



THE AGA KHAN UNIVERSITY

eCommons@AKU

Section of Otolaryngology, Head & Neck Surgery

Department of Surgery

May 2011

Diagnostic accuracy of fine needle aspiration cytology in parotid lesions.

Naeem Sultan Ali
Aga Khan University

Shabbir Akhtar
Aga Khan University

Montasir Junaid
Aga Khan University

Sohail Awan
Aga Khan University

Kanwal Aftab
Aga Khan University

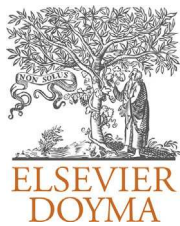
Follow this and additional works at: https://ecommons.aku.edu/pakistan_fhs_mc_surg_otolaryngol_head_neck

 Part of the [Otolaryngology Commons](#)

Recommended Citation

Ali, N., Akhtar, S., Junaid, M., Awan, S., Aftab, K. (2011). Diagnostic accuracy of fine needle aspiration cytology in parotid lesions.. *Isrn Surgery*, 2011, 721525.

Available at: https://ecommons.aku.edu/pakistan_fhs_mc_surg_otolaryngol_head_neck/24



ORIGINAL ARTICLE

Diagnostic Accuracy of Fine Needle Aspiration Cytology in Parotid Tumours[☆]



Vanessa Zerpa Zerpa, * Maria Teresa Cuesta González, Gabriela Agostini Porras, Martin Marcano Acuña, Enrique Estellés Ferriol, José Dalmau Galofre

Servicio de Otorrinolaringología, Hospital Universitario Dr. Peset, Valencia, Spain

Received 28 September 2013; accepted 9 December 2013

KEYWORDS

Parotid gland;
Parotid neoplasm;
Fine-needle aspiration;
Cytology;
Salivary glands

Abstract

Introduction and objectives: Fine needle aspiration cytology (FNAC) is a globally accepted technique in the preoperative evaluations of head and neck tumours; however, the effectiveness in the interpretation of salivary glands neoplastic lesions is still controversial. The objective of this study consisted of assessing the efficacy of FNAC in preoperative diagnosis of parotid tumours.

Methods: This retrospective study was conducted using 93 patient samples with parotid gland tumoral pathology, treated at the Otorhinolaryngology Department in our institution during the 2007–2011 period. Preoperative FNAC was employed and the patients subsequently submitted to surgical excision with histopathological diagnosis of the specimen. Cytology results were classified as negative for malignancy, positive for malignancy or insufficient sample, and later compared with the definitive histological diagnosis.

Results: The mean age of the studied sample was 52.9 years (range: 11–88 years); 55.9% were men. The FNAC showed significant sensitivity of 57.1%, with a specificity of 95.1%, for detecting malignancy in parotid gland tumours. The positive and negative predictive values for malignancy were 50 and 96.3%, respectively.

Conclusions: FNAC is considered a simple test but of limited use for diagnostic guidance in tumour pathology of the parotid gland in our environment, mainly because of its low sensitivity. However, the high specificity and high negative predictive value of FNAC make it a more accurate test in benign or negative result cases.

© 2013 Elsevier España, S.L. All rights reserved.

[☆] Please cite this article as: Zerpa Zerpa V, Cuesta González MT, Agostini Porras G, Marcano Acuña M, Estellés Ferriol E, Dalmau Galofre J. Precisión diagnóstica de la citología por punción aspiración con aguja fina en tumores de la glándula parótida. Acta Otorrinolaringol Esp. 2014;65(3):157–161.

* Corresponding author.

E-mail address: va.zerpa@gmail.com (V. Zerpa Zerpa).

