherapeutic agent and should be administered orally at a dosage of 10-15 mg/kg per day for at least 1 one week before the surgery and should be continuous for minimum 3-6 months after surgery. However, the optimal dose and duration of treatment with albendazole have not been formally assessed. Franchi C. et al reported a long-term follow-up of 848 patients with 929 cysts who received 3-6 months continuous BMZ treatment. Degenerative changes occurred in 74.1% of the cysts, but during follow-up, 22% of the cysts had degenerative changes and 25% of the cysts relapsed (20). Various percutaneous techniques (PAIR, PEVAC (percutaneous evacuation), modified catheterization technique, and dilatable multi-function trocar) have also been described as alternative treatments for HC. PAIR, the most popular percutaneous technique, can also be performed as a therapeutic minimally-invasive technique. Its main indications are patients with inoperable HC or for those who refuse surgery, cases of recurrence after surgery or failure to respond to BMZ alone (17). The primary advantages are less pain and shorter hospital stay when compared with surgery but it is contraindicated for lung cysts and stage CE2, CE3b, CE4, and CE5 cysts. Protoscolices are harmful to the biliary tract and contraindicated in biliary fistulae (17,21).

Surgery is still the best treatment option for complicated cysts (*i.e.*, rupture, biliary fistula, compression of vital structures, superinfection, and hemorrhage), cysts at high risk of rupture, or large cysts with many daughter vesicles, which are not suitable for percutaneous techniques (5). The most preferred method for surgery is the open approach via laparotomy. However, the first laparoscopic pericystectomy was performed in 1992 and various laparoscopic methods and tools have since been reported (6-14). As in percutaneous techniques, both techniques have limitations, advantages, and disadvantages. The main limitations and disadvantages of laparoscopic approach include the requirement for advanced laparoscopic skill ; cysts in deeper locations ; those covered with liver parenchyma of more than 3 cm ; fear of intraoperative spillage of cyst contents, bleeding, and covering mass of the cavity with bile, which may be more difficult to control laparoscopically ; aspiration of cysts with viscous content ; and requirements for special instruments (22). Our apparatus, PGAA, has an effective aspiration system and prevents spillage. On the other hand, laparoscopic surgery brings the advantages of shorter hospital stay (23), less pain, and in our opinion, the most important is magnification. In addition, the overall morbidity and recurrence rates are similar to those of conventional open surgery (23).

Conversion to open surgery should not be considered as a failure. In a review of Çıtgez et al., 22 literature articles were evaluated comprising 666 patients who underwent laparoscopy for HC. The rate of conversion to open surgery was 4% and disease recurrence was found as 1.6% (24). In our series, we had 2 (4.7%) conversions to open surgery. The reasons for conversions were difficulty in approach and advanced adhesions that surrounded the liver.

In our study, the mean duration of surgery was 67.5 ± 26.65 minutes (range, 30-127 min). Factors that affect the duration of surgery are the location of the cyst, the number of cysts, and experience in laparoscopy. Simple cysts with easily accessible locations are easier to manage and the operation takes less time. Our mean duration of surgery seemed shorter compared with other series (22-25). The main reason for a shorter surgery time was that there was no hepatectomy and/or cystectomy in this series and recent experience of conventional HC surgery. The length of hospital stay after laparoscopic management of HC ranged from 1 to 8 days and was significantly shorter when compared with open laparotomy (22). In our study, the average duration of hospital stay was 4.7 days (range, 3-20 days). The reason for a longer hospital stay is that our country is an endemic region and patients are referred to our clinic from other cities. As a strategy of our clinic, we do not discharge before 3 days.

Perioperative morbidity and complications are based on several factors. The factors that significantly increase morbidity and mortality rates are comorbid diseases, age over 40 years, more than 3 cysts, cyst size more than 10 cm, and complicated cysts (26,27). In the review of Tuxun et al., the ratio of postoperative bile leakage was 6.24% and residual cavity infection was reported in 2.19% of the total cases (22). In our study, we had 3 major and 1 minor complication. Three patients had small bile duct injuries that were recognized per-operatively and repaired with laparoscopic sutures. One patient had a biliary fistula (2.4%) which resolved

after ERCP and the other patient had no problem. Two patients (4.8%) had cavity infections and both were cured with percutaneous drainage. The patients who had cavity infections were aged over 55 years and one was diabetic. One patient (2.4%) had a port-site infection and incisional hernia. In this series, last 17 patients recovered without any complication.

