

Outcome of radical surgery in management of liver hydatid cysts a study at gastrointestinal & Hepatology Teaching Hospital

*Dr. Rafid Monneir Shakir

**Dr. Hasanain Talib Essa

***Dr. Raafat R. Ahmed

ABSTRACT

Background: Hydatid disease, or Echinococcosis, is a zoonosis that occurs primarily in sheep-raising areas of the world. It is common in IRAQ & most countries of the Middle East. **Aim of the study:** A combined retrospective & prospective study of (22) patients with hepatic hydatid cysts that treated with radical surgery are studied in all aspects. The outcome was compared with the national and international studies. **Patients & methods:** This study was based on data collected from patients, admitted and treated surgically for hepatic hydatid cyst, at gastrointestinal & Hepatology Teaching Hospital in Baghdad & studied retrospectively & prospectively for the period from (Jan.2011-Jan.2015). Patients were evaluated by history, clinical examination, investigations (CBP, Liver function tests, bleeding profile, abdominal ultrasound, Chest X ray & CT scan) done for all cases. MRI, MRCP, ERCP, were done for some patients when indicated. **Results:** There were 14 females and 8 males. The mean age of the patients was (34.5y). Two (9.1%) patients were asymptomatic, While 20 (91%) were symptomatic. Upper abdominal pain was the most common presenting symptom in 59% of patients. Most of the cysts were in segment 2&3 (60.5%). Most of patients had one cyst (45.5%). The cysts measuring between (5-10cm) in diameter were the commonest & presents (71.1%) patients. Most cysts (39.5%) were CE3, followed by CE4 (31.6%). Jaundice as a presenting feature occur in 6 (27.3%) patients, with ERCP done in 5 (22.7%) of cases. The liver was the only involved organ in 81.8% of cases. The treatment was by radical surgery alone or with addition of medical treatment. total pericystectomy used in (45.5%) patients. Left lateral sectionectomy in 6 (27.3%) patients, two of these cases associated with splenic hydatid cysts, one treated with Splenectomy & other treated with total pericystectomy of the splenic hydatid cysts. Left hepatectomy done in 4 (18.2%) & Right hepatectomy in two (9.1%) patients. The common postoperative complications were: chest infection (18.2%), sub hepatic collection (13.6%), & bile leak (13.6%). There was one mortality in this study due to pulmonary embolism, with no recurrence in the six month postoperative follow up.

Conclusions:

- Most patients are young, presented with abdominal pain. Liver is the commonest involved organ. Segment 2&3 are the most commonly involved segments. Preoperative ERCP done for jaundiced patients in 22.7% of cases. Recurrent presentation occurs in 27.3%. Total pericystectomy, Left lateral sectionectomy, Left hepatectomy were the commonest procedures used with low morbidity and can be recommended in the management of hepatic hydatid cysts.

- Radical surgery for liver hydatid cyst can be done safely in specialist centers & by well trained surgeons, with accepted morbidity & mortality & low recurrence rate.

Introduction:

Hydatid disease is one of the oldest diseases known to man, the word Hydatid is Latin in origin (**hyadatis**) meaning a drop of water ¹. **Leuchart (1867)** was the first to give a complete & accurate account of the life cycle & morphology of parasite ². In recent years laparoscopic surgical techniques to treat hydatid disease of the liver have been gradually introduced ³. Hydatid disease is a zoonotic infection that has a world-wide distribution ⁴. It is endemic in many cattle raising regions of the Mediterranean and Middle East countries (including IRAQ), Far East,

South America, Australia & certain areas of North America ^{5,6}. Germinative layer of the cyst advances toward the external layer (adventitia), which leads to some daughter cyst formation outside the cyst inner cavity known as exogenous daughter cyst (EDC) ^{7,8,9}. The EDCs if not treated are one of the disease recurrence causes which might not be visible if the external layer would not been removed entirely. (Fig.1,2,3,4) ¹⁰.

* M.B.Ch.B, F.I.C.M.S, C.A.B.S./Gastroenterology and Hepatology Teaching Hospital - Medical City, Baghdad

**C.A.B.S./Gastroenterology and Hepatology Teaching Hospital - Medical City, Baghdad

***F.I.B.M.S(Dig. Surg.); C.A.B.S; F.I.B.M.S(Gen.Surg.)/Gastroenterology and Hepatology Teaching Hospital - Medical City, Baghdad

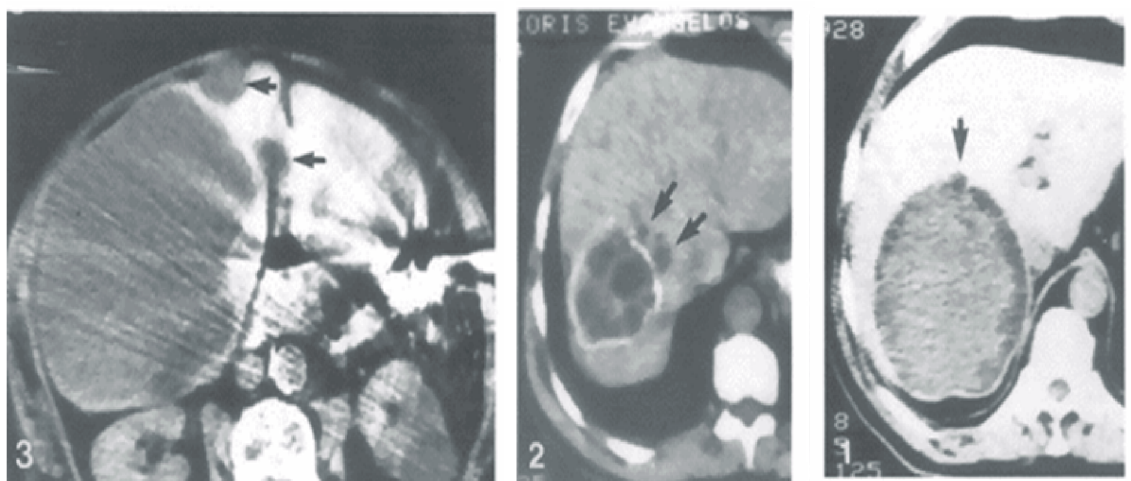


Fig. 1. A large hydatid cyst in the right lobe of the liver with multiple daughter cysts (0.5–1.5 cm in size) arranged in the periphery under the maternal cyst wall. Anteriorly one of these is located exterior to the maternal cyst wall (*arrow*). No difference in appearance exists between the extracapsular and endogenous daughter cysts. Both have much lower densities than the fluid content of the maternal cyst.

