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Epidermoid cyst appearing as a malignancy-mimicking subcutaneous lesion on ultrasonography

Abstract
Purpose. It is challenging to diagnose epidermoid cysts on ultrasonography; except in typical, benign-appearing cases. The purpose of this study was to include epidermoid cysts in the differential diagnosis of diverse subcutaneous lesions, especially malignancy-mimicking lesions, as seen on ultrasonography.

Methods. We reviewed 19 cases of pathologically confirmed epidermoid cysts in 19 patients (male, 8; female, 11). Three radiologists, who were blinded to the pathology data, classified (by consensus) these epidermoid cysts as benign or malignancy-mimicking lesions, according to generally accepted ultrasonographic criteria, including the margin, shape, echotexture, and transitional zone with surrounding tissue, and also including the growth pattern and adjacent tissue change. The ultrasonographic data were then correlated with the pathology results regarding the ruptured or unruptured status of the cysts.

Results. Epidermoid cysts have been noted as showing a wide-spectrum of findings on ultrasonography. Twelve of our cases showed benign ultrasonographic features: six cases had typical, benign ultrasonographic features with unruptured status; two cases with ruptured status did not have clear ultrasonographic features, although we decided by consensus that there were benign ultrasonographic features; and four cases with unruptured status had peculiar internal echogenicities, described as “internal rod-like contents”, that could be considered to be a variation of the typical ultrasonographic finding of epidermoid cysts. Seven cases showed malignancy-mimicking ultrasonographic features; all seven of these had ruptured status.

Conclusion. The diagnosis of ruptured epidermoid cysts should be included in the differential diagnosis of malignancy-mimicking subcutaneous lesions. The internal rod-like contents can be regarded as another typical ultrasonographic finding of epidermoid cysts.

Keywords epidermoid cysts · subcutaneous tumor · ultrasonography

Introduction
There are several types of cysts of epidermal origin, including epidermoid cysts, trichilemmal cysts, milia, sebaceous cysts, branchial cysts, and preauricular cysts. Of these types, the most common cysts detected on physical examination are epidermoid cysts, and clinicians often use terms such as keratin cysts, sebaceous cysts, epidermal (inclusion) cysts, and epithelial cysts to refer to them. Vinet et al.² and Denison et al.³ have indicated that an epidermoid cyst may be interpreted as a solid mass and even as a malignant tumor because its internal echogenicity varies according to its composition. Beginning with this proposition, we reviewed our ultrasonography results in 19 patients with a pathologically confirmed epidermoid cyst.

Patients, materials, and methods
Our institution’s Ethics Committee did not require patients’ informed consent for this retrospective study. Between March 2006 and September 2007, we scanned 19 patients (8 male; 11 female) who had been referred to the Ultrasound Division of the Department of Radiology for the characterization and differential diagnosis of subcutaneous nodules in the whole body and nodules in the breast. We used a broad-bandwidth 14-MHz linear scan...
head (L12-5, HDI 5000 [Philips, Bothell, WA, USA] and 15L8w, Acouson Sequoia 512 [Siemens, Mountain View, CA, USA]). All lesions were first scanned using B-mode imaging and they were then scanned with color Doppler imaging. The pathology results were obtained by surgical excision of the skin lesions. Surgical excision of palpable lesions was performed if patients complained or were concerned about their skin nodules for cosmetic reasons (10 cases) or were anxious about the possible malignant transformation of their lesions (2 cases). Surgical excision was performed in the other patients because the radiologist suspected a malignancy (7 cases). Following surgical excision, we retrospectively compared the pathology results with the expected a malignancy (7 cases). Following surgical excision, we retrospectively compared the pathology results with the initial ultrasonographic images.

We classified the initial ultrasonographic images as benign or malignant, because the purpose of this study was to include the ultrasonographic diagnosis of benign epidermoid cyst in the differential diagnosis of diverse subcutaneous lesions, especially malignancy-mimicking lesions.

