Section: Pathology

Original Research Article

# SALIVARY GLAND NEOPLASMS: THE ROLE OF FNAC IN DIFFERENTIATING BENIGN FROM MALIGNANT LESIONS" - 2YEAR STUDY

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**ABSTRACT**

**Background:** Mass in the salivary gland region often presents a diagnostic challenge. The present study is conducted to diagnose the benign and malignant neoplasms of the salivary glands based on cytomorphology and compare with histopathological diagnosis and to find out the sensitivity, specificity of FNAC of salivary gland lesions.

**Materials and Methods:** This study is retrospective and prospective and includes cases with both FNAC and histopathological examination done on partially resected or excised salivary gland lesions from Jan 2023 to dec 2024 over a span of 2 years, department of pathology, at tertiary care center. Cytology smears were made fixed in alcohol, haematoxylin&eosin staining done. Histopathological specimens were subjected for routine processing; slides prepared and stained with haemotoxylin and eosin. Total of 54 cases had cytological and histopathological correlation. Appropriate statistical analysis was done to analyse data.

**Results:** Of 54 cases, majority (69.3%) of cases involved parotid gland followed by submandibular gland. Pleomorphic adenoma was commonest benign tumor; mucoepidermoid carcinoma commonest malignant tumor. Cystic lesions posed diagnostic difficulty resulting in false negative diagnosis in 5 cases, false positive diagnosis in 1 case.

**Interpretation & Conclusion:** Salivary gland neoplasms represent wide variety of benign and malignant neoplasms. Tumors most commonly involved parotid gland. Tumors with cystic component posed diagnostic difficulty on FNAC. The overall sensitivity and specificity FNAC in present study are 80.7% and 97.0% which are in concordance with other studies.

**Keywords:** Salivary gland neoplasms, cytological and histopathological correlation, sensitivity and specificity.

## INTRODUCTION

Salivary gland neoplasms represent a wide variety of benign and malignant histological subtypes. Salivary gland neoplasms can arise from major or minor salivary glands. About 64-80% of primary salivary gland tumors occur in parotid gland, 7-11% occurs in submandibular salivary gland, less than 1% occur in sub lingual salivary glands and 9-23% occur in minor salivary glands.[1] The mean age of presentation for malignant salivary neoplasms is 55-65years, while benign tumors develop at least decade earlier, at mean age of 45 years.[2]

In files of armed forces pathology institute (AFIP), about 1/3 rd major gland tumors, and half of minor gland tumors are malignant. Ratio of malignant to benign tumors is greatest (>2.3:1) in sub lingual gland, tongue, floor of mouth, retro molar area.[3]
Pleomorphic adenoma is most common benign neoplasm accounting to 52.04% of tumors, of which 80% occur in parotid gland. Mucoepidermoid carcinoma is the most common malignant neoplasm, accounting to 4.06% of tumors & it commonly affects major salivary glands, especially parotid gland. Adenoid cystic carcinoma is second most common malignant neoplasm accounting to 1.63% of salivary

gland tumors and is seen most commonly in minor salivary glands.[4]

Preoperative information about nature of salivary gland neoplasms can be helpful in assessing and establishing a policy toward the neck lymph nodes, achieving wide tumor-free excision margins, preventing treatment delay, and informing patient more appropriately on treatment plan and on possible risk of facial nerve injury. Thus in case of a benign tumor, surgery can be postponed or patient can be followed if general health or other medical conditions pose a major surgical risk.

Preoperatively taken incisional, core biopsies or frozen sections for treatment planning carry risk of tumor spill, bleeding, or inflammation and damage to the facial nerve.[5]

Most of salivary glands are easily accessible and there is widespread acceptance FNAC in preoperative diagnosis of salivary gland lesions 5. In literature, diagnostic accuracy of FNAC ranges from 84% to 99%.[13-19] Risk of complications is less with FNAC and it is simple, rapid, inexpensive.[6]

**Aims and Objectives**

1. To compare FNAC results with histopathological diagnoses to evaluate its diagnostic concordance.
2. To find out sensitivity, specificity, and accuracy of FNAC in diagnosis of salivary gland neoplasms.

