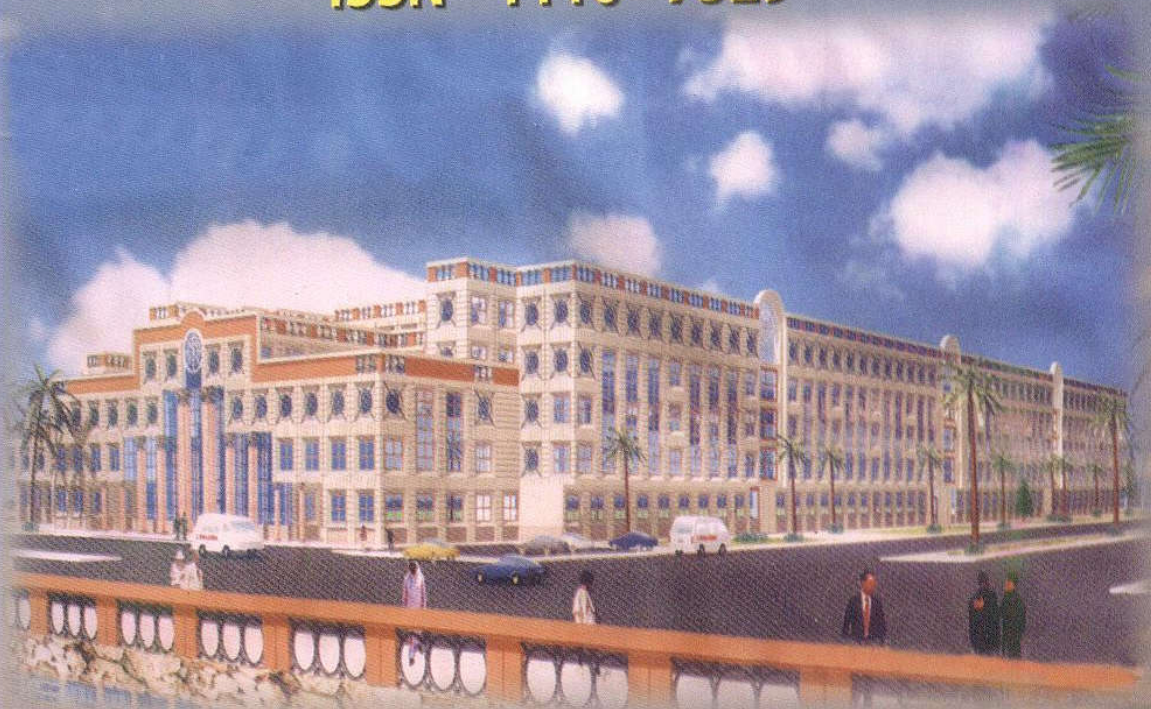




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Evaluation of different surgical techniques in treatment of cystic hydatid disease of the liver

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Abstract:

Background: several techniques have been described in liver hydatid disease surgery, with most well known conventional and radical procedures. Both are under debate.

Aim of the study: is evaluation of the results of different surgical procedures for treatment of hydatid cysts of the liver.

Patients and methods: between January 1999 and January 2005, 16 patients with cystic hydatid disease of the liver were managed in Sohag University Hospital, South Valley University. Diagnosis was made by both serological tests and imaging studies. Operative procedures included the conventional partial cystectomy with either omentoplasty or tube drainage in 9 cases, partial cystectomy with modified capitonage in 4 and radical procedures in 3. Complications were classified as minor or major according to their need of extra-hospital stay. Mean follow up was 20.6 months.

Results: the mean age was 42 years (range 11-69 years) with female to male ratio (1.7:1). Seventy five percent of cases were located in rural areas. Abdominal pain was the most predominant symptoms being present in 50 % of patients ($P = 0.02$). Right upper quadrant and epigastric tenderness were the remarkable physical findings in 62.5 % ($P = 0.003$). Concomitant disease was present in 43.75 % of patients, with obesity as dominant factor (31.7 %). Diagnostic sensitivity of ultrasonography and computed tomography were 93.7% & 83.3 % respectively. Postoperative complication rate was significantly better in patients with partial cystectomy with modified capitonage, than the other techniques (25 % versus 58.3 % respectively, $P < 0.05$). The overall mortality rate was 6.2 %. Five patients (31.7 %) had remained elevation of the serum levels of total IgG. Of those, 2 (12.5 %) patients showed radiologically confirmed recurrence.

