

# Surgical Treatment Approaches of Hepatic Cysts: A Review

<sup>1</sup>Ali Khalid Alkhalidi, <sup>2</sup>Khalaf Safar Saeed Alghamdi,  
<sup>3</sup>Ahmed Essa Abdulaziz Alkhalidi, <sup>4</sup>Abdulrahman Nasser Abdulrahman Alfayyadh,  
<sup>5</sup>Mohammed Ahmed Abdulrahman Alfayyadh

---

**Abstract:** The objective of this comprehensive review study was to focus on the different surgical intervention for treatment of different types of hepatic cysts. Also to discuss the different types of cysts and most common types. We comprehensively searched PubMed, EMBASE, and the Cochrane Library for studies involving humans surgically treated for any type of hepatic cyst, and published in English up to November 2016. Every references of chosen article were screened for more relevant studies which can be useful for our review. When laparoscopic surgical procedure, both traditional and also radical, is performed for hepatic cysts, there should be no concession in the concept of staying clear of cyst material spilling as well as maintaining the integrity of the cyst wall. The reported reappearances for open surgery arrays from 0% to 4.5% in different studies, however the reported collective recurrence rate is 1.1% for the laparoscopic therapy of liver cysts. Indicating the safety of these procedures in selected patients. The advantages for patients consist of excellent cosmetic results and also a much shorter health center keep. It shows up that the price is lower complying with radical procedures as a result of much better control of the recurring cavity as well as neighborhood reoccurrence. However, the radical approach is normally reserved for peripherally located cysts; if taken care of incorrectly, this strategy may create major bleeding and hence conversion.

**Keywords:** surgical intervention, types of hepatic cysts.

---

## 1. INTRODUCTION

Hepatic cysts are characteristically split right into parasitic and also non-parasitic types, with the last being the most prevalent globally. Huge hepatic cysts have the tendency to be symptomatic, and could cause issues regularly than smaller sized ones <sup>(1)</sup>. Liver cysts are likewise classified as false or real, based upon the existence or absence of epithelial lining. True cysts include congenital cysts, straightforward cysts, cysts caused by Echinococcus granulosus as well as multilocularis tapeworms, neoplastic cysts (e.g., cystadenoma, cystadenocarcinoma, cyst sarcoma, squamous cell cancer, and metastatic ovarian, pancreatic, colon, neuroendocrine and renal cancers), and biliary duct-related cysts (Caroli's disease, bile air duct duplication, and also peribiliary cysts). False cysts could be triggered by spontaneous intrahepatic hemorrhage, post-traumatic hematoma, or intrahepatic biloma <sup>(1,2)</sup>. The pathogenesis of liver cysts is not clear. Simple liver cysts are hereditary. They are generally stable in size overtime, however might slowly raise in dimension as well as periodically come to be symptomatic as a result of mass effect, rupture, infection, or hemorrhage <sup>(2)</sup>. Historically, therapy of symptomatic hepatic cysts needed laparotomy, yet today, cyst unroofing can be effectively carried out laparoscopically <sup>(3)</sup>. Unscientific reports of laparoscopic therapy came to be typical by the mid-1990s, and the laparoscopic strategy is presently considered the requirement of care <sup>(4)</sup>. As compared with laparotomy, this technique is connected with less postoperative pain and also impairment, shorter period of healthcare facility keep, and also exceptional cosmetic results <sup>(4)</sup>.

The medical indicator needs to be connected to the presence of the biliary cysts and not to other concomitant pathologies (gastro-esophageal reflux, cholelithiasis, etc.). Particularly, in a lot of cases the hepatic cysts or the polycystosis are asymptomatic. Subsequently, it is fundamental to define with certainty the nature of the straightforward hepatic cysts, by

excluding a parasitical etiology and also the uncertainty of malignancy. This is accomplished by assessment of the consistency of the cystic wall surface, densitometric characteristics of the web content, and characteristics of the surrounding hepatic parenchyma. Along with the preoperative study, serology for echinococcosis and also investigation of tumor pens need to be performed. Ultimately, it has to be figured out that the surgical sign is for cystic hepatic sores that are accountable for the professional circumstance and that they are non-neoplastic as well as absolutely nonparasitic. When the medical sign is established, it is required to choose the type of therapy. Nonsurgical treatments were proposed for basic cysts; percutaneous aspiration, sometimes executed, has no healing role since regressions reach the 100% degree<sup>(5,6)</sup>. Percutaneous aspiration, followed by the injection of 95% ethanol or other sclerosing compounds, is likewise followed by a high occurrence of relapses<sup>(6,7)</sup>.