One of the most dreaded problems after HC surgery is recurrence. The recurrence rate after open surgical procedures ranges from 0-4.5% (28), but 1.09% after laparoscopic approach (23). In our series, none of the patients had recurrence. Although we had an adequate follow-up period, the number of patients was small, which may be the reason why we had no recurrence.

Conclusion

There are several treatment options in HC and the most appropriate must be selected depending on the patient. Surgery is still the mainstay treatment, but in this minimally-invasive era, laparoscopic techniques must be a step forward. Albeit there are limited data in the literature, it is clear that laparoscopic procedures are efficient and we believe that PGAA will increase the use of laparoscopy for the treatment of HC.

References

1. GAVARA C.G., LÓPEZ-ANDÚJAR R., IBÁÑEZ T.B., ÁNGEL J.M.R., HERRAIZ Á.M., CASTELLANOS F.O. *et al*. Review of the treatment of liver hydatid cysts. *World Journal of Gastroenterology*, 2015, **21**(1), 124-131.
2. MCMANUS D.P., ZHANG W., LI J., BARTLEY P.B. Echinococcosis. *The Lancet*, 2003, **362**(9392), 1295-1304.
3. CRAIG P.S., BUDKE C.M., SCHANTZ P.M., LI T., QIU J., YANG Y. *et al.* Human echinococcosis : a neglected disease? *Tropical Medicine and Health*, 2007, **35**(4), 283-292.
4. SENTHILNATHAN P., INAMDAR S., NALANKILLI V.P., VIJAY A., RAJAPANDIAN S., PARTHSARATHI R. *et al.* Long-term results of hepatic hydatid disease managed using palanivelu hydatid system : Indian experience in tertiary center. *Surgical Endoscopy*, 2014, **28**(10), 2832-2839.
5. RINALDI F., BRUNETTI E., NEUMAYR A., MAESTRI M., GOBLIRSCH S., TAMAROZZI F. Cystic echinococcosis of the liver : A primer for hepatologists. *World Journal of Hepatology*, 2014, **6**(5), 293-305.
6. ALPER A., EMRE A., HAZAR H., ÖZDEN İ., BILGE O., ACARLI K. *et al.* Laparoscopic surgery of hepatic hydatid disease : initial results and early follow-up of 16 patients. *World journal of surgery*, 1995, **19**(5), 725-728.
7. AL-SHAREEF Z., HAMOUR O.A., AL-SHLASH S., AHMED I., MOHAMED A.A. Laparoscopic treatment of hepatic hydatid cysts with a liposuction device. JSLS : *Journal of the Society of Laparoendoscopic Surgeons*, 2002, **6**(4), 327-330.
8. KAYAALP C. Evacuation of hydatid liver cysts using laparoscopic trocar. *World Journal of Surgery*, 2002, **26**(11), 1324-1327.
9. SAGLAM A. Laparoscopic treatment of liver hydatid cysts. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*, 1996, **6**(1), 16-21.
10. PALANIVELU C., SENTHILKUMAR R., JANI K., RAJAN P.S., SENDHILKUMAR K., PARTHASARTHI R. *et al.* Palanivelu hydatid system for safe and efficacious laparoscopic management of hepatic hydatid disease. *Surgical Endoscopy and Other Interventional Techniques*, 2006, **20**(12), 1909-1913.
11. KATKHOUDA N., FABIANI P., BENIZRI E., MOUIEL J. Laser resection of a liver hydatid cyst under videolaparoscopy. *British Journal of Surgery*, 1992, **79**(6), 560-561.
12. VROMEN A., ZAMIR O., BEGLEIBTER N., FREUND H.R. The use of a disposable laparoscopic trocar for the injection and safe evacuation of echinococcus cysts of the liver. *Surgery, Gynecology & Obstetrics*, 1993, **177**(5), 517-518
