

Original article

Hydatid disease: imaging and management at Government hospital, Dhule

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ABSTRACT

Background: Hydatid disease is one of the oldest known diseases to mankind and still continues to be a health problem. Physicians and surgeons worldwide may encounter the hydatid disease sporadically because of increased travel and immigration. Cystic echinococcosis, is a disease of younger adults, while alveolar echinococcosis is a disease of older adults.

Material and methods: The present study has been done on 27 patients suffering from hydatid disease during Jan 2010 to December 2015 at government medical college, Dhule. We studied clinical and imaging features of hydatid disease.

Observations: In our study of 27 cases, 44.44% were male while 55.55% were female. The incidence was more in the 4th and 5th decade of life (59.25%). The minimum age involved in the study cases was 27 years while maximum was 70 years. Most of the patients were agriculture workers (92.59%). The commonest complaint was chronic abdominal pain (85.15%) followed by lump in abdomen (81.48%). The commonest organ in the study cases was Liver (70.37%). The cyst was unilocular in 77.77% of the cases. The liver hydatid cyst size was ranging from 4 cm to 17 cm. Calcification on plain roentgenogram suggest dead or dying cyst. Computed tomography and magnetic resonance imaging play a key role in recognizing the complications of hydatid cysts.

Conclusion: The radiologist's finding ranges from purely cystic lesions to completely solid appearance. The advent of ultrasonography has represented a breakthrough in the diagnosis, treatment and follow-up of patients with liver hydatid cysts.

Keywords- Albendazole, Anaphylaxis, Cetrime, Echinococcosis, Eosinophilia, Hydatid cyst, Sonography, X-ray

INTRODUCTION

Hydatid cyst infection or echinococcosis is one of the oldest disease which causes not only illness but also productivity loss in human. Hydatid disease has been recognized since ancient times and has a worldwide distribution. Berlot in 1790 is accredited with the first description of a splenic hydatid cyst as an autopsy finding.¹ It is endemic mainly in the Mediterranean countries (particularly Greece), the Middle East, the Baltic areas, South America, India, northern China and other sheep-raising areas.² According to study in 2009, it is estimated that the worldwide incidence of cystic echinococcosis is about 100,000-300,000 cases

annually³ and is known to occur in all continents and in at least 100 countries.⁴ Overall, human infection varies from 1-14/100000 population. The highest prevalence of human hydatid disease in India has been reported from Andhra Pradesh, Saurashtra and Tamil Nadu.^{5,6} The prevalence of the disease is reported to be high in food animals in India.⁷ Imaging modality is the main method of diagnosis. USG become its easy availability, affordability and diagnostic sensitivity as the initial test of choice.⁸ Only albendazole drug is ovicidal, and vermicidal.⁹ Surgery is the gold standard in the management of hydatid cyst liver and other sites as well.¹⁰ Hydatid disease or

Echinococcosis is a zoonotic disease caused by the larvae (metacestode) of the cestode species of the genus *Echinococcus* like *E. granulosus*, *E. multilocularis*, *E. vogeli* or *E. oligarthus*.³ Classical Cystic Echinococcosis (CE) is caused by *E. granulosus* complex, while *E. multilocularis* and *E. vogeli* are responsible for alveolar echinococcosis and polycystic echinococcosis, respectively.⁴ At least, seven of nine *E. Granulosus* genotypes are infective to humans. Globally, most human cases of CE are caused by the sheep strain (G1) of *E. Granulosus*. In India G1 and G5 (cattle strain) strain of *E. Granulosus* have been frequently associated with CE.⁴ G2 genotype (Tasmanian sheep strain) in buffalo has been reported from India.¹¹ Human hydatid disease is commonly caused by the parasite *Echinococcus granulosus* that has the dog as the definitive host and sheep as the intermediate host. Humans are accidental intermediate hosts.¹² Most symptomatic cysts are larger than 5 cm in diameter. Organs affected by *E. granulosus* are the liver (63%), lungs (25%), muscles (5%), bones (3%), kidneys (2%), brain (1%), and spleen (1%).¹⁴

AIMS AND OBJECTIVES: Aim of this study is to study organs involved and symptomatology. And also to correlate clinical and imaging features of hydatid disease.