The objective of this comprehensive review study was to focus on the different surgical intervention for treatment of different types of hepatic cysts. Also to discuss the different types of cysts and most common types.

## 2. METHODS

We comprehensively searched PubMed, EMBASE, and the Cochrane Library for studies involving humans surgically treated for any type of hepatic cyst, and published in English up to November 2016. Every references of chosen article were screened for more relevant studies which can be useful for our review.

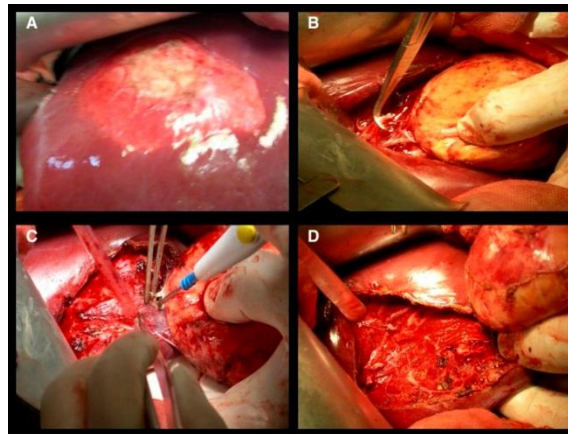
## 3. RESULTS

### **Surgical approach for treatment of hepatic cystic echinococcosis (CE):**

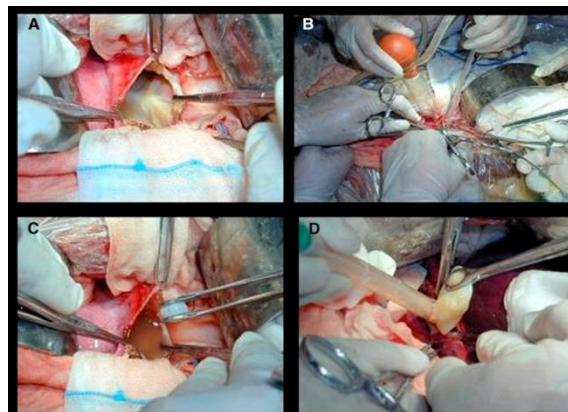
Surgical management of echinococcal cysts, the majority of typically with partial and total cystectomy, has actually long been thought about the definitive cure for CE<sup>(8,9)</sup>. Requirement of care also for a medical method includes pre- and postprocedure adjunctive medicine treatment to stop secondary seeding of the peritoneal cavity in case of a rupture. According to WHO guidelines, therapy with albendazole or mebendazole need to be begun four days before surgical procedure, as well as proceeded after for at least one month with albendazole as well as for three months with mebendazole<sup>(10)</sup>. There are several techniques to the surgical removal, yet all should accomplish two goals: cyst removal and also obliteration of the tooth cavity. If spillage happens, instant washout of the abdominal muscle need to be executed with hypertonic saline and also a scoliocidal agent, complied with by a much longer period of postprocedure mebendazole treatment, as much as 6 months in some cases<sup>(11,12)</sup>. Importantly, an absence of cysto-- biliary interactions must be verified prior to use hypertonic saline to avoid complications, such as sclerosing cholangitis and pancreatitis. This can be achieved with using intraoperative dyes as well as, if discovered, careful repair of such interactions<sup>(12)</sup>. Strategies vary from radical resection to easy cyst resection, however each case varies depending upon area, number of cysts, as well as architectural problems, with the excellent strategy being entire, basic resection without tear<sup>(13)</sup>. Other approaches vary from a more radical pericystectomy, all the way to a traditional method that includes cut and also water drainage of cystic liquid, injection of a scoliocidal representative, as well as goal of cyst contents with pericystic tissue elimination. An open overall pericystectomy makes use of protoscolicidal agents to disinfect the cyst, followed by removal of the pericystic tissue and also contents. In contrast, a shut, complete pericystectomy entails elimination of the cyst without opening it. A more recent surgical strategy called subadventitial cystectomy has actually been established for liver hydatid disease<sup>(14,15)</sup>. The pericyst is a combination of 2 tissue layers, namely the adventitial layer to the liver parenchyma as well as the exocyst layer in the direction of the parasitical cyst. The room between could quickly be separated, as a result protecting the layer adjacent to the liver parenchyma as well as resulting in fewer issues from structural damages and bleeding. The research done by Chen et alia<sup>(16)</sup> revealed that subadventitial cystectomy, when compared with pericysectomy (both full and partial) and also hepatic resection, caused fewer difficulties, less health center days, and also reduced bloodsucker concern as noted with lowered lotion Ig degrees when adhered to one year postoperatively.