PALABRAS CLAVE

Glándula parótida;
Neoplasias
parotídeas;
Punción aspiración
con aguja fina;
Citología;
Glándulas salivales

Precisión diagnóstica de la citología por punción aspiración con aguja fina en tumores de la glándula parótida**Resumen**

Introducción y objetivos: La citología por punción aspiración con aguja fina (PAAF) es un método globalmente aceptado en la evaluación preoperatoria de los tumores de cabeza y cuello, sin embargo, su efectividad en la interpretación de lesiones neoplásicas de las glándulas salivales es controvertida. El objetivo del presente estudio es evaluar la eficacia de la PAAF en el diagnóstico preoperatorio en los tumores de glándula parótida.

Métodos: Se realizó un estudio retrospectivo de una muestra de 93 pacientes con enfermedad tumoral de la glándula parótida tratados en el Servicio de Otorrinolaringología de nuestra institución durante el período 2007–2011, que fueron sometidos a PAAF diagnóstica preoperatoria y posteriormente a exéresis quirúrgica y estudio anatomopatológico. Los resultados de la citología fueron clasificados como negativo o positivo para enfermedad maligna, o muestra insuficiente. Posteriormente, los resultados fueron comparados con el diagnóstico anatomopatológico definitivo.

Resultados: La edad media de la muestra fue de 52,9 años, con un rango comprendido entre los 11 y los 88 años; el 55,9% eran hombres. La PAAF presentó una sensibilidad para detectar malignidad en tumores de la glándula parótida del 57,1% y una especificidad de 95,1%, con valores predictivo positivo y predictivo negativo para malignidad de 50 y 96,3%, respectivamente.

Conclusiones: La PAAF es una prueba sencilla pero de utilidad limitada para la orientación diagnóstica en la enfermedad tumoral de la glándula parótida en nuestro medio, debido principalmente a su baja sensibilidad; sin embargo, su alta especificidad y elevado valor predictivo negativo hacen de la misma una prueba con mayor precisión frente a un resultado benigno o negativo de la misma.

© 2013 Elsevier España, S.L. Todos los derechos reservados.

Introduction

Parotid masses represent some 3% of head and neck tumours.¹ They are characterised by their great histopathological diversity; the majority of them are benign lesions (75%–80%),^{2,3} with a malignancy rate of between 14% and 27%, according to the series reviewed.^{1,4,5}

Although there are clinical signs and symptoms that demonstrate malignancy (such as peripheral facial paralysis and pain), these present in only 25%–35% of the patients.⁴ Bearing in mind the lack of characteristic clinical or radiological features that can provided a definitive diagnosis,⁵ fine needle aspiration cytology (FNAC) generally plays an important role in preoperative diagnostic orientation in tumours of the parotid gland.

The FNAC technique is a simple, low-cost method with a very low complication rate.^{1,6,7} It is accepted world-wide in preoperative diagnosis of head and neck tumours.⁸ Despite being a technique used regularly in saliva gland tumours since the 1980s,⁹ its effectiveness in interpreting neoplastic lesions is controversial. This is mainly due to the great variety of morphological patterns, cell diversity and the overlapping of histopathological findings among benign and malignant lesions of the salivary glands; this means that a small sample from the lesion, such as that obtained FNAC, at times does not provide an overall view of the morphological spectrum of the tumour.¹⁰

FNAC has been questioned due to its low sensitivity and the idea that the majority of parotid gland tumours require surgery.^{11,12} Some authors, such as Batsakis et al.,¹³ even report that patient management would not change

depending on the FNAC result,¹ while other authors promote its use as part of preoperative management in patients with a parotid tumour, given that FNAC results along with some imaging methods, offer information that helps to plan the extent of surgical treatment; in addition, it makes it possible to inform the patient about his or her illness and the expectations following surgery.^{4,12,14} Layfield et al.¹⁵ carried out a study on FNAC cost-effectiveness in which they showed that fine needle aspiration can avoid the need for surgery in 35% of parotid masses because this technique presents high sensitivity for distinguishing neoplastic disease from non-neoplastic.

The objective of this study was to assess the efficacy of FNAC in preoperative diagnosis of parotid gland tumours in our environment.