MATERIAL AND METHODS:

Total 27 patients were studied in the department of Surgery during Jan 2010 to December 2015. In the Radiology department, we did X-ray chest PA, Plain X-ray Abdomen, Ultrasonography of abdomen and pelvis and CT scan abdomen when required. Necessary blood investigations were done in dept of pathology and biochemistry for fitness for general anaesthesia. Physician was on call as and when required in view of anaphylaxis. The age, sex, occupation, history of dog contact, clinical presentation, imaging features, site and size of

cysts, management of patients as well as morbidity and mortality were recorded and analysed.

RESULTS AND OBSERVATIONS:

In our study, the hydatid cyst cases were more common in the 4th and 5th decade of life i.e. 59.25%, while 3.70% above the age of 60 years. The minimum age involved in the study cases was 27 years of age while maximum age was 70 years. Ram dayal et al⁸ and Ankit Kayal et al¹⁵ also reported maximum cases from 4th to 6th decade of life. Most hydatid cysts are acquired in childhood but a latent period of five to twenty years occurs before the diagnosis is made.¹⁶ Hydatid disease is seen in young population who are in their active years of life¹⁷. The growth of hydatid cyst remains indolent yet unremitting by character. As a very crude estimate hydatid cysts grow at a rate of 0.3cm-1cm/year^{18,19}. The rate of growth of hydatids appeared to be dependent not only on immunologic relationship between the parasites and humans but also on the resistance offered by the enveloping structure. In our study, females were affected more often (58.55%) than males (41.44%). Siddharh rao et al¹⁷ also noted female preponderance. Similar finding is also reported by Ram dayal et al⁸ (63.3% females) and Ankit Kayal et al¹⁵ (M:F ratio 1:2). All the cases of our study were from rural area (100%). 92.59% patients were agriculture workers while 07.40% were non agriculture labours. Ram dayal et al⁸, Ankit kayal et al¹⁵ and Siddharth rao et al¹⁷ also noted majority of the cases from rural areas and majority had agricultural occupation. We observed the commonest complaint was chronic abdominal pain (85.15%) followed by lump in abdomen (81.48%). Siddharth rao et al¹⁷ reported similar findings of most common complaint of chronic abdominal pain then followed by complaint of lump in abdomen by own study and noted similar findings in balik et al and jacob et al studies. Ram Dayal et al⁸ also observed same finding.

TABLE 1: SHOWING THE ANATOMICAL LOCATION OF THE HYDATID CYST

Sr. No.	Anatomical location	NUMBER
1	Liver	19 (70.37%)
2	Spleen	1 (03.70%)
3	Kidney	2 (07.40%)
4	Peritoneal cavity	2 (07.40%)
5	Mesentery	1 (03.70%)
6	lungs	2 (07.40%)

The commonest organ in the study cases was Liver in 19 patients i.e.70.37% followed by Kidney, lungs and peritoneal cavity, each in 07.40%. Mesentery and spleen was involved each in one case (03.70%). Hydatid disease of the lung occurs from the larvae, which get trapped in the arterial capillaries of the lungs.¹⁷ In our study right lobe of liver was affected more (84.21%) than left (15.78%). Maingot in 2004 also reported

involvement of right lobe of liver in about 75% of the cases possibly on account of greater blood supply to right lobe than left lobe of liver. Liver as the commonest organ involved and right lobe mostly affected was also noted by Ram Dayal et al,⁸ Ankit Kayal at a,¹⁵ Siddharth Rao et al.¹⁷ The incidence of splenic involvement by hydatid cysts in relation to the rest of the abdominal viscera is very low¹⁵

TABLE 2: SHOWING THE TYPE OF HYDATED CYST

Sr.No.	Type	NUMBER
1	Unilocular	21(77.77%)
2	Multilocular	6(22.22 %)
	Total	27 (100%)

The cyst was unilocular in 21(77.77%) and multilocular in 6 (22.22%) % of the cases. Ram dayal et al⁸ also noted majority of unilocular cysts (70%) and multilocular in 30%.

