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Case report

Dermoid cyst in the subcutaneous tissues of the back: A rare case with multimodal imaging and pathologic correlation ☆,☆☆

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ABSTRACT

Dermoid cysts are lined by keratinizing squamous epithelium and consist of skin appendages such as hair follicles, apocrine glands, and sebaceous glands. They are usually diagnosed during infancy or early childhood, commonly reported in the head and neck region. A dermoid cyst on the back is extremely rare, with only three cases in the pediatric and adult populations. We report a rare case of a dermoid cyst in the subcutaneous layer of the back in an adult. A 75-year-old man presented with a soft, painless mass on his left upper back. Computed tomography revealed a low-density mass nearly identical to the subcutaneous fat in the subcutaneous layer with nodular soft-tissue density components. It was a heterogeneously hyperechoic mass without internal vascularity on ultrasonography. On magnetic resonance imaging, the lesion showed nearly identical signal intensity (SI) to subcutaneous fat on T1 and T2-weighted images. The soft tissue component was intermediately hyperintense on T1- and T2- weighted images with enhancement. This lesion was pre-operatively suspected as a lipoma variant or a well-differentiated liposarcoma/atypical lipomatous tumor because of the fat density or SI and enhancing portion. We demonstrated and reviewed the multimodality imaging features of dermoid cysts at an unusual location and suggested imaging features that could help readers differentiate dermoid cysts from lipomatous tumors. When a mass shows fat density or SI with or without enhancing soft

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tissue components at the trunk or extremity, dermoid cysts as well as lipomatous tumors could be considered in the differential diagnosis.

Introduction

Dermoid cysts are lined by keratinizing squamous epithelium and consist of skin appendages such as hair follicles, apocrine glands, and sebaceous glands [1,2]. In the fluid-filled center, fatty materials such as liquid cholesterol and degenerated blood components are observed [2]. They are usually diagnosed during infancy or early childhood and are commonly reported in the head and neck region [1,3–5]. Dermoid cysts in the subcutaneous layer of the back in adults are difficult to be considered in the differential diagnosis because of its rarity [1,6,7]. Here, we report a rare case of a dermoid cyst in the subcutaneous layer of the back in an adult with computed tomography (CT), ultrasonography (US), and magnetic resonance imaging (MRI) findings. This lesion was suspected to be a lipoma variant or a well-differentiated liposarcoma/atypical lipomatous tumor because of the fat density or signal intensity (SI) and enhancement of the soft tissue portion. We demonstrated and reviewed the multimodality imaging features of this rare case and suggested imaging features that could help readers differentiate dermoid cysts from lipomatous tumors. When a mass shows fat density or SI with or without an enhancing soft tissue component at the trunk or extremity, dermoid cysts as well as lipomatous tumors could be considered in the differential diagnosis.

Case description

A 75-year-old man presented with a mass on the left upper back incidentally detected on CT, which was performed to evaluate the cause of chronic cough. The mass was noted by the patient about 50 years ago and has gradually increased in size. The mass was soft and non-tender on palpation. No skin discoloration was observed. Chest CT revealed a low-density mass (-122 Hounsfield unit [HU]) in the subcutaneous fat layer of the left upper back measuring 8.2 × 6.7 × 3.1 cm. There was a nodular component with soft tissue density (5 HU) at the peripheral portion of the lesion mainly at the distal portion of the mass (Fig. 1A and B). On US, the lesion was a hyperechoic mass compared with the subcutaneous fat layer, with suspected nodularity at the proximal wall. The distal portion was slightly more heterogeneous echoic without internal vascularity. There were scattered hyperechoic linear foci (Fig. 2A–C). On MRI, the hypodense portion on CT was iso- or slightly hyperintense compared to the subcutaneous fat layer on T1- and T2-weighted images (WI). Unlike the subcutaneous fat layer, there were no thin fibrous septa in the lesion. This area showed a signal drop on fat-suppressed T1-WI with enhancement. The nodular soft tissue component showed intermediately high SI on T1-WI and T2-WI, compared with normal muscle. This nodular portion showed