Conclusion: Partial cystectomy with modified capitonage in obliteration of the cyst cavity is easy to perform, quick and safe procedure with satisfactory results provided that the hydatid cyst is in favorable anatomical location. The conventional procedures are associated significantly with an increased treatment failure with respect to the complication and recurrence rates. Radical procedures are effective in complete eradication of the disease but has significantly higher rate of complications. Serological tests, using ELISA should be considered in preoperative diagnosis of equivocal cases and in postoperative follow-up.

Introduction:-

Cystic hydatid disease is a zoonotic infestation caused by larvae of the canine tapeworm *Echinococcus granulosus*. The prevalence of the disease varies around the world. It is encountered in specific areas, as Mediterranean countries, Australia, South Africa, South America and Middle East (*World Health Organization "WHO", 1996*). Most common locations of the parasite are the

liver (60 %) and lungs (30 %), while rarely cysts can be found in the kidney, pericardium, brain and bones (*Meyers et al., 2001*). Liver hydatid cysts produce symptoms by either their mass effect or by complications such as infection, intraperitoneal leakage and rupture into the biliary tree (*Alfieri et al., 1997*). Hydatid disease can be reliably diagnosed by means of the serological tests such as the Enzyme Linked

Immunosorbant Assay (ELISA) (*Bulut et al, 2001*). Confirmatory evidence of the diagnosis can be made by ultrasonography (US) and computed tomography (CT) scanning (*Yorganci and Sayek, 2002*). Treatment strategy of liver hydatid cysts includes three main approaches. These are systemic chemotherapy, surgery and percutaneous treatment (PT) (*WHO, 1996*). The efficacy of systemic chemotherapy is limited (*Deger et al, 2000*) and there are areas of concern with PT including risk of spillage and dissemination, anaphylaxis and toxicity (*Silva et al, 2004*). Open surgery remains the cornerstone in the treatment of this disease (*Safioleas et al, 2000*). Surgical procedures vary and evidence based-knowledge is fragmentary (*Bulten-sehoen et al, 2004*). The most important postoperative complications in liver hydatid surgery are bile leak and the formation of dead space in which abscess is easy to develop (*Hadded et al, 2001*). Conventional and radical procedures are under debate with respect to these complications (*Yorganci and Sayek, 2002*). The purpose of this study is to evaluate the results of different surgical techniques for treatment of liver hydatid cysts in Sohag locality.

Patients and Methods Study design:

All patients operated on for hydatid cyst of the liver between January 1999 and January 2005 in Surgery Department of Sohag University Hospital were included in the study. A total of 19 patients were admitted during this period. Of those, 3 patients were not contacted, so they were excluded reducing the study population to 16 patients.

Diagnosis:

Besides the history and clinical examination, all patients underwent

preoperative radiological evaluation. Ultrasonography was routinely done in all cases to determine the morphology of the cyst, appearance of the intra-hepatic and extra-hepatic biliary system and for possible extra-hepatic extension of the disease. The following ultrasonic images of space occupying lesions in the liver, as described by *Gharbi et al (1981)* & *El-Tahir et al (1992)*, were considered to be pathognomonic diagnostic signs of the disease. Unilocular anechoic lesions which are round or oval with clear fluid content (type 1) or with snow like inclusions (type 2), multivesicular or multiseptated cysts with a wheel-like appearance (type 3), unilocular cysts with daughter cysts which may present with a honeycomb appearance (type 4), cysts with floating laminated membranes (heterogenous echopattern) (type 5) and thick walled calcified cysts (type 6).

The main reasons for CT examination were further need for anatomical details especially in recurrent cases (fig.1). In equivocal cases, preoperative diagnosis was established by ELISA. The serum levels of total IgM were markedly elevated in patients with hydatid disease. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) was performed when indicated to distinguish the possibility of coexistent biliary communication (fig.2). Baseline laboratory investigations including liver function tests and blood urea were also performed.

Previous therapies for hydatid disease and the presence of underlying medical conditions (co-morbidity) were also reported for each patient on admission.

All patients routinely received Albendazole therapy in a 10 mg/Kg dose per day, for at least 7 days, before any procedure and continued for one month after it in order to treat possible dissemination during manipulation.