In the last 2 researches<sup>(15,16)</sup>, the treatments for subadventitial cystectomy, pericystectomy, partial pericystectomy, as well as radical hepatic resection remained in accordance with those in The Principles for Diagnosis as well as Treatment of Human Hydatid Disease by the Ministry of Health of China. The treatments, including getting informed permission, were performed in accordance with the Ethical Committee on Human Experimentation of Xinjiang Medical University. The operations are shown in (**Figures 1 - 3**), and the key steps are described. Quickly, hepatic resection was performed using a physiological approach based upon Couinaud's category (**Figure 3**). Pericystectomy and also partial pericystectomy (**Figure 2**) were executed in patients with bilateral liver involvement or portal vein/inferior vena cava involvement. In

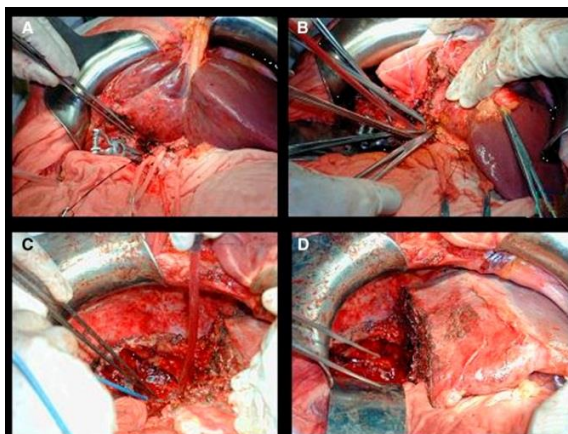
these procedures, the cyst roof was opened, and afterwards, the cyst liquid and contents were evacuated by unfavorable pressure suction. The recurring dental caries was washed by hypertonic saline and afterwards drained pipes to avoid abscess or bilioma. In subadventitial cystectomy, the tiny void in between the liver parenchyma and also the outer membrane layer of the cyst was separated from as well as entirely peeled the cyst by enucleation (**Figure 1**)<sup>(15,16)</sup>. According to numerous recent records, there has been a progressive boost in surgical strategies due to less relapses as compared to clinical treatment, as well as less postoperative problems as well as connected mortality<sup>(12)</sup>. On the other hand, some studies have actually shown a greater morbidity and also death with surgical therapy strategies, in addition to a relapse price of 2 - 25%<sup>(10,17)</sup>. This has moved the focus of first-line monitoring to less-invasive treatments, thus scheduling surgery for complex cases entailing multiple cysts, tear, blood loss, fistula formation, as well as compression.



**Figure 1: Subadventitial cystectomy.**



**Figure 2: Total or partial pericystectomy. (A)** The cyst is opened after the cyst fluid had been aspirated with a 20-gauge needle syringe to reduce the pressure. **(B)** Suction apparatus is inserted into the cyst for complete aspiration of the cyst fluid.



**Figure 3: Hepatic resection. (A)** Parasite cysts occupying a major part of a liver lobe (in this case, the right lobe). **(B)** The main vessels are separated from each other. **(C)** The right lobe is removed along with the cyst. **(D)** A drainage tube is placed

**Percutaneous aspiration injection and reaspiration (PAIR) for hepatic cysts:**

This less-invasive approach uses ultrasound or CT-guided aspiration of the cystic fluid. It plays an essential role for both confirmations of diagnosis as well as restorative treatment. Nonetheless, PAIR is not suitable for all cyst types. Prior determination of the number of areas as well as the visibility of child cysts is essential for successful treatment with this strategy<sup>(18)</sup>. Signs for PAIR consist of WHO-IWGE classification CE1 and also CE3a cysts (solitary compartment cysts) < 5 cm that have not responded well to clinical therapy, and also in combination with clinical treatment for cysts > 5 cm<sup>(17,19)</sup>. Contraindications for PAIR include percutaneously inaccessible cysts, shallow cysts as a result of a risk of spilling, cysts interacting with biliary structures, inactive cysts, and also complex multiseptated cysts<sup>(20)</sup>.