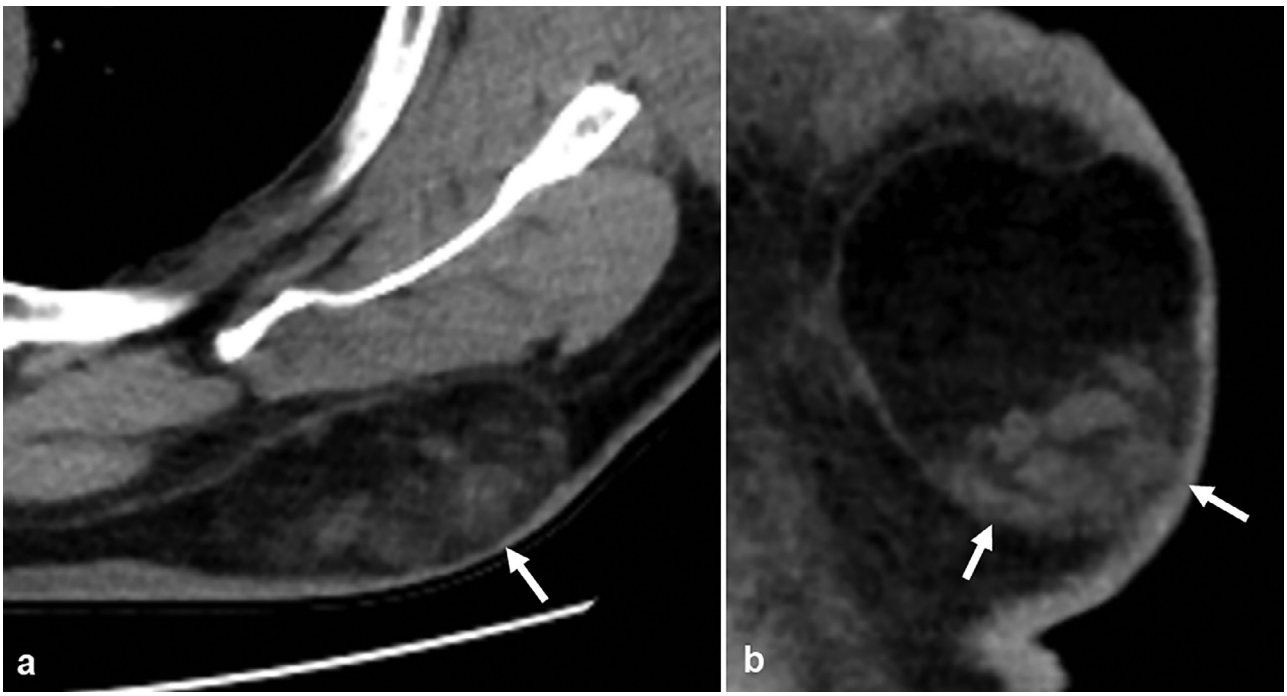

Fig. 1 – Axial (A) and coronal (B) images of non-enhanced CT show a low-density mass in the subcutaneous fat layer of the left upper back. Internal nodular component with soft tissue density is seen at the peripheral portion of the lesion (arrows).

