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Surgical management of remaining cavity after open cystectomy for hepatic hydatidosis relative study of different methods

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ABSTRACT

Background: Handling the residual cavity of liver hydatid cyst after surgical management, is one of the most common surgical arguments in the managing of the liver hydatid disease. The aim of this prospective study was to report our experience at Al-Nu' man Teaching Hospital, Baghdad, Iraq. To achieves a comparative study with other techniques to illuminate the appropriate acquire practice of treating the residual cavity of the hydatid disease.

Methods: A prospective study that achieved on 60 patients who have liver hydatid disease. The patients were treated in Al-Nu' man Teaching Hospital, Baghdad, Iraq between March 2010 and April 2016. The residual hepatic cavity after open cystectomy was managed by one surgical method; Simple Cyst Closure, Unroofing (Partial Cysto-Pericystectomy), Omentoplasty, Capitonnage, or Drainage in order to compare and highlight the postoperative complications.

Results: There were five groups according to the type of operative techniques and postoperative complication. Group I (Simple Cyst Closure). Group II (Unroofing). Group III (Omentoplasty). Group. IV (Capitonnage). Group V (Drainage). Simple cyst closure had minimum postoperative stay. Omentoplasty or Capitonnage were less postoperative stay and tiniest post-operative days of biliary or purulent discharge. Drainage group has the highest percentage of bile leakage and purulent discharge plus prolonged hospitalization.

Conclusions: Uncomplicated cysts have lower complication rates and short hospital stay with each cavity management technique. Complicated cysts have higher complication rates and longer hospital stay regardless of the management technique.

Keywords: Echinococcosis, Hydatid disease, Partial cystectomy, Surgical management of hydatid disease

INTRODUCTION

Hydatid cyst is a parasitic disease caused by the tapeworm Echinococcosis granulosus or Ech. alveolaris, the prevalence of the disease varies around the world. Hydatid disease is encountered in specific areas, as Mediterranean countries, Australia and New Zealand, South America, Middle East, India and China. 1 Most common locations of the parasite infection are liver (60%) and lungs (30%), while rarely cysts can be found in kidney, pericardium, brain, and bones.2 As far as medical therapy of hydatid disease is disappointing, surgery remains the cornerstone in the treatment of this disease. Numerous surgical techniques have been proposed for liver disease. These include open and laparoscopically surgical techniques, while lately; minimally invasive techniques have also been developed. (Percutaneous-Aspiration-Infusion-Reaspiration) technique which belongs to the minimally invasive techniques, a real alternative to surgical procedures and chemotherapy, is of great value especially in cases where surgery and prolonged medical treatment with benzimidazoles is difficult or too expensive.³ The most familiar surgical techniques include Simple cyst closure, deroofing (partial cystopericystectomy), partial cystectomy and Omentoplasty, partial cystectomy and Capitonnage, drainage, subtotal Pericystectomy, total Pericystectomy and for large cysts liver resection (hepatectomy or segmentectomy).⁴ One of the major postoperative complications in liver hydatid disease surgery is bile leaking and the formation of a "dead" space in which abscess is easy to develop. The most important purpose was to minimize the "dead" space, which usually remains after cystectomy or partial cystectomy.⁵

METHODS

This is a prospective study, which performed on 60 patients with liver hydatid disease. Those patients were admitted into the surgical ward of the Al-Nu' man Teaching Hospital- Baghdad, Iraq between March 2010 and April 2016. Different surgical techniques were managed the residual pericystic cavity after an evacuation of the parasite. Furthermore, the compared result was depending on postoperative complications, morbidity, mortality, and recurrence rate. Each patient has a single hydatid in the liver, either univesicular or multivesicular. The diagnosis depends greatly on clinical signs, physical examination, ultra-sonographic finding. The ages of the patients ranged between 20 and 50 years with a mean age of 35 years. Twenty-two patients (40%) were males and thirty-eight patients (60%) were females, with male to female ratio of 1:1.5. The patients were classified in groups according to the affected lobes, size of the hydatid cyst, the ultrasonographic picture and the hydatid cyst status whether it is complicated (an infected hydatid cyst or hydatid cyst with cystobiliary fistula or both) or uncomplicated. All patients were subjected to complete history taking and full clinical examination which are supported by ultrasonographic and CT scan.

