Calcifying Epithelioma of Malherbe (Pilomatrixoma): Clinical and Sonographic Features

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Received 11 January 2017; accepted 3 June 2017

ABSTRACT: *Purpose.* The purpose of this study was to describe the clinical and sonographic features of calcifying epitheliomas (pilomatrixomas).

Methods. We retrospectively reviewed the clinical data and sonographic appearances of 59 cases of calcifying epitheliomas in 58 patients that were confirmed pathologically.

Results. The mean age of the patients was 26 years (range, 5–69 years) and the female-to-male ratio was 1.2. All masses were located in subcutaneous soft tissues. Overall, 76.3% of the cases were located in the head and neck; the mean tumor size was 13 mm, and 72.9% of the cases were between 10 and 20 mm in size. Of the lesions, 62.7% were hypoechoic masses with internal calcifications, and 74.6% of them showed low or moderate internal vascularity on Doppler imaging.

Conclusions. The diagnosis of calcifying epithelioma should be considered in a patient with a painless, circumscribed, oval-shaped hypoechoic mass with internal calcifications and internal vascularity in the subcutaneous soft tissues of the head or neck. The mass may be small and have well-defined margins, with hypoechogenicity. *J Clin Ultrasound* **46**:3–7, 2018; Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/jcu.22517

Keywords: calcifying epithelioma of Malherbe; pilomatrixoma; subcutaneous tissues; ultrasonography; skin; benign neoplasms

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INTRODUCTION

Calcifying epithelioma, a benign superficial tumor derived from the hair follicle and consisting of hair matrix cells, is relatively prevalent in females. It occurs most commonly in the head, neck, and upper extremities in young adults. It is a benign skin neoplasm that is often confused with other lesions because of its rare occurrence, and its clinical and sonographic (US) characteristics are not well known to radiologists and clinicians.

Here, we report the clinical and US features of calcifying epitheliomas in 59 cases from 58 patients.

MATERIALS AND METHODS

Patient Selection

We retrospectively reviewed the clinical and US data of 59 pathologically confirmed cases of calcifying epitheliomas in 58 patients (1 patient had 2 distinct lesions) from January 2010 to April 2016.

US Examination

US examinations were performed using a Hi Vision 900 scanner (Hitachi Medical Corporation, Inc, Tokyo, Japan) equipped with a 5–10-MHz linear probe, an Acuson Sequoia 512 scanner (Siemens Medical Solutions, Malvern, PA) equipped with a 7–14-MHz linear probe, or an iU22 system (Philips Healthcare Andover, MA) equipped with a 5–12-MHz linear probe. The

sonograms were recorded in an image archiving and communication system.

Longitudinal and transverse sonograms of the mass were obtained using gray-scale and power Doppler imaging. Location, size, shape, margins, echotexture, calcifications, and vascularity of the lesions were assessed. The sonograms were retrospectively reviewed by two radiologists with more than 10 years of experience of US of soft tissue masses. The lesions were subdivided into calcified and noncalcified masses. The noncalcified type included substantial mass type and cystoid mass type. The calcified type included scattered dots calcification, clump calcification, and complete calcification with strong posterior acoustic shadowing.

RESULTS

Patient Clinical and US Features

A total of 59 lesions in 58 patients, who ranged in age from 5 years to 69 years, were included; the mean age was 26 years, and 54% (32/59) of the patients were between the ages of 10 and 30 years. The female-to-male ratio was 1.2. Of the lesions, 76.3% (45/59) were located in the head and neck (23 in the head and 22 in the neck); 12 were located in an upper extremity; one was located in the abdomen; and one was located in the back. One patient had two lesions, one in one upper extremity and the other in the preauricular area (Table 1).

All of the masses were slow growing over several months or years without pain. All masses were superficially located and close to or in contact with the dermis. The majority (79.7% [47/59]) of the masses were oval and well defined, whereas the margins of 12 lesions were obscured by the shadow from massive calcification.

The size of the lesions ranged from 4 to 31 mm, with a mean size of 13 mm. The majority

TABLE 1
Clinical and Sonographic Features of 59 Cases of Calcifying Epithelioma in 58 Patients

Clinical and Sonographic Feature	No. of Cases
Gender	
Female	32
Male	26
Female-to-male ratio	1.23:1.00
Age	
<10	4
10–30	32
>30	22
Location	
Head and facial	23
Neck	22
Upper extremity	12
Abdomen	1
Backside	1
Maximum diameter, mm	
<10	7
10-20	43
>20	9
Subcutaneous location	
Close to or contact with dermis	58
Deep located	0
Shape	
Oval	47
Irregular	0
Undetermined by posterior shadowing	12
Margin	
Well defined	47
Poorly defined	0
Undetermined by posterior shadowing	12
Internal calcifications	
Absent	22
Scattered dots	18
Clumped	7
Complete	12
Doppler flow	
Absent	14
Present	44

