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# ORIGINAL ARTICLE

## PILOMATRIXOMA: A DIAGNOSTIC PITFALL IN FINE NEEDLE ASPIRATION CYTOLOGY

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**ABSTRACT: BACKGROUND:** Pilomatrixoma is an unusual, slowly growing benign tumor of the skin appendages. The histopathological features of pilomatrixoma are characteristic and well recognized, but the cytological diagnosis remains problematic. **AIM:** The study was undertaken to analyze the cytological features of pilomatrixoma, which are helpful in making a reliable preoperative diagnosis. **METHODS AND MATERIALS:** A retrospective study was conducted in the Department of Pathology, Guru Gobind Singh Medical College and Hospital, Faridkot. All cases of pilomatrixoma reported on histopathology from April 2010 till March 2013 were retrieved. The cytological smears of these, histopathologically confirmed cases of pilomatrixoma were reviewed to ascertain the cytological features which are helpful in making a diagnosis. **RESULTS:** During the study period 23 cases of pilomatrixoma were reported on histopathology. However, preoperative FNAC was done only in 9 cases. Out of these 9 cases, a cytological diagnosis of pilomatrixoma was accurately made in 4 cases while, 5 cases were erroneously diagnosed. The most consistent features in the smears of accurately diagnosed cases were shadow cells, basaloid cells and multinucleate giant cells along with calcium deposits and nucleated squamous cells. **CONCLUSION:** The cytological features of pilomatrixoma are characteristic but still the chances of misdiagnosis are high. Shadow cells, basaloid cells and giant cells along with presence of calcification and nucleated squamous cells are helpful for its diagnosis. However, non-representative smears and smears showing predominance of one component lead to erroneous diagnosis. A high degree of suspicion should be kept while evaluating aspirates from subcutaneous growths.

**KEYWORDS:** Pilomatrixoma, Fine needle aspiration cytology (FNAC), shadow cells, basaloid cells.

**INTRODUCTION:** Pilomatrixoma or Calcifying epithelioma of Malherbe is a relatively uncommon benign skin adenexal tumor. It shows differentiation towards the hair matrix of the hair follicle. It usually presents as a solitary, asymptomatic, firm, subcutaneous nodule sometimes exhibiting bluish discoloration of the overlying intact skin.[1, 2] Occurring most often in the first two decades of life, it shows a predilection for the head and neck region, followed by the upper extremities, the trunk and the lower extremities.[2-5] Despite the characteristic and well recognized histopathological features the cytological diagnosis of this entity remains problematic with misdiagnosis and false positive diagnosis.[6-13] Misinterpretation of the Fine needle aspiration cytology (FNAC) specimens has been attributed to non-representative smears, predominance of one cellular component over the others in a sample or lack of awareness of the cytological features of pilomatrixoma by pathologists. In this study we reviewed our cases of pilomatrixoma in order to ascertain the various cytological characteristics that point towards the correct diagnosis of pilomatrixoma on FNAC.

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**MATERIALS AND METHODS:** This was a retrospective study conducted in the Department of Pathology, Guru Gobind Singh Medical College and Hospital, Faridkot. All the cases of pilomatrixoma reported on histopathology from April 2010-March 2013 were retrieved. The preoperative cytological slides for all these cases were also reviewed. FNAC had been performed using a 22 gauge needle and the smears were prepared and stained by Giemsa, Papanicolaou and Haematoxylin and Eosin. All the surgical biopsy specimens obtained were processed according to standard histopathological methods and stained with Haematoxylin and Eosin.

A morphological analysis of the cytology smears was done for the presence of various types of cells.

1. Basaloid cells: tight clusters or singly occurring, small cells having a high nuclear-cytoplasmic ratio, round to oval nuclei with smooth nuclear borders, finely dispersed to slightly granular chromatin, conspicuous to prominent nucleoli and unapparent cytoplasm.
2. Shadow cells (ghost cells/ anucleate squames): non – nucleated keratinized squamous cells with distinct cell borders and central pale nuclear zone, present singly or in clumps.
3. Nucleated keratinized squamous cells.
4. Multinucleated foreign body type giant cells.
5. Calcium deposits.
6. Chronic inflammatory cells and amorphous debris.

The cytological features for each case were recorded and the final impression was compared with the histopathological diagnosis.

**RESULTS:** 23 cases of pilomatrixoma were reported on histopathology. The patients affected were 9 males and 14 females (ratio 1: 1.5). The mean age of presentation was 27.2 years with age range 5-63 years. The lesions were located in the neck (34.7%), head/scalp (26.1%), upper extremities (21.7%) and face (17.5%). The distribution of these lesions according to site and sex is given in Table 1.

Out of 23 cases of pilomatrixoma reported on histopathology, preoperative FNAC had been performed in only 9 cases. The smears from these 9 cases showed various components in different proportions, which included basaloid cells, shadow cells, foreign body giant cells, calcium deposits, nucleated squamous cells, chronic inflammatory cells and amorphous debris. The clinical features, smear composition and cytological diagnosis for these 9 cases are summarized in Table 2.

