CASE REPORT

CT and MRI findings of renal infestation by a huge active hydatid cyst

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SUMMARY

Hydatid cysts derived from a type of tapeworm called *Echinococcus granulosus* larvae which can situate in various organs or tissues in human body. It encounters as an endemic zoonosis in many regions all over the world including eastern part of Turkey. Renal involvement of hydatid cysts is uncommon even in endemic areas. The imaging properties vary according to the phase of the disease. Although it is a benign condition, the diagnosis of a renal hydatid cyst is critical in managing treatment and complications, such as nephrectomy, medical treatment before surgery and the risk of anaphylaxis or dissemination during intervention. Herein authors reported a case of an isolated involvement of the right kidney by a huge active hydatid cyst in a young man who was treated surgically, emphasising its ultrasound, CT, contrast-enhanced MR and diffusion-weighted imaging findings.

BACKGROUND

Hydatid cysts (HC) derived from a type of tapeworm called *Echinococcus granulosus* larvae which can situate in various organs or tissues in the human body.¹ It encounters as an endemic zoonosis in many regions all over the world including eastern part of Turkey.² The cysts grow over time slowly where the larvae reaches the involved organ via capillary blood flow. It rarely involves kidneys with an incidence of 2–3% among the other sites of infection.^{1–4} Although it is a benign condition, the diagnosis of a renal HC is critical in managing treatment and complications, such as⁵ albendazole treatment before surgery⁶ and the risk of anaphylaxis or dissemination during intervention.^{7–8} The diagnosis is based primarily on imaging combined with laboratory findings. Other than HC, cystic nephroma, renal cell carcinoma and simple renal cyst must be taken into account in differential diagnosis of a cystic renal mass.⁹ Herein, we reported a case of an isolated involvement of right kidney by a huge active (type 2) HC in a young man who was treated surgically, emphasising its ultrasound, CT, contrast-enhanced MRI (CE-MRI) and diffusion-weighted imaging (DWI) findings.

CASE PRESENTATION

A 35-year-old man, who felt swelling in the abdomen in the last 6 years was referred to general surgery clinic. There was a palpable soft and mobile mass in his right abdomen, without tenderness or rebound sign. His medical record was negative for trauma and weight loss. His blood pressure and body temperature were normal. He was from

Çanakkale; a sheep-grazing area in the south Aegean region of Turkey.

INVESTIGATIONS

There was no remarkable change in the laboratory findings including complete blood count, erythrocyte sedimentation rate and urine analysis, except for mild eosinophilia. Abdominal sonography revealed an extremely large echo-free cystic mass fulfilling the right hemiabdomen with a mild vascularity through medial part of its wall. There was nodularity and 'lace like' thickening on the lower portion of the cyst wall which was hyperechoic as well.

A contrast-enhanced triple phasic multidetector row CT (Asteion 4, Toshiba Medical Systems, Japan) scan demonstrated a huge cystic low-density mass (+3 HU) measured (CC×T×AP) 22×16×12 cm, having a thick, non-calcified and smooth wall with mild contrast enhancement encompassing most of the right kidney. The wall of the cyst showed moderate-serpentine or lace-like thickening without contrast enhancement (figure 1A) small part of the kidney parenchyma was realised in the mid abdomen (figure 2A,B). The renal hilum was rotated and displaced medially without significant collecting system dilation.

For further characterisation of the mass, dynamic CE-MRI (signa hdxt GE Healthcare, Milwaukee, Wisconsin, USA) and DWI of abdomen and pelvis was achieved by using 1.5 T MRI with body coil. A fluid-filled mass having a thick and smooth wall was isointense on T1-weighted and markedly hypointense on T2-weighted images compared with the parenchyma of the liver. On the lower portion of the cyst, detached membranes were markedly hypointense on T2-weighted sequences which is a typical sign of type 2 HC (figure 1(B)). DWI showed increased diffusion with a corresponding mean appearing diffusion coefficient (ADC) value of $270 \times 10^{-3} \text{ mm}^2/\text{s}$. There was mild contrast enhancement in the cyst wall which was absent in the detached membranes (figure 1C,D). No any other organ with involvement of HC was detected. The laboratory results of serum echinococcus anticorps were positive (1/80). Taking all into consideration, renal hydatid cyst was the diagnosis. The patient underwent total nephrectomy via peritoneal approach. The cyst and the right kidney were removed en bloc by urology surgeon with uneventful postoperation period.

DISCUSSION

Echinococcus infections, most common type of it is *Echinococcus granulosus*, continue to be noteworthy

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Figure 1 Contrast-enhanced axial CT sectional image from lower abdomen shows cystic mass having a thick, non-calcified and smooth wall with mild contrast enhancement adhered to the right kidney. Arrows depict moderate serpentine or lace-like thickening within the wall of the cyst as well (A). Axial MRI from the lower abdomen demonstrates the marked T2-weighted hypointensity of both wall and detached membranes (arrow) (B). T1-weighted precontrast (C) and postcontrast (D) axial image from the similar level shows both the wall of the cyst and detached membranes have isointense relative to the striated muscle signal intensity. The wall of the cyst demonstrates contrast enhancement while the detached membrane does not.

health problem in many parts of the world especially in endemic areas.¹ Histologically the cyst wall consists of three layers; the outer layer called pericyst which is formed by the immune response of host to parasite cells. In the middle is the acellular laminated membrane which allows the passage of nutrients; and the inner layer is germinal membrane in which both scoleces (tapeworm larvae) and laminated wall is produced. The content of the cyst is also made by the germinal membrane which is a mixture of sodium chloride, protein, glucose, ions, lipids and mucopolisaccharides and has crystal-like appearance.¹ In case of rupture of the cyst, anaphylaxis or eosinophilia may be observed in the patient because of its highly the antigenic property.²

