FINE-NEEDLE ASPIRATION CYTOLOGY FOR PAROTID TUMOUR ASSESSMENT - CORRELATIONS AND CONTROVERSY

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Keywords: fine-needle aspiration, cytology, parotid gland tumours, cyto-histological correlation Abstract: Parotid tumours are rare but comprise a large variety of benign and malignant tumours, which may present diagnostic challenges to the surgeon and pathologist as well. Preoperative evaluation of various masses in the head and neck area includes fine needle aspiration cytology which is considered to be a valuable diagnostic procedure. This study aimed at evaluating fine-needle aspiration cytology of the parotid gland tumour lesion for sensitivity, specificity and diagnostic accuracy in our medical center. The clinical study included patients with tumour and non-tumour parotid lesions who underwent preoperative fine-needle aspiration procedure followed by surgical procedure and histological examination. The cytological findings were compared with the final histological diagnosis and concordance assessed. Most of the cases, 92.85% were neoplasms but 3.15% were non-neoplastic lesions. Out of neoplasms, 29 were benign and 10 were malignant parotid tumours. There were some situations when cytological features could not provide correct tumour characterization.

INTRODUCTION

The parotid glands are the largest salivary glands in human body and are frequently affected by general or local conditions. Approximately 75% of parotid masses are neoplastic (benign tumours or malignancies) and 25% are non-neoplastic lesions (infiltrative processes, cysts or inflammation). Of all parotid neoplasms, 70-80% are considered to be benign.(1) Neoplasms of the salivary glands represent only 6% of head and neck neoplasms. Parotid neoplasms account for 80% of salivary neoplasms.(2)

The gland is divided into a superficial and deep portion or lobes by the facial nerve, which passes through the gland. These "lobes" are very important from surgical point of view, as neoplasms involving the deep lobe require careful handling of the facial nerve to allow excision. The superficial lobe is the larger of the two and the location of the majority of parotid tumours.(1)

Numerous lymph nodes are present within the parotid gland itself, afterwards draining to preauricular, infra-auricular, and deep upper jugular nodes.(1)

In 2005, the World Health Organization has classified salivary gland tumours in 10 benign and 23 malignant entities all of epithelial origin. Non-epithelial tumours are very rare - about 2-5% of all salivary tumour pathology. Although this classification is very complex, it has advantages regarding the prognostic and therapeutic aspects, because the biological behaviour of each entity is different, and so is the therapeutic approach.(3,4)

Clinical examination of a patient with a parotid gland lesion begins with a thorough medical history and physical examination. The classic presentation of a benign parotid tumour is a painless, slow-growing mass on the posterior cheek region or angle of the jaw (parotid tail). A sudden increase in size may be indicative of infection, cystic degeneration, hemorrhage inside the mass, or malignant degeneration. Benign tumours are almost always freely mobile and facial nerve function should be normal.(1,2)

The next steps in the workup and management of parotid masses include ultrasonography, computed tomography, MRI and fine-needle aspiration. Imaging studies may be helpful in staging and for surgical planning.(1) Fine needle aspiration of the parotid mass or an enlarged lymph node may be performed to obtain a tissue sample for a more accurate diagnosis. The results of the fine needle aspiration provide a histologic diagnosis and assist in preoperative planning and patient counselling.(5)

First described by Kun in 1847, fine needle aspiration is a simple, cheap, quick and effective procedure, which can be used to assess parotid lesions. Performed either with or without imagistic assistance (ultrasound), it provides prompt information about the nature of the assessed lesion. The technique has very few contraindications and risks, and it is suitable for use in an ambulatory setting.(3,6,7) Although it cannot replace histologic examination, as the biological material obtained does not provide precise cellular architectural details, fine needle aspiration has the advantage of providing samples from multiple lesion sites (3), thus rendering incisional biopsy unnecessary.(8)

Some controversy exists about whether the procedure is warranted for masses in the superficial lobe of the parotid gland, as it is not likely to change the management. However, if the fine-needle aspiration cytological results are consistent with lymphoma or sialadenitis, for example, a large resection would be unnecessary, alleviating patient and family anxiety.