Operative Methods

A middle abdominal incision was carried out from the xiphoid process until 4 cm below the umbilicus or extended right subcostal incision. After entering the abdominal cavity, we examine the liver and cyst. The surgical field is packed with sterile clean pads to reduce the risk of intraperitoneal soiling and contamination. The inner of the cyst is sterilized by infusion of hypertonic saline solution and chlorhexidine. Next the hydatid cyst is opened and evacuated by aspiration with a closed system suction device. The content of the cyst is examined to define if it is bilious purulent. If biliary orifices are found they are sutured to avoid postoperative bile leaking, the cyst is opened the remaining daughter cysts are separately removed. Moreover, we put clean gauzes inside the cyst to identify bile leaking. However, authors used different operative procedures in the management of the residual cystic cavity of the hydatid cyst:

Simple cyst closure

The cyst cavity fills with saline solution after evacuating the parasite. Moreover, the edges of cyst cavity closed by running absorbable sutures.⁶ Used for small and mediumsized non-calcified, non-infected cysts, and for univesicular cysts because of no suspicion of existed major bile duct openings.⁷⁻⁸ In fact, closure of the pericystic opening without any drainage often works quite well, even for large multivesicular cyst.⁶

Unroofing (partial cystopericystectomy)

This method for managing the emptied pericystic cavity is to leave it wide open to the peritoneal cavity. The rim of the cavity opening is overrun with catgut sutures but otherwise left open. A more important prerequisite is that the evacuated cavity should be a univesicular one. Leaving the cystic cavity of a multivesicular hydatid cyst open would be inviting free leakage of bile into the peritoneal cavity.^{8,9}

Omentoplasty

The mesenteric omentum is mobilized from the transverse colon, providing sufficient length to the line and pack the cavity. The mesenteric omentum is sutured into place and, if the cavity has a large volume, a drain is passed together with the pedicle into the lumen, the drain can be fixed to the rim of the opening with a thin, plain catgut suture so that its tip is in the most dependent portion of the cavity.¹⁰

Capitonnage

Enfolding redundant cyst wall into the depth of the cyst by successive layers of sutures. An alternative technique is circular suturing from the depth of the cyst toward the surface, it is better to places a drain into the cyst cavity. Capitonnage is not possible when the volume of the cyst is large, and the walls are calcified and rigid.⁶

Drainage

After closing the pericystic cavity, it is better to insert a Foley catheter for prolonged drainage.^{8,9}

Patients groups

Each patient has single hydatid the liver either univesicular or multivesicular. Moreover, the patients were five groups.

- 1. Group I- 7 patients have managed by simple cyst closure. All have cyst size between 5 cm and 7 cm, univesicular, non-infected hydatid cyst, with no biliary communication (uncomplicated).
- 2. Group II- 6 patients have been managed by deroofing (partial cystopericystectomy). All have cyst size

- between 7.1 cm and 9 cm. 2 of them are complicated and the other cysts are uncomplicated.
- 3. Group III- 5 patients have been managed by Omentoplasty. All have cyst size between 7.1 of them were complicated and the other 4 complicated.
- 4. Group IV- 23 patients have been managed by Capitonnage. 16 patients have cyst size between 9.1cm and 11cm, the other 7 patients have cyst size more than 11cm. 16 of them were uncomplicated and 7 of them were complicated.
- 5. Group V- Nineteen (19) patients have been managed drainage for their pericystic them cyst size more than 11 cm, and the other four patients have a size between 9.1 cm and 11 cm, eighteen of them were complicated and the other eight were uncomplicated.

RESULTS

Authors treated sixty (60) patients liver hydatid disease. 24 of them were males and other 36 patients were females (Table 1).

Table 1: Hydatid cysts site were grouped according to the age of patients.

Age group	No. of patients		_ Dougonto ao	
(year)	Male	Female	Percentage	
20-30	6	8	14 (23.3%)	
31-40	6	10	16 (26.6%)	
41-50	12	18	30 (50%)	
Total	24	36	100%	

Table 2: Hydatid cysts site were grouped according to the affected liver lobe.