Fig. 2. A hydatid cyst with multiple endogenous daughter cysts in the liver. Two extracapsular cysts measuring 1.5 and 0.8 cm in contact with the antero-medial wall of the maternal cyst (*arrows*). The endogenous and extracapsular daughter cysts have the same appearance.

Fig. 3. A very large hydatid cyst in the right lobe of the liver. Two (extracapsular) cysts are seen, 2–3 cm in size (*arrows*).

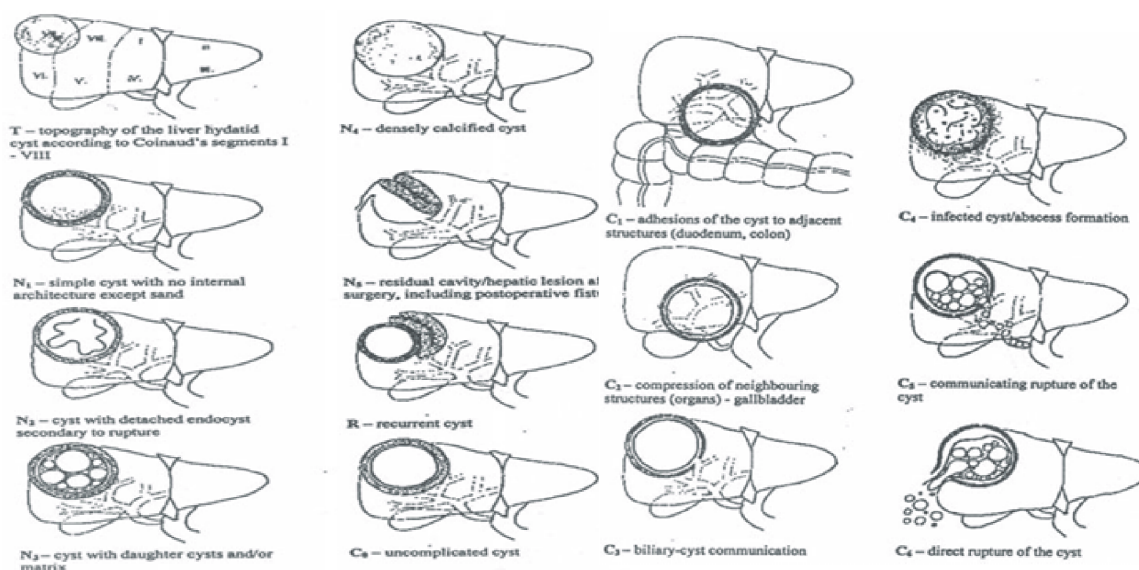
Fig. 4. A very large hydatid cyst in the liver with an endogenous daughter cyst (*white arrowhead*) and an extracapsular cyst (*black arrow*) in contact with the anterior wall of the maternal hydatid cyst.

Classifications of hydatid disease:

- I. There is another classification (**GHARBI**):
Which describe the pathognomonic characteristics and ultrasonographic signs of hydatid liver disease
- II. World Health Organization Classifications of Hydatid Cysts (2003).¹¹

World Health Organization Classifications of Hydatid Cysts

Cyst Type	Status	Ultrasound Features	Remarks
CL	Active	Signs not pathognomonic, unilocular, no cyst wall	Usually early stage, not fertile; differential diagnosis necessary
CE 1	Active	Cyst wall, hydatid sand	Usually fertile
CE 2	Active	Multivesicular, cyst wall, rosette-like	Usually fertile
CE 3	Transitional	Detached laminated membrane, water-lily sign, less round, decreased intracystic pressure	Starting to degenerate, may produce daughter cysts
CE 4	Inactive	Heterogeneous hypoechogenic or hyperechogenic degenerative contents; no daughter cysts	Usually no living protoscolices; differential diagnosis necessary
CE 5	Inactive	Thick, calcified wall, calcification partial to complete; not pathognomonic, but highly suggestive of diagnosis	Usually no living protoscolices

TN(R)C (topography, nature, recurrent, complication) classification.¹²

Complications:

- Compression
- Cyst Infection
- Rupture into the Biliary Tract
- Rupture into the Bronchial Tree
- Rupture into Other Cavities or Organs: including stomach, duodenum, pericardium & large vessels, including the inferior vena cava, have also been described.¹³

Treatment:

1. Medical treatment with (BENZIMEDAZOLE COMPOUNDS): It is used alone or combined with Surgical treatment. When cyst can't be removed, it's a valid alternative treatment to surgery.

* Albendazole:

* Praziquantel:

1. Percutaneous Treatment:

Three different techniques The first is the **PAIR technique** described by Ben Amor and associates (1986). PAIR is an acronym for *p*uncture, *a*spirin of cyst content, *i*njection of protoscolicidal solution, and *r*easpiration of the fluid.

