Pilomatrixoma: Variation in Presentation. Case Report

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Abstract
A pilomatrixoma, or benign calcifying epithelioma of Malherbe, is a benign skin tumor that is usually found in the head and neck region. It primarily affects children and adults over 50 years of age and presents as a solitary pink-to-purple lesion less than 1cm. Clinical diagnosis is often straightforward and can be confirmed by a combination of ultrasound imaging and histopathological examination. However, variability in clinical presentation can complicate the diagnosis of pilomatrixoma. Here, we present two atypical cases in children that could easily lead to misdiagnosis. We discuss clinical presentation, diagnostic confirmation and treatment approaches.

Introduction

A pilomatrixoma, also known as pilomatricoma, trichomatrixoma or benign calcifying epithelioma of Malherbe, is a benign soft skin tumor that originates from matrix cells of the outer root sheath of the hair follicle due to a mutation in the catenin beta-1 (*CTNNB1*) gene (1,2). It is a rare skin neoplasm with an incidence of approximately 1% among benign skin lesions.

While it can occur at any age, it is mainly seen in children (40% in the 1st decade of life) and adults over the age of 50. Cases in infants younger than six months are exceedingly rare.

Pilomatrixomas predominantly arise in the head and neck region (50%) as a solitary lesion with an average size of 1cm or less. They grow at a moderate rate and can present as either cystic or firm masses. Clinically, a pilomatrixoma usually exhibits a pink-to-purple coloration, with characteristic subepithelial white-to-yellowish tones due to calcification. The lesion is composed of irregular nodules that are freely mobile beneath the overlying skin in which telangiectatic vessels are frequently observed (3,4).

However, pilomatrixomas exhibit a wide range of unusual clinical presentations. Some reports describe large lesions, reaching up to 15 cm, or ulcerated lesions with extrusion of the calcifications (5,6). Additionally, the lesions may occur in anatomical locations outside the characteristic head and neck region.

In this article, we present two atypical cases that were prone to misdiagnosis because of their unusual presentation. Written informed consent for publication was obtained from the parents in both cases.

Case 1

A 3-month-old girl, born after an uncomplicated pregnancy and spontaneous vaginal delivery, presented with a nodule on the posterior aspect of the right auricle. The lesion underwent rapid enlargement in the initial weeks, followed by a plateau in growth. It was initially presumed to be a hemangioma. At the age of 6 months, the patient was referred to our hospital because of ulceration of the lesion. On examination, the mass measured 3.5 × 1.5 cm and exhibited a reddish discoloration of the overlying skin. The anterior portion was ulcerated, tender and inflamed, while the posterior part was firm to gritty upon palpation (Figure 1). Ultrasound imaging revealed an ovoid complex mass with calcifications located at the junction of the dermis and subcutaneous fat, along with focal thinning of the overlying dermis. A bacterial culture of the ulcerated area identified growth of *Haemophilus influenzae*. After a 5-day course of ampicillin, the lesion was surgically excised in toto. Histopathological examination confirmed the presence of a sharply circumscribed, non-encapsulated dermal lesion extending into the subcutaneous tissue. Peripheral areas of the lesion were composed of basaloid cells, while the central region contained ghost-like squamous cells, some of which were surrounded by foreign body giant cells. Most basaloid cells demonstrated maturation into ghost cells – anucleated cells with eosinophilic cytoplasm. Foci of calcification were identified, along with focal ulceration of the overlying epidermis. The combination of clinical examination, presence of calcifications on ultrasound and the corresponding histopathological findings resulted in the diagnosis of pilomatrixoma.