Surgical techniques:

No patient underwent PT or laparoscopic surgery. Open surgical designs were classified into 3 procedures in order to compare their efficacy:

- 1) The conventional partial cystectomy with either tube-drainage or omentoplasty.
- 2) Partial cystectomy with creation of a rosette-like capitonage from the cyst walls in order to obliterate the cavity.
- 3) The radical procedures with either total cystectomy (cystopericystectomy) or liver resection.

Complications

were classified as minor or major according to their need for extra-hospital stay. Atelectasis, superficial surgical wound infection and urinary retention were grouped as minor complications. Infection in the cyst cavity, pneumonia, pleural effusion, and biliary fistula were considered as major complications.

The conventional partial cystectomy as described by *Dawson et al, 1988*, depended on the idea that the endocyst comprising the germinal and laminated membranes (parasite elements) can be easily removed due to lack of adherence between the endo- and ectocyst. Preliminary withdrawal of cyst fluid and injection of scolicial agents into the cyst was performed. Biliary leaks were sutured. The cavity was then obliterated either by pedicled omental graft or close tube-drainage.

Partial cystectomy with modified capitonage (fig 3-6) was originally described by *Erdener et al, 1992*, in children (poorly developed omentum). They suggested that obliteration of the cyst cavity can be achieved by rolling the cyst wall and adjacent hepatic tissue around forceps and held in place by sutures between the outer layer of the cyst and the bottom of the cavity. In our

procedure, some modifications were applied on this technique in order to obliterate the cavity easily and safely. The liver was exposed by a middle abdominal incision or extended right subcostal incision. After entering the abdominal cavity, the liver and cyst were examined. The surgical field was packed with sterile clean pads to reduce the risk of intraperitoneal soiling and contamination. The inner of the cyst was sterilized by infusion of hypertonic saline solution and chlorexidine. Then the hydatid cyst was opened and evacuated by aspiration with a closed system suction device. The content of the cyst was examined to define if it is billious or purulent. When the cyst was unroofed, the remaining daughter cysts were separately removed. Clean gauzes were then put inside the cyst to identify bile leaking if biliary orifices were found they were sutured to avoid postoperative leaking. The remnants of the anterior wall of the cyst (capsule) were sutured to the posterior wall, which was intact. Each side of the anterior wall was anchored with absorbable sutures in the middle of the posterior wall. First, we anchored the lateral edge of the anterior cystic wall, with several sutures. Then we continued with the medial edge in the same manner. With this kind of interflexion, a rosette-like capitonage was performed and the cavity of the cyst disappeared.

The technique of cystopericystectomy was justified only in symptomatic calcified cysts. Cystopericystectomy as described earlier by *Sayek et al, 1980*, involved excision of the entire cyst wall, including the ectocyst. The operation was carried out through a non-existent surgical plane, the ectocyst and normal host liver with which it is continuous. Removal of the calcified pericyst by cystopericystectomy is the only means of avoiding a

large dead space. For small superficial cysts or cysts located at the periphery of the left lobe, **wedge resection or segmentectomy** was performed. The use of ultrasound dissector permitted precise liver dissection and minimized bleeding from the liver. **Follow up** was obtained in all patients. Mean follow up was 20.6 months (ranges from zero to 44 months). All patients underwent a routine ultrasonography every 3 months in the first year after surgery. Subsequent ultrasonography examinations were obtained only if patients were symptomatic. CT scan was done when ultrasonic findings were not conclusive. By using ELISA the serum levels of the total IgG were obtained at one month, 3 months, 6 months and one year after surgery in order to monitor recurrent hydatid cysts.

Statistical analysis:

Was done by using student's test and Chi square tests. If P-value < 0.05, it was considered statistically significant.