Liver lobe	No. of pa	atients	— No. (0/)
	Male	Female	No. (%)
Right lobe	17	28	45 (75%)
Left Lobe	07	08	15 (25%)
Total	24	36	100%

All between 20 and 50 years of age.15 of the cases had cyst in the left lobe and 45 cysts had in the right lobe (Table 2). All of the cyst above 5 cm in diameter (Table 3).

Table 3: Hydatid cysts site were grouped according to the size of the cyst that affects the liver as measured by the abdominal ultrasound.

Cryst size	No. of	patients	No. (0/)	
Cyst size	Male	Female	No. (%)	
Between 5-7 cm	2	4	6 (10%)	
Between 7.1-9cm	3	6	9 (15%)	
Between 9.1-11 cm	9	9	18 (30%)	
More than 11 cm	10	17	27 (45%)	
Total	24	36	100%	

Altogether presented with mild symptoms (weight feeling, mild pain, vomiting) but no history of jaundice. The disease was diagnosed by abdominal ultrasound (Table 4) and computed tomography scan (CT).

Table 4: Hydatid cysts were grouped according to the ultrasonographic picture that they reveal.

II/C mietuwe	No. of p	atients	No. (%)	
U/S picture	Male	Female		
Univesicular	10	16	26 (43.3%)	
Multivesicular	14	20	34 (56.6%)	
Total	24	36	100%	

All patients had negative medical history. However, albendazole was administrated preoperatively (400 mg x 2) for a month and postoperatively (400 mg x 2) for three months. There were a twenty-two (22) complicated hydatid cyst, either infected or has biliary communication or both. Infected hydatid cysts were cleaned from the purulent content, washed with 3% normal saline plus scrubbed with 1% povidone-iodine and biliary orifice was sutured (Table 5).

The postoperative presentation of that patient as shown in (Table 6). Entirely, the patients were divided into five (5) groups according to the type of surgical operation.

Table 5: Hydatid cysts were grouped according to the status of the cyst whether it is complicated (an infected hydatid cyst or hydatid cyst cystobiliary fistula both) or not complicated.

Hydatid cyst	No. of p	atients	No. (0/)	
Status	Male	Female	No. (%)	
Univesicular	6	16	22 (36.7%)	
Multivesicular	18	20	38 (63.3%)	
Total	24	36	100%	

Group (I) - Simple cyst closure

Seven patients; have uncomplicated hydatid (cysts containing no bile or pus). Their mean postoperative hospital stay is 5 ± 1 day, no biliary or purulent discharge postoperatively. No recurrence rate with in follow-up period (1-3).

Group (II) -Unroofing (partial cystopericystectomy)

Six patients; A 4 of the patients have uncomplicated hydatid cysts (cysts containing no bile or pus), while the other 2 patients have complicated hydatid cyst.

Uncomplicated hydatid cyst has the mean postoperative hospital stay 6 ± 1 day for, and 7 ± 2 days for complicated hydatid cyst. Complicated hydatid cysts have postoperative biliary discharge for 3 ± 2 days but no purulent discharge. no recurrence rates.

Group (III)-Omentoplasty

Five patients: 2 of them have complicated hydatid cysts, 3 have uncomplicated hydatid cyst. The mean postoperative hospital stay was 4±1 day for uncomplicated hydatid cyst, and 5±2 days for complicated hydatid cyst. Furthermore, complicated hydatid cysts have post-operative biliary discharge for 21 day, but no purulent discharge. No recurrence rates.

Group (IV) capitonnage

Twenty three patient: 9 of them have complicated hydatid cyst, and 14 has uncomplicated hydatid cysts. The mean postoperative hospital stay was 5 ± 2 days for

uncomplicated hydatid, and 8 ± 3 days for the complicated hydatid cyst. Complicated hydatid cyst has post-operative biliary discharge 3 ± 2 days and purulent discharge for 3 ± 2 days. No recurrence rates.