TABLE 3: SHOWING USG FINDINGS IN HYDATID DISEASE

Sr No	Size of cyst	No of cases	Percentage
1.	<5cms	1	03.70%
2.	5 to 10 cms	17	62.96%
3.	10-15 cms	7	25.92%
4.	>15 cms	2	07.40%

The smallest size of hydatid cyst was 4cms, in right lung at base and the largest size was in right lobe of the liver 17cms. Most common size was 5 to 10 cms, in 17 cases (62.96%). In study by Ram dayal et al⁸ majority of cysts were above 10 cms

(66.6%). We did open surgery for all cases. For liver hydatids excision of cyst, marsupialization, omentoplasty and drainage procedures were done. All patients had smooth postoperative recovery. Post operative wound infection was the commonest

complication in 3 cases (11.11%). Siddarth rao et al¹⁷ also noted most common complication as wound infection in 18.8% of the cases.

DISCUSSION:

X-RAYS:

Roentgen study is of more help in the diagnosis of pulmonary hydatids than liver. On chest films, an intact pulmonary hydatid cyst appears as rounded homogenous shadow with well defined margins¹⁵. Sometimes these hydatid cysts cast radiodense shadows suggesting calcifications. Calcified hydatid cyst is a dead cyst. A marginal/crumpled egg-shell-like calcification in the splenic area, an elevated left hemidiaphragm, displacement of stomach and/or left colonic flexure can be seen on plain radiograph in splenic

hydatidosis.²⁰ Round homogeneous opacities in the lung parenchyma are characteristic of simple uncomplicated cysts. The water lily sign or “Camelot sign” represents the separated endocyst, and appreciated on a radiograph when the collapsed endocyst is calcified. The “crescent sign” represents a crescent-shaped air shadow caused by trapped air between the pericyst and the laminated membrane. Air between the endocyst and pericyst creates the “onion peel sign.” The “empty cyst sign” is seen on complete expulsion of the contents of the cyst after cyst rupture. Lung hydatid cysts rarely show daughter cysts and calcification²¹ The above findings can be shown on chest radiography and, better, on CT²².



Image 1: Plain xray chest:lung hydatid.

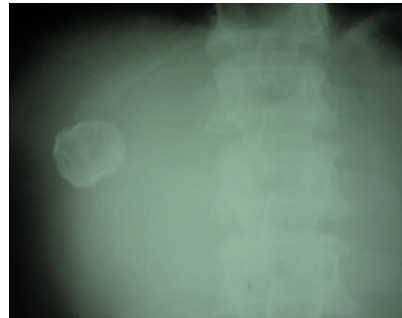


Image 2: plain xray abdomen: calcified hydatid cyst(dead)

ULTRASONOGRAPHY:

There are two classification systems used by clinicians worldwide while discussing hydatid disease – the WHO classification and the Gharbi classification, both based on ultrasonographic findings. The Gharbi classification is more popular due to its simplicity and ease of application.

Gharbi Classification of Hydatid Cases²³

Type I – Pure fluid collection – univesicular cyst,

Type II – fluid collection with a split wall – detached laminated membrane – ‘Water lilly’ sign,

Type III – fluid collection with septa – daughter cysts,

Type IV – heterogenous appearance – presence of matrix – mimics a solid mass,

Type V – reflecting thick walls – calcifications.