An accurate cytological diagnosis of pilomatrixoma was made in 4 out of 9 cases. The other 5 cases were diagnosed as epidermal inclusion cyst (2), granulomatous inflammation (1), and metastatic carcinoma (1)? Pleomorphic adenoma/? adenoid cystic carcinoma (1). The cyto-histopathological correlation for these 9 cases is depicted in Table 3.

**DISCUSSION:** Excisional biopsy is the preferred method of diagnosis for majority of cutaneous nodules. However, FNAC is being increasingly used preoperatively due to its ease of performance and rapid diagnosis. The histological features of pilomatrixoma are well recognized, but cytological recognition poses a problem. Studies in literature reveal a relative scarcity of FNAC exposure in cases of pilomatrixoma, which could be a cause for misdiagnosis.[11] We also observed that as compared to the number of cases of pilomatrixoma on histology (23 cases), the lesion is rarer in cytological

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specimens (9 cases). In our study, the lesion was noted in the age groups ranging from 5-63 years with the mean age of presentation being 27.2 years. There was a female predominance. Majority of the tumors were located in the head and neck region and upper extremities. Similar data has been reported by various authors.[12, 14-16]

On cytology case no. 1-4 were correctly diagnosed as pilomatrixoma which corresponded with the histopathology. The most consistent finding was the presence of shadow cells, basaloid cells and giant cells, which was further supported by the presence of calcification and nucleated squamous cells in variable proportions. However, other features like inflammatory cells and background debris were not present in any of the cases.

There was erroneous diagnosis in case no. 5-9, because the pathognomic components were not present in every case. Secondly, the predominance of one component over the others in the smears lead to the misinterpretation. A review of literature, reveals several cases of pilomatrixoma misinterpreted as trichilemmal cyst, epidermal inclusion cyst, granulomatous lesions, squamous and basal cell carcinoma, lymphomas, small round blue cell tumor, salivary gland and other appendageal tumors.[7,11,12, 17-18]

We observed that the smears were most commonly misinterpreted as benign lesions. Dominance of anucleate squamous cells and absence of basaloid cells lead to a misdiagnosis of epidermal inclusion cyst in case no. 5 and 6. Epidermal inclusion cyst consists of monomorphic population of delicate, well delineated anucleated squamous cells occurring singly or in clumps. Basaloid cells and calcification are rarely seen. However, a ruptured cyst with presence of inflammation and foreign body giant cells can be confused with pilomatrixoma.[8,9]

The cytological diagnosis in case no. 7 was granulomatous inflammation. The smears were composed of multinucleate giant cells, histiocytes and lymphocytes. Multinucleate giant cells and histiocytes in dermal aspirates may be observed in conditions like panniculitis, tuberculosis, infectious and noninfectious granulomatous conditions. The presence of multinucleate giant cells should be evaluated in the context of accompanying cells. In pilomatrixoma these cells correspond to a foreign body giant cell reaction adjacent to shadow cells.[19] Despite the abundance of shadow cells in histological sections, they might not be present in the cytological smears due to difficulty in detaching these cells during aspiration.[6]

The most dangerous mistake in FNA diagnosis of pilomatrixoma regards a diagnosis of neoplastic lesion. In our study there were two false positive cases. Case no. 8 was from a swelling in the parotid region and the smears showed mainly basaloid cells and debris. Keeping in mind the location and the basaloid cells a possibility of pleomorphic adenoma or adenoid cystic carcinoma was kept. Both these entities show abundant basaloid cells along with clumps of eosinophilic stromal material. Pilomatrixoma is one of the most frequent mimickers of salivary gland neoplasms. [20,21]So it has to be kept in mind that the diagnosis should not be over influenced by location. Fibrillar chondromyxoid stroma and plasmacytoid like epithelial cells in case of pleomorphic adenoma and hyaline globules surrounded by basaloid cells in case of adenoid cystic carcinoma are must for the diagnosis.[9]

The FNA smears from case no. 9 showed cells having a high nuclear-cytoplasmic ratio, fine nuclear chromatin, prominent nucleoli and moderate amount of ill-defined cytoplasm along with a background rich in debris and inflammatory cells resembling tumor necrosis. (Fig 1, 2) A cytological diagnosis of metastatic carcinoma was made which was supported by the clinical history of neck

swelling in an elderly patient. Studies show that pilomatrixoma has been very often misdiagnosed as carcinoma.[22-25] The differentiation from metastatic deposits may not be easy specially, in cases with high cellularity and cells having a high nuclear-cytoplasmic ratio and prominent nucleoli.[26]

The diagnostic accuracy of FNAC for pilomatrixoma in our study was found to be 44.4%, which was quiet similar to Leni et al [15] and Handa et al [16]. Prior reviews have shown the agreement between cytology and histopathology to be ranging from 0%-30%. [27-28]

**CONCLUSION:** Despite several studies delineating the specific features, pilomatrixoma continues to be a diagnostic challenge for the cytologist. However, knowledge of the complete spectrum of the findings and a thorough search for these can help in achieving an accurate diagnosis. The most important features are the ghost cells, basaloid cells and giant cells supported by calcification and nucleated squamous cells. Adequate FNAC sampling and resampling in cases of doubtful smears can help. Finally, the cytopathologist should think of pilomatrixoma while evaluating subcutaneous growths, particularly in the head and neck region of young individuals.