PURPOSE

We aimed at evaluating comparatively the efficacy of fine needle aspiration cytology and histopathological examination in a series of patients treated for parotid masses for avoiding surgery in unnecessary situations.

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MATERIALS AND METHODS

A prospective, cross-sectional study was conducted between May 2012 and February 2014 in the Oral and Maxillofacial Surgery Department of Tîrgu-Mureş County Emergency Clinical Hospital, and included patients with tumour or tumour-like masses located in parotid glands.

The inclusion criteria were aged over 20 years, patients with non-ulcerated tumours completely covered by intact skin, and the absence of any contraindications for performing fine-needle aspiration. Exclusion criteria were: cytology slides inadequate for interpretation, patients with recurrent lesions or who have not received surgical treatment and did not have a histological examination for comparison.

The procedure was explained to all patients and a written consent was obtained in each case. The study was approved by the Ethics Committee of the University of Medicine and Pharmacy of Tîrgu-Mures (No. 30/26.06.2012).

Fine-needle aspiration was performed in all cases by maxillofacial surgeon without any radiological guidance, using a 23 G needle and a 10ml or 20ml syringe unattached to an aspiration syringe holder; a minimum of two needle passes were made in each case in order to obtain adequate quantity of biological material. The aspirated material was spread onto 2-4 slides and fixed immediately by immersion in 95% ethylic alcohol. The slides were stained the same day using Papanicolaou stain and evaluated in the Pathology Department of the hospital. Patients underwent surgical treatment and histological specimens obtained were analyzed in the same Pathology Department, by different pathologists, blinded to the previous cytological results. Special stains and immunohistochemical evaluations were performed whenever needed. To determine the efficacy of fine-needle aspiration for parotid gland tumours, in each case the cytological result was compared to the final histological result, considered as "gold standard".

Statistical analysis was performed using GraphPad InStat 3 and MedCalc software. For the analysis and evaluation of qualitative variables and statistically significant differences between groups, the Fisher's test and Chi-square test were used, with a level of significance set at p< .05. In order to assess the efficacy of fine-needle aspiration procedure as a diagnostic test for parotid gland tumours, indicators of sensitivity, specificity, positive predictive value and negative predictive value were calculated for 95% confidence intervals.

RESULTS

A total of 42 patients have met the inclusion criteria, 19 (45.24%) female and 23 (54.76%) male patients, aged 23 to 92 years. In most cases fine-needle aspiration procedure was done without local anesthesia. Only in 5 cases, local anesthesia was used to provide comfort the patient. There were no complications, except for 3 cases who complained about mild pain immediately after aspiration, which was controlled by oral analgesia.Parotid lesions were histologically divided into benign lesions (benign tumours and inflammations) and malignancies. The highest frequency of cases was found in the age group over 70 years followed by the group of 60-69 years old (table no 1).

Table no 1. Cytological distribution of studied lesions in relation with age groups and lesion's nature

Malignant

0

0

1

3

10 (23,8%)

Benign

4

32 (76,2%)

Age groups

< 29 years

30-39 years

40-49 years

50-59 years

60-69 years

Total

70 years

Out of 42 tumours studied, 39 were neoplastic lesions (92.85%%) either benign or malignant histologically confirmed and only 3 (7.14%) were non-neoplastic (inflammatory) lesions. Of all neoplastic lesions, 29 (74.36%) were found to be benign, and 10 (25.64%) malignant tumours.

Following the age distribution of benign and malignant parotid gland tumours, there were found only benign tumours in age under 50, with the emergence of malignant tumours in age groups over 70 years, their incidence increasing progressively with age.

