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CLINICAL IMAGING

Radiological assessment of mesenteric and retroperitoneal cysts in adults: is there a role for chemical shift MRI?

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Abstract

Objective: The purpose of this study was to assess the potential role for chemical shift magnetic resonance imaging (MRI) in identifying lymphangiomas from other cystic mesenteric and retroperitoneal masses. **Materials and methods:** A retrospective search of radiology database identified 24 consecutive patients with mesenteric and retroperitoneal cysts (nine men, 15 women; mean age, 41 years; age range, 19–75 years) who had undergone MR which included in-phase and opposed-phase chemical shift imaging. Signal intensity (SI) decrease between in-phase and opposed-phase MR images of the cyst was evaluated qualitatively by two radiologists. Ultrasound (US), computed tomography (CT), and MRI findings of the morphological appearances of all the cystic lesions that demonstrated significant signal drop on chemical shift MR were also recorded. **Results:** Of mesenteric and retroperitoneal cysts, 33% (8/24) revealed qualitative decrease in intensity on opposed-phase MR images relative to that seen on in-phase images. On ultrasound, these cysts demonstrated anechoic simple fluid. Their mean CT attenuation was 13 HU (range: 5–20 HU). Signal loss on fat-suppressed T1-weighted sequences was displayed only by a single cyst. None of the lesions with qualitative SI decrease on opposed-phase MR showed suggestion of lipid on US and CT. **Conclusion:** The presence of intra cystic lipid detected by chemical shift MR may not be overt on cross-sectional imaging such as US and CT. Chemical shift MRI provides additional sensitivity and specificity as an imaging test for demonstration of lipid within mesenteric and retroperitoneal cysts enabling a higher diagnostic yield for lymphangioma leading to more appropriate patient management.

Keywords: Retroperitoneum; Mesentery; Lymphangioma; Chemical shift MRI

1. Introduction

Mesenteric and retroperitoneal cysts are a heterogeneous group of neoplastic and non neoplastic pathologic entities, the most common being benign cystic lymphangioma [1]. Cystic lesions seen in these locations substantially overlap in their radiological appearance [2]. Therefore, the role of imaging traditionally had been limited to documenting their site and cystic nature [2].

Lymphangiomas are slow growing benign cystic tumors. Although benign, a potentially aggressive behavior of lymphangiomas has been described, necessitating large and probably hazardous resections [3]. Whenever possible the treatment of choice is complete resection. Partial excision or simple drainage of the cyst usually results in recurrence at a reported rate of 10% to 100%, whereas the reported rate is 0% to 27% for complete resection [4]. As clinical implications and therapeutic strategies vary, the ability to noninvasively differentiate lymphangioma from the rest of the mesenteric and retroperitoneal cysts is highly desirable.

The content of a lymphangioma may be serous, chylous, hemorrhagic or mixed [2]. Demonstration of lipid within a mesenteric/retroperitoneal cystic lesion narrows down the

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differential to dermoid cyst, cystic lymphangioma with chylous fluid, lymphocele or mesenteric enteric duplication cyst [2,5].

Chemical shift magnetic resonance imaging (MRI) is a well-recognized technique that can be used to confirm the presence of lipid within lesions [6], a finding that can render a definitive diagnosis in this clinical scenario. To our knowledge, a study aimed specifically at assessing the utility of chemical shift MRI for evaluation of cystic mesenteric and retroperitoneal masses has not been performed. The purpose of this study was to assess the potential value of chemical shift MRI compared to ultrasound (US) and computed tomography (CT) in the differentiation of lymphangiomas from other cystic mesenteric and retroperitoneal masses.

2. Materials and methods

This retrospective study was approved by our institution's research ethics board and informed consent was waived.

All MR examinations performed between December 2000 and December 2007 were searched for the following keywords: "retroperitoneal cyst" or "mesenteric cyst." December 2000 was the date of establishment of our current radiology information system and hence used as the start date. The above parameters yielded reports of 24 patients with abdominal MRI whose clinical charts and imaging were reviewed. The male:female ratio was 3:5 with a mean age of 41 years (range 19–75 years).

The presenting symptoms of this group included abdominal pain (n=10/24, 42%), urinary complaints (n=1/24, 4%), and cystic hygroma in the neck (n=1/24, 4%). The remaining lesions were incidental findings during imaging (n=12/24, 50%). Cysts were mesenteric in location in 16 and retroperitoneal in eight patients.

2.1. Imaging

MRI was performed with a 1.5-T system (Echospeed LX; GE Medical systems). In-phase and opposed-phase MR images were obtained in the axial plane using the following parameters with a two-dimensional spoiled gradient-echo sequence: [repetition time (ms)/echo time (ms)] 80–200/4.2–4.6, 2.1–2.3; bandwidth, 31.25–62.5 kHz; one signal acquired; section thickness, 5–7 mm; gap, 0 mm; matrix, 256×160–192; flip angle, 75–90°. Dual-echo acquisition, where both the in-phase and opposed-phase MR images were obtained in the same breath hold was used for all the patients.

2.2. Determination of the presence of lipid in cystic lesions in the mesentery and retroperitoneum

Two expert readers with >10 years and 3 years of experience interpreting MR examinations were blinded to patient's clinical profiles including all history, laboratory, pathological, and prior imaging findings. Any discrepancy between the two radiologists was settled by consensus. Region of interest was placed on each cystic mass by using the largest ellipse possible while avoiding edges where chemical shift artifact was present. Identical regions of interest were drawn on both in-phase and opposed-phase MR images by using the copy and paste functions of the work station. A similar method was used to measure the signal intensity (SI) of the kidney by avoiding renal hilar fat and including the same amount of cortex and medulla. The kidney was used instead of spleen because in some of our patients the spleen had not been imaged and a few others had suggestion of iron deposition, which would limit our ability to use the spleen as a control for SI in all patients.

The percentage SI decrease was calculated by using the following formula, which normalizes SI to renal parenchyma:

$$\frac{\left(1 - SI_{cyst,OP} / SI_{kidney,OP}\right) \cdot 100}{SI_{cyst,IP} / SI_{kidney,IP}}$$

Where OP represents opposed-phase images, and IP represents in-phase images.

2.3. Evaluation of cross-sectional imaging of cystic lesions demonstrating signal drop

Imaging findings on ultrasound (n=7), CT (n=8), and MRI (n=8) were analyzed by two radiologists in consensus. The imaging features documented included location, shape, and size of the lesion, echogenicity, pattern of sound attenuation, CT attenuation, presence, and pattern of calcification, evidence of tumor invasion and T1- and T2-weighted signal intensity. If a wall could be identified, its thickness, character and enhancement were noted. In addition, we specifically documented the presence of hemorrhage or fat. We determined that hemorrhage was present if signal intensity was high on T1-weighted spin-echo and fat-suppressed T1 weighted MR sequences. We determined that fat was present if the lesion showed high signal on T1-weighted MR images that lost signal on the fat-suppressed T1-weighted MR images. CT attenuation of less than -20 HU was also considered indicative of presence of fat within the cystic mass.

3. Results

Of mesenteric and retroperitoneal cysts, 33% (8/24) demonstrated decrease in signal intensity on the opposed-phase gradient-echo images relative to the in-phase images [Figs. 1(C), (D), 2(B), (C), 3(B), (C)]. Seven patients showed homogeneous signal drop, and one patient had heterogeneous signal drop. No disagreement occurred between the two reviewers in the assessment of qualitative signal change in the cysts. The mean (±S.D.) chemical shift ratio 0.57±0.14.

Eight patients, four male and four female (M:F, 1:1), of mean age 46 years (range, 19–75 years) constituted the