CT and MRI features of intracranial hydatid cysts: Report of 11 cases

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Aims and objectives

- Illustrate and describe the imaging features of intracranial hydatid cysts on cross sectional imaging techniques (CT and MRI).

- Recognize and differentiate typical and atypical brain hydatid cyst.

- Establish a differential diagnosis algorithm permitting discrimination of brain hydatid cyst from other brain cystic diseases based on location, signal characteristics, cyst wall and contrast uptake.
Methods and materials

A retrospective study involving 11 histopathologically prooved cases of intracranial hydatid cysts diagnosed and treated at the neurosurgery department (Fattouma Bourguiba Monastir hospital) over a period of 15 years from juin 1997 to dec 2012. Patients were investigated by brain CT in all cases and MRI in 7 cases.
Results

The age of the patients ranged from 4 to 39 years with no sex predominance. The concept of contact with dogs was found in 9 cases. The clinical symptomatology was dominated by Intracranial hypertension symptoms (n = 10), isolated headache. Less common symptoms were: seizures (2 cases), visual disturbances (1 case) and focal neurological deficit (3 cases). All lesions were located in the supratentorial space with predilection for the temporoparietal lobes (60%). The size of lesion was ranging from 35 to 75 mm.

CT appearance:

Non enhancing, Hypodense, rounded, well-circumscribed cystic was found in 6 cases (Fig 1). A Septated cyst containing daughter cyst was noted in 3 cases (Fig 2). Calcifications were found in 2 cases (Fig 3). No perilesional edema seen in all cases. Intrallesional contrast uptake was not found in all cases and perilesional contrast enhancement was noted in 2 cases.

MRI appearance:

Rounded, well defined cystic formation with homogeneous content displaying identical signal as cerebrospinal fluid in all sequences was noted in 6 cases (Fig 4, 5). A Cystic lesion with membrane detachment displaying hypointense signal T2 was seen in one case. A calcified cyst noted on brain CT scan demonstrated T1 isointense signal and T2 hypointense heterogeneous signal (Fig 6, 7). The cyst was multiloculated with presence of daughter cysts in 2 cases. All cystic lesions demonstrated hypointense wall in all sequences without significant contrast uptake (Fig8, 9). No restriction seen in diffusion sequence for all lesions studied. The mass effect was seen in all cases and the perilesional edema was found only in 2 cases. No intrallesional contrast uptake seen for all cases.

Discussion:

Intracranial hydatid cysts are extremely rare, accounting for only 1-2% of all intracranial space occupying lesions [1], even in countries where this disease is endemic - the middle east, Mediterranean countries, South America, North Africa and Australia [2].

The typical intracranial hydatid cysts, caused by Echinocccus granulosus, present as well defined solitary cystic lesions in the middle cerebral artery territory [3], without surrounding edema, are non enhancing and show unremarkable mass effect unless large [4] when they can show significant parenchymal distortion, mass effect, hydrocephalus, and raised intracranial pressure. 6 of our cases presented typical appeareance.
Lesions can present as multicystic masses, with mass effect or with edema, when differentiation may be difficult from other entities like astrocytoma, infective lesions [4]. Multiple cysts can develop rarely either spontaneously, after trauma or post operatively [2],[4],[5].

The cerebral hydatid cysts are slow growing and present late when they increase in size and become large. Growth rate has been variably reported between 1.5-10 cm/year [1], [6]. As noted in our series hydatid cysts are generally found in middle cerebral artery territory (3) in the parietal lobes, although they can be seen in any location including skull vault, extradural, intraventricular, meningeal, posterior fossa and brainstem [4].

Children and young adults are more commonly affected than adults [1],[7].

Generally they are unilocular, CSF density(on CT) or intensity (on MRI) lesions with a fine fibrous wall which on T2WI MR scans appears as hypointense ring; this appearance being considered diagnostic [4].

Calcification is seen in less than one percent of cases [4] and is better seen on CT. Two of our cases presented amorphous calcifications on Ct scan studies. MRI was helpful by demonstrating the serpiginous membranes confned within the lesion and suggestive of hydatid disease.

Hemorrhage has not been reported.