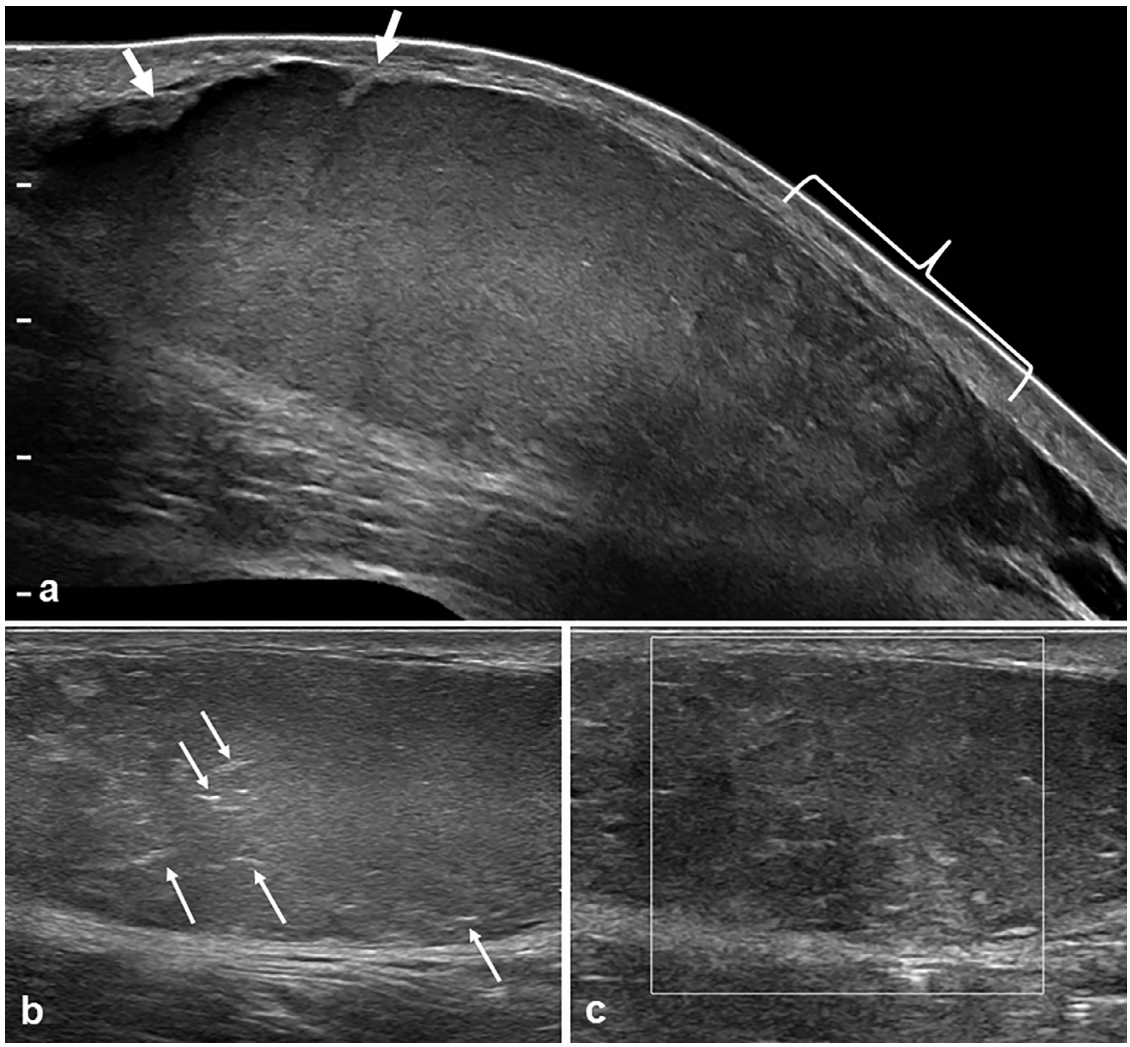

Fig. 2 – Panoramic longitudinal image in grayscale US (A) shows a hyperechoic mass compared with the subcutaneous fat layer, with suspected nodularity at the proximal wall (arrows). The nodular soft tissue component on CT shows a slightly more heterogeneous echogenicity (curly bracket). Transverse images in grayscale (B) and color Doppler US (C) show scattered hyperechoic linear foci (thin arrows), which may reflect the keratin debris. No internal vascularity was seen.

enhancement on fat-suppressed contrast-enhanced T1-WI (Fig. 3A–C).

Intraoperatively, a transverse incision was made. After the subcutaneous fat layer was divided and deepened, a cystic lesion was detected. During dissection, the cyst was focally ruptured and light brown colored fluid was expressed. The lesion was completely removed without complication. Grossly, the mass was a thick walled, grayish-white unilocular cyst with focal rupture (Fig. 4A). Microscopically, the cyst was lined by stratified squamous epithelium with sebaceous glands and containing keratin debris (Fig. 4B–D). The features were consistent with the dermoid cyst. The patient's postoperative course was uncomplicated after 4 weeks of follow-up.

Discussion

Dermoid cysts can be classified as congenial or acquired dermoid cysts [1,3]. Congenital dermoid cysts result from trapped epithelial elements when the neural groove closes to form the neural tube, whereas acquired cysts arise from traumatic inclusions of epithelial cells or from the occlusion of the sebaceous gland duct [1,3]. Dermoid cysts can remain stable or become symptomatic by enlargement or rupture [4,8]. Malignant transformation to squamous cell carcinoma is a rare but a possible complication [9]. The dermoid cyst and epidermoid cyst are different entities, although the term