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| Site | Male | Female | Total (%) |
|---|---|---|---|
| Neck | 1 | 7 | 8 (34.7%) |
| Head/Scalp | 5 | 1 | 6 (26.1%) |
| Upper extremities | 2 | 3 | 5 (21.7%) |
| Face | 1 | 3 | 4 (17.5%) |
| **Total** | **9** | **14** | **23 (100%)** |

Table 1 : Distribution of 23 cases of pilomatrixoma according to site and sex

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| Case No. | Age/sex | Site | Clinical diagnosis | Predominant Cytologic patterns | Cytologic Diagnosis |
|---|---|---|---|---|---|
| 1 | 11/M | Scalp | Pilomatrixoma | BC*, shadow cells, KSC†, MNGC‡ | Pilomatrixoma |
| 2 | 8/F | Face | Hemangioma | BC, shadow cells, MNGC, calcification | Pilomatrixoma |
| 3 | 35/F | Head | Sebaceous cyst | BC, KSC, few shadow cells, MNGC | Pilomatrixoma |
| 4 | 40/M | Arm | Neurofibroma | Shadow cells, few BC, MNGC, calcification | Pilomatrixoma |
| 5 | 35/F | nape of neck | Lipoma | Anucleate squamous cells, KSC, few MNGC | Epidermal inclusion cyst |
| 6 | 30/M | Scalp | Sebaceous cyst | Anucleate squamous cells, inflammatory cells | Epidermal inclusion cyst |
| 7 | 20/F | Neck | Lymphadenitis | MNGC, histiocytes, lymphocytes | Granulomatous inflammation |
| 8 | 30/F | preauricular ( parotid region) | Salivary gland tumor | BC, amorphous debris | ?Pleomorphic adenoma ?adenoid cystic carcinoma |
| 9 | 63/M | Neck | Metastatic lymph node | Cells with high nuclear – cytoplasmic ratio, fine chromatin, prominent nucleoli and moderate amount of ill-defined cytoplasm, debris, inflammatory cells | Metastatic carcinoma |

Table 2 : Clinical features, predominant cytological patterns and cytological diagnosis for 9 cases

*Basaloid cells
†Keratinized squamous cells
‡ Multinucleated giant cells

| Cytological diagnosis | No. | Subsequent Histological diagnosis | No. |
|---|---|---|---|
| Pilomatrixoma | 4 | Pilomatrixoma | 4 |
| Epidermal Inclusion cyst | 2 | Pilomatrixoma | 2 |
| Granulomatous inflammation | 1 | Pilomatrixoma | 1 |
| ?Pleomorphic adenoma ?Adenoid cystic carcinoma | 1 | Pilomatrixoma | 1 |
| Metastatic carcinoma | 1 | Pilomatrixoma | 1 |
| **Total** | **9** | | **9** |

TABLE 3: Cyto-histological correlation for 9 cases

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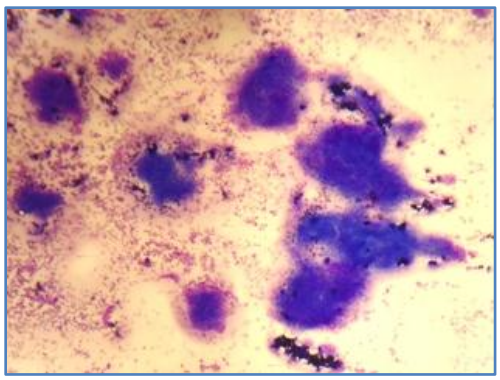

**Fig. 1: Smears from case 9. showing hypercellularity (H&E, x100)**

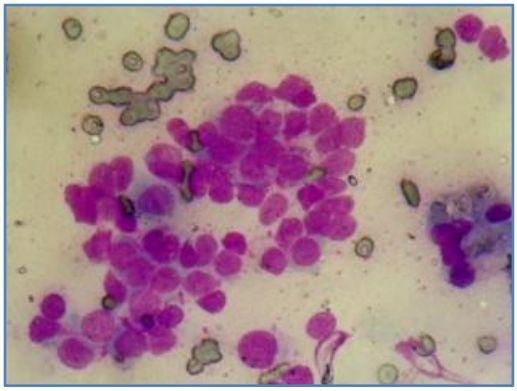

**Fig. 2: Smears from case 9. showing cells having altered nuclear -cytoplasmic ratio, prominent nucleoli, ill defined cytoplasm. (H&E, x400)**

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