## MATERIALS AND METHODS

The study is retrospective and prospective study done at tertiary care center; 2 year study from 2023, jan, to 2024 dec. For cases collected retrospectively details were obtained from case records. For prospective cases FNAC was performed in standard manner. Smears stained with haematoxylin and eosin. Histopathological specimens included partially resected and excised salivary gland neoplasms. The specimens were subjected for routine processing; slides prepared and stained with haemotoxylin and eosin. Appropriate statistical analysis was done to analyse data.

**Inclusion and Exclusion Criteria**

Only cases with cytological and histopathological correlation are included in the study, cases with no correlation are excluded from the study.

## RESULTS

In this study we analyzed 54 cases of salivary gland aspirates over a period of 2 years, from 2023 jan, to 2024 dec, which had cytological and histological correlation. Age of patients ranged from 24 to 65 years with maximum no of benign neoplasms observed in age group of 20-50years, maximum number of malignant neoplasms observed in age group of 41-50 years. [Table 1]

Among 54 cases observed 22 (40.7%) were females and 32(59.2%) males. Male to female ratio was 1.4:1. Female predilection observed for benign neoplasms and equal sex incidence for malignant neoplasms.

Most common site of involvement was parotid gland followed by sub mandibular gland. [Table 2]

**Diagnosis of salivary gland neoplasms on FNAC**

Cytological diagnosis displayed in table 3. [Table 3]

**Diagnosis of salivary gland neoplasms on histopathology**

The histopathological diagnosis, distribution and incidence displayed in table 4. [Table 4]

**Table 1: Age distribution of salivary gland neoplasms**

| Age group | Number cases of Benign neoplasms | No of cases of malignant neoplasms |
|---|---|---|
| 21-30 | 6 | 1 |
| 31-40 | 9 | 4 |
| 41-50 | 10 | 7 |
| 51-60 | 5 | 6 |
| 61-70 | 3 | 3 |

**Table 2: site distribution of salivary gland neoplasms**

| Site | Number of cases | Percentage |
|---|---|---|
| Parotid | 43 | 79.6% |
| Sub mandibular | 8 | 14.8% |
| Minor salivary glands | 3 | 5.5% |

**Table 3: Cytological diagnosis of salivary gland neoplasms**

| Cytological Diagnosis | Number of cases |
|---|---|
| **Benign Neoplasms** | **37** |
| Pleomorphic adenoma | 31 |
| Benign cystic lesion | 6 |
| **Malignant Neoplasms** | **17** |
| Mucoepidermoid carcinoma | 10 |
| Adenoid cystic carcinoma | 6 |
| Salivary duct carcinoma | 1 |

**Table 4: Histopathological diagnosis of salivary gland neoplasms**

| Histological Diagnosis | Number of cases | Percentage |
|---|---|---|
| **Benign Neoplasms** | **33** | **61.1**% |
| Pleomorphic adenoma | 32 | 59.2% |

| | | |
|---|---|---|
| Warthins tumor | 1 | 1.8% |
| **Malignant Neoplasms** | **21** | **38.9%** |
| Mucoepidermoid carcinoma | 11 | 20.3% |
| Adenoid cystic carcinoma | 7 | 12.9% |
| Salivary duct carcinoma | 2 | 3.7% |
| Acinic cell carcinoma | 1 | 1.8% |

**Table 5: Cases with false negative diagnosis**

| Cytological Diagnosis | Histological Diagnosis |
|---|---|
| Benign cystic lesion | Mucoepidermoid carcinoma |
| Benign cystic lesion | Mucoepidermoid carcinoma |
| Benign cystic lesion | Mucoepidermoid carcinoma |
| Benign cystic lesion | Acinic cell carcinoma |
| Pleomorphic adenoma | Adenoid cystic carcinoma |

**Table 6: Cases with false positive diagnosis**

| Cytological Diagnosis | Histological Diagnosis |
|---|---|
| Mucoepidermoid carcinoma | Warthins tumor |

**Table 7: Benign neoplasms with inaccurate diagnosis**

| Cytological Diagnosis | Histological Diagnosis |
|---|---|
| Benign cystic lesion | Pleomorphic adenoma |
| Benign cystic lesion | Pleomorphic adenoma |
| Benign cystic lesion | Mucoepidermoid carcinoma |

**Table 8: Malignant neoplasms with inaccurate diagnosis**

| Cytological Diagnosis | Histological Diagnosis |
|---|---|
| Mucoepidermoid carcinoma | Salivary duct carcinoma |

