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Diagnostic investigation of parotid neoplasms: a 16-year experience of freehand fine needle aspiration cytology and ultrasound-guided core needle biopsy

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Abstract. This study aimed to examine the diagnostic yield of fine needle aspiration cytology (FNAC) and ultrasound-guided core needle biopsy (USCB) in the diagnosis of parotid neoplasia. A 16-year retrospective analysis was performed of patients entered into our pathology database with a final diagnosis of parotid neoplasia. FNAC and USCB data were compared to surgical excision where available. One hundred and twenty FNAC, 313 USCB, and 259 surgical specimens were analyzed from 397 patients. Fifty-six percent of FNAC and 4% of USCB were non-diagnostic. One hundred and thirty-two (33%) patients had a final diagnosis made by USCB and did not undergo surgery. Surgery was performed in 257 (65%) patients, 226 (88%) of whom had a preoperative biopsy. Most lesions were benign, but there were 62 parotid and 13 haematological malignancies diagnosed; false-negative results were obtained in three FNAC and two USCB samples. The sensitivity and specificity of FNAC were 70% and 89%, respectively, and for USCB were 93% and 100%, respectively. This study represents the largest series of patients with a parotid neoplasm undergoing USCB for diagnosis. USCB is highly accurate with a low non-diagnostic rate and should be considered an integral part of parotid assessment.

Key words: parotid; neoplasia; ultrasound-guided core biopsy; fine needle aspiration cytology.

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A swelling in the parotid region provides a diagnostic clinical challenge, as the spectrum of pathologies presenting as a parotid mass is wide and it is not possible to reliably differentiate between benign, malignant, and non-neoplastic lesions on clinical grounds alone.[1]

An accurate preoperative diagnosis of a parotid lesion is essential as surgery may be avoided in certain benign neoplasms and in many non-neoplastic lesions. Where the patient is considered too elderly or unfit for surgery, biopsy diagnosis will allow prognostication and consideration of other treatment options, such as radiotherapy. Core biopsy alone can provide sufficient tissue for typing and grading of malignant parotid tumours, including lymphoma, thus avoiding diagnostic surgical excision biopsy.[2–5] Where surgery is required, preoperative diagnosis is an important determinant for operative planning, notably with the increased use of extracapsular, parotid-sparing dissection and to allow appropriate informed patient consent (in particular pertaining to facial nerve integrity and also possible nodal dissection in malignancy).

Open surgical excision biopsy (SEB), as a method of obtaining a histological sample, has long fallen out of favour due to the risk of tumour seeding, facial nerve injury, facial scarring, and fistula formation.[6] Consequently non-surgical approaches to tissue diagnosis, particularly fine needle aspiration cytology (FNAC), have been adopted widely. However, there are significant variations in the performance of FNAC within different practice settings.[7] Broadly, FNAC is capable of a high specificity in optimized circumstances, but has lower sensitivity[1,8–10]; thus the false-negative plus high non-diagnostic rate of FNAC are increasingly considered clinically unacceptable.

Ultrasound-guided core biopsy (USCB) has been described relatively recently in the diagnosis of parotid tumours and is developing into an established technique.[3,5,11] Controversy remains, however, regarding the optimal method for obtaining a tissue diagnosis. This study aimed to evaluate the utilization and performance of clinician-performed non-guided FNAC and USCB in the diagnosis of parotid neoplasia over a 16-year period in a district general hospital.

Materials and methods

Ethical exemption was granted for the study; approval was not required for this retrospective study at our centre. Patients were identified from the pathology database for a 16-year period (March 1997 to June 2013). Specimens were entered into the APEX pathology database (medical database software) using specific Systematized Nomenclature of Medicine (SNOMED) topography and morphology codes for salivary gland neoplasms. All patients with a pathological diagnosis of parotid neoplasia were included in the study. If a presurgical biopsy was performed, the results of the biopsy (FNAC and/or USCB) were compared with the surgical specimen as reference standard. If surgery was not performed, the results obtained from USCB or FNAC would constitute the final diagnosis.

Patients were retrieved using the specific coding parameters for salivary gland and neoplasia as search criteria; all parotid neoplasms were selected. Non-neoplastic parotid lesions and submandibular and minor salivary gland lesions were excluded. Once histology specimens were identified, the patients' complete prior and subsequent histology profiles were interrogated, and correlation was also made with patient records, radiology reports, and images from PACS (picture archiving and communication system).

The following data items were collated from the histology reports: (1) site and date of the biopsy. (2) For each sample, the technique used to provide the histological diagnosis was documented (i.e. FNAC, USCB, or SEB). (3) Needle gauge for USCB and the number of passes/samples. (4) For each patient, all relevant samples were collated for comparison (i.e. FNAC vs. USCB vs. SEB where available).

FNAC was performed freehand, without ultrasound guidance, by clinicians in the maxillofacial or ENT outpatient clinic. A 21-gauge needle was used without the need for local anaesthetic. The number of passes for FNAC was not recorded. Neither a cytologist nor a technician was present in the clinic at the time of sampling.

All USCB were carried out in the hospital radiology department where patients underwent an initial diagnostic ultrasound and would then proceed to biopsy, if indicated. The majority of USCB ($n = 306$) were performed using an 18-gauge (1.2-mm) needle; the remainder ($n = 7$) were performed using a 20-gauge (1.0-mm) needle. USCB was performed using an automated biopsy device with a variable throw facility of 15–22 mm (Magnum Gun; Bard, Covington, GA, USA) using the technique described previously.[11]

Standard calculations to determine the sensitivity, specificity, and accuracy of FNAC and USCB were then performed. For statistical analysis, the FNAC/USCB diagnosis was compared with the final surgical histology where available, with surgery considered the reference standard. Non-diagnostic results were excluded from these calculations.

Also evaluated were the results of FNAC and USCB in patients who had both procedures during investigation of the same lesion, actual findings following non-diagnostic FNAC and USCB where available, the number of cases with more than one FNAC or USCB during the work-up of the tumour, and the number of cases operated on with no firm preoperative diagnosis. We analyzed how often a diagnosis of malignancy was available preoperatively and the performance of USCB and FNAC in the diagnosis of haematological malignancy (i.e. how many cases were diagnosed and treated on the results of USCB or FNAC alone and how many required subsequent surgical excision for precise diagnosis).

Definitions

A non-diagnostic biopsy result was defined as a biopsy where definitive cytology/histology was not obtained. Also considered non-diagnostic were results where no firm diagnosis was reached, where the pathology report was equivocal (e.g. either reactive lymph node or low grade lymphoma) or likely not representative (inflammation only or necrotic material only).

A false-negative biopsy result was one where histology indicated benign disease but the final surgical diagnosis was confirmed as malignancy. A false-positive biopsy result was one where histology indicated malignant disease but the final diagnosis obtained at surgery was confirmed as benign disease. A true-negative biopsy result was one where histology indicated a benign neoplasm and this was confirmed on final surgical diagnosis. A true-positive biopsy result was one where histology indicated a malignant neoplasm and this was confirmed on final surgical diagnosis.

A therapeutic excision was one where a histological diagnosis, from biopsy, was available prior to surgery and subsequent surgery was performed for therapeutic purposes. A primary diagnostic surgical excision was a surgical excision without any previous biopsy being performed. In this circumstance, surgery was performed for diagnosis and for treatment. A secondary diagnostic surgical excision was a surgical excision performed when a prior sample from FNAC/USCB had been non-diagnostic.