The treatment involves goal, injection of scolicidal agent, and the reaspiration of materials. The fluid that is initially aspirated is reviewed for feasible proctoscolices, which verifies the medical diagnosis. It is also evaluated for biliary - cystic communication by screening for the presence of bilirubin in the fluid, which could also be identified before PAIR making use of cholangiography or endoscopic retrograde cholangiopancreatography.<sup>2</sup> The scolicidal agent that is injected is left for roughly 15 mins, after which there is separation of the germinal membrane layer from the bordering cyst. Currently, 3 options are most frequently made use of: 70 - 95% ethanol, 15 - 20% hypertonic saline, or cetrime option<sup>(10)</sup>. The procedure also includes close tracking for issues of anaphylaxis. Treatment with albendazole or mebendazole 4 hrs prior to the treatment need to be continued for one month postoperatively for albendazole, and for three months with mebendazole. This pre- as well as post-treatment reduces the risk for reappearance and also additional intraperitoneal seeding<sup>(10,17)</sup>. Post-PAIR, serial sonographic imaging is performed to monitor the patient's response. A great action is established by the visibility of one or more of the following factors: reduction in the size of the cavity, boosted wall calcification, enhanced areas of solidification in the cyst, and boosted echogenicity of the cyst (regular with a pseudomass look)<sup>(21,22)</sup>. In a meta-analysis research that contrasted 769 patients undertaking PAIR plus mebendazole or albendazole to 952 patients that underwent surgical procedure, far better professional and also parasitologic treatment was observed with PAIR plus radiation treatment, in addition to lower rates of morbidity, considerably fewer healthcare facility days (2.4 d vs 15 d), and also reduced disease reappearance prices<sup>(23)</sup>. In addition, problems of anaphylaxis, cyst infection, biliary fistula, and intra-abdominal abscess happened much more regularly in the surgical population.

**Surgical treatment non-parasitic hepatic cysts:**

Non-parasitic cystic disease of the liver occurs in as much as 5 - 10% of the population, with a sharp surge in occurrence with age<sup>(24)</sup>. The pathogenesis is connected to the kind of cyst. Easy cysts could be multiple or solitary, are lined by cuboidal epithelium and are believed to occur from the unusual development of intrahepatic bile air ducts in utero<sup>(25)</sup>. Polycystic liver disease (PCLD) is an autosomal dominant disease identified by mutations on two genetics on chromosome 19<sup>(26)</sup>. Patients with PCLD might likewise have cysts in other body organs, particularly the kidneys. Neoplastic cysts (benign biliary cystadenocarcinomas and also biliary cystadenomas) are obtained, yet the reason is unknown. Terrible cysts are additionally obtained as well as result from bile leak from a hurt intrahepatic bile air duct after injury<sup>(26)</sup>.

Most of patients with non-parasitic hepatic cysts are asymptomatic and the cysts may be located incidentally at laparotomy or with abdominal imaging. Nevertheless, 5% of patients are symptomatic as well as existing with non-specific signs such as pain, nausea or vomiting, vomiting, very early satiation or heartburn. Hardly ever, cysts could provide as a result of complications such as haemorrhage, tear, infection, torsion, portal hypertension, hatred and obstructive jaundice<sup>(27,28,29,30)</sup>. In symptomatic or complex situations, it is usual to interfere and also the treatments offered consist of percutaneous desiccation with ethanol shot, laparoscopic deroofing, open deroofing, hepatic resection and liver transplant. There is considerable dispute regarding which procedure is more effective<sup>(31)</sup>. Laparoscopic deroofing was first reported in 1991<sup>(32)</sup>, as well as most research studies seem to agree that it is the treatment of selection for basic cysts. Nevertheless, reoccurrence prices vary substantially, from 0% to 25%<sup>(33,34)</sup>. Various other researches have actually recommended that open deroofing and also resection are much better procedures<sup>(35,36)</sup>. There is no approved finest method for the treatment of patients with PCLD. In these patients, laparoscopic deroofing leads to reoccurrence prices of 60% to 100%, whereas resection and transplantation have lower reoccurrence rates, yet are associated with significantly higher morbidity prices<sup>(37,38)</sup>.