Table no. 2. Cyto-histological correlation in parotid gland tumours

Histological diagnosis	No. of cases	Concordant cytology	Discordant cytology	
			Benign	Malignant
Sialadenitis	3	3	-	-
Pleomorphic adenoma	12	11	1	-
Warthin tumour	12	8	4	-
Benign lymphoepithelial	3	3	-	-
lesion				
Schwannoma	1	-	1	-
Dermoid cyst	1	-	1	-
Lymphoma	3	-	-	3
Myoepithelial carcinoma	1	-	-	1
Metastasis of squamous cell carcinoma	5	4	-	1
Oncocytic carcinoma	1	1	-	-

Both cytological and histological examination indicated that the majority of lesions (76.2%) were benign, but cytology was less effective at differentiating between benign and non-tumour lesions (table no. 2). The predominant lesions in our series were pleomorphic adenoma (12 cases) and Warthin's tumour (12 cases).

There were 4 cases of Warthin's tumour where the cytology smears were suggestive for inflammatory lesions the diagnosis being established postoperative. Two situations with rare non-salivary tumours located into parotid gland were difficult to be diagnosed only on cytology due to lack of cytomorphological features. The final diagnosis was histological but the cytological examination managed to indicate the tumour benign nature.

Statistical analysis was performed to compare the results of histological and cytological examinations. Using Chisquare test p obtained was 0.0001, highly significant statistically which means that in case of parotid tumours the values of cytology results were very close to those of the histology. There was a statistically significant association between patient age and the presence of malignant tumours, detected by both examination methods. Thus, a higher frequency of malignant tumours was observed with increasing age in patients aged >60 years, compared to those <60 years (90% vs. 10%). Amongst those aged >60 years, the highest frequency of malignant tumours was observed in the age group over 70 years (60%), followed by patients aged 60-69 years (30%). The evaluation of specificity, sensitivity, positive and negative predictive value of the cytological examination in identifying parotid gland tumours nature, as compared to the histopathology examination, found a concordance between the two diagnostic tests. Cytology had a sensitivity of 96.97% and a specificity of 90.91 % for identification of benign lesions and malignancies in situations of parotid tumours. Positive predictive value was 96.97% and negative predictive value 90.91%.

DISCUSSIONS

In the present study, there was found concordant cytological diagnosis and tumour characterization in 30 cases (71.43%). In 12 cases (28.57%), the cytology could describe only the cellular population without rigorous tumour typing, but the

AMT, vol. 21, no. 2, 2016, p. 79

Total

5(119%)

4 (9,52%)

5 (11,9%)

4 (9 52%)

10 (23,81%)

14 (33,4%)

diagnosis of benign tumour or malignancy was right. In these cases the diagnosis could be made only on histology. There were two situations of inadequate sample so the cytological samples could not be interpreted. These cases were excluded from the final statistical assessment. Histology set the diagnosis to be benign lesion for one case and malignant tumour for the other. In cases of inadequate samples or insufficient material for correct cytological interpretation, fine-needle aspiration procedure can be repeated to improve the cytological diagnosis. The utility of repeated fineneedle aspiration in cytological diagnosis of salivary gland lesions for unclear cases has been evaluated by Brennan et al. in order to improve the diagnosing accuracy. However, the authors have reported the sensitivity and specificity in differentiation malignant from benign lesions similar to the initial examination (70% and 95% before, respectively 84% and 93% after repeated aspiration).(9)

In our study, there were found 7.15% non-neoplastic (inflammatory) lesions such as sialadenitis. The proportion is different from the existing literature. Ashraf et al. have reported 14% non-neoplastic lesions.(10) Jain et al. presented a study with 10% non-neoplastic lesions (11), and Singh et al. published a study with 55,9% inflammatory lesions.(12) There were also found 95.82% neoplastic lesions - benign and malignant tumours. Of these cases, 74.36% were benign and 25.64% were found to be malignant tumours. Most authors reported quite similar data: 79-89.5% benign and 10.5-21% malignant parotid and other salivary gland masses.(10,11,13,14) The present study found pleomorphic adenoma and Warthin's tumour to be the benign entities with the highest frequency. In 91.66% of cases was obtained cytohistologic correlation for pleomorphic adenoma diagnosis. This is similar to other reports.(10,11) Pleomorphic adenoma presents a significant cyto-morphological diversity consisting in an interference of ductal and myoepithelial cells in different proportions, placed in a fibroconjunctive matrix, with mucoid, myxoid or chondroid stroma (figures no. 1,2). Myoepithelial cells might be plasmacytoid or spindled producing a variety of incorrect interpretations.(15,16)

