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Magnetic resonance imaging characteristics of cardiac hydatid cyst

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ABSTRACT

Purpose: The purpose of this article is to describe the magnetic resonance imaging (MRI) features of cardiac hydatid disease and show the specific findings in the diagnosis of hydatic cysts.

Materials and methods: A retrospective review of cardiac MRI records between 2015 and 2017, 7 patients (3 males, 4 females; age range: 14–74) were identified with the histologic diagnosis of cardiac hydatid disease. Cardiac MRI examinations were performed in order to investigate the cardiac cystic-solid lesion obtained via previous echocardiography (ECG) and thorax computed tomography. 1.5 Tesla magnetic field power generation capacity was used and the images were acquired with ECG trigger.

Results: There is variation in signal characteristics of cysts on T1-weighted and T2-weighted images. Early contrast enhancement was not observed in the any of lesions on contrast-enhanced series. In all lesions examined, peripheral contrast enhancement was observed in the late contrast enhanced series, independent from the internal structure and signal intensity.

Conclusions: MRI reveals the exact anatomic location and nature of the cyst structures. Peripheral enhancement of non-enhancing lesion is very valuable for diagnosis of cardiac hydatids on MRI.

1. Introduction

Hydatid disease is a parasitic infection caused by larvae of *Echinococcus granulosus*, which is still endemic in some parts of the world. Domestic dogs and cats are the primary carriers of echinococcal organisms. Humans are infected as intermediary carriers when they eat raw or unwashed and uncooked vegetables and swallow parasitic ova. After the person digests the contaminated food, the embryo of the parasite is released into the intestinal tract and carried to the liver by the portal circulation [1]. Hydatid cysts are surrounded by periparasitic host tissue (pericyst) embracing the larval endocyst. The cyst inside the laminated layer, or hyaline membrane is covered by a multipotential germinal layer that leads to the production of brood capsules and protoscolices [1].

Cardiac involvement is an uncommon presentation of hydatid cyst disease, accounting for approximately 0.5–2% of all hydatidosis cases, and mainly occurring as part of a systemic infection [2]. In cases with cardiac involvement, the left ventricle is the most frequently (50%–60%) affected part, but the interventricular septum (10%–20%), right ventricle (5%–15%), pericardium (7%), pulmonary artery (6%), and right or left atrium (5%–8%) may also be involved [3,4]. Cardiac involvement occurs by invasion of the myocardium, first through the coronary artery circulation. The second route of infestation is the pulmonary vein from rupture of pulmonary echinococcal cysts into the vein or the portal system from invasion of hepatic hydatid cysts [3,5].

Signs and symptoms of cardiac hydatid disease are extremely variable and associated with the location and the size of the cysts. Most of the patients with cardiac echinococcosis have no symptoms because hydatid cysts, which are located in the heart, grow very slowly. The most common symptom is precordial pain. Only approximately 10% of patients, especially those with large hydatid cysts, have clinical manifestations [3]. If the cyst compresses the coronary arteries, it may cause angina pectoris. A compression of the bundle of His may result in conduction abnormalities. Mitral stenosis can be simulated when the cyst lies in the left atrium obstructing the cardiac outflow. Pericarditis, anaphylactic shock, systemic and pulmonary embolisms are major complications of the cardiac involvement. The most commonly used hydatid cyst classification is the Gharbi classification. It is classified hydatid cyst images into 5 types. Type 1, walled, unilocular, pure fluid collection; type 2, fluid collection with a detached a membrane; type 3, fluid collection with multiple septa and/or daughter cysts; type 4, heterogenic, hypo-hyperechogenic fluid collection; type 5, calcification of a section of the wall or completely calcified cyst [6].

Magnetic resonance imaging (MRI) is an excellent modality demonstrating with its higher soft tissue contrast that allow distinguishing circulating blood and soft tissue as well as demonstrating cardiac

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anatomy with a global view. Experience with MRI findings of patients with cardiac hydatid disease is still limited [3,4,7,8]. In this article, we describe the MRI features of cardiac hydatid disease and provide detailed description of peripheral enhancement that can be an important sign in the diagnosis of hydatid cysts.

2. Materials and methods

A total of 7 patients (3 males, 4 females; age range: 14–74) with a pathologic diagnosis of cardiac hydatid disease were retrospectively screened and evaluated from the hospital PACS system which includes cardiac MRI images archived. The study was approved by the hospital local ethics committee.