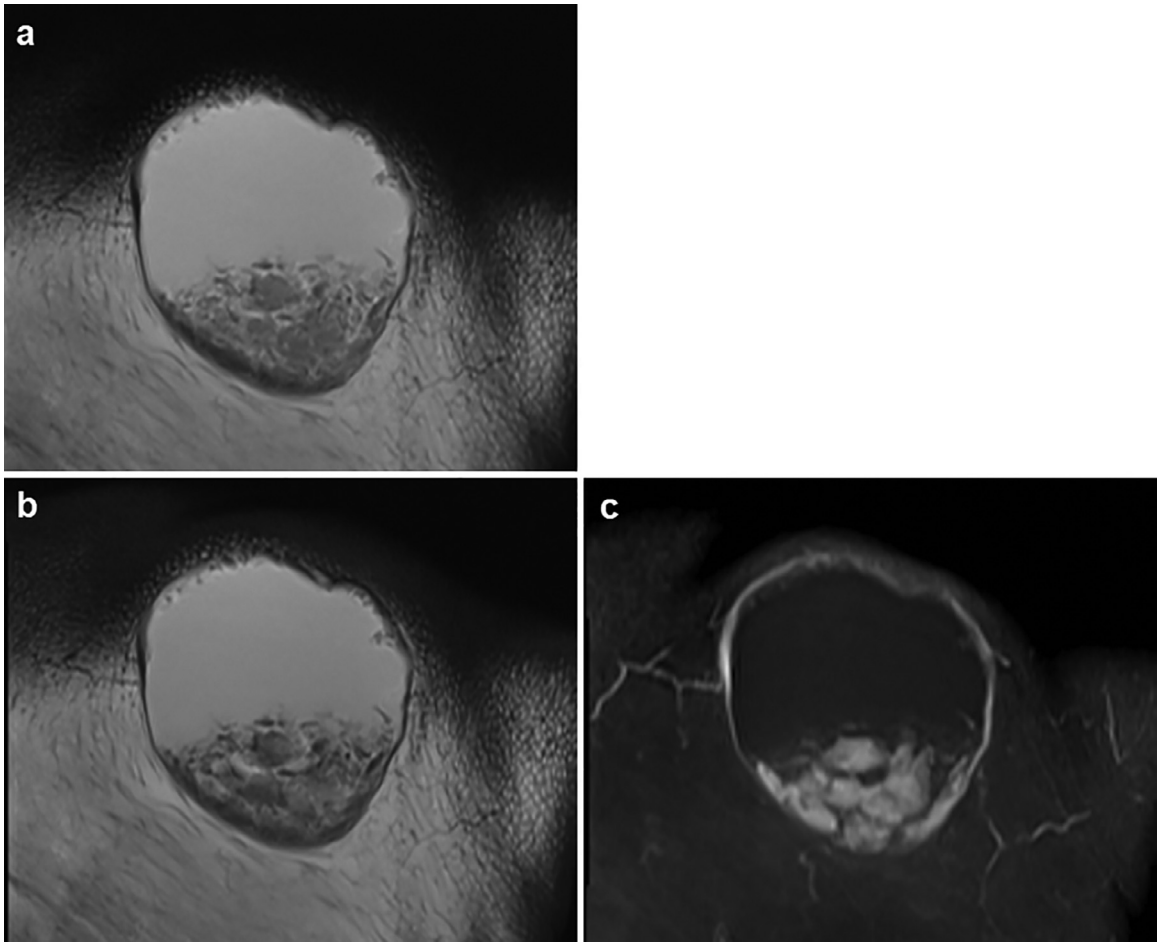

Fig. 3 – MR coronal images, T2-weighted (A), T1-weighted (B), fat-suppressed contrast enhanced T1-weighted images (C) show predominantly hyperintense lesion on T1 and T2-weighted images. There is no thin septation in the lesion. The hyperintense area shows signal drop without enhancement in fat-suppressed image. The nodular soft tissue component shows intermediately high SI on T1 and T2-weighted images and enhancement on post-contrast image.

"dermoid" has been used broadly to describe both entities [2]. They are both cystic choristomas with keratinizing squamous epithelium; however, unlike dermoid cysts, epidermoid cysts do not have skin appendages. Epidermoid cysts are reported in every part of the body and are usually diagnosed in the elderly, whereas dermoid cysts are usually located in the head and neck region, commonly diagnosed during infancy or early childhood [2,10]. The back is an extremely rare location for a dermoid cyst with only three reported cases in both the pediatric and adult populations. Two of them were mentioned in a study by Orozco-Covarrubias, who reported 75 cases of dermoid cysts in the pediatric population [8]. They described the locations as "lumbosacral region but not in the midline" and "posterior chest between the spine and scapula," and no imaging study was demonstrated [8]. Tanaka et al reported an intramuscular dermoid cyst on the lower back in a 67-year-old man with CT and MRI findings [11]. This is the first report of a dermoid cyst in the subcutaneous layer of the back.