**Parameters reflecting diagnostic accuracy of FNAC of salivary gland neoplasms in this study are as follows:**
**Sensitivity: 80.7%**
**Specificity: 97.0%**
**Positive predictive value: 95.4%**
**Negative predictive value: 86.8%**
**False positive rate: 2.9%**
**False negative rate: 19.2%**

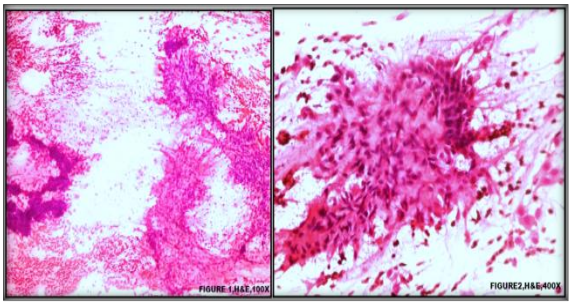

**Figure 1: (10X, H&E), 2 (40X, H&E): Pleomorphic adenoma- Cytosmears showing epithelial and mesenchymal components in fibrillarychondromyxoid background**

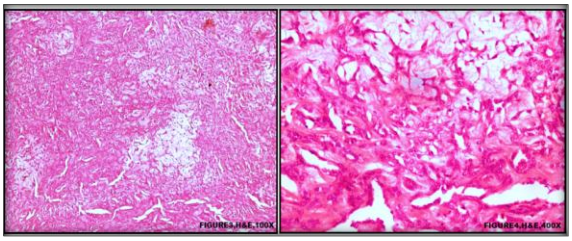

**Figure 3: (10X, H&E), 4 (40X, H&E): Histopathological Sections showing epithelial component in loose chondromyxoidstroma in case of pleomorphic adenoma**

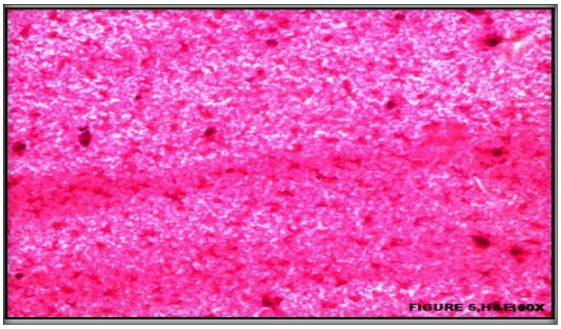

**Figure 5: (10X,H&E): Cytosmear showing necrotic debri few scattered inflammatory cells and few atypical cells and reported as mucoepidermoid carcinoma later diagnosed as warthin's tumor**

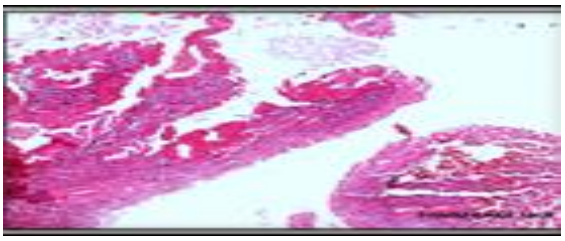

**Figure-6 (10X, H&E): Histopathological sections showing cystic spaces, with papillary structures projecting into lumina**

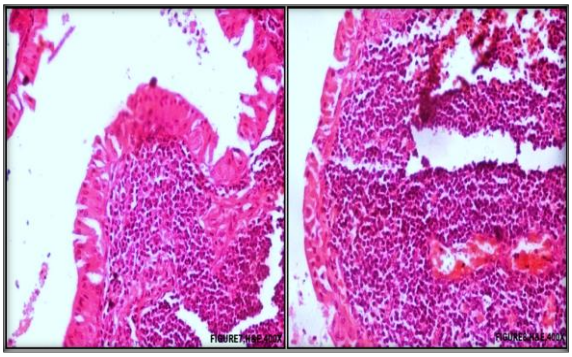

**Figure 7,8: (40X, H&E): Histopathological section showing papillary structure lined by oncocytic cells and flattened basal cells, with underlying lymphoid follicles**

