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Case Report

Pilomatrical carcinoma in the thigh: A case report and review of literature

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ABSTRACT

Pilomatrical carcinoma is a rare malignant hair follicle tumor. It may arise *de novo* or as a malignant transformation from benign pilomatricoma. The tumor is locally aggressive with an increased tendency of recurrence but with a low metastatic potential. A 51-year-old male patient presented with a slowly growing mass in the middle inner aspect of the left thigh. After surgical excision, microscopically the tumor was diagnosed as pilomatrical carcinoma.

KEY WORDS: Hair follicle, pilomatricoma, pilomatrical carcinoma, thigh

INTRODUCTION

Pilomatricoma, also called pilomatrixoma, or calcifying epithelioma of Malherbe is a relatively common benign cutaneous adnexal tumor derived from hair follicle matrix cells with differentiation toward the matrix and inner sheath of a healthy hair follicle as well as hair cortex [1]. Pilomatricoma accounts for 0.2% of all routine dermatopathologic specimens [2].

Pilomatricoma usually arises as skin colored solitary, asymptomatic, slowly growing, cystic, or firm nodules that may be mistaken for a sebaceous cyst, foreign body reaction, soft tissue tumor, or epidermal inclusion cyst [3].

Pilomatrical carcinoma also referred to as malignant pilomatrixoma or metrical carcinoma is the malignant counterpart of pilomatricoma [4]. It is an extremely rare tumor. Most cases occur in adults with a wide range of age [5]. The mean age at the time of diagnosis is about 48 years. The majority of pilomatrical carcinomas develop *de novo*; however, the malignant transformation from a pre-existing pilomatricoma has been reported [6]. Pilomatrical carcinomas mostly occur in the head and neck [7], upper extremities, and buttocks. Rare tumors have been reported in the axilla and inguinal regions [8]. The clinical feature of pilomatrical carcinoma is usually not distinctive with long duration ranging from several months to years before diagnosis [9].

CASE REPORT

A 51-year-old male patient presented to the outpatient clinic with a history of slowly growing subcutaneous mass in the middle inner aspect of left thigh for 8 months, recently the mass rapidly enlarged. The mass was painless with no history of trauma. On physical examination, a 4 cm well circumscribe firm non-tender mass was found. No skin changes or lymphadenopathy was noticed.

Magnetic resonance imaging (MRI) showed an encapsulated solid mass 34 mm × 57 mm × 45 mm in size. Local excision with wide safety margin was performed.

On gross examination, the mass was single nodular bizarre in shape, firm in consistency, 5 cm × 4 cm × 3 cm with a granular grayish white cut surface covered by edematous skin [Figure 1a and b].

Microscopic examination of the resected mass showed poorly circumscribed nodular lesion in the deep dermis composed of irregular nests of large pleomorphic basaloid cells undergoing abrupt trichilemmal type keratinization enclosing struturless eosinophilic cells (shadow or ghost cells), focal calcification, and exuberant foreign body reaction with multinucleated giant cells were seen. Focal areas showed infiltrating sheets of tumor cells, with numerous mitoses including atypical forms. Areas of transition into atypical squamous epithelial cells and abundant necrosis were also seen, clefts and palisading arrangement were observed around the nests [Figure 1c-h]. There was no infiltration of deep resection margin. The presence of infiltrative nests, pleomorphism, atypical mitoses, and abundant necrosis were leading to a diagnosis of pilomatrical carcinoma, despite the lack of vascular invasion or perineural involvement. A second opinion was taken by two expert dermatopathologists to confirm the diagnosis.

The patient was followed up and he did not show any evidence of local recurrence or metastasis for 15 months after the surgery without adjuvant chemotherapy or radiotherapy.

DISCUSSION

Pilomatricoma is a benign dermal and/or subcutaneous tumor that is histologically similar to the metrical portion of the hair at the level of the bulb. In 1880, Malherbe and Chenantais were first to describe this lesion, referred to as "calcifying epithelioma," however it was thought to derive from sebaceous glands [10]. Clinically, most of these lesions are solitary nodules located on the head, neck, or upper limb. They may be rubbery or hard and faceted, and they usually measure from 5 mm to 2 cm in diameter. Rarely, they can be multiple proliferating and rapidly progressive [11]. Rare cases are associated with myotonic dystrophy [12].