#### 4. CONCLUSION

When laparoscopic surgical procedure, both traditional and also radical, is performed for hepatic cysts, there should be no concession in the concept of staying clear of cyst material spilling as well as maintaining the integrity of the cyst wall. The reported reappearance price for open surgery arrays from 0% to 4.5% in different studies, however the reported collective recurrence rate is 1.1% for the laparoscopic therapy of liver cysts. Indicating the safety of these procedures in selected patients. The advantages for patients consist of excellent cosmetic results and also a much shorter health center keep. It shows up that the price is lower complying with radical procedures as a result of much better control of the recurring cavity as well as neighborhood reoccurrence. However, the radical approach is normally reserved for peripherally located cysts; if taken care of incorrectly, this strategy may create major bleeding and hence conversion.

#### REFERENCES

- [1] Regev A, Reddy KR, Berho M, Sleeman D, Levi JU et al. (2001) Large cystic lesions of the liver in adults: a 15-year experience in a tertiary center. *J Am Coll Surg* 193: 36-45. doi:10.1016/S1072-7515(01)00865-1.
- [2] Blonski WC, Campbell MS, Faust T, Metz DC (2006) Successful aspiration and ethanol sclerosis of a large, symptomatic, simple liver cyst: case presentation and review of the literature. *World J Gastroenterol* 12: 2949-2954.
- [3] Amendolara M, Bucca D, Barbarino C, Romano MF, Marino G, Zucchelli M, et al. Surgical management of symptomatic simple hepatic cysts. *G Chir.* 2012 Jan-Feb. 33(1-2):17-20.
- [4] Gall TMH, Oniscu GC, Madhavan K, Parks RW, Garden OJ. Surgical management and longterm follow-up of non-parasitic hepatic cysts. *HPB : The Official Journal of the International Hepato Pancreato Biliary Association.* 2009;11(3):235-241.
- [5] Kairaluoma MI, Leinonen A, Stahlberg M, Paivansalo M, Kiviniemi H, Siniluoto T. Percutaneous aspiration and alcohol sclerotherapy for symptomatic hepatic cysts. An alternative to surgical intervention. *Ann Surg.* 1989;210:208–15.
- [6] Montorsi M, Torzilli G, Fumagalli U, Bona S, Rostai R, De Simone M, et al. Percutaneous alcohol sclerotherapy of simple hepatic cysts. Results from a multicentre survey in Italy. *HPB Surg.* 1994;8:89–94.
- [7] Caremani M, Vincenti A, Benci A, Sassoli S, Tacconi D. Echographic epidemiology of non-parasitic hepatic cysts. *J Clin Ultrasound.* 1996;21:115–118.
- [8] Tuxun T, Zhang JH, Zhao JM, Tai QW, Abudurexti M, Ma HZ, et al. World review of laparoscopic treatment of liver cystic echinococcosis—914 patients. *Int J Infect Dis.* 2014;24:43–50. doi: 10.1016/j.ijid.2014.01.012.
- [9] Junghans T, da Silva AM, Horton J, Chiodini PL, Brunetti E. Clinical management of cystic echinococcosis: state of the art, problems, and perspectives. *Am J Trop Med Hyg.* 2008;79:301.
- [10] Brunetti E, Kern P, Vuitton DA. Writing Panel for the WHO-IWGE. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. *Acta Trop.* 2010;114:1–16.
- [11] Paksoy Y, Odev K, Sahin M, Arslan A, Koç O. Percutaneous treatment of liver hydatid cysts: comparison of direct injection of albendazole and hypertonic saline solution. *Am J Roentgenol.* 2005;185:727–734. doi: 10.2214/ajr.185.3.01850727.
- [12] Smego R, Sebanego P. Treatment options for hepatic cystic echinococcosis. *Int J Infect Dis.* 2005;9:69–76.
- [13] Tuxun T, Zhang JH, Zhao JM, Tai QW, Abudurexti M, Ma HZ, et al. World review of laparoscopic treatment of liver cystic echinococcosis—914 patients. *Int J Infect Dis.* 2014;24:43–50. doi: 10.1016/j.ijid.2014.01.012.
- [14] Lv H, Jiang Y, Peng X, Zhang S, Wu X, Yang H, et al. Total subadventitial cystectomy for the treatment of 30 patients with hepatic hydatid cysts. *Chin J Gen Surg.* 2002;17:529–530.
- [15] Peng X, Li J, Wu X, Zhang S, Niu J, Chen X, et al. Detection of Osteopontin in the pericyst of human hepatic *Echinococcus granulosus*. *Acta Trop.* 2006;100:163–171. doi: 10.1016/j.actatropica.2006.08.013.
- [16] Chen X, Chen X, Shao Y, Zhao J, Li H, Wen H. Clinical Outcome and Immune Follow-Up of Different Surgical Approaches for Human Cyst Hydatid Disease in Liver. *Am J Trop Med Hyg.* 2014;91:801–805. doi:

10.4269/ajtmh.14-0177.