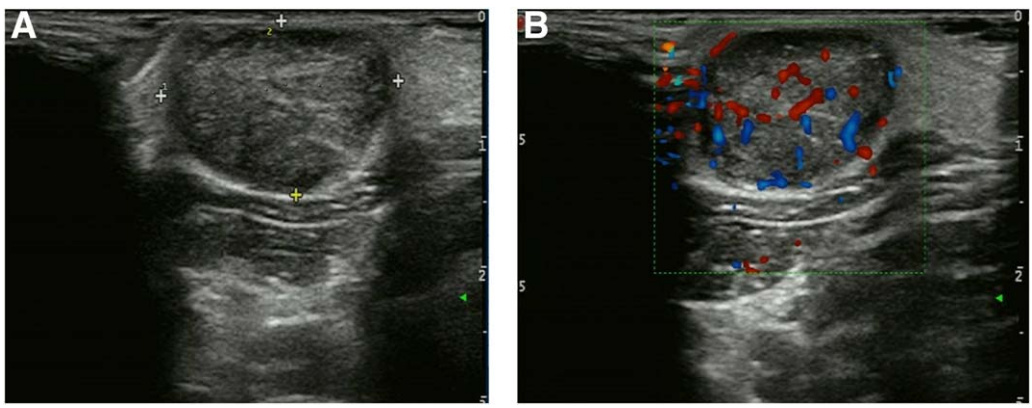

FIGURE 1. Pilomatrixoma in the neck of a 32-year-old man. **(A)** Gray-scale sonogram shows a subcutaneous hypoechoic, well-defined, oval mass (calipers) without calcification. **(B)** Color Doppler sonogram shows vascularity in the central and peripheral regions of the mass.

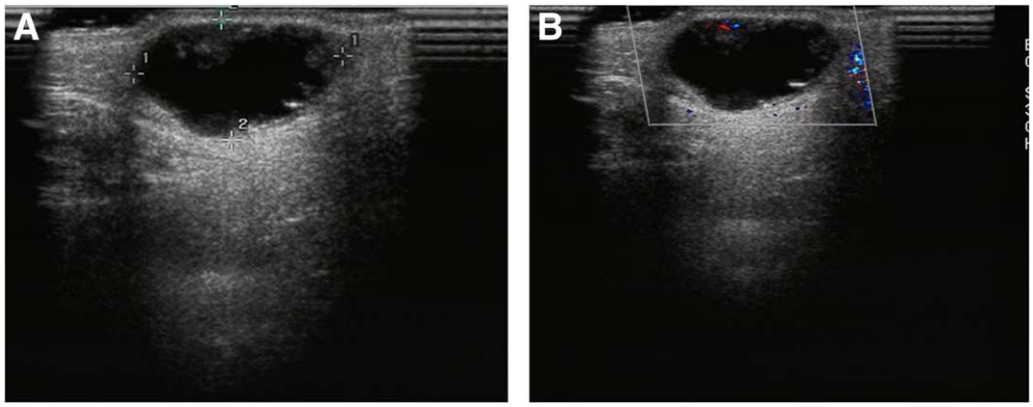

FIGURE 2. Pilomatrixoma in the left preauricular of a 29-year-old woman. **(A)** Gray-scale sonogram shows a mainly cystic, well-defined oval mass (calipers) in the subcutaneous layer. **(B)** Minimal vascularity is present at the periphery of the mass.

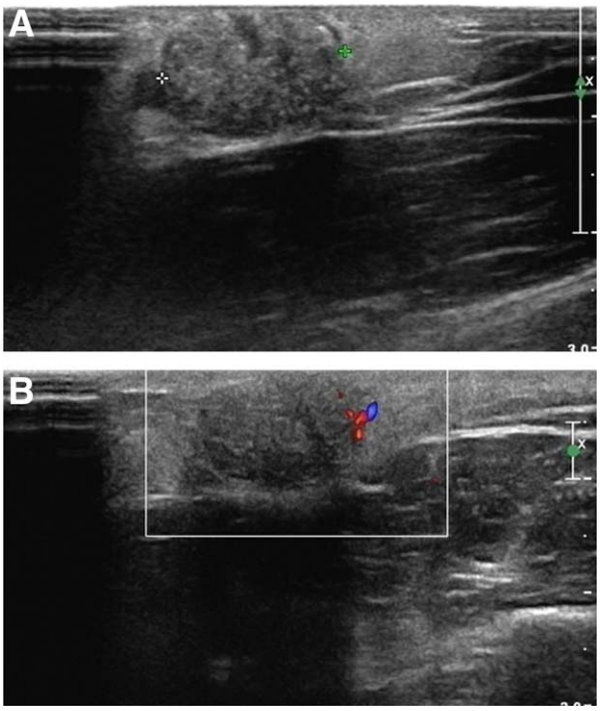

FIGURE 3. Pilomatrixoma in the left upper extremity in a 45-year-old man. **(A)** Gray-scale sonogram shows calcification appearing as multiple scattered dots throughout the mass without posterior acoustic shadowing. **(B)** Color Doppler sonogram shows minimal vascularity at the periphery of the mass.

