



Tehran University of Medical  
Sciences Publication  
<http://tums.ac.ir>

## Iran J Parasitol

Open access Journal at  
<http://ijpa.tums.ac.ir>



Iranian Society of Parasitology  
<http://isp.tums.ac.ir>

### Original Article

## Retrospective Review of Complications of Liver Hydatid Cyst Surgery with Emphasis on Outcomes of Omentoplasty

Sedighe HOSSEINI SHABANAN<sup>1</sup>, \*Seyed Habibollah DASHTI<sup>1</sup>, Mehrshad ABBASI<sup>2</sup>,  
Ali JAFARIAN<sup>1</sup>, Amirpasha EBRAHIMI<sup>1</sup>, Niloofar AYOobi YAZDI<sup>3</sup>

1. Liver Transplantation Research Center, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Nuclear Medicine, Vali-Asr Hospital, Tehran University of Medical Sciences, Tehran, Iran
3. Advanced Diagnostic and Interventional Radiology (ADIR) Research Center, Tehran University of Medical Sciences, Tehran, Iran

Received 10 Jan 2020  
Accepted 19 Mar 2020

#### **Keywords:**

Liver hydatid cyst;  
Post-operation compli-  
cations;  
Conservative surgery;  
Omentoplasty

#### **\*Correspondence**

**Email:**  
[habibdasht@gmail.com](mailto:habibdasht@gmail.com)

#### **Abstract**

**Background:** The outcome and complications of liver hydatid cyst surgeries with new and old techniques are not well determined. We intended to present the results of operations done for patients with hepatic hydatid cyst in an endemic area.

**Methods:** Data of 112 patients referred and operated for liver hydatid cyst, in Imam Khomeini Hospital complex, Tehran, Iran, from 2015 to 2018, were collected including demographic characteristics, operation parameters and complication related statistics. The variables were presented for different surgical methods including operations with and without omentoplasty.

**Results:** Patients aged  $39.3 \pm 13.9$  yr (70 females; 63.5%). Most frequent clinical complaint was vague abdominal pain ( $n=45$ ; 40.2%). The most prevalent comorbidity was hypertension (18; 16.0%). Conservative methods were chosen more frequently including omentoplasty (44; 39.3%), cyst drainage (27; 24.1%), cyst resection (19; 17%) and marsupialization (3; 2.7%). Overall, 56 patients (50%) were operated with omentoplasty as the single method or in combination with segmentectomy. Complications occurred less in patients operated with omentoplasty (41.1 vs. 23.2%;  $P=0.043$ ); particularly, biloma was more frequent in surgeries without omentoplasty (7.1 vs 0.0%;  $P=0.042$ ). Persistence and recurrence rates were 12.5% and 3.6% with relative predilection in, respectively, segmentectomy and lobectomy surgical methods compared to Omentoplasty. No mortality was recorded.

**Conclusions:** In our case series of hepatic hydatid cyst patients, omentoplasty was safe with less complication and similar long-term recurrence rate.



Copyright © 2020 Hosseini Shabanani et al. Published by Tehran University of Medical Sciences.  
This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license  
(<https://creativecommons.org/licenses/by-nc/4.0/>). Non-commercial uses of the work are permitted, provided the original work is properly cited.

## Introduction

Iran is an endemic area of hydatid cyst (HC), a parasitic zoonosis also called hydatidosis and cystic echinococcosis (CE) (1), and liver is the most affected organ (60%-70%) (2).

Surgery is the cornerstone of liver hydatid cyst treatment; however, different therapeutic approaches have been investigated with considerable controversy (3). Although surgical techniques have been improved, the rate of disease recurrence and complications after surgery remains at 10% (4). Numerous surgical procedures have been applied and still the choice procedure is under debate. Conservative surgeries, comprising those techniques with residual cyst wall, are the preferable treatment modalities in developing countries because of their safety and simplicity although they might bear a greater risk of cavity-related complications and recurrence comparing radical procedures in which the cyst and adjacent liver tissue is excised (2). Filling up the cavity with saline, marsupialization, capitonnage and omentoplasty are the described techniques of residual cavity management following conservative surgeries. Conservative treatment may be considered more appropriate in endemic areas (5).

In Iran, conservative surgeries are traditionally preferred, while there is a low tendency for omentoplasty. Reports suggest that omentoplasty is an effective procedure, which may limit unnecessary radical procedures (6). In this study, we aimed to describe postoperative complications in patients with liver HC undergoing surgery, with an emphasis on omentoplasty.