- [17] McNanus D, Gray D, Zhang W, Yang Y. Diagnosis, treatment, and management of Echinococcosis. *BMJ*. 2012;344:e3866. doi: 10.1136/bmj.e3866.
- [18] Golemanov B, Grigorov N, Mitova R, Genov J, Vuchev D, Tamarozzi F, et al. Efficacy and Safety of PAIR for Cystic Echinococcosis: Experience on a Large Series of Patients from Bulgaria. *Am J Trop Med Hyg*. 2011;84:48–51.
- [19] Beggs I. The radiology of hydatid disease. *Am J Roentgenol*. 1985;145:639–648. doi: 10.2214/ajr.145.3.639.
- [20] Marani SA, Canossi GC, Nicoli FA, Alberti GP, Monni SG, Casolo PM. Hydatid disease: MR imaging study. *Radiology*. 1990;175:701–706. doi: 10.1148/radiology.175.3.2343117.
- [21] Rajesh R, Dalip D, Anupam J, Jaisiram A. Effectiveness of Puncture-Aspiration-Injection-Reaspiration in the Treatment of Hepatic Hydatid Cysts. *Iran J Radiol*. 2013;10:68–73.
- [22] Rinaldi F, Brunetti E, Neumayr A, Maestri M, Goblirsch S, Tamarozzi F. Cystic echinococcosis of the liver: A primer for hepatologists. *World J Hepatol*. 2014;6:293–305.
- [23] 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. doi: 10.1086/378275.
- [24] Cowles RA, Mulholland MW. Solitary hepatic cysts. *J Am Coll Surgeons*. 2000;191(3):311–321.
- [25] Drenth JPH, Martina JA, Van de Kerkhof R, Bonifacino JS, Jansen JB. Polycystic liver disease is a disorder of cotranslational protein processing. *Trends Mol Med*. 2005;11(1):37–42.
- [26] Flagg RS, Robinson DW. Solitary nonparasitic hepatic cysts: report of oldest known case and review of the literature. *Arch Surg*. 1968;95:964–973.
- [27] Chan CY, Tan CH, Chew SP, Teh CH. Laparoscopic fenestration of a simple hepatic cysts. *Singapore Med J*. 2001;42(6):268–270.
- [28] Gesundheit N, Kent DL, Fawcett HD, Effron MK, Maffly RH. Infected liver cyst in a patient with polycystic kidney disease. *West J Med*. 1982;136:246–249.
- [29] Davis CK, Schoffstall RO, Glass TF. Fatal complication of hepatic cystic disease. *South Med J*. 1981;74:1409–1411.
- [30] Ratcliffe PJ, Reeders S, Theaker JM. Bleeding oesophageal varices and hepatic dysfunction in adult polycystic kidney disease. *Br Med J*. 1984;288:1330–1331.
- [31] Paterson-Brown S, Garden OJ. Laser-assisted laparoscopic excision of liver cyst. *Br J Surg*. 1991;78(9):1047.
- [32] Zalaba Z, Tihanyi TF, Winternitz T, Nehez L, Flautner L. The laparoscopic treatment of non-parasitic liver cysts. Five years experience. *Acta Chir Hung*. 1999;38(2):221–223.
- [33] Gigot JF, Legrand M, Hubens G, de Canniere L, Wibin E, Deweer F, et al. Laparoscopic treatment of nonparasitic liver cysts: adequate selection of patients and surgical technique. *World J Surg*. 1996;20:556–561.
- [34] Pitale A, Bohra AK, Diamond T. Management of symptomatic liver cysts. *Ulster Med J*. 2002;71(2):106–110.
- [35] Tocchi A, Mazzoni G, Costa G, Cassini D, Bettelli E, Agostini N, et al. Symptomatic nonparasitic hepatic cysts. *Arch Surg*. 2002;137:154–158.
- [36] Morino M, De Giuli M, Festa V, Garrone C. Laparoscopic management of symptomatic nonparasitic cysts of the liver. Indications and results. *Ann Surg*. 2019;219(2):157–164.