(72.9% [43/59]) of the lesions measured between 10 and 20 mm.

Twenty-two lesions were not calcified: 10 were hypoechoic (Figure 1), whereas the other 12 had a cystic appearance (Figure 2). The majority (62.7% [37/59]) of the lesions had internal calcification, including 18 cases with scattered punctate calcification (Figure 3), 7 cases with clumped calcification (Figure 4), and 12 cases with massive calcification with marked posterior acoustic shadowing (Figure 5). Most lesions (74.6% [44/59]) showed mild to moderate vascularity on color Doppler imaging.

A correct preoperative US diagnosis was made in only 15.3% (9/59) of the cases. Common misdiagnoses included sebaceous or dermoid cysts, lymph node calcification, and hemangioma. All masses were surgically excised, and the diagnoses confirmed pathologically (Figure 6).

DISCUSSION

Calcifying epithelioma of Malherbe (pilomatrixoma), a rare benign skin tumor of hair matrix cell origin, was first described in 1880 by Malherbe.[1] The precise etiology of this tumor remains unknown. Recent studies have shown that recurrent mutations in the beta-catenin gene may be involved, as they are with several other conditions, such as Gardner syndrome, myotonic muscular dystrophy, Rubinstein-Taybi syndrome, Turner syndrome, xeroderma pigmentosum, and basal cell nevus syndrome.[2] Calcifying epithelioma is usually a solitary mass affecting young individuals. A slight female predominance (female:male ratio, 1.1–2.5) has been observed.[3] In our study, the female-to-male ratio was 1.2. These findings are consistent with a previous report.[4] Moehlenbeck[5] reported that this tumor occurred in individuals younger than 10 years old in more than 40% of 900 cases examined in a dermatology department. In addition, patients developed symptoms in their 30s or at a younger age in more than 60% of cases, with an average delay of 4.4 years between the identification of the lesion and its excision.

Calcifying epitheliomas generally present as a subcutaneous single red to blue asymptomatic mass; it has an oval shape, exhibits well-defined margins, and is freely movable, slow-growing and

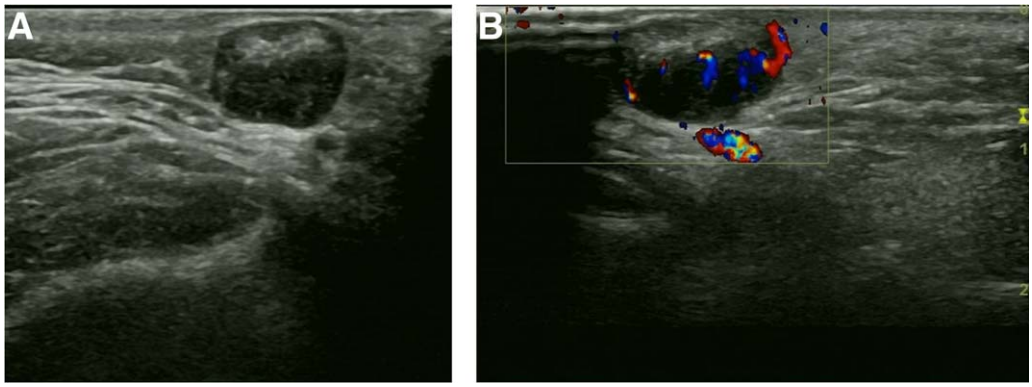

FIGURE 4. **(A, B)** Pilomatrixoma in the left preauricular in an 11-year-old girl. **(A)** Gray-scale sonogram shows clumped calcification in the mass without posterior acoustic shadowing. **(B)** Color Doppler flow was present in the central and peripheral regions of the mass.

