

PILOMATRIXOMA: FINE-NEEDLE ASPIRATION CYTOLOGY A REPORT OF THREE CASES

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Pilomatrixoma, or calcifying epithelioma of Malherbe, is a benign tumor of skin appendages with presumed differentiation towards hair cortical cells. The term pilomatrixoma is preferred to the former name of "calcifying epithelioma of Malherbe," which may give the unwary clinician a false impression that the lesion is malignant. It manifests clinically as a firm, deep-seated nodule, located mainly on the head, neck and upper extremities. It may arise in persons of any age, but about 40% arise in children younger than 10 years and 60% in the second decade of life. Histologically, it is composed of solid nests of small basaloid cells. The key feature is the presence of abrupt keratinization of these cells, leading to the formation of ghost or shadow cells. Foreign body reaction, calcification and ossification are common secondary events.^{1,2} Although several studies describing the cytologic features of pilomatrixoma have been reported in the literature, this lesion continues to cause difficulty in diagnosis on a cytologic basis.^{13,14} In this paper, we present the cytologic findings in three cases of pilomatrixoma in which fine-needle aspiration biopsy (FNAB) was performed. Definitive diagnosis of pilomatrixoma was rendered in only two of these cases. The cytologic features of pilomatrixoma are discussed with a review of the literature.

Material and Methods

Three cases of pilomatrixoma in which FNAB was performed form the basis of this study. Two of these underwent surgical resection following the FNAB, while in the third case no surgery was performed, since FNAB diagnosis was definitive. Fine-needle biopsy was done using a 25 x 1 inch and a 23 x 1 inch gauge needle, without aspiration. The material was smeared on

unfrosted slides and the smears were air-dried and stained by Diff-Quik method.

Case Reports

Case 1

A two-year-old female presented with a two-month history of a mass on the back of the neck, which gradually increased in size. The lesion was 2 x 2 cm, hard, mobile, and nontender, and located in the occipital area. The overlying skin was normal. FNAB was performed, followed by surgical resection.

Case 2

A 12-year-old female presented with a two-and-a-half-month history of a mass in the preauricular area on the right side of the face. It was slightly tender, firm and mobile. The skin overlying it was tethered and discolored. FNAB was performed, followed by surgical resection.

Case 3

An 11-year-old female presented with a 0.5-cm firm, mobile subcutaneous nodule on the shoulder. FNAB was performed.

Results

Cytologic Findings

The smears in all three cases were moderately cellular (Figure 1). The main cell population was basaloid. These were present as sheets of various sizes, as well as isolated cells. The cells had a high nuclear cytoplasmic ratio and scanty basophilic cytoplasm. Their nuclei were round to oval with fairly regular outline and prominent nucleoli (Figure 2). Scattered naked nuclei were present in the background. A large number of multinucleated giant cells were present in cases 1 and 2. There were areas of amorphous dark-stained material resembling calcification (Figure 3). Inflammatory cells were seen in the background. Numerous ghost cells forming sheets were seen in the smear of case 3, while these were not visualized

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FIGURE 1. FNA of pilomatrixoma showing a cellular smear with sheets of basaloid cells (Diff-Quik stain, 100x).



FIGURE 2. Clusters of basaloid cells. Although the cells show increased nuclear cytoplasmic ratio and prominent nucleoli, they are uniform with regular nuclear outline (Diff-Quik stain, 200x).



FIGURE 3. Calcifications appear as dense basophilic clumps. Multinucleated giant cells are seen (Diff-Quik stain, 100x).



FIGURE 4. Sheets of ghost cells showing dense cytoplasmic outline and unstained central nuclear shadow (Diff-Quik stain, 200x).

in the other two cases. The sheets of ghost cells had a honeycomb pattern with thick and deeply stained cytoplasmic membrane and a lightly stained central area (Figure 4).

These findings prompted the diagnosis of a neoplasm of unknown histogenesis in case 1. In view of the young age of the patient, however, a diagnosis of a malignant neoplasm was not favored. In case 2, diagnosis of pilomatrixoma was suggested, although it was not definitive. In case 3, a conclusive diagnosis of pilomatrixoma was rendered.

Histologic Findings

Microscopic examination of resected lesions in cases 1 and 2 revealed the characteristic features of pilomatrixoma. There were numerous islands of basaloid cells displaying abrupt transition into sheets of ghost cells (Figure 5). Numerous multinucleated giant cells were distributed throughout. Areas of calcification were present (Figure 6).