WHO Classification ²⁴

CE1 – Unilocular, simple cyst with uniform anechoic content. Cyst may exhibit fine echoes due to shifting of brood capsules that is often called hydatid sand (“snow flake sign”)

CE2 – Multivesicular, multiseptated cysts ; cyst septations produce “wheel-like” structures, and presence of daughter cysts is indicated by “rosette-like” or “honeycomb-like” structures. Daughter cysts may partly or completely fill the unilocular mother cyst.

CE3 – Unilocular cyst which may contain daughter cysts. Anechoic content with detachment of laminated membrane from the cyst wall visible as floating membrane or as “water-lily sign” which is indicative of wavy membranes floating on top of remaining cyst fluid.

When ultrasound reveals infoldings of the inner cyst wall, separation of the hydatid membrane from the wall of the cyst, or hydatid sand, a diagnosis of hydatid disease is probable²⁵. When the fluid pressure in cyst becomes high dissections may occur, resulting in the detachment of parasitic membranes, and these undulating pathognomic membranes seen on ultrasonography (USG) and CT are known as snake/serpent signs. In the more advanced stage of collapse; the membranes appear twisted on imaging known as spin/whirl sign.²⁰ The “Water-Lily” sign refers to a collapse of the endocyst layer which results in the inner cyst lining falling into the fluid in the dependent aspect of the cystic lesion. This gives the appearance of debris floating on a layer of fluid within the cyst. On axial sonogram, parallel stripes, called double-line signs

that delineate the space between parasite's ectocyst and host's pericyst are seen. When seen, this sign helps to differentiate hydatid cysts from simple cysts, cystic tumors, pseudocysts, and metastases. Sonography is particularly useful for detection of the double-line sign. US images in case of *E. multilocularis* infection show the typical Hailstorm pattern, characterized by multiple echogenic nodules with irregular and indistinct margins.²⁰ All our cases were diagnosed on USG (100%). In study by Ankit Kayalet al¹⁵ and Ram Dayal et al⁸ also, USG was proved diagnostic in all (100%) cases. While Balik et al²⁶ reported diagnostic accuracy of 97.7%. We have done CT scan in 12 cases (44.44%) and it was 100% diagnostic. Balik et al²⁶ and Ankit dayal et al¹⁵ both reported diagnostic accuracy of CT scan 100%.

Sonographic Features of Liver Hydatid Cysts²²

Feature	Characteristics
Anechoic cyst	Seen as an anechoic lesion with posterior acoustic enhancement
Daughter cysts	Seen as hypoechoic to anechoic cysts in the lumen of the mother cyst
Double echogenic line	Represents the ectocyst and pericyst with a hypoechoic zone between them
Snowstorm sign	Seen as hydatid sand dispersed in the cyst and appears as falling snowflakes with patient movement
Floating membrane and water lily sign	Seen as a thin undulating membrane due to separation of the endocyst
Spoked wheel pattern	Multiple daughter cysts filling the mother cyst; seen especially on CT

Feature

Characteristics

Wall calcification

Seen in long-standing dead cysts



Image 3: spoked wheel appearance of liver hydatid.

CT SCAN:

The CT scan has an accuracy of 98% to demonstrate the daughter cysts.¹CT has a higher overall high sensitivity than ultrasound, with sensitivity rates of 95-100%¹⁸.CT is the best mode for determining the number, size, and anatomic location of the cysts, and is also better than ultrasound in detecting extrahepatic cysts.The CT attenuation in hydatidosis depends on the intracystic content. Hydatid cysts usually have a homogeneous fluid content showing water attenuation values on CT.However, hydatid cysts may show high CT values on unenhanced CT scans. The presence of intracystic debris, hydatid sand, and inflammatory cells are presumed to cause the high CT values in these cases.²⁰ Density of the mother cyst is higher than that of the daughter cyst because of advanced degenerative changes resulting in intracystic debris, "hydatid sand," and inflammatory cells. The high-density fluid



Image 4: Multiple hydatid cysts liver.

