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REVIEW ARTICLE

A literature review of radiological findings to guide the diagnosis of gallbladder adenomyomatosis

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Abstract

Background: Gallbladder adenomyomatosis (GA) is a benign gallbladder entity discovered as an asymptomatic gallbladder mass. Since gallbladder cancer is in the differential diagnosis for gallbladder masses, the ability to differentiate benign disease avoids a more extensive oncologic resection. This study sought to review imaging modalities used to diagnose GA.

Methods: PubMed and SciVerse Scopus were systematically searched using the terms: "gallbladder adenomyomatosis" and "gallbladder imaging" for articles published between January 2000 and January 2015.

Results: A total of 14 articles were reviewed in this analysis. Contemporary series report the use of ultrasound (US), computed tomography (CT) or magnetic resonance imaging (MRI) in GA imaging. Ultrasound detection of Rokitansky-Aschoff sinuses, visualized as small cystic spaces with associated "comet-tail" or "twinkling" artifact, is pathognomonic for GA. A "Pearl-Necklace" sign of small connected sinuses on MRI or "Rosary" sign on CT are additional characteristics that may assist in establishing a diagnosis.

Conclusion: Ultrasound is the most commonly used tool to investigate GA. If not diagnostic, CT or MRI are effective in attempting to differentiate a benign or malignant cholecystic mass. Characteristic signs should lead the surgeon to perform a laparoscopic cholecystectomy in symptomatic patients or manage non-operatively in asymptomatic patients.

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Introduction

Within the differential of gallbladder masses belongs a spectrum of benign and malignant diseases. Adenomyomatosis of the gallbladder (GA) remains a common entity among benign gallbladder masses, diagnosed in 2%–8% of all cholecystectomies in recent studies.[1,2] Lack of familiarity surrounding the disease may lead to a more extensive operation than necessary. The condition is typically asymptomatic; though, it can present in a limited number of patients with vague abdominal pain, symptoms of epigastric distress or a picture of acute or chronic cholecystitis.[3,4]

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Currently, GA is most prevalent among the elderly population, with a female dominance.[5] The primary mechanism leading to GA formation is hyperplasia of the gallbladder wall epithelium and the formation of intramural diverticula, recognized as Rokitansky-Aschoff sinuses (RAS). These invaginations can extend beyond the tunica muscularis of the gallbladder wall and are pathognomonic for GA.[6–8]

The disease presents in three different types depending on the degree of wall involvement; diffuse, segmental or fundal GA.[9] Diffuse GA exhibits disseminated thickening and irregularity of the mucosa and muscularis mucosa, resulting in a cyst-like shape of the gallbladder. The segmental type, however, demonstrates a circumferential overgrowth of the gallbladder wall that leads to

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the formation of compartments within the gallbladder, resembling an "hourglass" appearance.[10] This circumferential thickening can lead to bile stasis in one part of the gallbladder, acting as a risk factor for gallstone formation.[11] Segmental GA has been reported as the most common type of GA.[11–13] The last type is referred to as fundal type, which appears as an overgrowth of gallbladder fundus with bulging into the lumen, that may resemble a polyp.[6]

The first imaging modality that was described in the literature to visualize GA was oral cholecystography.[9] "Collections of contrast medium in the dilated Rokitansky-Aschoff sinuses around the main gall-bladder shadow, strictures, septa, kinks and filling defects" were described as characteristic.[14] Oral cholecystogram has been used in later studies; however, the availability of other cost-efficient alternatives with similar, if not higher, accuracy and lower risks led to its diminished use. Current studies describe alternative imaging technique for GA visualization.

The aim of this study is to review the current literature as it relates to the different GA imaging modalities in an attempt to outline a useful diagnostic approach for GA. The differential diagnosis surrounding any gallbladder abnormality includes cancer, and therefore accurate diagnosis of GA offers the patient an operative approach that is less extensive and potentially less morbid in symptomatic cases.

Methods

A literature search of the online databases MEDLINE/PubMed and SciVerse Scopus was performed using the following terms: "gallbladder adenomyomatosis" and "gallbladder imaging". Search results were restricted to full text articles written in the English language published between January 1st of 2000 and January 31st of 2015. Search results were limited to studies including human subjects, of adult population. Additional articles were found through the manual search of included studies' references. A PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram was followed to reach the final articles included in this study. Data were extracted in a standardized spread sheet and screened for eligibility. Variables abstracted included year of publication, study location, study type, the number of patients reported with each modality, type of imaging, specific imaging characteristics and reported sensitivities and specificities. Since the main focus of the study was to describe pertinent imaging features of GA, imaging features of other gallbladder pathologies were beyond the scope of this study and thus, were not discussed.

Inclusion criteria:

1. Prospective cohort studies, retrospective cohort studies, and case series with more than 5 patients published between January 1st of 2000 and January 31st of 2015.
2. Studies involving only human subjects, older than 18 years.
3. Studies discussing any imaging modality for gallbladder adenomyomatosis.
4. Specific description of gallbladder adenomyomatosis imaging features.

Exclusion criteria:

1. Pictorial essays, case reports, case series with less than 5 patients
2. Studies examining pediatric age population or non-human subjects in languages other than English.
3. Studies with a deficient mention of specific GA features.

Results

A total of 189 articles were identified; 185 articles from the database search and 4 additional articles identified through the manual search of the references. After removing the duplicates, one hundred and twenty three articles were reviewed for eligibility, of which, 14 were included in the final analysis. Fig. 1 illustrates the logic for final article selection.

The most commonly utilized modalities in GA imaging include: ultrasound (US), (n = 7), computed tomography (CT), (n = 5), magnetic resonance imaging (MRI), (n = 4), and endoscopic ultrasound (EUS) (n = 5). An additional article reported the use of magnetic resonance cholangiopancreatography (MRCP) in GA visualization. Two studies published by the same group were included in this review due to the difference in patient populations examined; one of the two studies contained 45 patients examined solely by US, while the other included a smaller population of 13 patients, examined by a triple modality approach consisting of CT, MRI and US.[15,16] Table 1 shows the relative sensitivity and specificity of respective imaging techniques reported among studies.

Ultrasound

Ultrasound is commonly utilized in evaluating different gallbladder pathologies. It is one of the earliest modalities mentioned as a possible alternative for oral cholecystography to detect GA.[7,9,17] Major findings on ultrasound typically include: (i) RAS visualization as small cystic spaces in the gallbladder wall (ii) presence of multiple microcystic spaces or echogenic foci, (iii) "comet-tail" or color flow ultrasound "twinkling" artifacts, and lastly, (iv) thickening of the gallbladder wall.[15,16,18–21] Ultrasound visualization of RAS is pathognomonic for the disease. On US, RAS vary widely in echogenicity, ranging from hypoechogenic to hyperechogenic and occasionally mixed echogenicity.[18,20,22] The echogenicity depends on what accumulates inside these diverticula. Biliary content within the diverticula will appear as hypoechogenic spaces in the gallbladder wall. Sludge or stones would however, produce a hyperechogenic shadow. Thus

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