13. BICKEL A., EITAN A. The use of a large, transparent cannula, with a beveled tip, for safe laparoscopic management of hydatid cysts of liver. *Surgical Endoscopy*, 1995, **9**(12), 1304-1305.
14. ZENGIN K., UNAL E., KARABICAK I., APAYDIN B., TASKIN M. A new instrument, the "Perfore-Aspirator" for laparoscopic treatment of hydatid cysts of the liver. *Surgical Laparoscopy Endoscopy & Percutaneous Techniques*, 2003 ; **13**(2), 80-82.
15. AVTAN L. A new" Perforator Grinder-Aspirator Apparatus (PGAA)" for the minimal access surgery of cystic liver hydatidosis. *Hepato-gastroenterology*, 2004, **52**(62), 339-342.
16. GHARBI H.A., HASSINE W., BRAUNER M.W., DUPUCH K. Ultrasound examination of the hydatic liver. *Radiology*, 1981, **139**(2), 459-463.
17. BRUNETTI E., KERN P., VUITTON D.A. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. *Acta tropica*, 2010 ; **114**(1), 1-16.
18. ARIF S.H., SHAMS-UL-BARI, WANI N.A., ZARGAR S.A., WANI M.A., TABASSUM R. *et al.* Albendazole as an adjuvant to the standard surgical management of hydatid cyst liver. *International Journal of Surgery*, 2008, **6**(6), 448-451.
19. DOĞRU D., KIPER N., ÖZÇELIK U., YALÇIN E., GÖÇMEN A. Medical treatment of pulmonary hydatid disease : for which child? *Parasitology international*, 2005 ; **54**(2), 135-138.
20. FRANCHI C., DI VICO B., TEGGI A. Long-term evaluation of patients with hydatidosis treated with benzimidazole carbamates. *Clinical Infectious Diseases*, 1999 ; **29**(2), 304-309.
21. Nayman A., Guler I., Keskin S., Erdem T.B., Borazan H., Kucukapan A. *et al.* A novel modified PAIR technique using a trocar catheter for percutaneous treatment of liver hydatid cysts : a six-year experience. *Diagn. Interv. Radiol.*, 2016, **22**, 47-51.
22. TUXUN T., ZHANG J.H., ZHAO J.M., TAI Q.W., ABUDUREXTI M., MA H.Z. *et al.* World review of laparoscopic treatment of liver cystic echinococcosis - 914 patients. *International Journal of Infectious Diseases*, 2014, **24**, 43-50.
23. TUXUN T., AJI T., TAI Q.W., ZHANG J.H., ZHAO J.M., CAO J. *et al.* Conventional versus laparoscopic surgery for hepatic hydatidosis : a 6-year single-center experience. *Journal of Gastrointestinal Surgery*, 2014, **18**(6), 1155-1160.
24. CITGEZ B., BATTAL M., CIPE G., KARATEPE O., MUSLUMANOGLU M. Feasibility and safety of laparoscopic hydatid surgery : a systematic review. *Hepato-gastroenterology*, 2013, **60**(124), 784-788.
25. LI H., SHAO Y., AJI T., ZHANG J., KASHIF K., MA Q. *et al.* Laparoscopic approach for total cystectomy in treating hepatic cystic echinococcosis. *Parasite,* 2014, **21**.
26. DARADKEH S., HUSAM E.M., FARAH G., SROUJIEH A.S., ABU-KHALAF M. Predictors of morbidity and mortality in the surgical management of hydatid cyst of the liver. *Langenbeck's Archives of Surgery*, 2007, **392**(1), 35-39.
27. EL MALKI H.O., EL MEJDOUBI Y., SOUADKA A., MOHSINE R., IFRINE L., ABOUQAL R. *et al.* Predictive factors of deep abdominal complications after operation for hydatid cyst of the liver : 15 years of experience with 672 patients. *Journal of the American College of Surgeons*, 2008, **206**(4), 629-637
28. KAPAN M., KAPAN S., GOKSOY E., PEREK S., KOL E. Postoperative recurrence in hepatic hydatid disease. *Journal of Gastrointestinal Surgery*, 2006, **10**(5), 734-739.