3. Surgical Treatment:**I. Conservative surgery**

1. Endocystectomy &

2. Partial pericystectomy [with, or without obliteration of the residual cavity].¹⁴

II. Radical Surgery:

1. Total cystopericystectomy Also called radical cystectomy, capsulectomy, total pericystectomy, and cystopericystectomy, pericystectomy involves complete removal of the hydatid cyst. By creating a surgical plane just outside the pericyst layer without opening the cyst, the parasite and the adventitial layer are excised en bloc. No clear anatomic plane exists, although the surgical approach of this plane does not differ from a classic liver parenchymal transection. The Cavitron ultrasonic aspirator is used to isolate the vessels and biliary ducts that are deviated and compressed by the cyst, and the parenchymal transection allows the suture of these vessels and bile ducts within the liver parenchyma. The aspirator should be used away from the pericyst to avoid fracture of the cyst, which can be responsible for spillage of the cyst contents. Pericystectomy must be avoided for a cyst impinging on the major hepatic veins, inferior vena cava, or the liver hilum. On occasion, circumstances dictate a modified approach, and the surgeon may need to use a hybrid technique that uses both cystectomy with evacuation of hydatid contents and partial pericystectomy to resect peripheral liver parenchyma.¹³

2. Liver resection

a. Anatomical resection.

b. Non-anatomical resection. The indications for a formal hepatic resection for liver hydatid cysts are infrequent. Hepatic resection is the only surgical therapy for *E. multilocularis*, but it is inappropriately radical for *E. granulosus*. Other rare indications for liver resection are when the remaining parenchyma of a liver lobe is atrophic as a result of biliary obstruction, or when a large bile leak that cannot be

safely managed with a Roux loop is present. Resection should be reserved for peripherally placed cysts, usually in the left lateral segment; for pedunculated lesions; or for extrahepatic intra-abdominal cysts. Resection of small, pedunculated, and peripherally placed cysts is simple and safe, but in the majority of cases, cystectomy involves a major liver resection with its attendant increase in operative risk. Correct judgement is crucial because the operation may be complex as a result of distorted anatomy. Radical surgery should not be standard procedure in the management of *E. granulosus*. In addition, a standard hepatic resection should not be done in patients with large cysts that occupy the greater portion of the right lobe because the medial wall of such a cyst often involves the inferior vena cava and displaces the hepatic veins. Attempts to dissect outside the cyst are hazardous and unnecessary. Surgery for hydatid disease is done predominantly by general surgeons, frequently with limited resources. Surgeons who do not have extensive training and experience in liver resections should not be tempted to resect for hydatid disease. Meticulous and careful conservative surgery for this benign disease gives good results, and unnecessary operative mortality will certainly outweigh the merits of totally removing the cyst.¹³

III. Laparoscopic:

Although the laparoscopic approach to this disease offers some advantages, laparoscopic hydatid surgery has not gained a wide acceptance. Disadvantages of the laparoscopic approach are the limited area for manipulation, intricacy in controlling spillage during puncture, and difficulty in aspirating the thick, degenerated cyst contents. No prospective randomized clinical trials have compared laparoscopic treatment with conventional open treatment, and no reliable data are available on recurrence rates after laparoscopic treatment.

Patients & Methods:

Twenty two cases of hepatic hydatid disease (38 cysts) out of (174) patients with liver hydatid, were treated by radical surgery & studied retrospectively & prospectively at gastrointestinal & Hepatology Teaching Hospital in Baghdad for the period from (Jan.2011-Jan.2015). Cases collected were received as referral from other hospital surgical clinics & private clinics. Data were collected from patients &

medical records, a special formula sheet was filled for each patient which includes demographic information (age, gender, occupation, residence), as well as medical history, physical examination, investigations, operative management & early postoperative care. Surgical findings include information about site, size, nature & number of cysts in the involved organ. Surgical procedures, the recurrent cases, concomitant extra-hepatic infestation, morbidity & mortality were studied. All patients were evaluated by history interpretation regarding their occupation, residency (urban or rural), main complaint to seek medical advice, other related symptoms and past history of same problem. Patients were examined for their general condition and abdominally for a palpable mass. Proper examination of the abdomen & other organs was done to detect other affected organs and to decide patient's fitness for surgery. The study includes only patients who had radical surgery for their pathology. All patients were investigated by the following: Complete blood picture & ESR, Liver function tests, bleeding profile. Blood urea, serum creatinine, blood sugar and ECG, abdominal ultrasound, chest x-ray & CT scan were done for all patients. Plain X ray of the abdomen, MRI, MRCP, ERCP and pulmonary function tests were done for patients as indicated. All patients were admitted to the surgical ward & treated surgically. Medical treatment with antihelminthic drugs (Albendazole) in the perioperative period was given according to the general guidelines. Under general anesthesia, patients were explored through a suitable incision. Information about surgical procedure was documented. All patients were followed post-operatively until their discharge & for six months later. During their stay, post-operative complications were collected.

Surgical technique:

The types of hepatic resection depend on the size and location of the hydatid cyst of the liver. The abdomen was opened by midline or bilateral subcostal incision with or without midline extension. After routine abdominal exploration, the liver was mobilized and pieces of packs soaked in 10% povidone iodine were introduced into the abdominal cavity and placed around the cyst to prevent the spread and leakage of the hydatid fluid. Intraoperative assessment was done to detect the exact site of the cyst or cysts in the liver, and its relation with hepatic vasculature (portal

veins, hepatic arteries, and hepatic veins). The liver resection started by dissection of the hilum of the liver and isolation of the right portal triad or left portal triad depending on the site of the liver resection (right or left respectively). In right hepatectomy, the right side hepatic ligament was dissected and the right hepatic vein was isolated and encircled by tape, left side hepatic ligament dissected and middle and left hepatic veins also encircled in the left hepatectomy. Parenchymal dissection was achieved in our cases by electrocutery, crush clump technique & occasionally by Harmonic Scalpel. Cavitron Ultrasonic Surgical Aspirator (CUSA) not used in these cases. After complete resection the hemostasis was achieved and any minute bile ductules were ligated. Cyst enucleation or adventitia resection done in cases of total pericystectomy.

Results:

Clinical presentation:

two patients (9.1%) were asymptomatic, & were incidentally discovered to have hepatic hydatid disease, while 20 (90.9%) presented with symptoms. All managed as elective cases.