Dermoid cysts are typically well-defined hypodense masses (-20 to -140 HU) on CT, which is similar in density to fat tissue [12–14]. On MRI, they are usually hyperintense masses on T1-WI, and T2 signals vary from hypo- to hyperintense [12–14]. The "fat" density or SI in the CT or MRI is not due to the adipose tissue but a reflection of the internal composition like cholesterol [15]. The imaging features of dermoid cysts can vary depending on their contents. Dermoid cysts can rarely be hyperdense on CT and hypointense on T1-WI, which could reflect high protein content, saponification of lipid, or keratinized debris with secondary microcalcification in suspension [12]. The "sack of marbles" appearance which describes multiple fat globules in the cyst is also known as one of the imaging features of dermoid cysts [11]. Enhancement of mural nodules is rarely reported, but the pathologic explanation is unknown [13,14]. We also could not find the pathologic explanation for enhancing portion. Brown et al, demonstrated a microscopic examination with "a leash of distorted vessels" in their case of a dermoid cyst with enhancing portion, although it might be insufficient to explain the enhancement [13]. In our case, the cystic portion showed typical imaging appearance of dermoid cyst, hypodense on CT, hyperintense on T1- and T2-WI, identical to fat tissue. However, the enhancing solid portion was unusual and occupied a larger proportion