## Materials and Methods

Medical records of liver HC patients who underwent surgical treatment in Hepato-Biliary Surgery Department, Imam Khomeini Hospital Complex, Tehran, Iran, from Apr

2015 to Mar 2018 were reviewed retrospectively.

A total number of 114 patients were operated for liver HC, but data of 2 patients were not available, hence, 112 patients were included. Medical records of the patients were collected including age, sex, medical comorbidities, disease symptoms, and serologic hydatidosis tests, history of antihelminthic drug use, treatment procedure, and post-operation morbidities within patients' follow-up period. Pre-operative evaluation of the patients included blood tests (i. e. complete blood count, liver enzymes, total and direct bilirubin, and anti-echinococcosis antibody testing), ultrasonography (US) and computerized tomography (CT). The patients underwent operation after a 2-week preoperative course of albendazole 15 mg/kg/day; albendazole course continued for three months after the operation.

The diagnosis of HC was histopathologically confirmed in all patients after surgery. Cyst residual or recurrence, biliary fistula or strictures, biloma, bleeding and hematoma, sub-diaphragmatic collection, diaphragmatic rupture, surgical site infection, and gastrointestinal obstruction and herniation were considered as post-operation complications.

Selection of the surgery method had been more surgeon decision based rather than the consideration of multiplicity and size of the cysts. For multiple cysts, omentoplasty was done for one of the cysts combined with another conservative or radical approach for the other cysts. In cases with both segmentectomy and omentoplasty surgery, data of patients were registered as omentoplasty method.

Data handling and analysis were performed using SPSS (Chicago, IL, USA) version 16. 0.

## *Ethical approval*

This study has been approved by the Tehran University of Medical Sciences Ethics Committee and has therefore been performed in

accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and all subsequent revisions. The participants' written informed consent form was collected before the study.

## Results

The study population consisted of 112 patients (70 females; 62. 5%), with the mean age

of 39. 3±13. 9 yr. Data of four patients treated with puncture-aspiration-injection-respiration (PAIR) were also collected, but not presented. Overall, 86 (76. 8%) patients (51 females, 72. 9%; 35 males, 83. 3%) aged 39. 3 yr (interquartile range: 29. 0-48. 2 yr) had positive serology results for hydatidosis. Health characteristics and disease-related data of the patients undergoing different surgical procedures are presented in Table 1.

**Table 1:** Health characteristics and operation related data in hydatid cyst patients with and without omentoplasty

Variable	Omentoplasty		Cyst drainage	Cyst resection	Marsupialization	Segmentectomy	Lobectomy	Total
	Without	With						
Sex (female)	45(0. 8)	25(0. 45)	22 (0. 8)	19 (1)	3 (1)	1 (0. 2)	0 (0)	70(0. 63)
Positive serology	46(0. 82)	40(0. 71)	18 (0. 66)	18 (0. 94)	3 (1)	5 (1)	2 (1)	86(0. 77)
Diabetes	6(0. 11)	3(0. 05)	2 (0. 07)	3 (0. 16)	0 (0)	0 (0)	1 (0. 5)	9(0. 08)
Hypertension	8(0. 14)	10(0. 18)	2 (0. 07)	3 (0. 16)	3 (1)	0 (0)	0 (0)	18(0. 16)
Hyperlipidemia	4(0. 07)	6(0. 11)	4 (0. 15)	0 (0)	0 (0)	0 (0)	0 (0)	10(0. 09)
CVA	2(0. 04)	1(0. 02)	0 (0)	1 (0. 05)	0 (0)	0 (0)	1 (0. 5)	3(0. 03)
IHD	2(0. 04)	0(0)	0 (0)	0 (0)	0 (0)	2 (0. 4)	0 (0)	2(0. 02)
Complication	23 (0. 41) †	13(0. 23) †	12 (0. 44)	4 (0. 21)	3 (1)	3 (0. 6)	1 (0. 5)	36(0. 32)
Biloma	4(0. 07) †	0(0) †	4 (0. 15)	0 (0)	0 (0)	0 (0)	0 (0)	4(0. 04)
Cavity persistence	10(0. 18)	4(0. 07)	4 (0. 15)	2 (0. 1)	1 (0. 33)	3 (0. 6)	0 (0)	14(0. 13)
Recurrence	3(0. 05)	1(0. 02)	1 (0. 04)	1 (0. 05)	0 (0)	0 (0)	1 (0. 5)	4(0. 04)
Infection and abscess	1(0. 02)	3(0. 05)	0 (0)	1 (0. 05)	0 (0)	0 (0)	0 (0)	4(0. 04)

Data are number (percentages); the significant differences between patients with and without omentoplasty are marked by †. CVA: cerebrovascular accident, IHD: ischemic heart disease.