Results

The base line characteristics of the patients are shown in table (1). Sixteen patients who underwent operation for hydatid cysts of the liver comprised the study. The mean age was 42 years (ranges from 11-69 years). There were 10 females and 6 males with female to male ratio (1.7:1). Seventy five percent (12/16) of cases were located in rural areas in comparison to 25 % (4/16) in urban areas. There was a statistically significant difference between the two areas (P < 0.05). Past history of traveling to endemic areas such as Iraq & Saudi Arabia was recorded in 18.7 % (3/16). Right upper quadrant and epigastric pain was significantly predominant in 50 % of patients (8/16) (P = 0.02), anorexia and nausea in 25 % (4/16), weight loss in 12.5 % (2/16), and non specific symptoms in 12.5 %

(2/16). The most frequent physical examination findings were right upper quadrant and epigastric tenderness in 62.5 % of patients (10/16) (P = 0.003), hepatomegaly in 18.7 % (3/16), palpable upper quadrant mass in 12.5 % (2/16) and unremarkable physical examination in 6.2 % (1/16). Three patients (18.7 %) had previously undergone surgical therapy for hydatid disease in other locations. Of those, 2 patients had surgical intervention for isolated liver disease (one patient once & one patient twice) whereas one patient for liver and pulmonary diseases (in two separate interventions). Conventional surgical procedure has been the treatment of choice in these 3 patients who had undergone liver hydatid surgery. A concomitant disease was present in 43.75 % (7/16) of patients, with obesity as dominant factor in 31.7 %, (5/16). Premorbid illness other than obesity was significantly related to the age of the patient. In patients aged 50 years or younger, the frequency of co-morbidity was 11.1 % (1/9). This percent was 42.8 % (3/7) in patients older than 50 years (P = 0.009). Obesity didn't show any influence on complications and length of hospital stay (P > 0.05). The rates of complications and length of hospital stay increased significantly in patients who had co-morbidity illness other than obesity (P = 0.02). However, age didn't influence risk of complications and length of hospital stay (P = 0.4). Preoperative diagnosis was established by ultrasonography (US) and computed tomography scanning (CT). US was done routinely in all cases (100 %). Six patients (37.5 %) were also examined with CT. In general, there was a good correlation between US and CT. However, in one patient a cystic structure could not be differentiated from simple liver cyst in both

radiological examinations. Preoperative diagnosis, in that patient was established by serology (ELISA). Diagnostic sensitivities of US and CT were 93.7 % and 83.3 % respectively. There was also a good correlation between radiological and operative findings, although in one patient (6.2 %), US didn't show a second cyst and incorrectly localized the cyst in another one (6.2 %) (right lobe cyst instead of left one). These results revealed that sensitivity of US and CT in determination of the location and numbers of hydatid cysts were 87.5 % and 100 % respectively. Two patients (12.5 %) had undergone ERCP before surgery. The indications for ERCP were presence of slight hyperbilirubinemia in one patient and dilatation of bile ducts on US in another. In the first patient, ERCP and sphincterotomy successfully relieved the obstruction caused by Echinococcal material and this patient didn't require further biliary exploration during surgery. In the second patient, ERCP showed external compression caused by hydatid cyst.

Surgical results:

Operative findings were shown in table (2). Hydatid cysts were solitary in 93.7 % (15/16) of patients, and multiple in 6.2 % (1/16) ($P = 0.0001$). Right lobe of the liver was significantly affected than the left (81 %; 13/16 versus 18.9 %; 3/16 respectively, $P = 0.001$). Bilateral disease was not recorded in this study. The main cyst size was 8.91 cm (range from 3.5 to 30 cm). Cystobiliary communications were identified in 31.7 % (5/16). Gallstones were present in one patient (6.2 %). Types of operations, post-operative minor and major complications, length of post-operative hospital stay and recurrence rates are shown in table (3). Partial cystectomy plus omentoplasty

was performed in 4 patients (25 %), partial cystectomy plus tube drainage in 5 (31.7 %), partial cystectomy with modified capitonage in 4 (25 %) and one for each cystopericystectomy, segmentectomy, and wedge resection (6.2 %). Of the 5 patients with cystobiliary communication, one (20 %, 1/5) had common bile duct drainage by using T-tube, in the course of partial cystectomy with omentoplasty. Debris of Echinococcal material was found in the biliary tree and removed by using biliary balloon catheter. This patient had been under-gone preoperative ERCP, that showed hydatid cyst compressing the bile ducts causing their dilatation. In the other 4 patients (80 %), biliary communications were oversewn by using non absorbable sutures. Post-operative minor complications were equally recorded among all procedures (one patient for each). These were superficial wound infection in 2 patients (12.5 %), atelectasis in one (6.2 %), and urinary retention in one (6.2 %). There were no differences between conventional and radical procedures with respect to post-operative major complications (3/9 and 1/3; 33.3 %; respectively). However, there was a statistically significant difference between these procedures and partial cystectomy with modified capitonage (33.3 %; 4/12 versus zero % respectively; $P = 0.0007$), in favor of the last procedure. The recorded post-operative major complications were infection of the cyst cavity in one patient (6.2 %, 1/16), pneumonia in one (6.2 %, 1/16) and bile leak in 2 (12.5 %, 2/16). Those patients didn't required reoperation for complications. Infection of the cyst cavity and pneumonia were managed with antibiotic therapy. Bile leaks were closed spontaneously with prolonged drainage.