Histologically, the hallmark of pilomatricoma is basaloid lobules and eosinophilic cells (shadow or ghost cells) admixed with keratin. The basaloid cells are typically homogeneous and monomorphous, similar in size to the basaloid cells of basal cell carcinoma. Many of these cells may show mitosis in any given histologic field. The shadow cells are anucleate but retain the essential morphology of the basaloid cells. A giant cell infiltrate and dystrophic calcification are also usually present, presumably as a host response to the shadow cells and keratin [13].

The derivation of pilomatricomas from the hair matrix has been confirmed by biochemical studies demonstrating prominent staining of tumor cells with antibodies directed against lymphoid-enhancing factor 1, a marker for hair matrix cells.

Pilomatrical carcinoma is the malignant counterpart of pilomatricoma. It is an extremely rare tumor with the most cases present in adults. The epidemiology of pilomatrical carcinoma differs from that of pilomatricoma, while pilomatricomas are more common in females (male:female ratio is 1:3) and more in individuals younger than 20 years, pilomatrical carcinomas are more common in males (male:female ratio is 2:1) and more often in middle-aged or elderly individuals. The clinical appearance of pilomatrical carcinoma is not characteristic [14]. The patients show solitary, sometimes, ulcerated, or fungating nodules ranging in size from 1 to 10 cm in diameter. These nodules are often of long duration ranging from several months to years before diagnosis, although cases of recent onset and a history of rapid growth have been reported [15].

Histopathologically, pilomatrical carcinoma is a large, asymmetrical, poorly circumscribed dermal or dermal-subcutaneous mass composed of several, irregularly shaped and variously sized aggregations of basaloid cells (metrical and supramatrical cells). Foci of cornified material containing shadow cells are characteristically observed within the basaloid cell aggregations. Some tumors show a variable desmoplastic stroma surrounding the basaloid cell aggregations. Focal connections of basaloid cell aggregations to the overlying

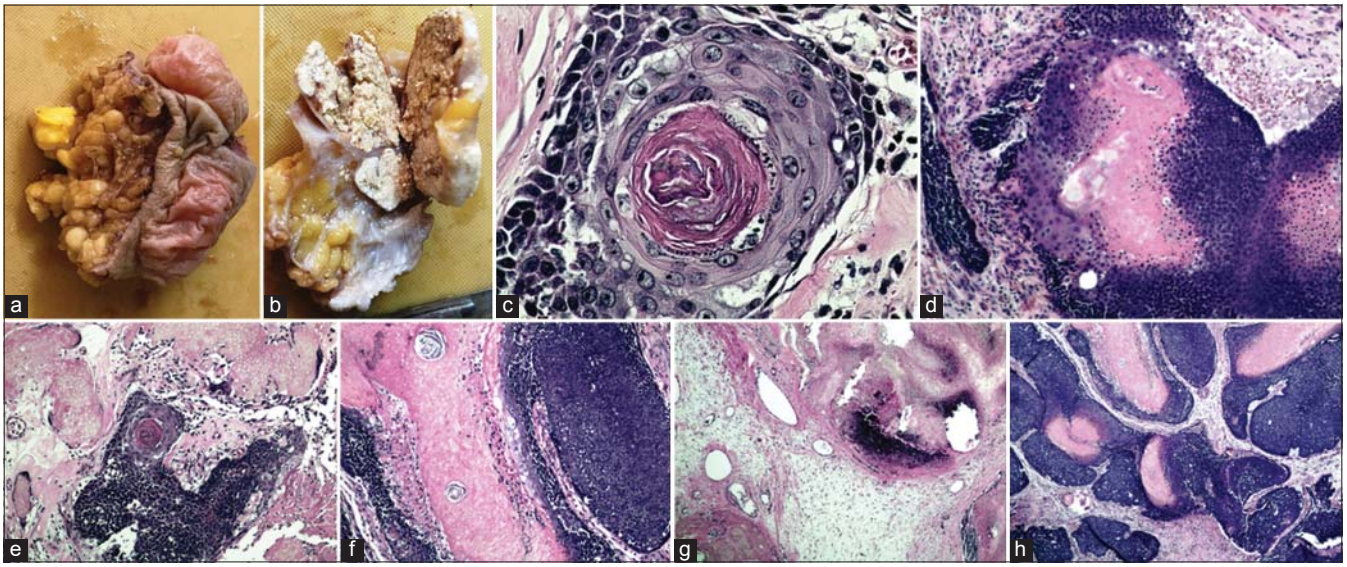

Figure 1: Lobulated grayish brown mass 4 cm × 3 cm in diameter (a and b). Pilomatrical carcinoma shows infiltrating nests of pleomorphic basaloid cells into the dermis with abrupt transition to pilar "shadow" eosinophilic cells with focal areas of necrosis (c-h)