The most common clinical complaints included vague abdominal pain (n=45; 40. 2%), jaundice (n=25; 22. 3%), and abdominal mass (13; 11. 6%). However, no clinical symptoms were recorded in 8 (7. 1%) patients.

Most laboratory test results were within normal limits (data not shown), particularly the mean bilirubin level (1. 2±1. 3 mg/dL).

The most frequently used surgical techniques were omentoplasty (n=44; 39. 3%),

cyst drainage (n=27; 24.1%), cyst resection (n=19; 17%), and marsupialization (n=3; 2.7%). Radical surgeries included segmentectomy with omentoplasty (n=12; 10.7%) and without omentoplasty (n=5; 4.5%), followed by lobectomy (n=2; 1.8%). Overall, 56 (50%) patients underwent omentoplasty as a single method or in combination with other methods.

Age, frequency of positive serology, and prevalence of comorbidities were not significantly different between the two groups. The mean follow-up period was  $10.9 \pm 5.7$  months. No patient was lost to the follow-up. The follow-up duration was similar in patients undergoing surgery with and without omentoplasty ( $P=0.07$ ).

Out of all complications, permanent cyst cavity (n=14; 12.5%), recurrence (n=4; 3.6%), and biloma (n=4; 3.6%) were the most frequent findings; however, 67.9% (n=76) of the patients reported none of these complications. Other complications included gastrointestinal obstruction (n=3; 2.7%), hernia (n=3; 2.7%), hematoma (n=2; 1.8%), surgical site infection (n=2; 1.8%), sub-diaphragmatic abscess formation (n=2; 1.8%), diaphragmatic perforation (n=1; 0.9%), and biliary fistula (n=1, 0.9%).

The occurrence of complications was more frequent in patients who did not undergo omentoplasty (41.1% vs. 23.2%;  $P=0.043$ ), especially biloma (7.1% vs. 0.0%;  $P=0.042$ ). Among patients treated with PAIR, two experienced recurrence. Permanent cysts and recurrence were more common in patients with segmentectomy and lobectomy, respectively, compared to those undergoing omentoplasty (Table 1). The mean length of hospital stay was  $6.9 \pm 3$  days, which was similar for different surgical methods. Patients undergoing lobectomy and segmentectomy were hospitalized longer than patients undergoing other procedures were.

## Discussion

Echinococcosis is an endemic disease in the Eastern Mediterranean region (7), including Iran (1), with 1295 surgeries expected per year (8). The WHO has documented an annual incidence of 4-6 cases per 100,000 population in the Mediterranean region (2). The incidence rate in some endemic areas has been estimated to peak at 220 cases per 100,000 population (9). Clinical management of liver HC ranges from watchful waiting and medical treatment to percutaneous drainage and surgical interventions (open conservative/radical surgeries and laparoscopic surgeries).

Radical procedures are associated with liver (segment/lobe) resection and pericystectomy, associated with the resection of cyst and 1-2 cm of normal hepatic parenchyma, while partial cyst resection and sterilization of the residual cavity are the main steps in conservative surgeries (10). It has been claimed that patients treated with radical surgeries achieve faster healing with shorter hospitalization, because ideally, these procedures leave no residual cavity, although the intraoperative risks are higher; also, the overall rates of morbidity and relapse after these surgeries are probably lower (11, 12).

Several comparative studies have demonstrated significantly higher rates of morbidity and recurrence in patients undergoing conservative surgeries (13-15). In 2003, a meta-analysis reported complication and recurrence rates of 11.7% and 2%, respectively after radical procedures and 23% and 10.4% after conservative operations (3). In general, most surgeons find radical surgeries to be very invasive for benign diseases. In the current study, radical surgeries were limited and mostly performed in combination with omentoplasty when the patient had multiple cysts or when the cyst was limited to easily resectable segments. The permanence and recurrence rates of the disease were lower in our patient population undergoing omentoplasty, compared to

patients undergoing segmentectomy and lobectomy, respectively.