The cysts lie just few millimeters below the cortex [6] and can protrude and adhere to the meninges [4],[5] and calvaria and erode the vault [4]. Surrounding sclerosis may be present as well at the periphery [4]. Bone erosion was not seen in any of our cases.

Daughter cysts have similar features as the mother cyst though they are less hyperintense on T2W MR image than the mother cyst [4].

Intracranial hydatid cysts are classified as primary or secondary depending on whether other organs haven't/have been involved. Primary hydatid cysts contain brood capsule and scolices and their rupture can produce secondary cysts which lack scolices and brood capsules. Primary multiple cysts are rare [8],[9] most being secondary, whether they have developed spontaneously or after embolization from rupture of a primary cyst [6].

The scolices of the cyst are not seen on MRI [5],[8],[10].

Edema is not a feature of intracranial hydatids. When present, edema and post contrast enhancement indicate ongoing inflammation [11]. Presence of significant edema may indicate rupture of the cyst and may be present in post operative cases. Such cases are difficult to differentiate from other cystic lesions with enhancement and peripheral edema such as abscesses, large granulomas or cystic gliomas [4].
Kohli et al [12] performed in vivo MR spectroscopy (MRS) studies in a patient of intracranial hydatid cyst and found, besides lactate, alanine and acetate, a large resonance for pyruvate. The MRS pattern appeared different from the other cystic lesions of brain and they have suggested MRS as an adjunct to imaging in the differential diagnosis of intracranial hydatids.

Garg M et al [13] have done ex vivo study on hydatid fluid and found that they do not contain creatine unlike cysticerus cysts, and if fertile, they also contain malate and,or fumarate.

There have not been complete in vivo MR spectroscopy studies to give an accurate formulation of the findings although it has shown promise in differentiating hydatid disease from other confusing entities.

Other differentials apart from infective lesions and astrocytomomas are an epidermoid, an arachnoid cyst and a porencephalic cyst.

Arachnoid cyst has similar appearance as that of a hydatid but they are said to have an irregular inner border [14] and are not spherical shaped.

Epidermoids can be differentiated usually by their lobulated, vessel engulfing, self moulding behaviour however in certain situations, diagnosis can be difficult.

The identification of a single, large, unilocular cyst lesion without surrounding oedema in the parietal region of the brain displaying T1, T2 hypointense wall signal is most typically suggestive for hydatid cyst.
**Images for this section:**

![Axial CT image without IV contrast injection showing large left parietal lobe cyst with thin regular wall and displaying marked compression of left lateral ventricle with shifting of midline](image)

**Fig. 1:** Axial CT image without IV contrast injection showing large left parietal lobe cyst with thin regular wall and displaying marked compression of left lateral ventricle with shifting of midline

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**Fig. 2:** Plain axial brain CT scan demonstrating left parieto occipital multilocular cyst with presence of daughter cyst. Note the mass effect towards the left occipital horn and left lateral ventricle with shifting of mid line.

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Fig. 3: Plain axial brain CT scan showing left occipital calcified mass.

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Fig. 4: Axial T1 weighted image: Right parietal simple cyst displaying homogeneous hypo intense signal with thin regular walls.

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Fig. 5: Axial T2 weighted image: Right parietal simple cyst displaying homogeneous bright signal with thin regular hypo intense membrane.

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Fig. 6: Sagittal T1 weighted image without contrast showing left occipital mass displaying isointense signal (The lesion was calcified on brain CT (see fig 3.)

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**Fig. 7:** Axial T2 weighted image showing left calcified occipital mass displaying heterogeneous signal with conjunction of hypo and hyperintense signals. Note serpiginous linear structures within the lesion.

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Fig. 8: Axial T1 weighted image after contrast injection showing no contrast uptake in the right parietal cyst wall.

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**Fig. 9:** Axial and coronal T1 weighted images after gadolinium injection showing mild parietal contrast uptake.

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Conclusion

The identification of a single, large, unilocular cyst lesion without surrounding oedema in the parietal region of the brain is most typically suggestive for hydatid cyst. CT allows the diagnosis in the vast majority of cases. MRI is useful for the unusual or complicated atypical cysts and enables appropriate surgical planning.
References