The main presenting clinical features: The most common presenting symptom was abdominal pain in 13 (59.1%) of patients. It was mild intermittent or described as heaviness. Jaundice as a presenting feature was the 2nd

in order & occur in 6 (27.3%) with major biliary communications & intrabiliary rupture, followed by abdominal mass in one patient (4.5%), with two patients were asymptomatic.

ERCP & biliary communications: Jaundice as a presenting feature was the 2nd in order & occur in 6 (27.3%) with major biliary communications & intrabiliary rupture occur in five of them & they treated preoperatively by endoscopic retrograde cholangiopancreatography (ERCP) & endoscopic sphincterotomy (EST). two of jaundiced cases were severe & presented with cholangitis. One of the cases was mild & treated conservatively.

The distribution of hydatid cysts in liver:

From the total of 38 cysts located in the liver, most cysts (23 cysts, 60.5%) were located in segment II & III, followed by segment IV (6 cysts, 15.8%), followed by segment VI (4 cysts, 10.5%), three cysts (7.9%) in segment V, one cyst (2.6%) in segment VII & one cyst (2.6%) in segment VIII. The total right lobe cysts were 9 (23.6%) & the total left liver cysts were 29 (76.3%).

The number of cysts in each patient :

Most of patients had single cyst in 10 (45.5%)

Another 9(40.9%) patients had two cysts, while three cysts were present in two (9.1%) patients. One (4.5%) patient had only four cysts.

The relation between number of the patients & size of cysts: The cysts measuring between (5-10cm) in diameter were the commonest & presents in 27(71.1%) patients, followed by cysts of less than 5cm in diameter which presents in 7(18.4%) patients. Cysts more than 10cm in diameter presents in 4(10.5%) patients.

The classification of the cysts according to WHO: From the total of 38 cysts located in the liver, most cysts (15 cysts, 39.5%) were CE3, followed by CE4 (12 cysts, 31.6%), then CE2 (7 cysts, 18.4%), CE1 (2 cysts, 5.3%), & CE5 (2 cysts, 5.3%).

The distribution of cysts; hepatic & extra hepatic: the liver was the single organ involved in 18(81.8%) patients. Both liver & spleen were involved in two (9.1%) patients, liver & omentum were involved in one (4.5%) patients, Both liver & right kidney were involved in one (4.5%) patients.

Medical treatment (antihelmenthics):

used in our study in 17(77.3%) patients in the postoperative period only, while in 5(22.7%) patients was used in both pre & postoperative periods. In our study, 16 (72.7%) of cases presented for the first time, while 6(27.3%) of patients presents as recurrent cases.

The radical surgical procedures :

The radical procedures used for dealing with the hydatid cysts, were total pericystectomy which was used in 10(45.5%) patients. Left lateral sectionectomy in 6(27.3%) patients, two of these cases associated with splenic hydatid cysts, one treated with Splenectomy & other treated with total pericystectomy of the splenic hydatid cysts. Left hepatectomy done in 4(18.2%), & Right hepatectomy in two (9.1%) patients. the affected segments of the liver were atrophied in all cases that treated by liver resections.

Blood loss & duration of surgery:

The duration of surgery ranging from 90-240 minute (165 ± 75 min.) & the blood loss ranging from 100-2000 milliliter (1050 ± 950 ml.)

Early postoperative complications:

In early post-operative period, the most common complication was chest infection in 4 patients (18.2%), followed by sub hepatic collection which occur in 3 patients (13.6%) & require drainage under US guide.

followed by bile leak in 3 patients (13.6%) which treated conservatively, followed by seroma & wound infection which occur in 2 (9.1%) & one (4.5%) respectively, death occur in one (4.5%) patient in the fifth post-operative day due to pulmonary embolism. Hospitals stay time & drainage duration:

The hospital stay time ranging from 3-6 days (4.5 ± 1.5 D), & the drainage duration ranging from 2-8 days (5 ± 3 D).

Discussion:

In spite of the efforts to control Echinococcosis in many parts of the world, the disease is still frequent in endemic areas; the true incidence of this disease is difficult to estimate, as it is usually asymptomatic in most patients¹⁵. The disease continues to exert a heavy burden on human health in a number of countries, including Egypt and reemerges as a major public health issue, with potentially life-threatening complications¹⁶. The infestation should be suspected in patients who live in rural areas and who present with abdominal pain and hepatomegaly or a palpable hepatic mass. The detection of cysts had increased with the advent and routine use of ultrasonography which, in addition to the diagnosis, provides information about the cyst wall, fluid content and surrounding liver tissues. CT is carried out to further delineate the anatomy and rule out proximity of vital structures. Hepatic hydatid cysts are usually single, uncomplicated and located in the right lobe of the liver. A large series of retrospective multicenteric studies for hydatid cyst of the liver indicated that the most frequent clinical patterns were uncomplicated cysts (82%); remaining present with complicated cysts mass¹⁷. Which treatment modality should be used for liver hydatid cysts is still a subject of controversy. When we look at choice of surgical treatment used, conservative surgery is the most common, then radical surgery, and more recently, laparoscopy. Conservative surgery is recommended for the elderly, deeply located cysts = 10 cm, more than one cyst at the same time, cysts located in both lobes and in the liver posterior segment. Radical surgery can be carried out by experienced surgeons on younger patients, where the cysts are located in the anterior superior liver and in the left lobe lateral segment, those with exophytic location, when the remaining parenchyma of a liver lobe is atrophic as a result of biliary obstruction, or when a large bile leak that cannot be safely managed with a Roux loop is present^(18,19,20). Resection should be reserved for peripherally placed cysts, usually

in the left lateral segment, for pedunculated lesions, or for extra hepatic intra abdominal cysts. Resection of small, pedunculated, and peripherally placed cysts is simple and safe, but in the majority of cases, cystectomy involves a major liver resection with its attendant increase in operative risk. Correct judgment is crucial because the operation may be complex as a result of distorted anatomy. Although the rate of recurrence is lower with radical surgery, application is limited as the associated morbidity and mortality rates are high^(30,31,32). Those who believe in the radical approach (total removal of cyst) credit its less postoperative complications and recurrence^(21,22,23). Bulber's et al²⁴ concluded that outcomes were the same in both approaches but according to Smiths-Mtisen's et al²⁵

the radical approach had more complications. In our study all patients choosed selectively which include mainly complicated cysts, cysts localized to one lobe, & cysts with major biliary communications especially those presented with jaundice & or cholangitis. A compind retrospective & prospective study of (22) patients with hepatic hydatid cysts that treated with radical surgery are studied in all aspects. The outcome was compared with the national and international studies^(26,27,28).