epidermis and/or ulceration are often noted [16]. Basaloid cells exhibit hyperchromatic nuclei, with one or more prominent nucleoli and ill-defined cytoplasmic margins as well as variable numbers of occasionally atypical mitotic figures (up to 10 mitoses per high-power field). Foci of geographical necrosis, calcification and ossification are observed. Mitotic activity is not a reliable indicator of malignancy because mitoses are common in pilomatricoma. Other parameters, such as an infiltrative growth pattern, atypical mitoses as well as lymphovascular and perineural invasion, are more reliable features [4].

Pilomatricomas and pilomatrical carcinomas are often misdiagnosed on pre-operative fine-needle aspiration cytology (FNAC). FNAC has been documented as a pre-operative diagnostic method [17]. However, the diagnosis may be misleading without the presence of ghost cells in the aspirate.

Immunohistochemical studies did not define the appropriate markers that can differentiate pilomatricoma from pilomatrical carcinoma. Mutations in the gene CTNNB1 encoding β-catenin have been detected in both benign and malignant tumors, same in cyclin-D1. However, p53 showed positive expression in pilomatrical carcinoma while it was negative in all studied cases of pilomatricoma in the previous study [18].

Plain X-ray films have limited utility but may detect calcification. The characteristic ultrasonographic picture of pilomatricoma is an ovoid mass with echogenic center surrounded by a hypoechoic rim with acoustic shadows at the junction of dermis and subcutaneous fat with focal thinning of the overlying dermis. It also shows calcification [19]. Computed tomography shows a sharply demarcated subcutaneous lesion of soft tissue density, with or without calcification. MRI may show a rim-enhancing lesion with small areas of signal drop out which may be consistent with calcifications [20].

Besides ordinary pilomatricoma, the main histopathologic differential diagnoses of pilomatrical carcinoma are proliferating pilomatricoma, basal cell carcinoma with matrical differentiation and matricoma. Proliferating pilomatricoma is usually a symmetrical lesion with an expansive growth pattern, which differs from the asymmetrical infiltrative growth pattern of pilomatrical carcinoma. The cells show nuclear atypia and mitotic activity ranging from 4 to 15 mitoses per high-power field with no perineural and/or vascular invasion [21]. However, the absence of perineural and/or vascular invasion does not exclude malignancy as present in this case. In our opinion, the distinction between malignant and proliferating pilomatricoma has no therapeutic implication, as the high risk of recurrence and treatment being the same. Basal cell carcinoma with matrical differentiation is a rare variant of basal cell carcinoma. The tumor has typical features of basal cell carcinoma with nests containing shadow cells [11]. Important histological features distinguishing pilomatrical carcinoma from basal cell carcinoma with matrical differentiation are cytological atypia, high mitotic rate, and frequent atypical mitoses. Matricomas are presents an unusual pilomatricoma variant characterized by discrete, small, and solid aggregations of basaloid cells with several connections to pre-existing infundibula at different points [1].

The treatment of choice is by surgical excision with adequate margins. Adjuvant radiotherapy may be started after excision. Chemotherapy is necessary in the case of extensive local infiltration or presence of distant metastasis. Pilomatrical carcinoma is mainly a locally aggressive tumor which often recurs if not completely removed but very rarely shows distant metastases. Metastatic spread occurs to regional lymph nodes, lungs and/or bone [22].

CONCLUSION

The pilomatrical carcinoma is an extremely rare malignant tumor of skin appendages. The diagnosis is often not straight forward and missed due to shared features with its more common benign counterpart. In patients with recurrence or fast growth of pilomatricoma, the diagnosis of carcinoma should be considered. Wide excision with 1-2 cm safety margin is the treatment of choice with regular follow-up to detect recurrence.

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