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**Research Article**

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# Diagnostic value of fine needle aspiration biopsy in parotid gland neoplasm

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## ABSTRACT

**Background:** The value of fine needle aspiration biopsy (FNAB) in the diagnosis of parotid masses remains unclear, considering current literature. The surgical procedure is not planned according to the FNAB results by the majority of the otorhinolaryngologists. Objectives of the study was to compare the results of FNAB and histopathological results in diagnosing malignancy and benign lesions of parotid gland and to determine the sensitivity, specificity and accuracy of FNAB.
**Methods:** It is a retrospective clinical chart review study. In total, 61 patients (28 females and 33 males; average age, 46.31±15.79 years; age range: 12-82 years) with parotid gland masses who underwent preoperative FNAB were included in this study. All patients underwent FNAB under ultrasound guidance following clinical examination. Histopathological results of the surgical specimens and preoperative results of FNAB were compared and, the sensitivity, specify, positive predictive value (PPV), negative predictive value (NPV), the diagnostic accuracy of FNAB was calculated. A P-value <0.05 was considered to reflect statistical significance.
**Results:** The specificity of FNAB was 100% and its sensitivity was 57.2%. Accuracy for benign lesion was 91.4%, accuracy for a malignancy was 42.8% and overall diagnostic accuracy was 92.0%, respectively. PPV for benign lesion was 91.4% and the NPV was 100%, respectively. PPV for malignancy was 100% and the NPV was 91.4%, respectively.
**Conclusions:** We suggest that FNAB is a valid, safe, easy-to-use method for identifying of parotid gland neoplasms. We recommend FNAB for all potential surgical patients. In our opinion, good collaboration between the Otorhinolaryngologist and the pathologist provides the best results.

**Keywords:** Fine-needle aspiration, Parotid neoplasm, Preoperative, Negative results

## INTRODUCTION

The salivary gland system includes major and several minor glands. Major salivary glands are consist of parotid, submandibular and sublingual glands and also, many minor glands occur in sub-mucosa of the oral cavity such as floor of mouth, gingiva, hard and soft palate, tongue and oropharynx. Salivary gland tumours constitute less than 3% of all head and neck tumors, despite the potential to occur at every site in the salivary gland. The most common location, as reported in the literature is on the parotid gland.[1-3] The salivary gland tumours are usually encountered clinical problems. In the literature, there is inconstancy between the time the tumour is first noticed by the patient and when it is presented to the physician. For example, sialadenoma papilliferum is a benign, exophytic, slow-growing, painless tumour of minor salivary gland. The patient described in the study by Abrams and Finck had the tumour for 10 to 12 years prior to presentation. Therefore, the majority of these tumours are benign.[2,4] Management of these tumour remains unclear. Also,

management of salivary gland tumours differs from surgeon to surgeon. Suspicion for malignancy in parotid masses usually withstands a correlation between clinical indications and patient's history. Unfortunately, the correct diagnosis of malignancy cannot be predicted considering only a single factor. Also, diagnostic tests seem to be very significant in management of parotid neoplasms.[1] Three diagnostic tests are recommended to definitively diagnose a tumour as benign or malignancy. The first diagnostic test is fine-needle aspiration biopsy (FNAB). FNAB has used widespread popularity in the field of otorhinolaryngology, especially in the diagnosis of thyroid and neck masses.[3-5] However, its uses in the diagnosis of parotid gland tumours has generally not been accepted. In the literature, there is no consensus on diagnosis of parotid gland tumours preoperatively. In study of Batsakis et al preoperative FNAB was not necessary for management of parotid mass considering required surgery in most parotid masses.[4] However, some authors recommended preoperative FNAB for management of parotid masses.[6-9] Also, it has some advantages and disadvantages. Low risk of complications and performing in the outpatient , minimal recovery time are important advantages of this procedure.[10,11] However, the most potential disadvantage of this procedure is that it has a wide variation on sensitivity and specificity in differential diagnosis of malignancy and benign lesions.[10,13] Therefore, in literature, high rates of non-diagnostic results have been reported. An ultrasound guided core biopsy and open excisional biopsy are recommended as second and third option of diagnostic test.