Materials and Methods

This was a retrospective study, in which the case histories of patients with tumoral parotid gland disease that had been treated surgically in the Otorhinolaryngology (ORL) service at our institution from 2007 to 2011 were reviewed. All the patients had previously had a preoperative FNAC of the tumour.

To homogenise the data, we selected only the patients in which the FNAC was performed by our hospital's pathology department. All the cytologies were carried out by pathologists with an N 23 G or 25 G needle and stained with Papanicolau stain. However, it was not always the same pathologist who performed the tests.

Cytology results were classified as negative or positive for malignant disease, and as non-diagnostic in the cases in which the pathologist was unable to make a diagnosis due to insufficient sample material.

The FNAC results were compared with the definitive anatomopathological diagnosis following surgery. We calculated sensitivity, specificity, positive and negative predictive value and positive and negative likelihood quotients for malignancy.

Results

Of the 105 parotidectomies carried out in our service during the 2007–2011 period, 93 patients were included, with each having had a preoperative FNAC at our institution. Of these, 55.9% (52) were male and 44.1% (41) were female, with a mean age of 52.9 years and a range between 11 and 88 years.

A mass on the right side was presented by 60.2% of the patients, and on the left side, 39.7%. The most common clinical presentation was the appearance of a progressively growing parotid mass (80% of the patients); 1 of them presented a mass in the parapharyngeal space at the examination. A rapidly growing mass (<3 months) was presented by 19%, in 3 of which the definitive histopathological diagnosis was malignant neoplasia (mixed malignant tumour, cystic adenoid carcinoma and non-differentiated carcinoma). Only 1 patient presented peripheral paralysis of the facial nerve, and definitive diagnosis of that case was mucoepidermoid carcinoma.

FNAC was not diagnostic in 3 cases, with a benign result for malignancy in 82 cases (88.1%) and with a positive result for malignancy in 8 (8.07%).

In the pathology study of the definitive piece, 92.4% (86 cases) presented benign disease as the definitive diagnosis; 5 of these had non-neoplastic involvement and 81 had neoplastic, with the most frequent tumour being pleomorphic adenoma, con 42 cases (45%), followed by Warthin's tumour, with 34% of the cases (Fig. 1). Malignant neoplasia was the diagnosis in 7.52% (7 cases), each one presenting a different type of neoplasia (mucoepidermoid carcinoma, cystic adenoid carcinoma, acinar cell carcinoma, non-differentiated carcinoma, lymphoma, melanoma metastasis and oncocytic carcinoma).

The correlation between the cytological and the histopathological diagnoses was evaluated in 90 patients: in 92% of the cases (83/90) there was appropriate correlation between cytology and histopathological diagnosis: 4 true positives (cytology and histology positive for malignancy) and 79 true negatives (cytology and histopathology benign) (Table 1).

Sensitivity of FNAC for diagnosing malignancy was 57.1% and specificity was 95.1%. Positive predictive value for malignancy was 50% and negative predictive value, 96.3%. Positive likelihood quotient was 11.85, while the negative quotient was 0.45.

The 4 false positive cases corresponded in 3 of them to Warthin's tumour and 1 to pleomorphic adenoma. Two of the false negative cases were diagnosed by FNAC as pleomorphic adenoma, with the definitive histopathological result being mucoepidermoid carcinoma and mixed malignant tumour.

