ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 01 | January - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

DIAGNOSTIC PITFALLS IN CYTOLOGICAL DIAGNOSIS OF PLEOMORPHIC ADENOMA WITH EXTENSIVE SQUAMOUS METAPLASIA: A CASE REPORT

Pathology

Shivani Panhotra Assistant Professor, Pathology, GMC Rajouri, J & K

Aumbreen Firdous Senior Resident, Pathology, GMC Rajouri, J & K

Dr Meenakshi Khajuria* Associate Professor, Pathology, GMC Rajouri, J & K *Corrresponding Author

Kulbhushan Badyal Consultant Medicine, GMC Rajouri, J & K

ABSTRACT

On cytology, pleomorphic adenoma (PA), the most prevalent benign salivary gland tumor, usually exhibits a combination of myoepithelial, chondromyxoid stromal, and epithelial components. However, when extensive squamous metaplasia occurs, the diagnostic picture becomes challenging and may mimic malignancy, leading to diagnostic pitfalls. We report a case of a 20-year-old female who presented with a gradually enlarging, painless swelling in the right parotid region for two months, with an associated history of fever. Fine-needle aspiration cytology (FNAC) smears were cellular and revealed abundant squamous cells in cohesive clusters, with nuclear pleomorphism and keratinization. Squamous cell carcinoma or mucoepidermoid carcinoma were suspected based on the first impression. However, a thorough examination showed remnants of chondromyxoid matrix, epithelial cells with mucinophages, and scattered squamous metaplastic cells in a myxoid backdrop, all of which pointed to a benign mixed tumor. The predominance of squamous elements masked typical pleomorphic adenoma features, resulting in a diagnostic dilemma. Histopathologically, the tumor was eventually shown to be a pleomorphic adenoma with widespread squamous metaplasia. The significance of identifying metaplastic alterations in pleomorphic adenoma and avoiding overdiagnosis is shown by this example. Careful search for matrix and myoepithelial elements in cytology smears is crucial for correct diagnosis and prevention of unnecessary aggressive treatment.

KEYWORDS

Pleomorphic adenoma, squamous metaplasia, FNAC, salivary gland tumor

INTRODUCTION

About 60% of all parotid tumors are pleomorphic adenomas (PA), also known as benign mixed tumors, which are the most prevalent neoplasm of the salivary glands. It is characterized by a varied cellular makeup that includes myoepithe lial and epithelial components embedded in a stromal background that can be chondroid, myxoid, or hyalinized. Pleomorphic adenoma usually shows a triad of fibrillary or chondromyxoid stromal fragments, plasmacytoid myoepithelial cells, and ductal epithelial cells on fine-needle aspiration cytology (FNAC).

Despite its well-characterized morphology, pleomorphic adenoma is also known for its heterogeneity and ability to undergo metaplastic changes. Among these, squamous metaplasia is uncommon but well-recognized. Extensive squamous metaplasia, however, is a rare phenomenon and can present a diagnostic pitfall. Squamous cells, keratinization, and related mucinophages can all be signs of cancer, including mucoepidermoid carcinoma and squamous cell carcinoma. This diagnostic challenge can lead to overdiagnosis, resulting in overtreatment or unnecessary surgical procedures.

Awareness of such cytological pitfalls is crucial for pathologists. The identification of even minimal myoepithelial cells or chondromyxoid matrix can provide essential clues to the benign nature of the lesion. Ancillary methods, such as immunocytochemistry, may assist in difficult cases, but histopathological correlation remains the gold standard for confirmation.

We describe a young female patient who had an uncommon incidence of pleomorphic adenoma with widespread squamous metaplasia, highlighting the cytological challenges encountered and the importance of recognizing this diagnostic trap.

CASE PRESENTATION

A 20-year-old woman complained of edema in her right parotid region when she arrived at the outpatient clinic. The swelling had been present for the past two months, with gradual increase in size. It was painless and not associated with difficulty in chewing or swallowing. The patient also reported a history of intermittent fever during this period. No history of weight loss, trauma, or other systemic illness was present.

A firm, movable, non-tender enlargement measuring roughly 2.5 × 2 cm was observed in the right preauricular region during clinical examination. The overlying skin was normal, with no signs of inflammation. There was no facial nerve involvement, cervical lymphadenopathy, or other local abnormalities. Based on clinical findings, a salivary gland neoplasm was suspected, and FNAC was performed for further evaluation.

Cytological Findings:

The FNAC smears were cellular and revealed a striking predominance of squamous cells. These were arranged in cohesive clusters as well as singly dispersed. Many squamous cells showed nuclear pleomorphism, hyperchromasia, and keratinization. At this point, the cytological impression suggested either squamous cell carcinoma or mucoepidermoid cancer.