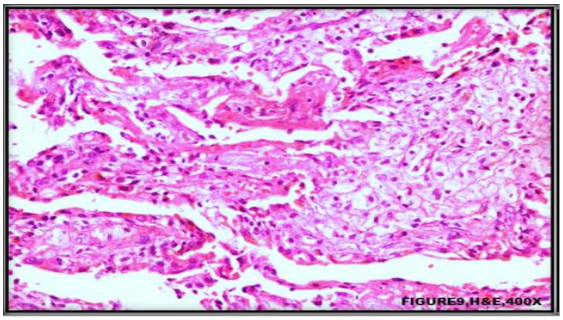


**Figure 9: (40X, H&E): Histopathological section showing epidermoid component of mucoepidermoid carcinoma with clear cells and intermediate cells**

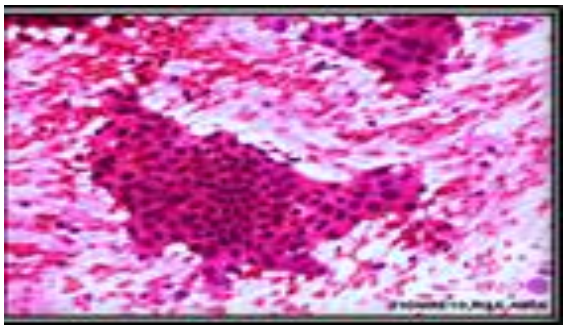

**Figure 10 (40X,H&E):Cytosmear of mucoepidermoid carcinoma showing intermediate cells, and basaloid cells in mucoid background.**

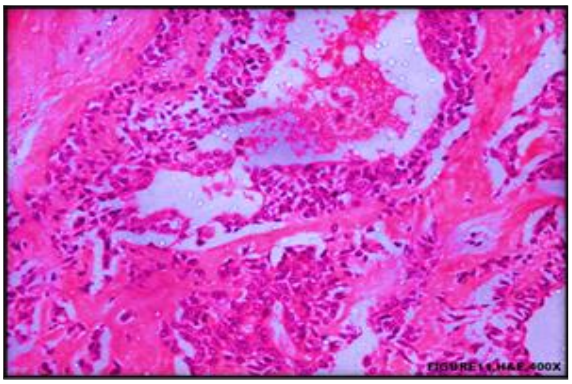

**Figure 11(40X,H&E):Histopathological section showing intermediate cells lining cystic spaces**

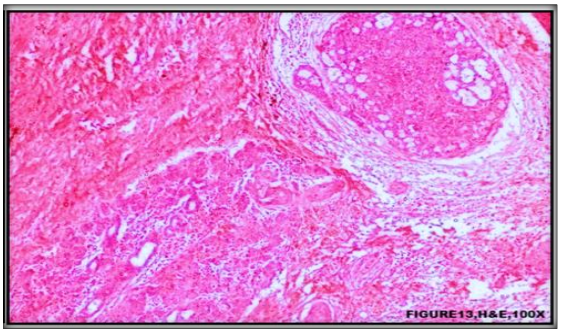


**Figure112(40X, H&E): Cytosmear showing clusters and singly scattered tumor cells admixed with eosinophilic material**

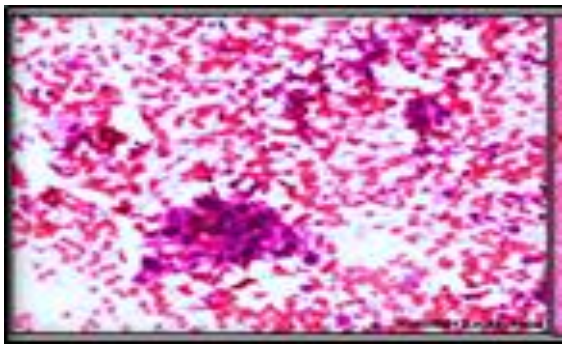

**Figure-13(10X, H&E): Histopathological section showing tumor tissue arranged in tubules, solid sheets and cribriform pattern**

