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Role of FNAC in diagnosis of parotid lesions

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Abstract

Background: Salivary gland masses are considered challenging for diagnosis regarding its origin and whether benign or malignant. Unique features of FNAC as a safe and easy diagnostic procedure with little discomfort to the patient made it a favorable primary diagnostic tool. Information regarding the nature of parotid lesions whether being benign or malignant is the main objective of FNAC. We have done a restrospective study for FNAC for parotid masses performed in John Hunter hospital (Newcastle, NSW, Australia) along the peroid from 2014-2018. Histopathological correlation was done in 74 cases to test the accuracy of FNAC in diagnosis of parotid lesions.

Results: Of the total 74 FNAC done for parotid lesions in which a histopathological correlation was done, we get 46 (62.2%) benign lesions (37 neoplastic and 9 non-neoplastic) while 28 (37.8%) were malignant tumor. Pleomorphic adenoma was the most common in benign tumor side (45.7%) while SCC is the most common in malignant group (53.6%). Compatibility between FNAC and histological diagnosis was found in 74% (55/74), of which 78.3% in benign lesions (36/46) and in 68% of malignant lesions (19/28). FNA cytology was true positive in 21/74 cases (28.4%) and true negative in 41/74 (55.4%) cases. We have 5 (6.8%) false-negative and 7 (9.5%) false-positive results. As a result, we get sensitivity of 81%, specificity of 85%, and accuracy of 84%.

Conclusion: The role of FNAC in diagnosis of primary salivary gland pathology is considered with some debate about sensitivity/specificity; however, sometimes it should be repeated or correlated with clinical/histopathological confirmation.

Background

Salivary gland masses are considered challenging for diagnosis regarding its origin whether being benign or malignant. They usually affect parotid, submandibular, sublingual, and minor salivary glands in descending order. Parotid accounts for 3% of all head and neck and 0.6% of all tumors of human body [1].

Parotid tumors are mostly benign (85%), mostly of pleomorphic adenoma type, while mucoepidermoid carcinoma is the most common malignant tumor. Other causes of parotid masses such as metastatic cancers, inflammatory conditions, and lymphoma may also cause parotid gland masses [2, 3]. Histopathological examination offers the final definitive diagnosis of tumor types after surgical resection in spite of risks and complications associated with parotidectomy. So, a less invasive reliable method of diagnosis is therefore often preferred, which can help with management.

Since 1920s, the concept of fine needle aspiration cytology (FNAC) started where it came into use simultaneously in Europe and the USA [4, 5]. FNAC is a diagnostic tool based on the morphological findings of individual or group of cells obtained using a needle [6]. This procedure was further developed in the 1950s and 1960s by the Karolinska Institute in Stockholm [7] and the Institut Curie in Paris [8]; then, it was popular in the 1970s. Nevertheless, Batsakis et al. [9] argued that parotid masses require surgery and that the preoperative FNAC has had little impact on clinical management. Other authors consider FNAC as a superior diagnostic tool compared to the combination of physical examination and radiological evaluation [10, 11], which cannot distinguish reliably between benign and malignant

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lesions. FNAC is a relatively painless, quick, and minimally invasive procedure that is usually conducted in the outpatient setting [12]. It is easy to perform and feasible with few contraindications. The only limitation is that it has been associated with variable sensitivity and specificity in differentiating malignant from benign disease. Moreover, high rates of non-diagnostic aspirations have been reported in the literature [13]. An open biopsy is another option that is not preferred because of the risk of tumor spillage, facial nerve injury, scarring, and fistula formation [6]. Currently, ultrasound-guided core biopsies (USCBs) have been described as a very reasonable option [14–18]. The use of large bore needles in core biopsies has been associated with tumor seeding along the needle tract in literature [19–21] making FNA a more convenient option.

Methods

We have done a restrospective study for FNAC for parotid masses performed in John Hunter hospital (Newcastle, NSW, Australia) along the peroid from 2014-2018. Histopathological correlation was done in 74 cases to test the accuracy of FNAC in diagnosis of parotid lesions.

FNAC was performed by a cytopathologist using a 23-gauge fine needle attached to a 10-ml plastic syringe and employing a Cameco gun. Slides were air dried for Diff-Quik staining, and an on-site, provisional cytopathologic diagnosis was rendered on all slides. Additional smears were prepared and fixed immediately in 95% ethanol for subsequent Papanicolaou staining. In some cases, needle rinses with balanced salt solution were used to make paraffin cell blocks, and 4-m thin sections were stained with hematoxylin and eosin.

Histological correlation of FNAC results with surgical specimen was done to confirm accuracy of cytological diagnosis.

Results

A total of 74 FNAC done for parotid lesions in which a histopathological correlation was done were reviewed in Table 1.

We get 46 (62.2%) benign lesions (37 neoplastic and 9 non neoplastic) while 28 (37.8%) were malignant tumors (Table 1). Pleomorphic adenoma was the most common in benign tumor side (45.7%) while SCC is the most common in malignant group (53.6%) (Table 1).

