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WILEY
What Is the Utility of Fine-Needle Aspiration in Parotid Gland Neoplasms?

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BACKGROUND

Although commonly obtained by head and neck surgeons in the workup of parotid gland lesions, controversy remains regarding the diagnostic necessity of fine-needle aspiration (FNA) in preoperative decision making. Citing low sensitivity, some would argue that excision is required regardless of preoperative workup due to concerns for false negatives. Variations in technique (i.e., palpation vs. ultrasound), operator (i.e., surgeon vs. radiologist vs. pathologist), and interpretation (i.e., community vs. academic practice pathologists) have complicated precise characterization of the diagnostic efficacy of FNA in published reports. Moreover, unlike cytologic interpretation of thyroid lesions, there is no standardized reporting methodology for salivary neoplasms, which adds further uncertainty. As the use of FNA in the preoperative workup of parotid lesions remains controversial, it is important to be familiar with the recent literature examining the merits of this test.

LITERATURE REVIEW

When counseling patients with lesions of the parotid gland on appropriate surgical management, the ability to differentiate benign from malignant disease is paramount. In 2015, Liu et al. performed a systematic review and meta-analysis including 63 studies comprising 5,647 FNA procedures. The overall sensitivity and specificity of FNA were 78% and 97.7%, respectively, numbers that are generally in agreement with other reports in the literature. However, on subgroup analysis, studies that were prospective and those that specified FNA was performed under ultrasound guidance demonstrated sensitivities of 88% and 84.8% and specificities of 99.5% and 98%, respectively. The authors advise that pre- and posttest probabilities be considered when interpreting the results of FNA. Though there are not strict metrics for calculating pretest probability, history and physical exam can suggest either a high or low probability. To calculate posttest probability, one needs a rough estimate of pretest probability and the likelihood ratio (LR) of the test, defined as the probability of a positive test in a person who has a disease divided by the probability of the same result in a person without the disease. Positive likelihood ratio (LR+) can be calculated as sensitivity/1 − specificity, whereas the negative likelihood ratio (LR−) is equal to 1 − sensitivity/specificity. As an example, a patient presenting with a rapidly enlarging parotid mass and facial paralysis would have a high pretest probability of malignancy (greater than 80%). The posttest probability of malignancy with a positive result would be 99% (LR+ = 169). Probability of a malignancy in this scenario with a negative test would be 32%, a number that remains associated with a high clinical suspicion of malignancy despite a negative test result.

In a retrospective review encompassing 470 parotid gland procedures, Shkedy et al. examined the positive predictive value (PPV) (i.e., true positives/true positives + false positives) of FNA, specifically examining this metric in benign disease (pleomorphic adenoma and Warthin’s tumor). Their goal was to determine if the PPV of FNA was sufficiently high to forgo surgical excision in purported benign disease. They found an overall accuracy of 82.6% and PPV of 92.0% for pleomorphic adenoma and 87.7% for Warthin’s tumor. In cases of Warthin’s tumor, PPV varied over a wider range (77%–100%) based on population characteristics such as age, duration of lesion, and smoking status. The authors argue that although the PPV is fairly high in benign disease, it is not sufficiently high to preclude surgical management due to concern of false negative rates as high as 20% in their study. Importantly, the authors note the dependence of disease prevalence on positive and negative predictive value. The inclusion of patients referred to a tertiary academic center would almost certainly affect prevalence of malignant disease in the study population. Patients electing to forgo surgical management and thus,
histologic confirmation of disease, would be excluded, also impacting PPV and NPV. It is for this reason that Liu et al. would argue for the use of likelihood ratios and considering results in the context of pre- and posttest probabilities, figures that are not dependent upon prevalence.¹

The benefits of FNA in operative planning can include identifying patients with high-grade histology who can more appropriately be counseled on the possibility of more aggressive surgical intervention (i.e., neck dissection), and identifying those patients in whom observation could be considered due to frailty or medical comorbidity. Few studies have directly examined these roles in preoperative planning. Eytan et al. compared surgeons’ clinic and operative notes with FNA results and determined that preoperative FNA impacted the surgical plan in 18.9% of cases. This was predominantly reflected in the addition of neck dissection, for which FNA demonstrated high-grade histology in 14.6% of patients. To a lesser degree, FNA downgraded the planned operation in 2.6% of patients, particularly in cases of lymphoproliferative processes.³ Layfield et al. performed a cost analysis utilizing 2004 Medicare reimbursement rates and found that preoperative FNA reduced the number of parotid gland procedures by 35%, resulting in total operative and hospital savings of $686,256 per 100 patients compared to surgical management alone. This reduction was attributed to identification of nonsurgical pathologies including benign lymphoepithelial cysts, intraparotid lymph nodes, and abnormal nodularity of the gland. Perhaps more important than cost savings, the associated reduction in procedures spares older and sicker patients the morbidity of surgical procedures when the diagnosis is a benign process.⁴

Liu et al. found a rate of nondiagnostic and indeterminate results in 5.3% to 14%. Handling of these two categories was highly variable across studies, contributing to heterogeneity and affecting test performance.¹ Feinstein et al. examined indeterminate results in their 2016 study. When the pathologist was uncertain of diagnosis, histologic diagnosis demonstrated 72.2% benign and 27.8% malignant disease. If the pathologist favored benign disease, the diagnosis was benign in 75% and malignant in 25% of cases. When malignancy was favored, 100% of cases were malignant.⁵ As Liu et al. suggest, a standardized reporting methodology could improve patient care and enhance future research by minimizing heterogenous language and handling of indeterminate and nondiagnostic results.¹

As a matter of safety, complications associated with FNA are quite rare. In 1,880 patients, Liu et al. cited complication rates of hematoma in 0.1%, infection in 0.16%, pain in 0.1%, and no cases of facial nerve injury.¹

**BEST PRACTICE**

FNA of the parotid gland is a low-risk, cost-effective procedure that can aid in preoperative counseling and appropriate surgical management when pre- and posttest probabilities are considered. Where availability and cost considerations permit, sensitivity and specificity may be improved when FNA is performed under ultrasound guidance and should be considered.

**LEVEL OF EVIDENCE**

Levels of evidence were 3a¹ and 4.²–⁵

**BIBLIOGRAPHY**