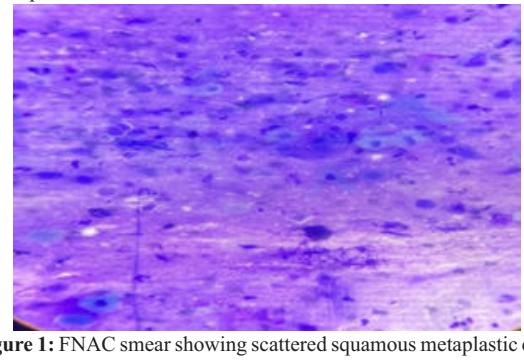

Figure 1: FNAC smear showing scattered squamous metaplastic cells in a myxoid background.

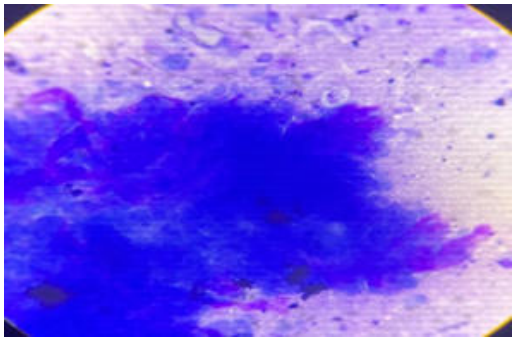

Figure 2: FNAC smear showing chondromyxoid matrix material.

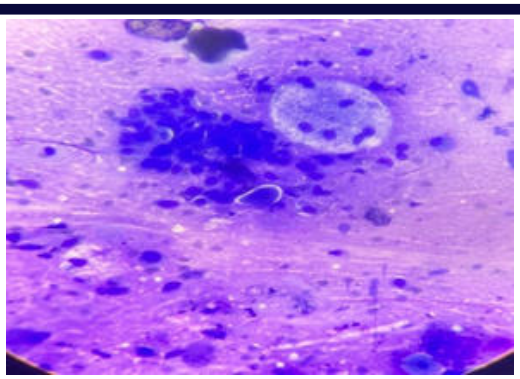

Figure 3: FNAC smear showing epithelial cell component along with mucinophages.

However, careful screening of the smears revealed additional features that altered the interpretation. Scattered squamous metaplastic cells were identified in a myxoid background (Figure 1). Fragments of chondromyxoid matrix were also present, although they were relatively scanty (Figure 2). In addition, clusters of epithelial cells along with mucinophages were observed (Figure 3). These findings suggested a benign mixed tumor rather than a primary malignant process.

Diagnostic Dilemma:
The challenge in this case arose due to the overwhelming predominance of squamous elements, which obscured the typical benign features of pleomorphic adenoma. While the absence of necrosis and frequent mitotic activity made malignancy less likely, the cytological impression remained equivocal.

Final Diagnosis:
Histopathological analysis verified the diagnosis of pleomorphic adenoma with significant squamous metaplasia after the patient had the lump removed. The tumor was encapsulated, with areas of squamous metaplasia embedded within abundant myxoid stroma, and no evidence of invasion.

DISCUSSION

Known for its diverse morphology, pleomorphic adenoma is the most common benign tumor of the salivary glands. Its cytological features are usually diagnostic, especially when the characteristic triad of epithelial, myoepithelial, and stromal elements can be identified. However, deviations from this classic pattern may create considerable diagnostic difficulties. Among the various metaplastic changes that can occur in pleomorphic adenoma—such as osseous, cartilaginous, and sebaceous metaplasia—squamous metaplasia is relatively uncommon. When present, it is usually focal and does not significantly alter the overall cytological impression. In rare instances, however, squamous metaplasia may become extensive and dominate the cytological picture, obscuring the benign features and mimicking a malignant process.

The major diagnostic challenge in such cases lies in differentiating pleomorphic adenoma with squamous metaplasia from malignant salivary gland tumors, particularly squamous cell carcinoma and mucoepidermoid carcinoma. Squamous cell carcinoma is typically suggested by the presence of malignant squamous cells showing nuclear pleomorphism, irregular nuclear membranes, and keratinization, often accompanied by necrosis and frequent mitoses. These features were not identified in our case, thereby making carcinoma less likely. Mucoepidermoid carcinoma, on the other hand, is characterized by a mixture of mucous, epidermoid, and intermediate cells. The presence of mucinophages in our smears initially raised this possibility, but the identification of chondromyxoid matrix fragments and the absence of intermediate cells were more supportive of a benign mixed tumor.

The diagnostic pitfall in the present case was the overwhelming predominance of squamous elements, which masked the diagnostic stromal and myoepithelial components. This emphasizes the importance of thorough cytological evaluation, including a careful search for subtle matrix fragments or plasmacytoid myoepithelial cells, even when smears are dominated by squamous cells. Ancillary techniques such as immunocytochemistry can be useful in problematic cases, as markers like S-100, calponin, and GFAP may highlight myoepithelial differentiation and support a diagnosis of pleomorphic adenoma. However, in many situations, particularly in resource-limited settings, diagnosis must rely primarily on careful morphological assessment.