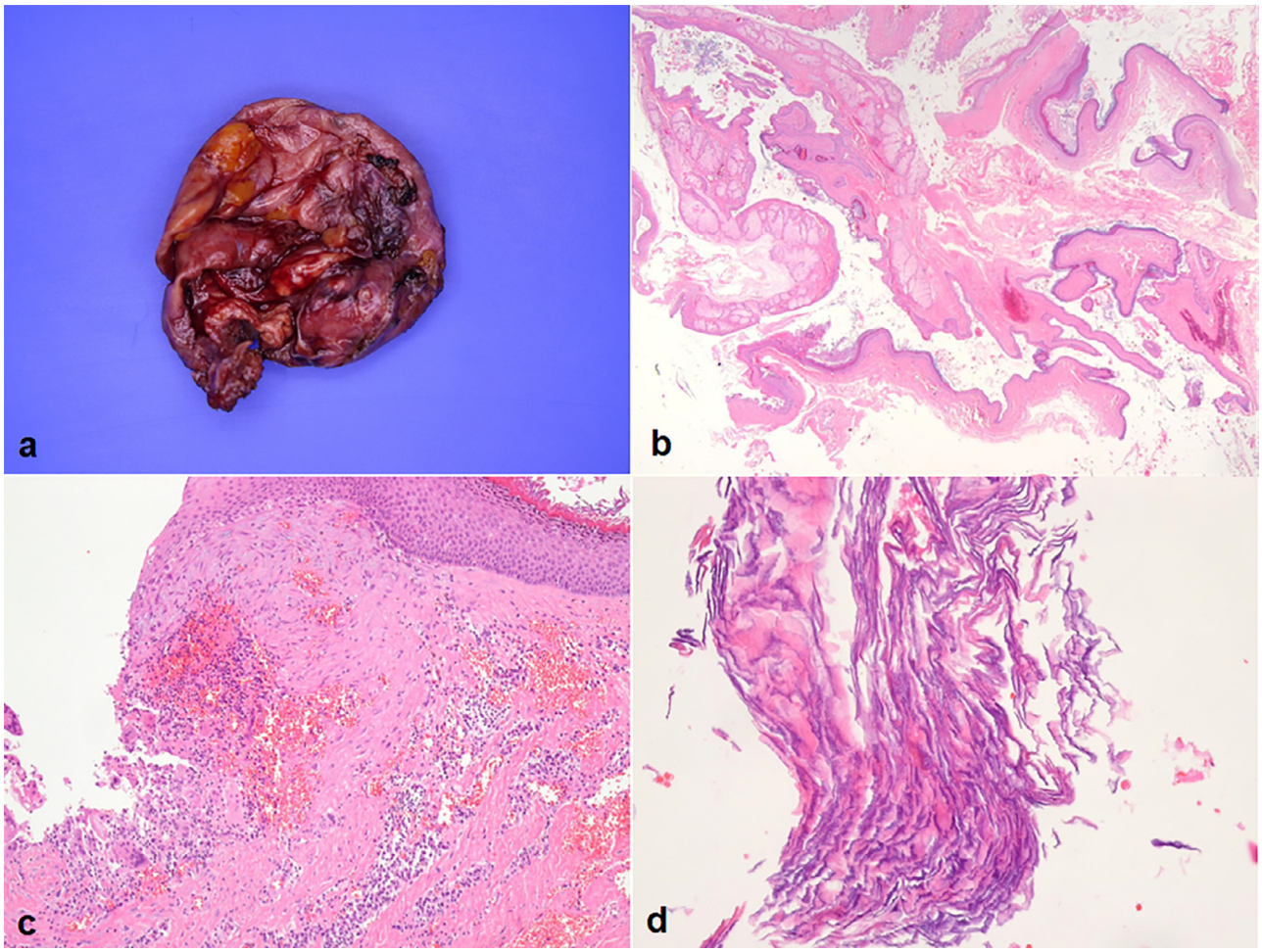

Fig. 4 – (A) Grossly, the dermoid cyst was about 4.5 cm sized, thick walled, grayish-white unilocular cyst with focal rupture. (B) The cyst wall is lined by stratified squamous epithelium associated with sebaceous glands (H&E, x10). (C) The cyst wall also contains foreign body type giant cells and inflammation (H&E, x100). (D) In the cyst lumen, keratin debris is observed (H&E, x200).

of the mass compared with previously reported enhanced intracranial dermoid cyst cases [13,14]. On US, dermoid cysts are reported as hypoechoic masses with scattered echogenic foci without internal vascularity [5,7]. The keratin debris detected on microscopic examination would be correlated with the echogenic foci on US [5,7]. Our case showed a well-defined mass with multiple linear hyperechoic foci without any internal vascularity, which was consistent with the literature.

When evaluating soft tissue tumors at the trunk or extremities on MRI, detecting the T1 hyperintense portion suppression on fat-suppressed sequences is important because it could narrow the differential diagnosis to fat-containing lesions such as lipoma, lipoma variant, well-differentiated liposarcoma/atypical lipomatous tumor, hemangioma, and mature ossification [16]. If fat-containing masses show septa thicker than 2 mm or globular or nodular non-fatty components, well-differentiated liposarcoma/atypical lipomatous tumor should be suspected [16,17]. Based on such literature, we suspected a lipoma variant or well-differentiated liposarcoma and/or atypical lipomatous tumor preoperatively. Differentiating lipomatous tumors from dermoid cysts is also difficult in the head and neck or in the intracranial location, which are relatively common locations for dermoid cysts [9,18]. Bertot et al reported a lipoma at the cerebellopontine angle and indicated that the loss of signal on fat saturation sequences could suggest a lipoma than a dermoid cyst [9]. However, the dermoid cyst in our case showed a signal drop in the fat-suppressed image. On retrospective review, we found two imaging features that could aid in the preoperative diagnosis of a dermoid cyst. The first was the absence of thin septations in the fat-SI portion on MRI, which is commonly seen in lipomatous tumors. This might suggest the cystic character of the lesion. The second was the hyperechoic linear foci scattered in the mass on US. However, the enhancement of soft tissue components makes it difficult to exclude malignant soft tissue tumors.

In conclusion, dermoid cysts in the subcutaneous layer of the back in adults are difficult to be considered as a

differential diagnosis because of their rarity. Dermoid cysts can mimic lipomatous tumors at the trunk or extremities due to their identical density or SI to the subcutaneous fat layer on CT or MRI. In addition, enhancing the solid portion could raise concerns for malignant soft tissue tumors. However, dermoid cysts could be suspected in a mass with fat density or SI with or without enhancing portions on CT or MRI. The absence of thin septations on MRI or scattered linear hyperechoic foci on US could potentially help in the differential diagnosis. Awareness of the multimodality imaging features of dermoid cysts would be helpful in arriving at the proper diagnosis, decreasing patient anxiety, and preventing aggressive wide resection.

Patient consent

Institutional Review Board approval was obtained for this retrospective study, and the requirement for informed consent was waived.

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