The main presenting symptoms:

The main presenting symptom in our collection was abdominal pain in (59.1%). This pain was described by our patients as mild pain and some as heaviness. Same results had been mentioned by Ibraheemet al²⁹ (Egypt-63 cases) 2012 which was (50.5). The mild symptom is due to the slow growing of hydatid cysts and are even symptomless unless they cause pressure on vital organ or if they rupture spontaneously or because of an injury. Chronic right upper quadrant pain is due to distension of the liver capsule⁶. Other presenting features were cholestatic jaundice (27.3%). Different results had been mentioned in studies of Mohammad Reza³⁰ (India 74 cases) 2010 which was (14%), & that of Roland et al³¹ (Switzerland 78 cases) 2003 which was (4%). This is explained by the small number of our collection in comparison in those studies, with our selection criteria choosing mainly the complicated cases for radical surgery. Asymptomatic cases with incidental finding were 9.1% in our study. Near result was found in study by Ibraheemet al²⁹ (Egypt-63 cases) 2012 which was (12.5%).

ERCP & biliary communications:

Biliary communications are reportedly common in hydatid disease with variable frequencies between 3.5%³² and 19%³³.

Therefore, meticulous attention should be paid to their preoperative detection. Patients who have jaundice or a history of cholangitis, elevated liver enzymes, and dilatation or debris in major bile ducts should be assessed for main bile duct contamination.³⁴ If the bile ducts are evaluated with ERCP before surgery, it is not necessary to perform main duct exploration. Kayaalp and coworkers have shown that hydatid cysts lying around the hilum of the liver had a higher biliary communication rate (48%) than did peripherally located cysts (27%)^{35,36}.

Endoscopic retrograde cholangiopancreatography (ERCP) plays an important role in the diagnosis and management particularly in patients with obstructive jaundice or history of jaundice, recurrent cholangitis, or in patients with recurrent hydatid disease. ERCP & EST were done in 5 (22.7%) patients in this study (all had jaundice and two of them with history of cholangitis) and all cases revealed cystobiliary communication with migration of daughter cysts in biliary tree in 2 patients. These results are consistent with most of the reports which indicates that ERCP and related therapeutic maneuvers are safe and valuable in the management of patients with hepatic hydatid disease^{37,38}.

The classification of the cysts according to WHO :

From the total of 38 cysts located in the liver, most cysts (39.5%) were CE3, which show partial or total detachment of the laminated layer with floating and undulating hyperechogenic membranes showing the dual wall and "water lily," and "water snake" signs, followed by CE4 (31.6%), which show cysts that contain cystic and solid components together without visible daughter cysts. Both are complicated types & conservative surgical approach difficult to cure them. & these results were similar to results had been mentioned by that of Roland et al³⁰ (Switzerland 78 cases) 2003. Ibraheemet al²⁹ (Egypt-63 cases) 2012. & Sami et al³⁵ (Turkey-59 cases) 2010.

Patients presented with recurrent cysts:

Recurrence is likely to be due to residual vesicles left in place, even if cysts were carefully emptied. Vesicles can develop from a main cyst and grow next to it, which is especially the case in older cysts. Recurrences may also develop if peritoneal soiling occurs during emptying of a cyst. Recurrence will become symptomatic 34 years after surgery^{39,40}. Patients presented with recurrent cysts: were 6 (27.3%). This is a high number as compared to study of Mustapha⁴¹ (Morocco) which was 2.12%. This difference may be due to the difference in

methods used for treatment & also due to the fact that the already affected patient or the one who has been treated might continue to live in his endemic environment to become reinfested & to develop a new hydatid cyst in the remaining liver parenchyma⁴².

The radical surgical procedures :

It is widely accepted that radicality of the intervention increases the operative risk, but lowers the like hood of a relapse and vice versa⁴³. Conservative methods are recommended in difficult cases. Some authors believe that radical procedures are time consuming with increasing blood loss and unjustifiable for a benign disease^{44,45}. Advances in liver surgery have occurred over last two decades, hepatectomy has evolved from a rough, hastily and bloody procedure to a refined, deliberate, and relatively bloodless operation. The preoperative assessment for liver resection from anesthetics point view has advanced with advent of surgical tools (CUSA, Harmonic Scalpel, and Organ beam coagulation) and technique of rendering the hepatic resection become a safe procedure.

Applying major hepatic resection for hydatid disease of the liver which has advantage to do hepatic resection without opening the cyst cavity and therefore avoiding the problems of spillage and cavity management. In this study, the multiple cysts of the liver hydatid disease treated by radical surgery. It is advantage to treat the multiple hydatid cysts in one stage, so the hepatectomy can remove all cysts, especially if the cysts are deeply inaccessible position in liver parenchyma. In huge liver hydatid cyst, it is better to resect the whole liver lobe occupied by the hydatid cyst without opening the cyst for fear of rupture. Considering the recurrence rates after operation for liver hydatid cysts, it ranges from 8% - 20%⁴⁴ especially in endemic areas. Multiple operations may be necessary during the course of this benign disease, thus radical operations (hepatectomy) should be performed from the start.