Before evaluating the ultrasonography of epidermoid cysts, we selected the characteristic ultrasonographic findings that general radiologists agree on as indicating benign status, i.e., circumscribed margin, ovoid or elongated shape, homogeneous internal echotexture, and a clear or narrow transitional zone between the lesion and the surrounding tissue. Findings opposite to the above-mentioned findings, i.e., uncircumscribed margin; irregular shape; inhomogeneous internal echotexture; and a wide transitional zone, such as peri-lesional increased echogenicity; were considered to be malignant findings. In evaluating breast lesions, the ultrasonographic criteria we used differed from those used for all other body parts. For the breast lesions, we used the American College of Radiology Breast Imaging Reporting and data system (ACR BI-RADS) categorization, as almost all breast radiologists worldwide use this system for evaluating breast images, including ultrasonographic evaluation. We considered category 4 as a point of reference; category 4 or 5 lesions are considered as possible malignancies requiring biopsy. Therefore, we used category 4 findings as malignant criteria for breast evaluation.

Two experienced radiologists (I.Y.W. and S.L.L.) reviewed all the available ultrasonography images. In cases where a consensus could not be reached on the interpretations by these two radiologists, the lesions were classified as not correctly matched, and three radiologists, including another experienced radiologist (N.Y.J.), made the final decision by consensus, based on their ultrasonographic experience with the musculoskeletal and breast regions. All of the ultrasonography images were stored in our hospital’s Picture Archiving and Communication Systems, and we reviewed the images on dedicated monitors.

The pathognomonic histopathology finding of epidermoid cysts indicates that the lesion is lined by epidermal-type epithelium and is filled with keratin material. The only difference among the numerous types of epidermoid cysts is the presence of inflammatory infiltrate cells or a possible foreign-body reaction in the adjacent tissue, which could suggest the diagnosis of ruptured cyst. The pathology reports of the excised epidermoid cyst specimens were retrospectively reviewed from this point of view. We then compared the ultrasonographic features indicating the possibility of malignancy and the pathology report regarding the presence of rupture.

Results

Our study population consisted of 8 male (mean age, 47.5 years) and 11 female (mean age, 37 years) patients. Each patient had one lesion, and the scanned region encompassed the subcutaneous layers of the back (n = 2), flank (n = 1), buttock (n = 6), suprapubic region (n = 1), neck (n = 2), occipital region (n = 1), axilla (n = 1), and breast (n = 5). The ultrasonography and pathology results are shown in Table 1.

As seen on ultrasonography, in 12 of the 19 patients the cases had benign features. In these 12 cases, the two radiologists reached a decision regarding benign status (without interpretation differences) in only 6 cases with the typical ultrasonographic appearance of epidermoid cyst (see example in Fig. 1). However, in the remaining 6 cases, the radiologists could not agree on which cases matched their criteria and therefore classified the lesions as not correctly matched. Findings of loculated fluid with perilesional skin thickening (Fig. 2), cord-like structure (Fig. 3), and internal rod-like contents (Fig. 4) were shown in these 6 cases. By consensus of the three radiologists, these types of lesions were also considered to be benign. The other 7 cases exhibited malignant ultrasonographic features (see examples in Fig. 5).

In the pathology report, nine cases were identified as having ruptured epidermoid cysts. Of these nine cases, seven showed malignancy-mimicking ultrasonographic features and two showed benign features. In one of these two cases with benign features, we first considered the possibility of abscess formation in the subcutaneous layer, because

Fig. 1. Ultrasonographic appearance of an uncomplicated epidermoid cyst detected in the breast of a 25-year-old woman. This well-defined, ovoid lesion lies partially within the skin. We could easily have made the diagnosis of a cyst of epidermal origin; however, when this cyst was optimally scanned using an acoustic standoff, it was more easily seen that the lesion was located in the skin and that a dilated gland neck would have been found if the lesion were an epidermoid cyst.