In the present study, we compared the results of FNAB and histopathological in diagnosing malignancy and benign lesions of parotid gland and determined the sensitivity and specificity of FNAB.

## METHODS

We retrospectively reviewed data collected from January 2010 to September 2014 on patients treated in the Department of Otolaryngology, Head and Neck Surgery, of our hospital. In total, 61 patients with parotid gland masses who underwent preoperative FNAB were included in this study. All patients were informed about the study and a written consent was obtained from each patient or parents of the patients. The study protocol was approved by the institutional ethics committee. The study was conducted in accordance with the principles of Helsinki declaration. Otorhinolaryngological and further systemic examination was performed before FNAB. All patients underwent FNAB under ultrasound guidance following clinical examination. In our hospital, all of FNAB were performed by the same radiologist under US-guidance (with the use of a 25 gauge needle). All specimens were examined by the same pathologist. FNAB cytological materials were fixed in alcohol for hematoxylin eosin stain (H and E). Preoperative cytological findings of FNAB were divided into three groups as follows benign, non-diagnostic and malignant. According to results of FNAB, all surgical procedures were performed by the same otorhinolaryngologist. All patients were followed up at our clinic for at least 12 months after surgery. All surgical specimens were fixed in 10% neutral buffered formalin for H and E stain. Histopathological results of the surgical specimens and preoperative results of FNAB were compared and, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), the diagnostic accuracy of FNAB was calculated.

### *Statistical analysis*

Number Cruncher Statistical System (NCSS) 2007 software (Kaysville, UT, USA) was used for all statistical analyses. Descriptive statistics (means and standard deviation, medians with interquartile range) were derived. The significance of each intergroup difference was analysed using Student's t-test, and the significance of any difference in median values was explored with the aid of the Mann Whitney U-test. Qualitative data comparisons were performed using the Yates Continuity Correction test. A P-value <0.05 was considered to reflect statistical significance.

## RESULTS

We included 61 patients, 28 (45.9%) females and 33 (54.1%) males. Their average age was 46.31±15.79 years (range: 12-82 years). Parotid masses were defined on 40 right parotids (65.6%) and 21 left parotids (34.4%), respectively. In results of FNAB, benign in 47 patients (77.0%), non-diagnostic in 11 patients (18.1%) and malignant in 3 (4.9%) were reported. The FNAB results are summarized in (Table 1).

**Table 1: Results of fine needle aspiration biopsy of the parotid gland.**

| FNAB Diagnosis | No. of cases | Percentage | |
|---|---|---|---|
| Pleomorphic adenoma | 34 | 55.7% | Benign lesions |
| Warthin's tumour | 13 | 21.3% | |
| Mucoepidermoid carcinoma | 3 | 4.9% | |
| Non-diagnostic | 11 | 18.1% | |
| | 61 | 100% | |

The histological diagnosis in the study is summarized in (Table 2). The correlation between the FNAB and histopathological results was assessed in 50 patients (Table 3).

The most common histopathological result was benign neoplasm that identified in 51 patients (83.6) and consists of pleomorphic adenoma in 30 patients (49.2%) and Whartin's tumour in 13 patients (21.4%), respectively.

Mucoepidermoid carcinoma (9.8%) was the most common malignancy, followed by adenocarcinoma (6.5%), respectively.