Hydatidectomy (resection of the hydatid membrane) and partial/subtotal resection of the cyst for evacuating the cyst content are the mainstay of treatment in conservative surgeries. Following these procedures, residual cavity remains, which increases the risk of postoperative complications, including secondary bacterial infection, abscess formation, and bile leakage (16). Conservative surgeries are more suitable for high-risk patients, who have cysts in the deeper parts of the liver or in both lobes (17). Considering the benign nature of hydatidosis, it is preferable to spare the normal hepatic parenchyma as much as possible. Simple drainage and omentoplasty (i. e., filling the cavity with omental plug), capitonnage/introflexion of the cavity (i. e., reapproximation) without drainage, marsupialization, and synthetic fibrin injection are possible approaches to manage the residual cavity (18).

Several studies have shown that omentoplasty is the procedure of choice in the management of residual cavity, as it reduces the rate of disease recurrence and can be used after radical surgeries to reduce postoperative complications (19,20). Use of omentoplasty may reduce the risk of complications (21). Based on our results, we cannot conclude that omentoplasty is superior to other procedures, although it had lower permanence and recurrence rates than segmentectomy and lobectomy. The omentum can be utilized not only to fill the residual cavity, but also to take advantage of its biological characteristics, including resorption of the serosal fluid and macrophage migration to the septic collection (22).

Omentoplasty is a suitable surgical technique for complicated HCs (23). Omentoplasty was compared with introflexion in terms of postoperative complications and hospitalization. They concluded that omentoplasty is superior to both introflexion and combination of these two methods (24). Moreover, the medical records of 304 HC patients were reviewed in a

retrospective study and reported that omentoplasty significantly reduces complications, such as bile tract fistula formation and infection in comparison with external drainage (25). However, controversial results have been reported in this area, for example a study performed in 2013 has shown that omentoplasty leads to more postoperative morbidities; nevertheless, they concluded that a larger sample size is needed for precise assessment (26).

In the current patient series, complications, such as biloma, biliary strictures, and biliary fistula (defined as prolonged bile leakage for more than 10 days), were only reported after procedures without omentoplasty. Omentoplasty may be effective in reducing biliary complications by sealing off any leakage from the viscus (27). In our study, cyst permanence and recurrence rates were significantly higher in patients who underwent procedures without omentoplasty. Nonetheless, the incidence rates of surgical site infection and subdiaphragmatic abscess formation were similar in omentoplasty and other methods. According to previous report, mortality rate after surgery for hydatidosis ranges from 0% to 3.5% (22); however, there was no case of mortality in our study.

The increased availability of laparoscopic surgeries and other advantages of minimally invasive procedures, including shorter hospital stay, better cosmetic results, and less postoperative adhesions, promote conversion from open surgery to laparoscopic treatment. However, it should be mentioned that there are some limitations in broadening the indications for laparoscopic surgeries. Laparoscopic surgery is not indicated for relapsed cysts or cysts located in the parenchyma or posterior segments of the liver (28). In addition, intraoperative management of bleeding and spillage of cyst content during laparoscopic surgeries is much more difficult than open surgeries (28). Moreover, the rate of extrahepatic and peritoneal recurrence of hydatidosis is higher in laparoscopic procedures, compared to primary open surgeries (29). We had three cases of

laparoscopic segmentectomy and omentoplasty, which comprised a small proportion of our study sample, possibly due to the lack of experience and financial constraints.

As a limitation to this study, we may point out that we suggested the data of omentoplasty surgeries with segmentectomy operation continued with omentoplasty. This may hindered the compatibility of our results with those classifying the conservative procedures from radical surgeries otherwise.

## Conclusion

Omentoplasty is a safe and simple surgical treatment for liver hydatosis, which leads to fewer postoperative complications in comparison with other surgical treatments.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. ) have been completely observed by the authors.

## Acknowledgments

No financial support was revived.

## Conflict of interest

The authors declare that there is no conflict of interest.