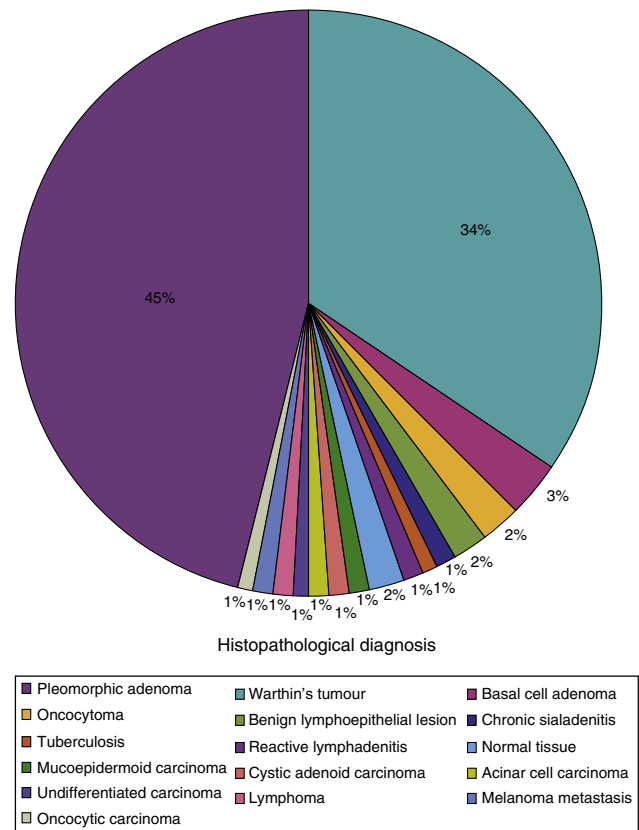


Figure 1 Definitive histopathological diagnosis.

The third case was a lymphoma, whose cytological result from FNAC was reactive lymphadenitis (Table 2).

In the cases in which FNAC proved insufficient for the diagnosis due to acellular samples, all of them presented a definitive diagnosis of benign neoplasia: 2 cases with Warthin's tumour and 1 that presented as a parapharyngeal mass but turned out to be pleomorphic adenoma.

Discussion

The main objective of FNAC is to establish if a mass is of inflammatory and/or reactive, benign or malignant nature, and if it is possible to achieve the specific diagnosis.

In this study, we were able to determine that FNAC is a valid test, highly precise in preoperative orientation on parotid gland tumours, with sensitivity of 57.1% and specificity of 95.1% in differentiating malign from benign disease.

Table 1 Correlation Between Histopathological Diagnosis and Fine Needle Aspiration Cytology (FNAC) Diagnosis.

FNAC diagnosis	Histopathological diagnosis		
	Benign	Malignant	Total
Benign	79 (TN)	3 (FN)	82
Malignant	4 (FP)	4 (TP)	8
Total	83	7	90

FN: false negative; FP: false positive; FNAC: fine needle aspiration cytology; TN: true negative; TP: true positive.

Table 2 Diagnostic Errors From Fine Needle Aspiration Cytology (FNAC) in the Parotid Gland.

FNAC diagnosis	Histological diagnosis
<i>False negatives</i>	
Pleomorphic adenoma	Mucoepidermoid ca.
Pleomorphic adenoma	Mixed malignant tumour
Non-specific lymphadenitis	Lymphoma
<i>False positives</i>	
Mixed malignant tumour	Warthin's tumour
Mucoepidermoid ca.	Warthin's tumour
Suspicion of malignancy	Warthin's tumour
Undifferentiated ca.	Pleomorphic adenoma

Ca.: carcinoma; FNAC: fine needle aspiration cytology.

This means that FNAC is of greater usefulness in confirming a diagnosis than in establishing one in a population.

Our results were similar to those published in recent literature. In these results, FNAC sensitivity ranged between 54% and 98%, and specificity, between 86% and 100%.^{12,16–19} Diagnostic precision had a range from 78% to 98%.²⁰

The meta-analysis performed by Schmidt et al.¹¹ showed that FNAC sensitivity and specificity was located around 0.80 (confidence interval [CI] 95%; 0.76–0.83) and 0.97 (CI 95%; 0.96–0.98) respectively. These values were considerably higher in sensitivity compared with those of our study.