In our study all of the hepatic hydatid cyst, are dealt with by radical surgery, with total pericystectomy was used in (45.5%) patients, which was near the results by other studies^{25,43}.

In our study Left lateral sectionectomy (27.3%) & Left hepatectomy (18.2%), more frequently done than Right hepatectomy (9.1%). This results were different from result from other studies that show right hepatectomy performed more frequently^{25,27,28}.

Duration of surgery:

The duration of surgery ranging from 90-240 minute (165±75min.), which was near the results by Mohammad Reza²⁶ (India 74 cases) 2010, & ibraheem et al²⁵ (Egypt-63 cases) 2012.

Post operative complications:

The most common complication was chest infection (18.2%) which is near the results by Mohammad Reza²⁶ (India 74 cases) 2010. & more than results by ibraheem et al²⁵ (Egypt-63 cases) 2012. sub hepatic collection occur in (13.6%) which is near the results of other studies^{38,39}. bile leak in our study (13.6%) which is slightly more than results of other studies^{25,27,28}. Postoperative biliary leak or fistula has been reported in other studies in a rate of 6% - 47%^{46,47,48}, as a consequence of small, undetected communications between the cyst and the bile duct. Such communications have been reported to occur in 10% - 80% of cases⁴⁸.

Mortality rate:

In our study we had one postoperative mortality (4.5%) which was female died in the 5th post operative days, due to pulmonary embolism. which was slightly higher than results by ibraheem et al²⁵ (Egypt-63 cases) 2012. & the results by Mohammad Reza²⁶ (India 74 cases) 2010. Both results show mortality of (1.6%). & this is may be due to low number of cases in our study. But overall postoperative mortality in other studies ranges between 0% to 7.5%^{49,50} in early period.

Local recurrence :

Surgical treatment of hepatic hydatid cyst which rate has been reported to be 1.1 to 9.6% in several studies^{51,7}. Finding the exact mechanisms of daughter cyst formation put some lights on this problem. By gradual swelling of hydatid cyst, small particles of the inner layer dissent into the cyst cavity, helping daughter cyst formation⁷. The rate of daughter cyst formation has been reported to be around 29.5%⁵². Germinative layer advances toward the external layer (adventitia), which leads to some daughter cyst formation outside the cyst inner cavity known as exogenous daughter cyst (EDC).

The EDCs if not treated are one of the disease recurrence causes which might not be visible if the external layer would not been removed entirely. That is why the radical approach is more acceptable than the other methods based on the recurrence rate^{7,8,9}. In our study During the six month of post operative fallow up there was no recurrence reported in the managed cases.

Conclusions:

* In conclusion, radical surgery for liver hydatid cyst can be done safely with accepted morbidity & mortality & low recurrence rate.

* The most effective method for cure & preventing postoperative recurrences is radical surgery. This is indicated for patients meeting the indications in

terms of age, medical history, location and size of the cyst, and relation of the cyst to the vasculature and biliary system.

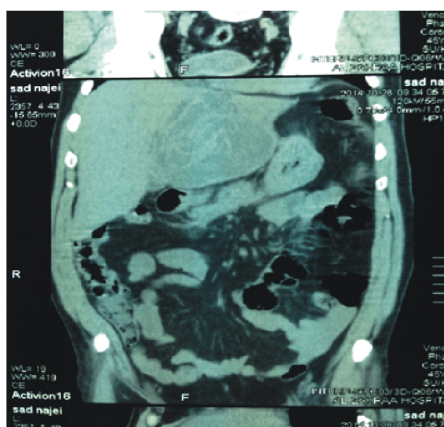
- * The major hepatic resection which is a radical procedure is a safe and effective option for treatment of liver hydatidosis and should be performed whenever possible when the entire segment or lobe is diffusely involved by one huge or multiple sized cysts with little healthy liver tissue left.
- * Selection criteria must be used in choosing our patients which include medically fit & operable patients with a peripherally placed cysts, usually in the left lateral segment, pedunculated lesions, or for extrahepatic intra-abdominal cysts, complicated cysts or patients with intrabiliary rupture & jaundice.

Recommendations:

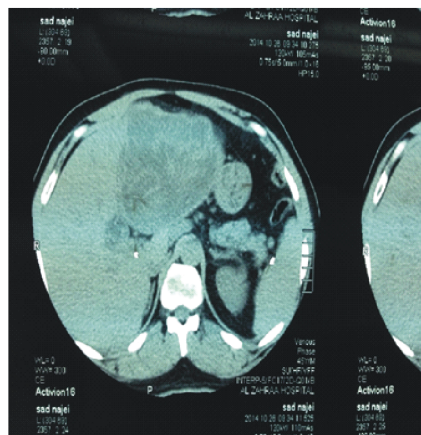
- * We recommend selective doing of radical surgery for hepatic hydatid lesions, provided that

localization of the cysts is favourable and that the technical and logistic infrastructure is available & according to the selection criteria mentioned.

- * We recommend the doing of ERCP preoperatively for patients with Jaundice, cholangitis & dilatation of biliary tree, to deal with intrabiliary rupture and obstructive jaundice & to decrease the risk of Postoperative bile leak.
- * We encourage the general surgeon for more practicing radical surgery in management of liver hydatid cysts as this needs precise surgical skills.
- * More studies about radical surgery in liver hydatid cysts are necessary in the future for comparison with other studies leading to a better outcome.
- * Prevention: Eradication of the disease by prevention is the best treatment.



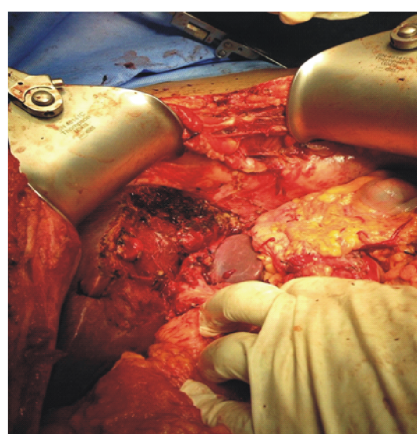
Pic 1



Pic 2



Pic 3



Pic 4

Picture:

(1,2,3&4) show C.T scan, Gross, & operative picture for hydatid cyst occupying the left lobe, managed by left hepatectomy.