Patients included in the study, were referred to our hospital for various reasons such as chest pain, dyspnea or palpitation. All patients underwent transthoracic echocardiography (ECG), three patients additionally underwent thorax computed tomography (CT). Cardiac MRI examinations were performed in order to investigate the cardiac cystic-solid lesion obtained via previous echocardiography and thorax CT. In our study, MRI device (Symphony, Siemens Medical Solutions) with 1.5 Tesla magnetic field power generation capacity was used and the images were acquired with ECG trigger. The obtained MRI sequences were T1-weighted spin echo (TR/TE: 700/26; matrix size: 133 × 256; slice thickness of 5 mm), T2-weighted spin echo (TR/TE: 800/81; matrix size: 133 × 256; slice thickness of 5 mm) echo-planar cine true fast imaging with steady-state precession (50/170; matrix size: 256 × 256; slice thickness: 6 mm) and dark blood (TR/TE 800/26; matrix size: 256 × 256; slice thickness: 6 mm). First pass myocardial perfusion imaging and late gadolinium enhancement known as myocardial delayed enhancement is performed. Late contrast enhanced obtained as 10–20 min following intravenous injection of 0.1–0.2 mmol/kg gadolinium-based contrast agent. For delayed phase images 3D inversion recovery-prepared single shot gradient-echo sequence (turbo FLASH) with the following parameters (TR/TE: 700/3.3 ms; TI: 300 ms; flip angle: 25; acquisition matrix: 133 × 256) on short axis plane of heart and if necessary long axis images were obtained. Also mid-diastolic left ventricle diameter and ejection fraction of left ventricle for functional evaluation were measured in all patients.

3. Results

The patients were aged 14–74 years (mean: 34.5 ± years). Only one lesion was depicted in all patients. Two of these lesion is multilocular (2/7) and the remaining (5/7) were unilocular. Presence of daughter cysts in hydatid cyst was seen in two patients and detached membranes were seen in one patient. Two of the lesions were type 1, one was type 2, two were type 3 and two were type 4 hydatic cyst according to Gharbi classification. One of the lesions was located in the supero-posterior portion of the left atrium and did not create any indentation towards the heart chambers. Two of the remaining lesions were localized in the interventricular septum and three of seven lesions were localized in the left ventricular freewall. One of the lesion was depicted in the intramyocardial localization of the left ventricular anterior-superior wall and formed bulging from the septum anterior to the right ventricle. Another lesion was localized to the left ventricular postero-lateral wall and had an exophytic extension towards the paracardiac area. In the images examined, the longest axis of the lesions ranged from 41 mm to 66 mm. Left ventricle size and ejection fraction were reported in the Table 1.

Lesions were hyperintense in five patients and hypointense in one patient and isointense in one patient on T1-weighted images. One of these lesions was heterogeneously hypointense. On T2-weighted images, all of the lesions were hyperintense. The lesions located ventricular myocardium caused low ejection fraction and one of them shows heterogeneous signal intensity. The wall thickness of these lesions is based on a 2 mm cut-off value. One of the lesions had a wall

Table 1
Magnetic resonance imaging features of cardiac hydatic cysts.

Case	Age	Location	Ventricular function (EF*)	Mid-diastolic left ventricle diameter (mm)	Gharby classification	Size (mm)	Single/multiple	Unilocule/multilocule	Thin/thick wall (mm)	Daughter cyst	Membrane detachment	T1-weighted signal	T2-weighted signal	Hypointense ring on T2-weighted	Late enhancement
1	74	Left atrium/exophytic	55%	39	Type 1	61 × 47 × 57	Single	Unilocule	Thin (1,8)	−	−	Hyperintense	Hyperintense	+	Peripheral
2	24	Left vent, intramyocardial	45%	41	Type 3	41 × 29 × 29	Single	Unilocule	Thick (5,3)	+	-	Isointense	Mildly hyperintense	−	Peripheral
3	14	Interventricular septum	41%	29	Type 3	56 × 44 × 49	Single	Unilocule	Thick (2,6)	+	−	Hypointense	Hyperintense	−	Peripheral
4	27	Left vent, intramyocardial/exophytic	35%	43	Type2	66 × 54 × 39	Single	Unilocule	Thin (2,1)	−	+	Hyperintense	Mildly hyperintense heterogeneous	−	Peripheral
5	15	Interventricular septum	40%	31	Type1	51 × 43 × 47	Single	Unilocule	Thick (2,5)	−	−	Hyperintense	Hyperintense	−	Peripheral
6	35	Left atrioventricular septum/exophytic	39%	42	Type 4	56 × 70 × 100	Single	Multilocule	Thick (4,1)	−	−	Hyperintense	Hyperintense	−	Peripheral
7	53	Left ventricle ant. intramyocardial	46%	39	Type 4	28 × 41 × 30	Single	Multilocule	Thick (3)	+	−	Mildly hyperintense heterogeneous	Mildly hypointense heterogeneous	−	Peripheral

* EF, ejection fraction of left ventricle.