Compatibility between FNAC and histological diagnosis was found in 74% (55/74), of which 78.3% in benign lesions (36/46) and in 68% of malignant lesions (19/28) (Table 1).

FNA cytology was true positive in 21/74 cases (28.4%) and true negative in 41/74 (55.4%) cases. We have 5 (6.8%) false-negative and 7 (9.5%) false-positive results (Table 2).

As a result, we get sensitivity of 81%, specificity of 85%, and accuracy of 84% as shown in Table 3.

Table 1 Cytological diagnosis and final histological diagnosis

	Cytology
Pleomorphic adenoma	21
Warthin tumor	15
Epidermoid cyst	6
Reactive lymph node	3
Sialectasia	1
Total (benign)	46
SCC	15
Malignant cells	8
Metastatic melanoma	3
Adenocarcinoma	1
Lymphoma	1
Total (malignant)	28
Total cases	74

Discussion

FNAC is a reliable diagnostic procedure with little discomfort to the patient. So, it is considered a useful diagnostic tool to differentiate between benign and malignant tumors of parotid masses. However, definite tumor type and grading is achieved through final histological examination.

The accuracy of FNAC depends on important factors like the experience of the clinician performing the procedure in addition to the experience of the pathologist in assessing the cytological sample. Inadequate cellularity or smears have been reported in 2 to 10% of cases in literature [22, 23], which can be explained by needle insertion outside the target tissue or because of necrosis, hemorrhage, or cystic areas in the tumor. So, repeating the sampling may be a good option to obtain more information [24].

Fakhry et al. has made a review that showed FNAC sensitivity ranging from 54 to 92% and a specificity ranging from 86 to 100%, compared to his own study that showed a sensitivity of 80% and specificity of 89% [25].

Table 2 FNAC and histological results for diagnosis of malignancy

FNAC	Histological Diagnosis		Total
	Malignant Positive	**Benign Negative**	
Malignant Positive	21 (28.4%) TP	7 (9.5%) FP	28
Benign Negative	5 (6.8%) FN	41 (55.4%) TN	46
Total	26	48	74

Table 3 FNAC results

FNAC	%
Sensitivity	81
Specificity	85
Accuracy	84

Another review done by Zbaren et al. mentioned that the accuracy ranged between 84 and 97%, while the sensitivity range was from 54 to 95%, and specificity ranged from 86 to 100%. On the other hand, study showed the accuracy 84%, sensitivity 64%, and specificity 95% [26].

Our study illustrated a sensitivity of 81%, a specificity of 85%, and an accuracy of 84%, in compatible with Stewart et al. that showed overall sensitivity, specificity, and accuracy of 92%, 100%, and 98% respectively [27], while Naeem et al. showed a sensitivity, specificity, and accuracy of 84%, 98%, and 84–97% respectively [28]. Along Suzuki et al.'s study, sensitivity, specificity, and accuracy were calculated as 82.3%, 98.7%, and 95.9% respectively [29]. Altin et al. showed sensitivity, specificity, and accuracy of 68.96%, 89.63%, and 86.52% [30]. Feinstein et al. showed sensitivity of 75% and specificity of 95.1% [31].

In our study, the most common benign tumor was pleomorphic adenoma while the most common malignant was squamous cell carcinoma in compatible with Bachar et al. [32]. However, Naeem et al. [28] and Altin et al. [30] reported mucoepidermoid carcinoma as the most common malignant tumor.

The overall concordance between FNAC and histology was 74% (55/74 cases) of which 78.3% (36/46) were benign cases and 68% (19/28) were malignant cases; this is slightly closer to the results obtained by Zbaren et al. [26] that showed 84% (benign) and 49% (malignant), while lower than results shown by Naeem et al. [28] which were 85% (total), 88% (benign), and 78% (malignant), and Al-Khafaji et al. [33] with 92% (benign) and 84% (malignant).

False-negative results were 6.8% close to the results obtained by Zurrida et al. [10] and other studies [26, 34, 35] but higher than results obtained by Naeem et al. [28], which is considered a problem so all parotid masses clinically suspected for malignancy with a non-diagnostic or negative finding on FNAC which required re-aspiration or a parotidectomy with frozen-section diagnosis must be performed [26].

False-positive results were reported 9.5% as high as compared to other studies ranging from 0 to 7% [26] and 10–12% [33, 36].

Conclusion

The role of FNAC in the diagnosis of primary salivary gland pathology is considered with some debate about sensitivity/specificity; however, it should be correlated with clinical/histopathological confirmation.

Abbreviations

FNAC: Fine needle aspiration cytology; SCC: Squamous cell carcinoma

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Authors' contributions

All authors have read and approved the manuscript. AY: corresponding author. DC: surgical data. SA, MZ, AT: planning and organization of article by reviewing data and doing literature review.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by John Hunter Hospital along with the approval of the data protection committee in April 2019. In addition to Alexandria Faculty of Medicine Ethics Committee in August 2019, reference no. 00018890. Consent to participate is not applicable as it is a retrospective study.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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