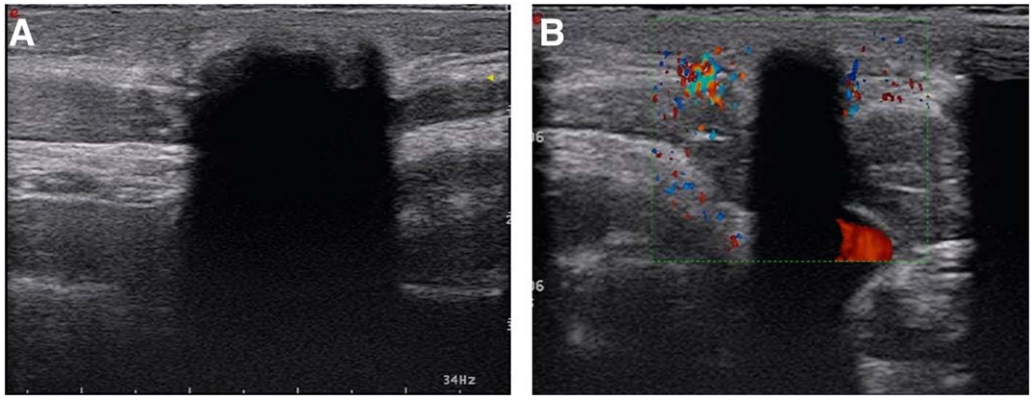

FIGURE 5. Pilomatrixoma in the right upper extremity of an 18-year-old woman. **(A)** Gray-scale sonogram shows complete calcification with massive posterior acoustic shadowing. **(B)** No vascularity could be detected in the mass because of the massive shadowing.

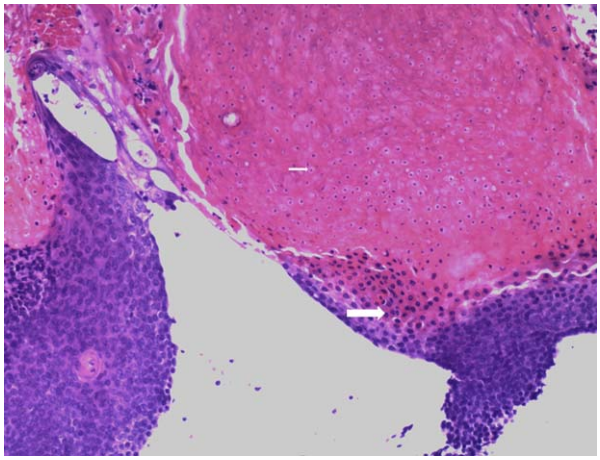

FIGURE 6. Typical microscopic appearance of pilomatrixoma consisting of basophilic cells (large arrow) and shadow cells (small arrow) (H&E, ×200).

firm to gritty on palpation.[6] Calcifying epithelioma most commonly affects the head and neck, followed by the upper extremities, trunk, and lower extremities.[7] The size of the lesion generally ranges between 0.5 and 3 cm, and multiple lesions are observed in 2–10% of cases.[8] Calcifying epitheliomas usually grow slowly over several months or years, and they occasionally present with rapid growth and resemble keratoacanthoma. Calcifying epitheliomas rarely undergo malignant transformation into pilomatrix carcinomas.[9] Malignant transformation, distant metastases, and local recurrences are extremely rare.[10] Most calcifying epitheliomas have excellent prognosis after complete surgical excision.

US is superior to CT or MRI for the diagnosis of subcutaneous soft tissue masses because of its high spatial resolution.[11] However, in our study, the preoperative US diagnosis was correct in only 15.3% of the cases.

Pathologically, calcifying epitheliomas mostly consist of basophilic and shadow cells, and the proportion of shadow cells increases over time, resulting in characteristic calcification and osteogenesis.[12] Some studies have described the US appearance of a well-defined subcutaneous mass with strong posterior acoustic shadowing.[11] Solivetti et al described five US patterns to differentiate pilomatrixoma from other subcutaneous tumors.[13] Regarding the

internal vascularity noted on color Doppler imaging, it is worth noting that Ichikawa et al described the angiographic findings of calcifying epithelioma as hypervascular with arterial encasement.[14] The differential diagnosis of calcifying epithelioma includes sebaceous cyst, hemangioma, epidermoid and dermoid cysts, and lymph node calcification.[15] Sebaceous cysts appear as round or oval hypoechoic masses with soft, well-defined margins and deformable shape under pressure with the probe. There is no peripheral or internal Doppler flow. Hemangioma has a lobulated contour and a soft consistency, and color Doppler signals can be seen within anechoic vascular channels.

Epidermoid cysts are sharply circumscribed lesions with an echogenic central portion surrounded by an echolucent zone; the central echogenic region is probably due to keratin plugs and debris and does not show Doppler flow. Calcification of lymph nodes is common in tuberculosis and metastases. However, complete calcification is rare, and superficial lymph nodes are usually deeper than the subdermal calcifying epitheliomas.

ACKNOWLEDGMENTS

The authors thank the participants for volunteering their time. The authors are grateful to Shi-Hao Xu and Zuo-Liu Xie for coordinating the data collection for this study.

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