The variability of results among the various studies could mainly be due to the pathologist's skill, as well as to technical factors¹: whether the sample is or is not taken by pathologists, if cytology is carried out just after extraction to verify if the sample is satisfactory, or whether it is performed guided by sonography or blind. This last point is important, given that it has been shown that when FNAC is associated with a sonographic guide, its precision increases.² In fact, sensitivity of even up to 38% has been published when FNAC is carried out blindly.⁶ Consequently, it can be said that for appropriate cytological diagnosis by FNAC, you need good sample quality and in-depth experience from both the pathologist and the individual that carries out the needle aspiration.¹²

In our study the majority of the FNAC tests were performed blindly. In addition, it was not always the same pathologist that interpreted the cytology and the definitive piece. These facts could explain the lower sensitivity in our results.

Of the diagnoses established using FNAC, 7.8% were erroneous. Among the most frequent diagnostic errors, it is notable that in almost all of the false positives the definitive diagnosis was Warthin's tumour, a benign neoplasia that generally presents metaplastic changes in the epithelium, and that is sometimes accompanied by cytological atypia, which could lead the pathologist to a false diagnosis of carcinoma.^{5,8}

Different series show that false negatives are frequently observed in malignant tumours of the parotid gland, between 13% and 29%.^{4,19} In general, malignant tumours can be difficult for the pathologists to diagnose, above all for those whose experience in this field is limited; this is because such tumours are of low incidence and have an

extensive variety of histological patterns that present very seldom.²¹

In this study only 57.14% of the malignant tumours were diagnosed by FNAC; the rate of false negatives was 42.8%, in which the definitive diagnosis was mucoepidermoid carcinoma (1 case), mixed malignant tumour (1 case) and lymphoma (1 case). This rate of false negatives is very high compared with that of other studies. We can attribute this to the low prevalence of malignant tumours in our sample (7.52%), as well as to their histological variability (given that all corresponded to different histopathological forms).

Both mucoepidermoid carcinoma and mixed malignant tumour are tumours that present great cell heterogeneity, with various degrees of atypia, so low grade lesions can be mistaken for benign lesions and give false negative results.^{10,19} That is why it is important for cytopathologists to have in-depth experience in parotid gland disease, as the precision of FNAC depends in great part of them.

Cytological diagnosis using FNAC should never prevail over the surgeon's clinical impression; faced with a benign FNAC result, but with suspicion of a malignant process from the clinical data or imaging, performing an intraoperative biopsy is recommended to confirm the diagnosis and guide appropriate treatment.

Conclusions

The FNAC test is simple but it has limited usefulness as a diagnostic guide in tumoral disease of the parotid gland in our environment. This is mainly due to its low sensitivity and high rate of false negatives. However, its high specificity and elevated negative predictive value make it a test with greater precision when faced with a benign or negative result.

This test plays a role in treatment planning, above all considering the patient's informed consent and in special situations such as with individuals having high surgical risk and suspicion of benign or non-neoplastic disease. In these circumstances, the FNAC can make it possible to choose conservative management.

We have to make a cautious interpretation of the FNAC results, which along with the characteristics of the physical examination and imaging tests will allow for a more precise diagnosis and, consequently, appropriate management.

Conflict of Interest

The authors have no conflicts of interest to declare.

References

1. Ali NS, Akhtar S, Junaid M, Awan S, Aftab K. Diagnostic accuracy of fine needle aspiration cytology in parotid lesions. *ISRN Surg.* 2011;2011:721525, <http://dx.doi.org/10.5402/2011/721525>.
2. Smith R. Patient with a parotid mass. *Arch Otolaryngol Head Neck Surg.* 2011;137:508–12.
3. Veder LL, Kerrebijn JD, Smedts FM, den Bakker MA. Diagnostic accuracy of fine-needle aspiration cytology in Warthin tumors. *Head Neck.* 2010;32:1635–40.