Discussion

Pilomatrixoma is a skin appendageal tumor that manifests itself as a dermal or subcutaneous nodule covered by normal skin. Occasionally, it may be more superficial, causing a blue-red discoloration of skin. The histology of pilomatrixoma shows two types of cells, basaloid cells and shadow or ghost cells. The basaloid cells have round to oval hyperchromatic nuclei and scanty cytoplasm. There is abrupt transition to ghost cells, which are eosinophilic with a distinct border and possess a central unstained area as a shadow of the lost nucleus. Calcification, foreign body giant cells and keratinization are a constant feature.^{1,2} Although histologic features of this lesion are well recognized, pathologists continue to encounter difficulty in diagnosis on aspiration cytology. There are several reports in the literature describing its cytologic features and addressing the main differential diagnosis and its diagnostic pitfalls.³⁻¹⁴ However, a review of the literature showed that out of the 34 reported cases, a correct cytologic diagnosis was made in only 12 cases, one

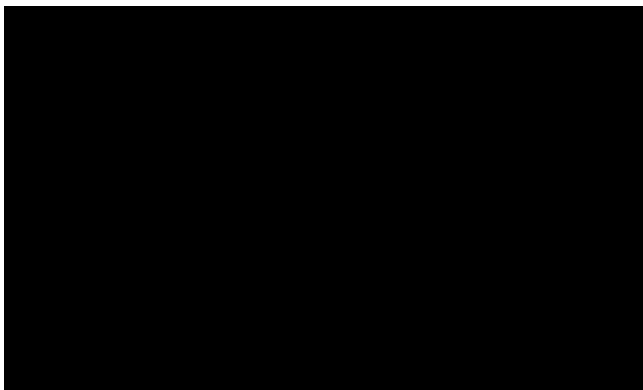


FIGURE 5. Histological section of pilomatrixoma, showing basaloid cells undergoing abrupt keratinization and transformation to ghost cells (Hematoxylin and eosin, 100x).

of these on repeat FNAB. Most of the cases were reported as carcinoma, mainly squamous cell carcinoma, or suggestive of carcinoma (Table 1).

All of the reports emphasize consistent features in cytologic smears of pilomatrixoma. These include a dominant basaloid cell population, shadow or ghost cells, squamoid cells, multinucleated giant cells, inflammatory cells and calcium deposits. These were reported to be present in varying proportions. The major pitfall in the diagnosis of pilomatrixoma is the over-interpretation of the basaloid cells as malignant due to their increase in nuclear cytoplasmic ratio, slight nuclear hyperchromasia and prominent nucleoli. However, if strict cytologic criteria are applied, the benign nature of these cells may be easily recognized. In their review of fine-needle aspiration of eight cases of pilomatrixoma, Sanchez et al. recommended the importance of examining smears stained by Papanicolaou, as well as Diff-Quik stains, since the nuclei of basaloid cells may appear unduly enlarged in the smears stained by Diff-Quik.¹⁴

The presence of shadow cells with characteristic central pale nuclear zone has been repeatedly reported in the literature as the most important cytologic feature for the diagnosis of pilomatrixoma. However, despite their abundance in histologic sections, their detection was reported to be difficult in the cytologic smears and they may not be present at all. This is probably due to difficulty in detaching these cells during aspiration.⁴ Woyke et al. reported the presence of ghost cells in only three out of six cases,⁴ while in the Solanki et al. series of three cases, they were not easily visualized.⁵ Gomez-Aracil et al. noted the ghost cells in Giemsa-stained smears from all four cases, but these cells were not visible in Papanicolaou-stained smears.³ In the case reported by Ma et al., ghost cells were not present in the first FNAB, but were easily recognized in repeat aspiration.¹⁰ Wong et al. noted a few scattered ghost cells in FNAB smears only on retrospective

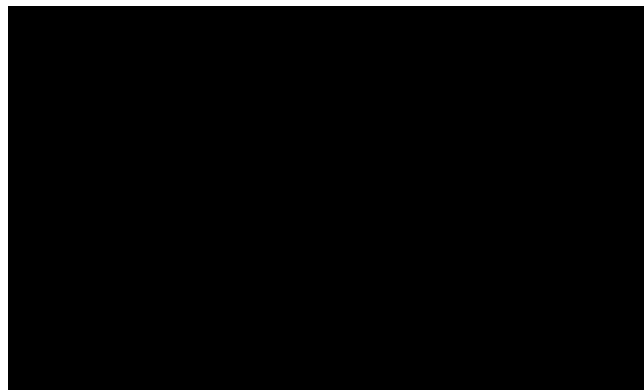


FIGURE 6. Calcification and foreign body giant cells (Hematoxylin and eosin, 100x).