## References

1. Rokni MB. Echinococcosis/hydatidosis in Iran. *Iran J Parasitol.* 2009;4(2):1-6.
2. Eckert J, Gemmell MA, Meslin FX, et al. World Health Organization. WHO/OIE manual on echinococcosis in humans and animals: a public health problem of global concern. 2001.
3. Buttenschoen K, Buttenschoen DC. Echinococcus granulosus infection: the challenge of surgical treatment. *Langenbecks Arch Surg.* 2003;388(4):218-30.
4. Sielaff TD, Taylor B, Langer B. Recurrence of hydatid disease. *World J Surg.* 2001;25(1):83-6.
5. Brunetti E, Kern P, Vuitton DA. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. *Acta Trop.* 2010;114(1):1-16.
6. Pandey A, Chandra A, Masood S. Abdominal echinococcosis: outcomes of conservative surgery. *Trans R Soc Trop Med Hyg.* 2014;108(5):264-8.
7. Grosso G, Gruttadauria S, Biondi A, et al. Worldwide epidemiology of liver hydatidosis including the Mediterranean area. *World J Gastroenterol.* 2012;18(13):1425-37.
8. Deplazes P, Rinaldi L, Rojas CA, et al. Global Distribution of Alveolar and Cystic Echinococcosis. *Adv Parasitol.* 2017; 95:315-493.
9. Schantz PM. Epidemiology and control of hydatid disease. *Echinococcus* and hydatid disease. 1995:233-331.
10. iGavara CG, López-Andújar R, Ibáñez TB, et al. Review of the treatment of liver hydatid cysts. *World J Gastroenterol.* 2015;21(1):124-31.
11. Stojkovic M, Weber TF, Junghans T. Clinical management of cystic echinococcosis: state of the art and perspectives. *Curr Opin Infect Dis.* 2018;31(5):383-92.
12. Georgiou GK, Lianos GD, Lazaros A, et al. Surgical management of hydatid liver disease. *Int J Surg.* 2015;20:118-22.
13. Tagliacozzo S, Miccini M, Bonapasta SA, et al. Surgical treatment of hydatid disease of the liver: 25 years of experience. *Am J Surg.* 2011;201(6):797-804.
14. ÇOKER A, Aydın U, Yazici P, et al. The optimal treatment of hydatid cyst of the liver: radical surgery with a significant reduced risk of recurrence. *Türk J Gastroenterol.* 2008;19(1):33-9.
15. Yüksel O, Akyürek N, Şahin T, et al. Efficacy of radical surgery in preventing early local recurrence and cavity-related complications in hydatid liver disease. *J Gastrointest Surg.* 2008;12(3):483-9.
16. Atmatzidis KS, Pavlidis TE, Papaziogas BT, et al. Recurrence and long-term outcome after open cystectomy with omentoplasty for hepatic

- hydatid disease in an endemic area. *Acta Chir Belg.* 2005;105(2):198-202.
17. Keong B, Wilkie B, Sutherland T, et al. Hepatic cystic echinococcosis in Australia: an update on diagnosis and management. *ANZ J Surg.* 2018;88(1-2):26-31.
  18. Malik AA, Bari SU, Amin R, et al. Surgical management of complicated hydatid cysts of the liver. *World J Gastrointest Surg.* 2010;2(3):78-84.
  19. Dziri C, Haouet K, Fingerhut A. Treatment of hydatid cyst of the liver: where is the evidence?. *World J Surg.* 2004;28(8):731-6.
  20. Gloor B, Ly Q, Candinas D. Role of laparoscopy in hepatic cyst surgery. *Dig Surg.* 2002;19(6):494-9.
  21. Kern P, da Silva AM, Akhan O, et al. The echinococcoses: diagnosis, clinical management and burden of disease. *Adv Parasitol.* 2017;96:259-369.
  22. Dziri C, Paquet JC, Hay JM, et al. Omentoplasty in the prevention of deep abdominal complications after surgery for hydatid disease of the liver: a multicenter, prospective, randomized trial. *J Am Coll Surg.* 1999;188(3):281-9.
  23. Köksal N, Müftüoğlu T, Günerhan Y, et al. Management of intrabiliary ruptured hydatid disease of the liver. *Hepatogastroenterology.* 2001;48(40):1094-6.
  24. Menten A, Yüzer Y, Ozbal O, et al. Omentoplasty versus introflexion for hydatid liver cysts. *J R Coll Surg Edinb.* 1993;38(2):82-5.
  25. Balik AA, Başoğlu M, Çelebi F, et al. Surgical treatment of hydatid disease of the liver: review of 304 cases. *Arch Surg.* 1999;134(2):166-9.
  26. Manterola C, Roa JC, Urrutia S, et al. Treatment of the residual cavity during hepatic hydatidosis surgery: a cohort study of capitonnage vs. omentoplasty. *Surg today.* 2013;43(12):1412-8.
  27. Muftuoglu MT, Köksal N, Topaloglu U. The role of omentoplasty in the surgical management of remnant cavity in hepatic hydatid cyst. *HPB (Oxford).* 2005;7(3):231-4.
  28. Tuxun T, Zhang JH, Zhao JM, et al. World review of laparoscopic treatment of liver cystic echinococcosis—914 patients. *Int J Infect Dis.* 2014;24:43-50.
  29. Jerraya H, Khalfallah M, Osman SB, et al. Predictive factors of recurrence after surgical treatment for liver hydatid cyst. *Surg Endosc.* 2015;29(1):86-93.