4. Zbaren P, Nuyens M, Loosli H, Stauffer E. Diagnostic accuracy of fine-needle aspiration cytology and frozen section in primary parotid carcinoma. *Cancer*. 2004;100:1876–83.
5. Jain R, Gupta R, Kudesia M, Singh S. Fine needle aspiration cytology in diagnosis of salivary gland lesions: a study with histologic comparison. *Cytojournal*. 2013;10:5.
6. Howlett DC. Diagnosis a parotid lump: fine needle aspiration cytology or core biopsy? *Br J Radiol*. 2006;79:295–7.
7. Zurrida S, Alasia L, Tradaft N, Bartoli C, Chiesa F, Pilotti S. Fine-needle aspiration of parotid masses. *Cancer*. 1993;72:2306–11.
8. Parwani AV, Ali SZ. Diagnostic accuracy and pitfalls in fine-needle aspiration interpretation of Warthin tumor. *Cancer*. 2003;99:166–71, <http://dx.doi.org/10.1002/cncr.11207>.
9. Amedee RG, Dhurandhar NR. Fine-needle aspiration biopsy. *Laryngoscope*. 2001;111:1551–7.
10. Alphs H, Eisele D, Westra W. The role of fine needle aspiration in the evaluation of parotid masses. *Curr Opin Otolaryngol Head Neck Surg*. 2006;14:62–6.
11. Schmidt R, Hall B, Wilson A, Layfield L. A systematic review and meta-analysis of the diagnostic accuracy of fine-needle aspiration cytology for parotid gland lesions. *Am J Clin Pathol*. 2011;136:45–59.
12. Ashraf A, Shaikh AS, Kamal F, Sarfraz R, Bukhari MH. Diagnostic reliability of FNAC for salivary gland swellings: a comparative study. *Diagn Cytopathol*. 2010;38:499–504.
13. Batsakis JG, Sneige N, el-Naggar AK. Fine-needle aspiration of salivary glands: its utility and tissue effects. *Ann Otol Rhinol Laryngol*. 1992;101 2 Pt 1:185–8.
14. Stewart C, MacKenzie K, McGarry G, Mowat A. Fine-needle aspiration cytology of salivary gland: a review of 341 cases. *Diagn Cytopathol*. 2000;22:139–46.
15. Layfield L, Gopez E, Hirschowitz S. Cost efficiency analysis for fine-needle aspiration in the workup of parotid and submandibular gland nodules. *Diagn Cytopathol*. 2006;34:734–8.
16. Tryggyason G, Gailey M, Hulstein S, Karnell L, Hoffman H, Funk G, et al. Accuracy of fine-needle aspiration and imaging in the preoperative workup of salivary gland mass lesions treated surgically. *Laryngoscope*. 2013;123:158–63.
17. Tahoun N, Ezza N. Diagnostic accuracy and pitfalls of preoperative fine needle aspiration cytology in salivary gland lesions. *J Egypt Natl Canc Inst*. 2008;20:358–68.
18. Herrera Hernández A, Díaz Pérez J, García C, Herrera L, Valderrama P, Orozco Vargas L. Evaluación de la citología por punción-aspiración con aguja fina en el diagnóstico de cáncer de la glándula parótida. *Acta Otorrinolaringol Esp*. 2008;59:212–6.
19. Muñoz Plaza C, Cordero Jiménez A, Tenor Serrano R, García Mata R, Contreras Molina P, García Muñoz I. Correlación citohistológica en tumores de la glándula parótida. *Acta Otorrinolaringol Esp*. 2010;61:184–8.
20. Piccioni L, Fabiano B, Gemma D, Sarandía D, Bussi M. Fine-needle aspiration cytology in the diagnosis of parotid lesions. *Acta Otorhinolaryngol Ital*. 2011;31:1–4.
21. Bussi F, Parrilla C, Rizzo D, Almadori G, Paludetti G, Galli J. Clinical approach and treatment of benign and malignant parotid masses, personal experience. *Acta Otorhinolaryngol Ital*. 2011;31:135–214.