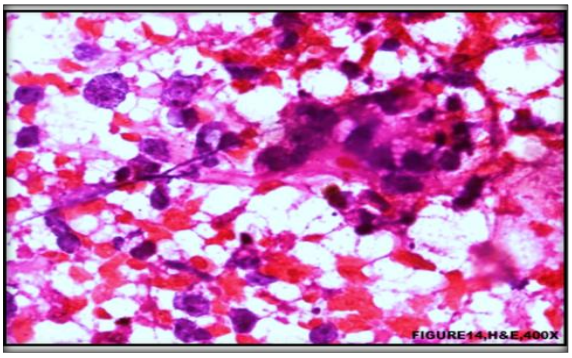


**Figure 14(40X, H&E): Cytosmear of salivary duct carcinoma showing obviously malignant epithelial cells**

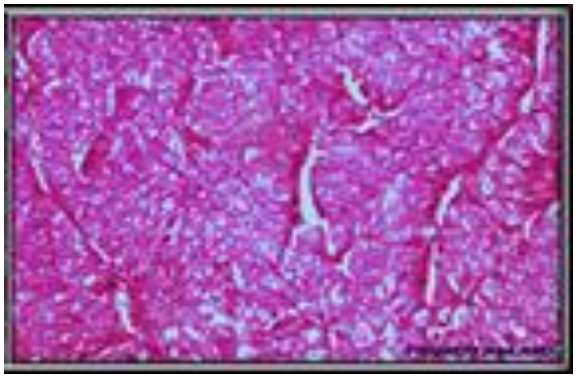

**Figure 15(40X, H&E): Histopathological section of salivary ductcarcinoma**

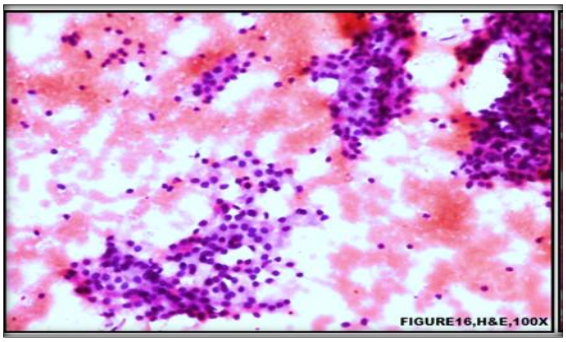


**Figure 16(10X, H&E): cellular cytosmear of acinic cell carcinoma showing cells with vacuolated cytoplasm, bland nuclei,**

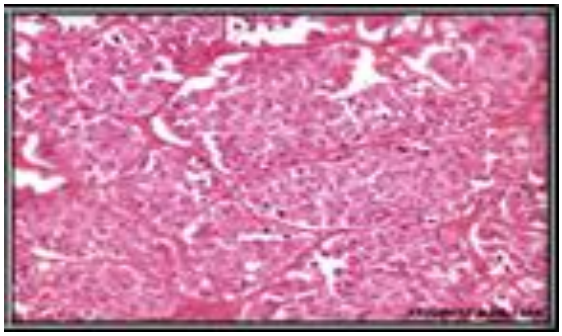

**Figure17 (10X, H&E): Histopathological section of acinic cell carcinoma**

## DISCUSSION

**Pleomorphic adenoma**

Cytologically 30 cases were diagnosed as pleomorphic adenoma, Histopathologically 32 cases were diagnosed as pleomorphic adenoma. 2 cases of pleomorphic adenoma were diagnosed as benign cystic lesions cytologically. One case of adenoid cystic carcinoma falsely diagnosed as pleomorphic adenoma.

The cases cytologically given as cystic lesion were scanty cellular with few cyst macrophages with mucoid material in the background. Cystic change in pleomorphic adenomas is a diagnostic dilemma and can mimic mucocele, mucoepidermoid carcinoma, carcinoma ex pleomorphic adenoma and squamous cell carcinoma.[7]

**Warthin's tumor**

Histopathologically one case of warthins tumor diagnosed in 65 year old male patient. Cytologically it is diagnosed as mucoepidermoid carcinoma giving a false positive diagnosis. Aspirated material showed mucoid, granular debris with scant cellularity with cytological details obscured by mucoid debris, few cells showing vacuolated cytoplasm, hyperchromatic nuclei giving a suspicion of mucoepidermoid carcinoma.

In a study done by Hughes et al, one case of mucoepidermoid carcinoma was given as warthins tumor on FNAC. They concluded that presence of abundant dirty background material which is commonly seen in warthins tumor and eosinophilic tumor cells being misinterpreted as oncocytes led to error on diagnosis.[8]

Mucoepidermoid carcinoma:

Cytologically,[11] histologically 11 cases were diagnosed as mucoepidermoid carcinoma. But 3 cases of mucoepidermoid carcinoma were falsely diagnosed as benign cystic lesions cytologically. The reason for false negative diagnosis as benign cystic lesion was scant cellularity and aspiration of only cystic contents. One case each case of salivary duct carcinoma, warthins tumor was diagnosed as mucoepidermoid carcinoma cytologically.