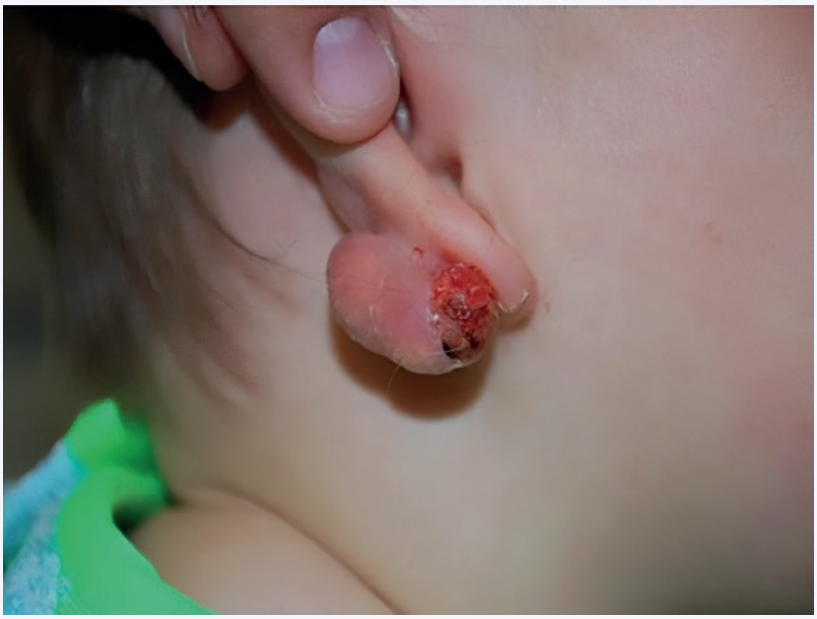
Case 2

A 15-year-old boy with no significant past medical history presented with a lesion on the medial aspect of his right upper arm (Figure 2). The lesion was first noticed 6 months earlier as multiple small red spots, initially misdiagnosed as insect bites. Over the following 4 months, the lesion exhibited slow but progressive growth, eventually becoming purplish-red, elevated and painful.

On physical examination, the mass measured 15 mm in diameter. Palpation revealed a firm and tender lesion. At first, differential diagnosis included a dermatofibrosarcoma protuberans because of its location. This is a rare, locally aggressive, soft tissue sarcoma primarily found on the trunk and proximal extremities, typically appearing as a slow-growing, firm, reddish-violet nodule.

However, ultrasound imaging showed a heterogeneous well-demarcated subcutaneous lesion of 14mm with multiple small hyperreflective foci and peripheral vascularization.

FIGURE 1: Ulcerated pilomatrixoma on the posterior aspect of an earlobe.



Furthermore, the lesion was freely mobile under the skin. These findings were more consistent with pilomatrixoma. The lesion was completely excised. Histopathological findings confirmed the diagnosis of pilomatrixoma.

Discussion

The differential diagnosis of pilomatrixomas is broad. Epidermoid and dermoid cysts, both common benign skin lesions, are frequently mistaken for pilomatrixomas due to their firm texture. Hemangiomas and giant mollusca contagiosa may also mimic pilomatrixomas. However, the presence of calcifications typically favors the latter. Lipomas can present as soft, mobile masses that may occasionally calcify, further complicating the diagnosis. Calcified lymph nodes are another potential mimic, as they can present as firm, palpable masses. Similarly, neurofibromas in children with neurofibromatosis, may resemble pilomatrixomas but are usually softer. Foreign body reactions, resulting in calcified or fibrotic lesions from prior trauma or surgery, can also be mistaken for pilomatrixomas. In rare cases, rhabdomyosarcoma, a malignant soft tissue tumor, may enter the differential diagnosis, particularly if rapid growth or ulceration is observed, necessitating histopathological confirmation.

Other benign soft tissue tumors, such as juvenile xanthogranulomas or myofibromas, and malignant tumors like neuroblastoma, must also be considered, especially in pediatric patients (7).