Ultimately, histopathology remains the gold standard for confirmation. In our patient, excisional biopsy revealed a well-circumscribed lesion composed of epithelial and myoepithelial cells in a myxoid stroma, with extensive squamous metaplasia. Importantly, there was no evidence of invasion, supporting its benign nature. The clinical relevance of recognizing such cases is significant, as misdiagnosis can have serious consequences. Overdiagnosis as carcinoma may lead to unnecessarily aggressive surgical procedures or adjuvant therapy, while underdiagnosis of a true malignancy can delay appropriate treatment.

Several reports in the literature have described similar cases of pleomorphic adenoma with extensive squamous metaplasia, and most have highlighted the same diagnostic difficulty—namely, the masking of classical features by squamous elements. A consistent message across these reports is the value of recognizing even small amounts of matrix fragments as critical diagnostic clues. Although rare, such presentations serve as a reminder of the remarkable morphological variability of pleomorphic adenoma and the need for vigilance when evaluating cytology smears dominated by atypical squamous cells. The present case contributes to this body of evidence by documenting extensive squamous metaplasia in a young patient and reinforces the importance of detailed cytological examination to avoid misinterpretation and overtreatment.

CONCLUSION

Pleomorphic adenoma usually presents with characteristic cytological features, but extensive squamous metaplasia can obscure these and mimic malignancy. This case highlights the diagnostic pitfall posed by such presentations. Careful cytological evaluation, with attention to subtle myoepithelial and stromal elements, is critical for avoiding misdiagnosis. Awareness of this phenomenon helps prevent unnecessary aggressive treatment. Ultimately, histopathology remains essential for confirmation. Pathologists should remain vigilant when evaluating salivary gland FNAC smears dominated by squamous elements, and always consider pleomorphic adenoma in the differential diagnosis.

REFERENCES

1. Barnes L, Eveson JW, Reichart P, Sidransky D, editors. *World Health Organization Classification of Tumours. Pathology and Genetics of Head and Neck Tumours.* Lyon: IARC Press; 2005.
2. Seifert G, Brocheriou C, Cardesa A, Eveson JW. WHO International Histological Classification of Salivary Gland Tumours. *Pathol Res Pract.* 1990;186(5):555-81.
3. Rajwanshi A, Gupta K, Gupta N, Shukla R. Fine-needle aspiration cytology of salivary gland lesions: diagnostic pitfalls—revisited. *Diagn Cytopathol.* 2006;34(8):580-4.
4. Chauhan S, Sharma R, Chandra S, Dixit J, Sharma A. Cytodiagnosis of pleomorphic adenoma with extensive squamous metaplasia: a diagnostic challenge. *J Cytol.* 2010;27(2):74-6.
5. Stewart CJ, MacKenzie K, McGarry GW, McMahon J. Fine-needle aspiration cytology of salivary gland: a review of 341 cases. *Diagn Cytopathol.* 2000;22(3):139-46.
6. Das DK, Petkar MA, Al-Mane NM, Sheikh ZA, Mallik MK, Anim JT. Pleomorphic adenoma of salivary gland with extensive squamous metaplasia and keratin cysts: report of a case with diagnosis by fine needle aspiration cytology. *Diagn Cytopathol.* 2001;24(1):53-7.
7. Klijanienko J, Vielh P. Fine-needle sampling of salivary gland lesions. IV. Cytology and histology correlation of 75 cases of "pleomorphic adenoma." *Diagn Cytopathol.* 1996;14(3):195-200.
8. Stenner M, Klussmann JP. Current update on diagnostics and therapy of salivary gland neoplasms. *Head Neck Oncol.* 2012;4(1):11.
9. Boccato P, Altavilla G, Blandamura S. Histologic and cytologic pitfalls in the diagnosis of salivary gland lesions. *Pathologica.* 1998;90(6):563-7.
10. Jayaram G, Dashini M. Evaluation of fine needle aspiration cytology of salivary glands: an analysis of 117 cases. *Indian J Pathol Microbiol.* 1989;32(1):1-10.
11. Orell SR, Sterrett GF, Whitaker D. *Fine Needle Aspiration Cytology.* 5th ed. Philadelphia: Churchill Livingstone Elsevier; 2012.
12. Nagarkar N, Bansal S, Dass A, Singhal SK. Cytological diagnostic pitfalls in salivary gland lesions: our experience. *Indian J Otolaryngol Head Neck Surg.* 2013;65(Suppl 1):73-7.
13. Kapila K, Sharma R, Das DK, et al. Fine needle aspiration cytology of salivary gland lesions: a study of 712 cases in Kuwait. *Med Princ Pract.* 2012;21(6):573-9.
14. Klijanienko J, Vielh P. Fine-needle sampling of salivary gland lesions: Cytology, histology and clinical correlations of 295 cases. *Cytopathology.* 1997;8(6):306-17.
15. Atula T, Grénman R, Laippala P, Klemi PJ. Fine-needle aspiration biopsy in the diagnosis of parotid gland lesions: evaluation of 438 biopsies. *Diagn Cytopathol.* 1996;15(3):185-90.
16. Safirullah, Amanullah, Azeemuddin M. Cytological challenges in diagnosing pleomorphic adenoma with extensive squamous metaplasia. *Pak J Med Sci.* 2015;31(5):1270-3.