The HCs localise mostly in the liver followed by lungs, with a ratio of 74.8% and 24%, respectively.¹ The involvement of the kidney is rare and is reported only 2–3% of all cases in literature.^{1–4} As in our case, renal HCs are mostly unilateral, solitary and slow-growing masses, which might reach great dimensions. They are usually asymptomatic unless the cyst ruptures into the collecting system causing acute urinary obstruction and hydatiduria, with an incidence of 18%.^{1 7 10} Eosinophilia is non-specific, which is found in 25–50% people.¹¹ The indirect haemagglutination test for searching echinococcus antibody is positive in most of the cases. Diagnosis could be made depending on the imaging findings with positive laboratory results, especially in endemic countries.

Figure 2 Sagittal T2 (A) and coronal fat-saturated T2-weighted (B) images show extremely large cystic mass fulfilling the right hemiabdomen. Detached membranes can be seen as thickening on the lower portion of the cyst wall which was hypointense as well (arrows).

Abdominal radiography in the initial diagnosis might demonstrate soft tissue mass; with or without rim like calcification in 20–30% people.¹²

Excretory urography (EU) can depict caliceal distortion mimicking other renal masses. After a long period, the mass effect of the cyst might cause loss of renal function.⁴ A seldom sign can be filling defects of daughter cysts due to the perforation of the cyst into the collecting system.² EU was not required for our patient as he did not have renal colic or hydatiduria.

Gharbi *et al*¹³ had categorised HCs into five types depending on the sonographic findings. In 2003 WHO-IGWE classified the types of HCs according to disease activity; cysts like pure cystic or those having dominant cystic components (types 1 and 2) representing active disease, cysts involving detached membranes and daughter cysts are transitional forms (type 3) and the cysts having solid appearance (types 4 and 5) are agreed to represent inactive disease.¹⁴

On CT examination, type 1 HCs demonstrate a low attenuation mass surrounded by a thick wall,¹³ while type 2 HCs are uniloculated cysts having a detached membrane¹ as in our case. Type 3 HCs are multiloculated cysts seen as multiple low-density daughter vesicles surrounded by a higher density matrix in the parent cyst.² The calcification of the cyst wall can be total or partial, which can be demonstrated easily by CT. After contrast administration, thick and smooth wall of the cyst and inner membranes reveal contrast enhancement.²

On MRI the wall of the HC is typically hypointense on T2-weighted sequences, related to fibrous pericyst. The cystic contents have long T1 and T2 times characteristic of water signal intensity in type 1 or 2 lesions and daughter cysts in type 3 lesions.² The signal intensity of cyst matrix can be hypointense, isointense or hyperintense on both T1-weighted and T2-weighted images according to the proteinous content of parent cyst in type 3 HCs.^{2–6} The detached (as in our case) or collapsed membranes are also hypointense on T2-weighted sequences just as in our case. The wall of the cyst and the membranes demonstrate contrast enhancement as well.² Çeçe *et al*¹⁵ found out that ADC values of types 1, 2 and 3 are significantly different from types 4 and 5 on DWI in a recent study.

One of the major causes of cystic renal masses is a complicated form of a simple renal cyst due to ischaemia, haemorrhage and infection; and the other is cystic renal cell carcinoma. Multiloculated, multiseptated appearance, wall or septal thickening, contrast enhancement and nodularity within the wall require further examination as renal cell carcinoma can present as a cystic mass approximately in 10% of cases.¹⁶ In CT there was nodularity within the cyst wall in our patient it was confounding for cystic renal cell carcinoma. Other than this, type 1 HCs may mimic simple renal cysts.⁶ A multiloculated type 3 HC may look like congenital polycystic renal disease.⁶ An infected hydatid cyst or a type 4 HC can be interpreted as heterogeneous or solid mass.

The treatment of HC includes both medical and surgical management. Benzimidazole compounds, commonly albendazole, might be helpful in decreasing the size of the cyst under US follow-up.⁶ Nephron sparing surgery can be an option for removing the cyst while nephrectomy is preferred in case of accompanying destroyed kidney as in our case.¹⁷ Percutaneous aspiration, injection of scolicidal agent (eg, 10% povidone iodine or 95% ethanol) and reaspiration techniques can be selected for renal cysts as interventional procedure.⁸ Radiologists should be aware of the imaging findings of percutaneously treated cysts such as decrease in the cyst size,

solidification of the internal content, change in echo structure and deformation of the cyst wall.⁸

Renal involvement of HCs is uncommon even in endemic areas. They are usually solitary, unilateral and asymptomatic for long periods of time and tend to reach great dimensions. They are rarely symptomatic causing urinary obstruction, hydatiduria or colicky flank pain. The imaging properties vary according to the phase of the disease.

Typical imaging findings such as floating or detached membranes having spiral or serpentine appearance, bilayered thick wall, uniloculated or multiloculated cyst containing multiple daughter vesicles can be helpful findings in proper diagnosis.

Learning points

- ▶ Hydatid cysts must be taken account in differential diagnosis of cystic renal pathologies.
- ▶ The imaging properties of hydatidosis vary according to the phase of the disease.
- ▶ Floating or detached membranes having spiral or serpentine appearance, bilayered thick wall, uniloculated or multiloculated cyst containing multiple daughter vesicles can be helpful findings in diagnosis of hydatid disease.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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