According to Orell et al,[9] a definitive diagnosis of MEC requires the coexistence in smears of cells showing squamous differentiation and of mucin-secreting cells. Unequivocal evidence of both is not always found in mucoepidermoid carcinoma with cystic change posing diagnostic difficulty on FNAC.

**Adenoid cystic carcinoma**

In the present study 7 cases were given as adenoid cystic carcinoma, cytologically 6 cases were diagnosed as adenoid cystic carcinoma. One case is inaccurately diagnosed as pleomorphic adenoma.

The case diagnosed as adenoid cystic carcinoma on pleomorphic adenoma on cytology showed clusters of small cells and stromal globules giving suspicion of adenoid cystic carcinoma. Pleomorphic adenoma is most common problem in the differential diagnosis of ACC, because both PA and ACC can grow in a cylindromatous or cribriform pattern, complete with hyaline globule formation.[10]

Jesse Jaso et al states that differential diagnosis of AdCC includes tumors that also exhibit tubular and cribriform structures such as polymorphous low-grade adenocarcinoma, tumors with basaloid cellular morphology such as basal cell adenoma and basal cell adenocarcinoma, and tumors with a dual population of ductal and myoepithelial cells such as pleomorphic adenoma.[11]

**Salivary duct carcinoma**

Histologically two case of salivary duct carcinomas were diagnosed, cytologically one case was given as salivary duct carcinoma; other case was given as mucoepidermoid carcinoma.

Perkins Mukunyadzi et al stated that initial recognition of salivary duct carcinoma as a high grade neoplasm is crucial as this tumor carries a dismal prognosis. High-grade mucoepidermoid carcinoma, squamous cell carcinoma, and metastatic breast carcinoma are important differential diagnosis. High-grade mucoepidermoid carcinoma consists of a mixture of cell types, including mucous cells, intermediate cells, and cells showing squamous differentiation. Squamous differentiation seen in MEC is subtle and does not usually show full maturation, and degree of nuclear atypia is often mild. Cytoplasm of salivary duct carcinoma cells may appear dense and squamoid, but obvious squamous differentiation and presence of keratin material and high-grade nuclei are more consistent with squamous cell carcinoma.[12]

**Acinic cell carcinoma**

Histologically one case of acinic cell carcinoma was diagnosed it is diagnosed false negatively as benign cystic lesion cytologically. In this case FNAC yielded only hypo cellular fluid with scant cellularity, the cells resembling normal acinar cells with that picture cytologically it was false negatively given as benign cystic lesion. In a study done by Hughes et al, a case of acinic cell carcinoma was incorrectly diagnosed as normal salivary gland and they found that most likely reason for this error was failure to appreciate the cellularity of the lesion and architecture of acinar structures which were more disorganized and discohesive than those of normal salivary gland.[8]

**Table 9: Comparative analysis of sensitivity, specificity, accuracy of FNAC**

| study | No of cases | sensitivity | Specificity |
|---|---|---|---|
| Singh A et al (2011)[13] | 56 | 76.9% | 97.1% |
| Naeem Sultan Ali et al [14] | 129 | 84% | 98% |
| Neveen Tahoun [15] | 82 | 91.7% | 92.5% |
| SiedZiaodin et a [16] | 235 | 67.27% | 91.2% |
| present study | 54 | 80.7% | 97.0% |

## CONCLUSION

Salivary gland tumors are relatively less common, they exhibit a wide variety of microscopic appearances, even within one particular lesion, this causes considerable problems in categorization and diagnosis.

Familiarity with the cytological features of rare lesions and morphological variations of the commoner lesions is necessary to avoid misinterpretation. Cystic lesions remain a problematic area for correct diagnosis on cytology

With high diagnostic sensitivity, specificity, accuracy present study reaffirms that FNAC of the salivary glands neoplasms, being a safe quick, safe, and affordable procedure offers an invaluable and highly accurate initial diagnostic approach for the management of patients, whether it is local excision for a benign neoplasm, radical surgery for a malignant neoplasm or alternate treatment.

**Appendices:** Nil

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**Conflict of interest:** Nil

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