Table (1): Shows the base line characteristics of all patients

Patient's characteristics	Patients		P-value
	No.	%	
Age:			
< 14 years	1	6.2 %	
15-50	8	50 %	
> 50	7	43.7 %	
Mean age	42 years		
Range	11-69 years		
Sex:			
Females	10	62.5 %	Not significant
Males	6	37.5 %	
Location:			
Rural areas	12	75 %	< 0.05
Urban areas	4	25 %	
Symptoms:			
Abdominal pain	8	50 %	0.02
Anorexia & nausea	4	25 %	
Weight loss	2	12.5 %	
Non specific	2	12.5 %	
Signs:			
Abdominal tenderness	10	62.5 %	0.003
Hepatomegaly	3	18.7 %	
Abdominal mass	2	12.5 %	
Unremarkable	1	6.2 %	
History of hydatid surgery:			
Conventional procedures	3	18.7 %	-
others	-	-	
Co-morbidity:			
Obesity	5	31.7 %	Significant in patients > 50 years (0.009)
Cardiovascular	2	12.5 %	
Lung disease	1	6.2 %	
Diabetes	1	6.2 %	
Ultrasonic features:			
Anechoic pattern devoid of septa	1	6.2 %	(0.011) significant in favor of septated cysts
Cart-wheel and split wall signs	4	25 %	
Septa	8	50 %	
Heterogenous	2	12.5 %	
Thick walled cyst	1	6.2 %	

The length of hospital stay was related to the rate of complications. Partial cystectomy with modified capitonage showed a significantly shorter length of hospital stay compared with the other procedures ($P < 0.05$). The mean length of hospital stay was 8.5 days after partial cystectomy with modified capitonage whereas it was 15 & 12.3 days after the conventional and radical procedures respectively. Four patients (25 %) had cholecystectomy as part of their surgical intervention. Of these, one patient had cholelithiasis as well. Cholecystectomy patients had a homogenous distribution in different operative groups. A logistic regression analysis was undertaken and showed that only the conventional and radical procedures had a significant effect on the rates of complication and length of hospital stay (Odds ratio 5.1, 95 % confidence interval 2.4 to 8.9).

One patient (6.2 %) died during surgery. This patient had a history of previous surgery for lung and liver hydatid diseases. As there were two separate hydatid cysts deeply seated and

adjacent to inferior vena cava, the decision was to perform partial cystectomy with tube drainage. However, bleeding occurred during the exploration of the right lobe. There were intense adhesions, and bleeding was impossible to control. The patient died because of massive bleeding from laceration of the hepatic veins

Post operative recurrence:

By using ELISA a remained elevation of the serum levels of total IgG was observed in 5 out of the 16 cases within the first year after surgery (3 cases after conventional procedures and 2 cases after modified partial cystectomy).of those 5 cases post operative recurrences were confirmed radiologically in 2(12.5%) with a mean period of 14 months and both were recorded among patients with conventional techniques. On the other hand radiologically proven recurrence wasn't recorded in patients treated with either modified partial cystectomy or radical procedures with a mean period of 16 and 28 months respectively.

Table (2): Shows operative finding in all patients

Operative findings	Patients		P-value
	No.	%	
Number of cysts			
Single	15	93.7 %	0.0001
Multiple	1	6.2 %	
Localization:			
Right lobe	13	81.3 %	0.001
Left lobe	3	18.7 %	
Both lobes	-	-	
Size of the cavity:			
Mean (cm)	8.91 cm		
Range (cm)	5-30 cm		
Biliary communication	5	31.7 %	
Cholelithiasis	1	6.2 %	