surrounding the daughter cysts appears as radiating spokes like a "rosette" pattern. Calcification is shown well on computed tomography.²² Difference of density gives characteristic CT picture that is diagnostic for the presence of multivesicular E. granulosus cysts. Daughter cyst densities vary between 0 and 15 H, in contrast to higher densities of mother cyst fluid (30-40 H). Exogenously proliferating cysts which are only rarely observed are seen in E. multilocularis along with large, irregularly shaped, hypoattenuating lesion with diffuse punctate calcifications, which are more clearly seen on the unenhanced image.²⁷ Computed tomography is indicated in cases in which USG fails due to patients-related difficulties (e.g.obesity,excessive intestinal gas,abdominal wall deformities and previous surgery)or disease complications.²⁸



Image 5:renal cortical hydatid cysts.



Image 6:liver hydatid left lobe

MAGNETIC RESONANCE IMAGING FEATURES :

A hydatid cyst appears hypointense on T1-weighted images and hyperintense on T2-weighted images. Magnetic resonance imaging (MRI) accurately shows the hydatid matrix, daughter cysts, and pericyst. A detached endocyst appears as a floating membrane in the cyst and is described as

the “snake sign”²² MRI can be helpful in identifying the rim and differentiating this diagnosis from other encapsulated liver lesions, which can be accepted as signs of partial detachment are more reliably demonstrated with MRI than with CT or USG²².

Computed Tomographic and MRI Features of Liver Hydatid Cysts²²

Feature	Characteristics
CT	
Cyst	Seen as a well-defined lesion with an attenuation value of water
Daughter cysts	Seen as peripherally arranged cystic lesions in the mother cyst
Rosette pattern	High-density fluid surrounding the daughter cysts appears as radiating spokes
Wall calcification	Seen in long-standing cysts
MRI	
T2 hyperintense lesion	Typical of any cystic lesion
Serpent sign or snake sign	Seen as an undulating collapsed membrane; described as having the appearance of a serpent

Splenic hydatid cysts are generally solitary. The imaging characteristics of these cysts are similar to those of any other hydatid cysts .The differential diagnosis for splenic hydatid cyst includes other splenic cystic lesions such as epidermoid cysts, splenic abscesses, pseudocysts, hematomas, and

cystic neoplasms of the spleen²² Ultrasound in spleen hydatid has a sensitivity of approximately 90-95%.¹⁸ When the cyst contains membranes, mixed echoes will appear that can be confused with an abscess or neoplasm. When daughter cysts are present, characteristic internal septations

result²⁰Renal hydatid cysts are generally unilateral and involve the cortex. Unilocular hydatid cysts can mimic simple renal cysts. Multilocular hydatid cysts can be misdiagnosed as renal cysts, cystic nephroma, or cystic variants of renal cell carcinoma.²²Unilocular hydatid cysts can mimic simple renal cysts. Multilocular hydatid cysts can be misdiagnosed as renal cysts, cystic nephroma, or cystic variants of renal cell carcinoma.²⁹When daughter cysts are formed, the cyst will typically demonstrate low echogenicity on ultrasound, hypodensity on CT, and low to intermediate signal intensity on T1- and high signal intensity on T2-weighted MR images.²⁰

SURGICAL MANAGEMENT

The open abdominal surgery for hydatid cysts is gold standard for years together. In the era of modern surgical technique the laparoscopic management is a new horizon. Both open as well as laparoscopic technique includes radical surgery such as liver pericystectomy with omentoplasty, anatomical and non anatomical liver resections. A tailored approach is required in each patient due to variations in size, multiplicity, location and associated complications. Many authors recommend pericystectomy for hepatic hydatid disease³⁰Intraoperative irrigation of 0.5% cetrimide, 15% hypertonic saline and 0.5% silver nitrate solution, before cyst opening, may kill daughter cysts and further reduces the risk of dissemination and anaphylactic reaction.³¹ In our study, the scolicial agent was 0.5% cetrimide. The large packs of this scolicide agents tucked around the exposed liver or target organ. For liver hydatids Incision was made through liver overlining the cyst and adventitia was opened. The aim was to separate the laminated membrane and deliver the cyst intact. The resulting cavity was managed by omentoplasty. For splenic hydatid we did splenectomy. For Kidney hydatid cysts, we did the