examination.⁷

Wong et al. reported an important feature which, if present, helps in establishing the cytologic diagnosis of pilomatrixoma. That is the presence of sharply outlined masses of refractile keratin clumps, which they interpreted as sheets of ghost cells.⁷ This feature is recognized mainly in Papanicolaou stain. This had been mentioned briefly in previous reports but was underemphasized. It was described by Woyke et al. as eosinophilic clumps,⁴ and by Chan and McGuire as birefringent keratin material.⁸ Unger et al. recognized these masses as compact sheets of ghost cells.⁶ Because of their prominent optical characteristic, Wong et al. found them to be the most helpful feature in alerting the pathologist to look for ghost cells, leading to the diagnosis of pilomatrixoma.⁷

Several other lesions may contain a mixture of squamous cells, basaloid cells or reactive granulomas and may thus mimic pilomatrixoma on aspiration smears. Layfield et al. reviewed the fine-needle aspiration findings in a large series of cutaneous masses, including pilomatrixoma.¹¹ Lesions which mimic pilomatrixoma include skin appendageal tumors, such as epidermal inclusion and trichilemmal cysts, cylindroma, and such malignant neoplasms as squamous cell or basal cell carcinoma, as well as granulomatous lesions. Salivary gland lesions also enter in the differential diagnosis of pilomatrixoma, especially if they are located in the parotid or submandibular area.⁸ Aspirates from epidermal inclusion cysts consist mainly of nucleated and anucleated squamous cells and keratin. They lack the sheets of basaloid cells and shadow cells. Trichilemmal cysts do not have the shadow cells and the sheets of basaloid cells may show palisading of their peripheral cells. FNA samples from cylindroma show numerous tissue fragments of small basaloid cells with adjacent hyaline cylinders which appear as amorphous homogenous material. Aspirates from pilomatrixoma may be misinterpreted as squamous cell

TABLE 1. Summary of the cytologic diagnosis of pilomatrixoma reported in the literature.

	Woyke ⁴ 1982	Solanki ⁵ 1987	Chan ⁹ 1989	Bhalotra ¹³ 1990	Gomez- Aracil ³ 1990	Unger ⁶ 1990	Ma ¹⁰ 1991	Chan ⁸ 1992	Layfield ¹¹ 1993	Wong ⁷ 1994	Chen ¹² 1995	Sanchez ¹⁴ 1996
No. of cases	6	3	1	1	4	1	1	2	4	1	2	9
Cytologic diagnosis		-*										
Malignant tumor	4	-	1	0	1	0	0	0	1	1	0	1
Suggestive of malignancy	2	-	0	1	1	0	0	0	0	0	0	0
Benign	0	-	0	0	0	0	0	1	0	0	1	2
No. definite diagnosis	0	-	0	0	0	0	0	1	1	0	0	1
Pilomatrixoma	0	-	0	0	2	1	1**	0	2	0	0	5

*The cytologic diagnosis was not mentioned in the report; **the diagnosis of pilomatrixoma was made on repeat FNAB.

carcinoma. The young age of the patients, the absence of definite features of malignancy in the nucleated squamous cells, and the presence of other characteristic features of pilomatrixoma help in differentiating between both neoplasms. Basal cell carcinoma aspirates have sheets of basaloid cells with prominent peripheral palisading of cells. In addition to nuclear crowding and overlapping, the cells are relatively large with oval nuclei and finely granular chromatin. Nucleoli are small or absent. The presence of inflammatory cells and foreign body type giant cells may cause confusion with granulomatous inflammation. However, granulomas do not contain basaloid and shadow cells of pilomatrixoma. Monomorphic adenoma and adenoid cystic carcinoma of the salivary gland both show abundant basaloid cells with clumps of eosinophilic stromal material. In the cribriform areas of adenoid cystic carcinoma, ball-like masses of hyaline globules are surrounded by uniform hyperchromatic basaloid cells. The identification of shadow cells and the keratin clumps of pilomatrixoma will aid in its proper diagnosis.

It should be stressed that the possibility of pilomatrixoma should always be considered in the differential diagnosis of an aspirate of a small, slowly growing tumor of skin or subcutaneous tissue, especially if the tumor is located in the head and neck region of a child or adolescent. Careful cytologic examination interpreted in the light of clinical information may permit an accurate cytologic diagnosis of pilomatrixoma.

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