Group (V) drainage

Nineteen patients: 6 of the patients have uncomplicated hydatid cyst, and 13 of them have complicated hydatid cysts. The mean postoperative hospital 7±2 days for uncomplicated hydatid and 14±4 days for complicated hydatid cyst. Complicated hydatid cysts have postoperative biliary discharge for 15±10 days and purulent biliary discharge for 7±2 days. no recurrence rates.

Table 6: Different operative procedure that were used in the management of residual cavity of the hepatic hydatid cyst. patient were divided into five groups according to the surgical techniques that was used, hydatid cyst status (pyogenicity and biliary communication), mean post-operative purulent discharge and recurrence rate.

Group no.	Surgical technique	No. (%) of patient	Hydatid cyst status (pyogenicity and communication) complicated or un- complicated		Mean post- operative hospital stay	Mean postoperative biliary discharge	Mean postoperativ e purulent discharge)	Re- currence rate
Group I	Surgical cyst	7	Uncomplicated	7 cases	5±1 day	Nil	Nil	0.0%
Group I closure	(11.6%)	Complicated	Nil					
Group II	C H H	6	Uncomplicated	4 cases	6±1days	Nil	Nil	0.0%
Group II Unroofing	Ulliooning	(10%)	Complicated	2 cases	7±2 days	3±2	Nil	
Commented to the commen	5	Uncomplicated	3 cases	4±1 days	Nil	Nil	0.0%	
Group III	Group III Omentoplasty	(8.3%)	Complicated	2 cases	5±2 days	2±1	Nil	0.0%
Group IV Capitonnage and drainage	23	Uncomplicated	14 cases	5± days	Nil	Nil	0.0%	
	and drainage	(38.3%)	Complicated	9 cases	8±3 days	3±2	3±1	0.0%
Group V Draina	Dunimana	19	Uncomplicated	9 cases	7±2 days	Nil	Nil	0.0%
	Dramage	(31.6%)	Complicated	10 cases	14±4days	15±10	11±2	0.0%
Total		60(100)						

DISCUSSION

The surgical management of liver hydatid cyst is still a matter of controversial issues. Moreover, surgical procedures are many.

The surgical techniques are; (1) simple cyst closure, (2) Unroofing (partial cystopericystectomy), (3) partial cystectomy and Capitonnage, (4) partial cystectomy and Omentoplasty, (5) partial cystectomy and drainage, (6) marsupialization, (7) subtotal peri-cystectomy, (8) total Pericystectomy and hepatic resection, (9) partial cystectomy and introflexion.¹¹

Rupture into the bile duct with big communication was managed by decompressing T-tube drainage or T-tube drainage or bilio-digestive anastomosis.¹¹

Authors practiced and analyzed the first five surgical techniques:

Simple cyst closure

The simplest method of handling the cyst cavity after evacuation the parasite. It performed by filling the residual cavity by saline solution and close the edges with running absorbable sutures. ¹²

Used for small and medium-sized, non-calcified, non-infected cysts, and for univesicular cyst because of no idea of major bile duct openings are existing. ⁶⁻⁸ It works quite well even for large multi-vesicular cyst. ⁸

In present study, a 7 patient was managed by this method without any complications postoperatively.

Technique is suitable for all uncomplicated (no infection or major bile duct communication) small- and medium-sized cyst. 6-8

Unroofing (partial cystopericystectomy)

It executed by removing the portion of the wall that extends to the surface of the liver, that lead to produces a saucer-type appearance in the remaining cyst. Any fluid secreted from the remaining epithelium going to leaks into the peritoneal cavity where it can be absorbed. Cyst deroofing can be also successfully performed laparoscopically. When compared to laparotomy, this technique is associated with less postoperative pain and disability, shorter duration of hospital stays, superior cosmetic results. 11,13 In present study, this method ended with good results although biliary discharge persists for 2 to 5 days probably from small undetected bile duct opening. 8

Partial Pericystectomy Capitonnage

This technique involves enfolding redundant cyst wall into the depth of the cyst by successive layers of sutures. An alternative technique is circular suturing from the depth of the toward the surface. It is better to places a drain into the cyst cavity when performing Capitonnage. Capitonnage is not possible when the volume of the cyst is large and when the walls are calcified and rigid.⁶