References :

1. Saidi F. The Parasite. In: Saidi F. Surgery Of Hydatid Disease. 1st ed. London: Saunders, 1976: P1-56.
2. Gabriel A. Kune, David L. Morris. Hydatid Disease. In: Seymour I Schwartz, Harold Ellis. Maingot's abdominal operations, 9th ed: Appleton & Lange, London: WB Saunders; 1990, 1225-1240.
3. Amitai Bickel, Norman Loberant, Jonathan Singer, et al. Laproscopic Approach To Abdominal Hydatid Cysts. *Jama Hospital & Surgery*. 2002; 1: p 45-50.
4. Ahmed R Al-Bahrani, Mohamed A Al-Maiyah, Zuhair R Al-Bahrani. Survey Of Abdominal Hydatidosis, Review Of 791 Patients In Iraq. *Arab Journal of Gastroenterology*. 2003; 4: P151-156.
5. Zeki A. Al, Fadgh, Mazin H. Al-Hawaz, Wadah M. Al-Badiri. Complicated Hydatid Cyst In Basra. *Iraqi Journal Of Gastroenterology*. 2002; 1 (2): p 27-31.
6. Yüksel O, Akyürek T, Salman B et al. Efficacy of radical surgery in preventing early local recurrence and cavity related complications in hydatid liver disease. *J Gastrointest Surg*. 2008; 12: 483-489.
7. Magistrelli P, Masetti R, Coppola R et al. Surgical treatment of hydatid disease of the liver. A 20-year experience. *Arch Surg*. 1991; 126: P518-522.
8. Karavias DD, Vagianos CE, Bouboulis N et al. Improved techniques in the surgical treatment of hepatic hydatidosis. *Surg Gynecol Obstet*. 1992; 174: P176-180.
9. A. Kalovidouris A, Gouliamos A et al. Extracapsular (satellite) Hydatid cysts. *Gastrointest radiol*. 1992; 17: P353-356.
10. Kjossev KT, Losanoff JE. Hydatid disease of the liver: TN(R)C classification. *Int. Surg*. 1998; 83: P311-313.
11. Jake Krige, Phillipus C. Bornman, and Jacques Belghiti. Hydatid disease of the liver. In: William R. Jarnagin, MD, FACS, Jacques Belghiti, MD, Markus W. Büchler, MD, PhD. Blumgart's Surgery of the Liver, Biliary Tract, and Pancreas. John F. Kennedy Blvd. Ste 1800 Philadelphia. 2012; P1035-1051.
12. E. Moreno Gonzalez, P. Recosel, Bercedo Martinez, et al. Result Of Surgical Treatment Of Hepatic Hydatidosis: Current Therapeutic Modifications. *World Journal Of Surgery*. 1991; 15: P254-263.
13. F. Guiliant, F. D'Acapito, M. Vellone, et al., "Risk for Laparoscopic Fenestration of Liver Cysts," *Surgical Endoscopy and Other Interventional Techniques* 2003; 17: P1735-1738.
14. A. M. El Shazly, S. E. Awad, M. A. Hegazy, K. A. Mohammad and T. A. Morsy, "Echinococcosis Granulosa Hydatidosis an Endemic Zoonotic Disease in Egypt," *Journal of the Egyptian Society of Parasitology*, 2007; 37: P609-622.
15. H. M. Salama, N. H. Ahmed, N. Eldeeb and R. Ahmed, "Hepatic Hydatid Cysts: Sonographic Follow Up after Percutaneous Sonographically Guided Aspiration," *Journal of Clinical Ultrasound* 1998; 26: P455-460.
16. A. Gharbi, W. Hessine, M. W. Brauner and K. Dupuch, "Ultrasound Examination of Hydatid Liver," *Radiology* 1981; 139: P459-463.
17. I. Sayek and D. Onat, "Diagnosis and Treatment of Uncomplicated Hydatid Cyst of the Liver," *World Journal of Surgery* 2001; 25: P21-27.
18. S. Iwatsuki, S. Todo and T. E. Starzl, "Excisional Therapy for Benign Hepatic Lesions," *Surgery, Gynecology & Obstetrics* 1990; 171: P240-246.
19. Vagenas C, Spyropoulos C, Stratis C, Maroulis J. Surgery for hepatic hydatidosis endoscopic treatment of complications. *Arch Hellen Med* 2006; 23: P351-358.
20. Moreno González E, Jover Navalón JM, Landa García JJ et al. Surgical management of liver hydatidosis. 10-year experience with 269 patients. *Ital J Surg Sci* 1985; 15: P267-273.
21. Agarwal S, Sikora SS, Kumar A, Saxena R, Kapoor VK. Bile leaks following surgery for hepatic hydatid disease. *Indian J Gastroenterol* 2005; 24: P555-558.
22. Bülbüller N, İlhan YS, Kirkil C et al. The results of surgical treatment for hepatic hydatid cysts in an endemic area. *Turk J Gastroenterol* 2006; 17: P273-278.
23. Yildiran MI, Başoğlu M, Atamanalp SS et al. Intrahepatic rupture in liver hydatid cysts: results of 20 years' experience. *Acta Chir Belg* 2003; 103: P621-625.
24. Raja M, Hazim H.S. Rupture Of Hydatid Cyst Of The Liver In To Biliary Tract. *Br. J. Surg* 1987; 65: P103-106.
25. Adbulla Ali Al-Hureibi, Ahmed Amer, Mohammed Ali Al-Hureibi, et al. Hepatic Hydatid Cysts: Presentation & Surgical Management In