Figure no. 1. Pleomorphic adenoma – histology. A cellular tumour with biphasic population of epithelial and mesenchymal cells. Stroma is myxoid with hyaline areas (obj. $10\times$, HE stain)



Figure no. 2. Pleomorphic adenoma – cytology. Epithelial cells together with mesenchymal cells. (obj. 20×, Papanicolaou stain)



Warthin's tumour is histologically characterized by cystic spaces surrounded by two layers of oncocytic epithelial

cells that can develop papillary projections into the cavities (figure no 3). A variable amount of lymphoid tissue is present. The absence of the epithelium on cytological smears may be interpreted as an inflammatory lesion (figure no. 4).(17)

Figure no. 3. Warthin's tumour – histology. Cystic spaces lined by double layer of epithelial cells resting on dense lymphoid stroma with germinal centers and polypoid projections (obj. $10\times$, HE stain)



Figure no. 4. Warthin's tumor – cytology. Oncocytic cells grouped in a lymphoid background with small mature lymphocytes (obj. 20×, Papanicolaou stain)



Out of parotid malignant tumours, specific elements of squamous cell carcinoma were histologically diagnosed in 5 cases (50%), differentiation of primary tumours from those metastatic being difficult only by cyto-morphological analysis.(18)

In situations of lymphoma, cytological examination also proved to be difficult, where the lesions could only be identified as lymphoproliferative masses. A definitive diagnosis was obtained only after histopathological and immunohistochemical assessments. Fine-needle aspiration usefulness in diagnosis of lymphoma is narrowed without ancillary techniques such as flowcytometry.(19,20) Cyto-morphological features of these entities do not provide sufficient evidence for a specific diagnosis and a rigorous classification. Because of particular histology of lymphomas and the complexity of their classification the final diagnosis of these cases remains histological.(21) However, fineneedle aspiration cytology is considered to be valuable for the initial assessment and further management of these patients.(22,23,24)

The only relative contraindication of the performing the fine-needle aspiration procedure is the hemorrhagic disease. In our series no complications such as tumour cells seeding, hemathoma, nerve damage, or infection were observed.(25)

The value of routine fine-needle aspiration procedure for parotid tumours is not clear. Some authors state that the cytological results rarely modify the management of parotid masses, which consists in surgical excision.(26)

The standard biopsy approach is a superficial parotidectomy with preservation of the facial nerve. For 80-90% of parotid neoplasms, this procedure is both diagnostic and therapeutic. For this reason, preoperative fine-needle aspiration biopsy is recommended, since it can change the clinical approach in up to 35% of patients.(2) Authors believe that obtaining a

preoperative cytological diagnosis is very significant for some important reasons. Knowing the histological type of the tumour may be valuable in preparing patients and surgeons for the more extensive surgery required for high-grade malignancies. On the other hand, non-neoplastic causes of parotid masses may be ruled out without surgical intervention.(26,27)

Recent studies have found parotid gland fine-needle aspiration biopsy (FNAB) to have an accuracy of 94-97%, a sensitivity of 83-84%, and specificity of 96-100%. Positive and negative predictive values for malignancy were 84.6% and 96.4%, respectively.(26)

The sensitivity of fine-needle aspiration cytology in differentiation of malignant from benign lesions in studied group was 100%. The specificity in the same situation was 97.73%. The positive predictive value was 93.3% and the negative predictive value was 100%. Numerous clinical trials have reported the accuracy of cytological diagnosis of parotid gland neoplasms as being 86-98%. The sensitivity has ranged from 62-97.6% and specificity from 94.3% to 100%.(10,11,14,27,28)

CONCLUSIONS

Preoperative cytological assessment can differentiate in most cases benign versus malignant parotid tumours, thus surgeon being able to prepare the appropriate treatment and provide adequate patient counselling.

Fine-needle aspiration can also be helpful in identifying non-neoplastic masses that respond to medication and in detecting lymphomas and metastatic masses in order to indicate further management.

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