Partial Pericystectomy and Omentoplasty:

the omentum is mobilized from the transverse colon, providing sufficient length to the line and pack the cavity. If the mesenteric omentum is short and the cavity is large and in the dome of the liver, it may be necessary to a pedicle on one or the other gastro-epiploic artery. The mesenteric omentum is sutured into place, with drain if the cavity has a large volume. The drain is passed together with the pedicle into the lumen cavity.¹⁰ Omentoplasty is useful for excision of giant hepatic hydatid cysts. After simple cystectomy, the residual cavity is obliterated by manual compression of the healthy liver parenchyma from the left and right toward the midline of the cavity. While compression is maintained, the approximated edges of the cyst's fibrous capsule are closed with mattress sutures. Omentoplasty or gelatin sponges are used to fill the dead space prior to suturing of the fibrous capsule. This method is beneficiary for extremely large residual cavities after cystectomy. It may be used safely in the selected patient.¹⁴ There is an incidence rate of postoperative necrosis omentum and the development of septic complications.1 In present study, this method was performed for complicated and uncomplicated cases with no postoperative complications except for 2 days biliary discharge in 2 complicated cases.

Partial Pericystectomy and drainage

The parasitic foci are eliminated and surrounded pericyst is removed too. After closing the cavity, it is better to insert a Foley catheter prolonged drainage.^{8,9} In present study, authors used this method mainly for complicated

hydatid cysts and those with more than 11 cm in diameter. There were postoperative complications concerning post-operative biliary discharge (15±10 day) and mean postoperative purulent discharge (11±2 days) also with more prolonged postoperative hospital stay (14±4). An infected hydatid cyst undergoes structural changes. A pyogenic membrane develops on the inner surface of the adventitia.

Marsupialization

Although it is safe and quick but, it has high rate of complication postoperatively. complications like a residual cavity, disease spoilage in biliary tract or intraperitoneal, bile leaking, vessels injuries and hemorrhage, sepsis, cholangitis and allergic shock.^{3,15} For those reasons, surgical improvements have been proposed such as the closing of all external communications of the cyst and obliterating the remaining cyst with omentum or muscle flaps.⁶

Subtotal Pericystectomy

Small pericystic areas, which are located close to vascular and biliary vessels, are not resected because of the high risk for severe complications.¹⁶

Total Pericystectomy and Hepatic resection

In radical operations, the parasitic content and the entire pericystic membrane are removed. These operations are accompanied by increased morbidity and mortality.¹⁷

Partial cystectomy and introflexion

Finally, some authors suggest introflexion of the cyst, while others suggest a modified combination of Capitonnage and introflexion. It is well known that these techniques can be used without mesenteric omentum. The cyst is being unroofed and evacuated from the daughter cysts with bile vessels ligated. The remnants of anterior wall (capsule of the cyst) are anchored with sutures the posterior wall in a manner that the cavity of the cyst disappears. No postoperative complications were observed including bile leaking and/or abscess formation. 18,19

CONCLUSION

Uncomplicated cysts have lower complication rates and short hospital stays with each cavity management technique. Complicated cyst rates have higher complication rate and longer hospital stay regardless of the management technique. Therefore, complicated and uncomplicated should be considered different forms of the disease and evaluated differently.

In the management of hydatid cysts of the liver, the surgical techniques, do not employ drainage of the cystic

are superior to those, which use drainage regardless the status of the hydatid cyst, whether complicated or not.

The primary closure of the cyst cavity without drainage, seems to offer the best therapeutic option for uncomplicated hydatid cysts 5-7 cm.

Capitonnage and Omentoplasty produced the lowest complication rates, and the best clinical results among complicated hydatid cyst.

Infected hydatid cyst cavity managed by Capitonnage and Drainage has a better outcome than drainage alone. Capitonnage could assist in obliteration of residual fibrous cavity.

Evacuation of the cyst with partial excision of the pericyst and omentoplasty resulted in the lowest morbidity, shortest post-operative hospital stays and the best clinical results either complicated or uncomplicated hydatid cyst.

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