excision of the cysts with drainage by kidney incision. For peritoneal and mesenteric hydatid cysts removal of the cysts with drainage was done. There was no anaphylaxis reaction intraoperative and post operatively. All the cases were operated in general anaesthesia and recovered smoothly. Various laproscopic operative techniques described are total pericystectomy, puncture and aspiration of contents followed by marsupialization, unroofing and drainage, unroofing and omentoplasty and omentoplasty using helical fasteners.³⁰ Palanivelu C et al³² described Palanivelu Hydatid system for management of hydatid disease which uses special trocar-canula system which is new, safe with optimum efficacy. For hepatic cysts, the more radical the intervention, the higher the intraoperative risk and the lower the frequency of relapse and vice versa in the more conservative approach.²⁸ Manterola³⁰ et al have reported operative pericystectomies after evacuating the cyst. The most common complication we noted is wound infection in 3 cases.(11.11%) similar finding are observed by Siddarth rao et al¹⁷ (18.80%). Today, percutaneous treatment of liver hydatid cysts, a safe, easily applicable and well tolerated method, has become the most effective and reliable treatment procedure in most cases if hydatid cyst is viable. In patients treated with the percutaneous treatment technique, a decrease in the dimensions of the cyst, solidification of the cyst contents and irregularity in the walls of cysts are signs suggestive of cure.³⁵

MEDICAL MANAGEMENT

All our patients are treated with albendazole 10 mg/kg/day for at least two weeks pre-operatively before subjecting them to surgery and this is continued post operatively for four weeks. Pre and postoperative chemotherapy with Albendazole was given to all our patients because of its proven

effects in sterilizing the cyst, decreasing the chance of anaphylaxis, decreasing the tension in the cyst wall (Thus reducing the risk of spilling during surgery) and in reducing the recurrence rate postoperatively.^{33,34} The standard regimen is albendazole (10-15mg/kg/day) three cycles of 1 month with a break of 14 days between courses.²⁸ Praziquantel in a dosage of 40 mg/kg body weight once a week as an adjunct to albendazole. After medical therapy, detached membranes within the degenerated cyst – Snake or serpent sign indicates that the parasite is responding to medical therapy.²⁰

CONCLUSION

In our study, The hydatid cyst disease was more in the 4th decade and 5th decades of life. The minimum age involved in the study cases was 27 years of age while maximum age was 70 years. This is due to very slow growth of hydatid cysts and decades are required that a cyst to grow such a size that it can cause the pressure symptoms. A cyst manifests its symptoms depending upon the intra cystic pressure, its size and site. The commonest

complaint was chronic abdominal pain (85.15%) followed by lump in abdomen (81.48%). All the study cases were from rural area. The rural population lives very close to the domestic animals. Most of the patients were agriculture workers (92.59%) while two cases were non agriculture labour (07.40%). Definitive host of the Hydatid disease is animal while intermediate host is human. That's why the disease prevalence is more in rural area. The commonest organ in the study cases was Liver in 19 patients (70.37%) followed by Kidney, Peritoneal cavity, and lungs each in 2 cases (07.40% each). The cyst was unilocular in 77.77% of the cases. All the cases were operated in general anaesthesia, recovered smoothly. Ultrasonography was the investigation of choice. The radiologist should also be familiar with the postoperative follow-up ultrasound findings of hydatid cyst to prevent misinterpretation of the hypoechoic, anechoic, or hyperechoic appearance of post-treatment hydatid disease appearance as recurrence.

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