**Table 2: Results of histopathological examination of the parotid gland.**

| Histological diagnosis | No. of cases | Percentage |
|---|---|---|
| Adenocarcinoma | 4 | 6.5% |
| Lymphoepithelial cyst | 1 | 1.6% |
| Lipoma | 2 | 3.3% |
| Castleman's disease | 1 | 1.6% |
| Mucoepidermoid carcinoma | 7 | 11.5% |
| Oncocytoma | 1 | 1.6% |
| Pleomorphic adenoma | 30 | 49.2% |
| Chronic inflammation | 2 | 3.3% |
| Warthin's tumour | 13 | 21.4% |
| Total | 61 | 100% |

**Table 3: Comparison between results of fine needle aspiration biopsy and histopathological examination.**

| Diagnosis | FNAB No. (%) | Histopathological No. (%) |
|---|---|---|
| Benign/ inflammatory lesions | 47(77%) | 50(81.9%) |
| Malignancy | 3(4.9%) | 11(18.1%) |
| Non-diagnostic | 11 (18.1%) | 7(11.5%) benign lesions |
| | | 4 (6.6%) malignancy |

**Table 4: Summary of studies on the fine needle aspiration biopsy of the parotid gland.**

| | n | Se (%) | Sp (%) | Accuracy (%) |
|---|---|---|---|---|
| Al-Khafaj et al[16] | 154 | 82 | 86 | 84 |
| Stewart et al[17] | 341 | 92 | 100 | 98 |
| Zbaren et al[10] | 228 | 64 | 95 | 86 |
| Postman et al[18] | 388 | 88 | 99 | 96 |
| Bajaj et al[14] | 69 | 84 | 96 | 94 |
| Seethala et al[19] | 220 | 86 | 92 | 90 |
| Aversa et al[12] | 310 | 83 | 100 | 97 |
| Fakhry et al[20] | 202 | 80 | 89.5 | 86.5 |
| Piccioni et al[7] | 176 | 81 | 99 | 97 |
| Lurie et al[6] | 52 | 66 | 100 | 69.2 |
| Lim et al[9] | 91 | 80 | 100 | 85.1 |
| Javadi et al[21] | 70 | 57.9 | 97.8 | 86 |
| Lee et al[22] | 22 | 92.3 | 87.5 | 90.5 |
| Present study | 61 | 57.2 | 100 | 92 |

Sp- specificity; Se-sensitivity.

The specificity of FNAB was 100% and its sensitivity was 57.2%. Accuracy for benign lesion was 91.4%, accuracy for a malignancy was 42.8% and overall diagnostic accuracy was 92.0%, respectively.

PPV for benign lesion was 91.4% and the NPV was 100%, respectively. PPV for malignancy was 100% and the NPV was 91.4%, respectively.

**Table 5: The histopathological examinations of non-diagnostic results of FNAB.**

| Patients | Histopathological diagnosis |
|---|---|
| Male, 42 years | Adenocarcinoma |
| Male, 53 years | Adenocarcinoma |
| Female, 39 years | Adenocarcinoma |
| Female, 41 years | Castleman's disease |
| Female, 48 years | Pleomorphic adenoma |
| Female, 46 years | Pleomorphic adenoma |
| Male, 61 years | Pleomorphic adenoma |
| Male, 42 years | Pleomorphic adenoma |
| Female, 59 years | Chronic inflammation |
| Male, 47 years | Mucoepidermoid carcinoma |
| Female, 33 years | Warthin's tumour |

## DISCUSSION

FNAB is a safe, easy to perform, well tolerated, relatively painless, and inexpensive diagnostic procedure with few complications, such as hemorrhage, facial palsy, acute parotitis and the risk of tumour seeding.[11-14] The value of FNAB in the diagnosis of parotid masses remains unclear, considering current literature. The surgical procedure is not planned according to the FNAB results by the majority of the otorhinolaryngologists.[15,16] Some authors recommended that FNAB is an obligatory procedure of the management of parotid tumours, in contrast to others consider that this procedure is not necessary accurate.[17-19] The most important aim of FNAB is to allocate a malignant tumours from a benign one. Considering preoperative diagnostic information, the otorhinolaryngologist may take into consideration combined or more radical surgical plan for parotidectomy.[5] According to the WHO 2005 classification of parotid tumours, there are more than 25 different types of malignant tumours, comparing with only nine types of benign tumours have been described.[5,6] The preoperative FNAB in the case of a malignant result allows:

- Staging,
- Determination of a surgical plan,
- Giving more convenient information to the patient about the surgical plan, risk and complications of surgery such as especially facial palsy.[7,8]

Considering current literature, a sensitivity ranging from 54 to 92% and a specificity ranging from 86 to 100 % (Table 4). In study of Piccioni et al.[7] shown that the sensitivity and specificity of FNAB for parotid masses were 81 and 99%, respectively. In study of Lurie et al.[6] Reported that the sensitivity, specificity and the accuracy of FNAB for parotid masses were 66, 100 and 69.2% respectively. In study of Lim et al.[9] reported that the sensitivity and specificity of FNAB in the diagnosis of

malignant tumours 80 and 100%, respectively. In study of Zbaren et al.[10] Shown that the sensitivity, specificity, PPV, NPV and the accuracy of FNAB for parotid masses were 64, 95, 83, 87 and 86%, respectively. In study of Stow et al.[11] Reported that the sensitivity, specificity and accuracy in their series were 86.9, 96.3 and 92.3%, respectively. In the Aversa's study, the sensitivity was 83%, the specificity and the accuracy were reported as 100 and 97%, respectively.[12] In the present study, the sensitivity and specificity were 57.2% and 100%, respectively, consistent with the relevant literature. In 2011, a meta-analysis established also an estimated global sensitivity of 80% and an estimated specificity of 97%.[13] No published study has reported a sensitivity of FNAB higher than 92%. This low sensitivity can be attributable to the high false negative rate for the diagnosis of malignancy, as the malignant tumours were falsely diagnosed as benign in 8 to 49% of cases depending on the series.[7-12] Therefore, malignant tumours can be falsely diagnosed as benign tumours. Also, FNAB can never exclude a malignancy. Diagnosis of parotid mass by FNAB is affected by two significant conditions including non-diagnostic specimen and misdiagnosis. Non-diagnostic specimen is defined as inadequate material obtained for histological diagnosis. Inexperienced pathologist and the variety of cells in specimen can be caused to misdiagnosis. Non-diagnostic and inadequate specimens have been reported in 2-10% of cases in the literature.[10-12] In the present study, we observed 11 of 61 (18.1%) non-diagnostic results. The histopathological examinations of non-diagnostic results of FNAB were summarized in (Table 5), in the present study.

The potential reasons that to cause to non-diagnostic results are follow as:

- Inexperienced otorhinolaryngologist who performed FNAB.
- Being necrosis, hemorrhage in the parotid mass.
- Very rigid lesions with low cellularity,
- Taking specimen from small nodules.[12-17]

The potential reasons that caused to misdiagnosis results are follow as:

- Inexperienced pathologist who examined the specimen.
- Atypical cells.
- Chronic reactive sialoadenitis may be connected with several types of malignancy. Therefore, the opposite is possible.
- Diagnosing lymphoma is very difficult , among pathologist experiences.[13-21]

Good collaboration between the otorhinolaryngologist and the pathologist provides the best results. However, in the context of a non-diagnostic FNAB, high suspicion for parotid malignancy may be warranted for otorhinolaryngologist.[19-22] FNAB under ultrasound guidance has higher sensitivity more than blind FNAB. Bajaj et al and Pratap et al reported that the sensitivity of FNAB was increased by 20% from to 65% to 85%, respectively, with using ultrasound guidance.[14,15] Our clinical praxis has been modified since this study, and now in our clinic, all FNAB were performed by using ultrasound guidance by an expert radiologist.

## CONCLUSION

In conclusion, we suggest that FNAB is a valid, safe, easy-to-use method for identifying of parotid gland neoplasms. We recommend FNAB for all potential surgical patients. In our opinion, good collaboration between the otorhinolaryngologist and the pathologist provides the best results.

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