- Yemen. Journal Of The Royal College Of Surgeons Of Edinburgh 1992; 37: P229-231.
26. S. Hadidy, M Barakat, F.Nahhas, et al. Echinococcus In North Syria : Clinical & Epidemiological Features. Annals Of Saudi Medicine 1986; 6: P173-177.
 27. Ibrahim Abdelkader Salamal, Mohammed Abdallah Aboushady, Osama Hegazy Abdelsalaml et al. Major Hepatic Resection in Hepatic Hydatidosis. Surgical Science 2013; 4: P 20-28.
 28. Mohammad Reza Motie & Mohammad Ghaemi. Study of the Radical vs. Conservative Surgical Treatment of the Hepatic Hydatid Cyst: A 10-Year Experience. Indian J 2010; 72: P448452.
 29. Roland Chautems, Leo Buhler, Benjamin Gold et al. Long term results after complete or incomplete surgical resection of liver hydatid disease. Swiss med wklly 2003; 133: P258 262.
 30. A. Bilge and E. M. Sozuer, "Diagnosis and Surgical Treatment of Hepatic Hydatid Disease," HPB Surgery 1992; 6: P57-64.
 31. S. Berrada, B. Essadki and N. Zerouali, "Kyste Hydatique du Foie. Treatment par Resection du Dome Saillant. Notre Experience a Propos d'Une Serie de 495 Cases," Annales De Chirurgie 1993; 47: P510-512.
 32. I. Sayek, M. B. Timakeiz and R. Dogan, "Cystic Hydatid Disease: Current Trends in Diagnosis and Management,". Surgery Today 2004; 34: P 987-996.
 33. C. Kayaalp, B. Bostana, S. Yol and M. Akoglu, "Distribution of Hydatid Cysts into the Liver with Reference to Cystobiliary Communications and Cavity Related Complications". American Journal of Surgery 2003; 185: P175-179.
 34. A. Alper, O. Ariogul, A. Emre, A. Uras and A. Okten, "Choledochoduodenostomy for Intrabiliary Rupture of Hydatid Cysts of Liver". British Journal of Surgery 1987; 74: P243-245.
 35. O. Elbir, H. Gundoghu, M. Gagilulekci, C. Kayaalp, F. Atalay et al., "Surgical Treatment of Intrabiliary Rupture of Hydatid Cysts of the Liver: Comparison of Choldochoduodenostomy with T-Tube Drainage," Digestive Surgery 2001; 18: P 289-293.
 36. E. Ozaslan and Y. Bayraktar, "Endoscopic Therapy in the Management of Hepatobiliary Hydatid Disease," Journal of Clinical Gastroenterology 2002; 35: P160-174.
 37. H. Simsek, E. Ozaslan, I. Sayek, C. Svas, O. Abasoglu, A. Soyly, et al., "Diagnosis and Therapeutic ERCP in Hepatic Disease," Gastrointestinal Endoscopy 2003; 58: P384-389.
 38. Morel Ph, Robert J, Rohner A. Surgical treatment of hydatid disease of the liver: a survey of 69 patients. Surgery 1988; 104: P85962.
 39. Khuroo MS, Wani NA, Javid G, Khan BA, Yattoo GN, Shah AH, et al. Percutaneous drainage compared with surgery for hepatic hydatid cysts. N Eng J Med 1997; 337: P881887.
 40. Barros JL. Hydatid disease of the liver. Am J Surg 1978; 135: P597600.
 41. T. H. Davey. Cestodes. In: T. H. Davey. A Guide To Human Parasitology, Seventh Edition. London: saunders. 1994: P179-182.
 42. Mustapha Daali, Rachid Hssaida, Mohamed Zoubir, et al. Moroccan Experience In The Surgical Treatment Of Multiple Hydatid Cysts In The Liver. Carriers D'etudes Et De recherches Francophone/ Santes. 2001; 3: P177-184.
 43. WHO/OJE, "Manual on Echinococcosis in Humans and Animals. A Public Health Problem of Global Concern," World Organization, Paris, 2001.
 44. J. M. Little, M. J. Hallands and H. Ekberg, "Recurrence of Hydatid Disease of the Liver," World Journal of Surgery 1988; 12: p 700-704.
 45. A. A. Malik, S. U. Bari, R. Amin, and M. Jan, "Surgical management of complicated hydatid cysts of the liver," World Journal of Gastrointestinal Surgery 2010; 2: P7884.
 46. A. Zaouche, K. Haouet, M. Jouini, A. El hachaichi and C. Dziri, "Management of Liver Hydatid Cysts with a Large Biliocyst Fistula: Multicenter Retrospective Study," World Journal of Surgery 2001; 25: P28-39.
 47. K. Yorganci and I. Sayek. "Surgical Treatment of Hydatid Cysts of the Liver in the Era of Percutaneous Treatment," Am J of Surg. 2002; 184: P63-69.
 48. C. Dziri, K. Haouet and A. Fingerhut, "Treatment of Hydatid Cyst of the Liver: Where Is the Evidence?" World Journal of Surgery 2004; 28: P 731-736.
 49. D. D. Karavias, C. E. Vaglanos, N. Bouboulis, et al. "Improved Techniques in the Surgical Treatment of Hepatic Hydatidosis," Surgery, Gynecology & Obstetrics 1992; 174: P176-180.
 50. C. Dziri, J. C. Paquet, J. M. Hay, et al., "Omentoplasty in the Prevention of Deep Abdominal Complications after Surgery for Hydatid Disease of the Liver: A Multicenter Prospective Randomized Trial," Journal of the American College of Surgeons 1999; 188: P 281-289.
 51. Priego P, Nuño J, LópezHervás P et al. Hepatic hydatidosis. Radical vs. conservative surgery: 22 years of experience. Rev Esp Enferm Dig 2008; 100: 8285.
 52. Voros D, Kalovidouris A, Gouliamos A et al. The real incidence of extracapsular (satellite) cysts of liver echinococcus. HPB Surg. 1999; 11: P249-252.