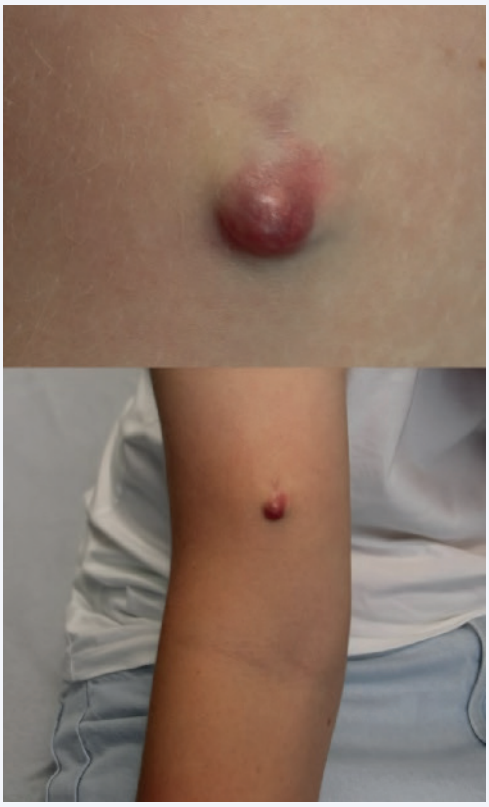
Ultrasound imaging plays a pivotal role in distinguishing these conditions, as the identification of calcifications within the lesion strongly supports the diagnosis of pilomatrixoma. Ultimately, histopathological examination remains essential for definitive diagnosis in ambiguous cases.

As demonstrated in our 2 cases, variability in presentation can potentially delay the accurate identification and treatment of a pilomatrixoma.

In the first case, the patient was a 3-month-old girl, an age at which pilomatrixomas are exceedingly rare. Furthermore, the lesion exhibited ulceration and had larger dimensions than those commonly found with this type of benign skin tumor.

Nevertheless, the presence of calcifications prompts further investigations and effectively excludes hemangioma as a diagnosis (8).

FIGURE 2: Pilomatrixoma on the right upper arm.



Histopathological examination confirmed the diagnosis of pilomatrixoma in this patient.

Characteristically, pilomatrixomas consist of a well-demarcated nodular collection of cells. The borders are made up of basaloid epithelial cells that transition centrally into “shadow” or “ghost” cells. These are eosinophilic anucleated cells. Early-stage lesions have a larger number of basaloid cells. The further the stage of the pilomatrixoma, the more basaloid cells have transformed into ghost cells with calcifications and ossifications.

Subsequent genetic testing on the tumor identified a heterozygous missense mutation (c.94G>T, p.Asp32Tyr) in the *CTNNB1* gene. Mutations in the *CTNNB1* gene, which encodes the signaling protein beta-catenin, are frequently associated with pilomatrixoma. Beta-catenin plays a crucial role in hair follicle development, and its dysregulation has been implicated in the pathogenesis of this tumor (1). The genetic basis of pilomatrixoma extends beyond sporadic cases. When multiple pilomatrixomas are observed in a single patient or among affected family members, the condition has been linked to several syndromes. These include myotonic dystrophy, familial adenomatous polyposis, Turner syndrome, trisomy 9, Kabuki syndrome, sarcoidosis, xeroderma pigmentosum and basal cell nevus syndrome (9). Rare cases of malignant transformation and even metastasis have been described, although these are generally considered to have been malignant from the outset (i.e., pilomatric carcinoma). Moreover, rare associations with Rubinstein-Taybi syndrome have been described. Such associations and possible transformations highlight the importance of an adequate diagnosis and if needed, a genetic analysis (10).

In the second case, the pilomatrixoma presented in an uncommon anatomical location. Again, the key to diagnosing a pilomatrixoma in this patient lies in the presence of hyperreflective foci on ultrasound, which should raise suspicion of calcifications – a hallmark feature of this lesion. Histopathology further confirmed the diagnosis.

Complete surgical excision is the preferential treatment, as no spontaneous regression can be expected. This management is usually curative with a low recurrence rate. A recent review even suggests excision of suspected pilomatrixomas without prior imaging, as most of the cystic lesions that mimic pilomatrixoma, will eventually require surgical excision (11).

Conclusion

In conclusion, even though the clinical diagnosis of pilomatrixomas is often straightforward, pediatricians should maintain a high index of suspicion when encountering atypical lesions in atypical regions, particularly when calcifications are observed or objectivated by ultrasound.

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