



CLINICAL STUDY

ACCURACY OF NON-ULTRASOUND GUIDED FINE-NEEDLE ASPIRATION CYTOLOGY AS THE INITIAL DIAGNOSTIC PROCEDURE

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SUMMARY

Objective: Fine needle aspiration cytology (FNAC) results were compared with the results of excisional biopsy to investigate the diagnostic value. Results were analyzed and compared in literature.

Patients and Methods: During 2005-2009, 145 patients with palpable neck mass were included in our study. Cytological diagnoses of patients were compared with final histology results.

Results: Mean age of patients was 51.5 (14 to 96 years). While fine-needle aspiration cytology results were reported as malign in 72 (49.7%) patients, 93 (64.1%) specimen results were reported as malign. Inadequate material rate was 9.7%. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy values were determined as 83.1%, 91.9%, 95.8%, 70.8, and 85.8% respectively.

Conclusion: We conclude that fine-needle aspiration cytology applied in ENT clinics without guide is still valuable and highly useful diagnostic tool in differential diagnosis of neck masses. The advantages of this technique considered much cheaper and can be applied without losing time.

Keywords: Head and neck mass, fine-needle aspiration cytology, sensitivity, specificity

BOYUNDA KİTLENİN AYIRICI TANISINDA BAŞLANGIÇ TANI YÖNTEMİ OLARAK İNCE İĞNE ASPİRASYON SİTOLOJİSİNİN YERİ

ÖZET

Amaç: Çalışmamızda İnce iğne aspirasyon sitolojisi sonuçlarının tanısal değerini araştırmak için eksizyonel biyopsi sonuçları ile karşılaştırıldı. Sonuçlar analiz edilerek literatür ile karşılaştırıldı.

Hastalar ve Metod: Kliniğimizde 2005-2009 tarihleri arasında boyunda kitle nedeniyle takip edilmiş ve kendi kliniğimizde ince iğne aspirasyon sitoloji alınmış 145 hasta çalışmaya dahil edildi. Hastaların sitoloji sonuçları final patoloji sonuçlarıyla karşılaştırıldı.

Sonuçlar: Hastaların yaş ortalaması 51,5 (14-96) idi. Hastaların 72(49,7%)'sinde sitoloji sonuçları malign iken, 93(64,1%)'ünde final patoloji sonuçları maligndi. Yetersiz materyel oranı (asellüler örnek) ise 9,7% idi. Sensitivite, spesifite, pozitif ve negatif prediktif değer, doğruluk değerleri sırasıyla 83,1%, 91,9%, 95,8%, 70,8 ve 85,8% olarak belirlendi.

Tartışma: Boyun kitlelerinin ayırıcı tanısı için KBB kliniklerinde USG kullanılmadan yapılan ince iğne aspirasyon sitoloji tekniği, halen oldukça kullanışlı ve değerli bir ayırıcı tanı yöntemidir. USG eşliğinde yapılan teknikle kıyaslandığında; sonuçlar oldukça kabul edilebilir olduğu gibi daha ucuz ve zaman kaybedilmeden uygulanabilir olması avantajlarıdır.

Anahtar Sözcükler: Baş ve boyun kitlesi, ince iğne aspirasyon sitolojisi, duyarlılık, özgülük

INTRODUCTION

Neck mass could be signs of several diseases. It is classified three main groups as congenital, inflammatory and neoplastic. It can be seen in all age groups.¹⁻³ Quick and accurate diagnosis is essential for evaluation of each patient admitted to ENT clinic with neck mass. The story of the patient, clinical findings and radiological evaluation results provide valuable information in the diagnosis of neck masses, but in many cases, the treatment protocol is needed in order to identify pathological diagnosis.

Patients' age and localization of the mass can help to clinician in the differential diagnosis to assess the neck masses. Any neck mass in adult patients must be approached as being neoplastic and possibly malignant. In fact, these patients usually refer to physician with a fear of cancer. Appropriate approach, successfully and timely diagnosis will be very important in these patients^{2,4}. The head and neck masses that did not respond to antibiotic treatment often need to biopsy.

Excisional biopsy often requires hospitalization, whereas outpatient FNAC is a good alternative method for the diagnosis of neck masses. The first time FNAC described by Kun in the 1930s, as and brought into routine practice by Martin et al. Franzen et al have developed the technique of FNAC with 20-22 gauge needles in its current meaning in the 1950s at the Karolinska Institute. Most of the

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head and neck mass is superficial and FNAC can be easily applied in ENT clinics⁵. It is founded a simple and inexpensive method in such cases⁴⁻⁶⁻⁷. In addition it causes to minimal trauma and carries virtually no risk of complications even for children⁸.

In this study we evaluated the patients who admitted to our clinic with complaints of neck masses and underwent FNAC. Cytological and histopathological results of patients were compared in terms of the sensitivity, specificity, and accuracy. The results are compared with similar studies in the literature and discussed.

MATERIAL and METHODS

Subjects:

One hundred forty-five patients who admitted to our ENT clinic with palpable neck mass and applied FNAC before surgical excision were retrospectively analyzed in between July 2005 and January 2009. Eighty-nine (61.4%) males and 56 females (38.6%) were included to our study. Patients' mean age was 51.5 years (range: 14 to 96 years). FNAC was performed all patients in our ENT clinic by different physicians. None of the patients applied to imaging-guided biopsy included in the study. The patients who have been thyroid and glandular pathologies were excluded in study.

Fine-needle aspiration biopsy method (FNAC):

The skin on the mass is cleaned with betadine solution. Then FNAC is carried out using a 10 cc disposable syringe with a 22-caliber single needle. Local anesthesia is not required. Each aspiration was performed two times on the mass. After suction of the aspiration material, the taken to the air with a syringe extruded to lam and then at least 3 smear preparations were prepared. Smears were fixed with alcohol and stained by the method of Papanicolaou. None of the patients occurred complications after this procedure. All cytological examinations performed by a pathologist experienced in cytopathology and reported by same pathology department.

Diagnosis and the localization of the neck mass in all patients were evaluated. The pre-operative FNAC results were compared with post-operative

pathological findings in each patient. The cytopathological findings were categorized as malignant, suspicious malignant, non-diagnostic material and benign. Pathology results of the specimens were categorized as malign and benign.

Statistical analysis:

Statistical analysis was performed by Statistical Package for Social Sciences (SPSS) 11.5 software (SPSS Inc., Chicago, IL, United States). Continuous data were shown as mean \pm standard deviation; otherwise, nominal data were expressed as number of cases and percentage values (%). Sensitivity, specificity, positive and negative predictive value and diagnostic accuracy values for FNAC were calculated to determine the diagnostic performance using the method of Galen and Gambino⁹.

RESULTS

The distribution of neck masses in our patients are shown in Table I. The most frequent mass locations were found to be level II (36.3%), level III (25.5%) and the sub-mandibular region (19.3%), respectively. According to the results of the biopsy specimens, 52 (35%) samples were found to be benign and 93 (65%) samples were found to be malign (Table II). The most frequent pathological result was found to be metastasis of squamous cell carcinoma (24.1%). While the FNAC results reported as benign in 48 (33.1%) patients, 72 (49.7%) samples were malign. Blood cells, lymphocytes or macrophages were obtained with FNAC in 11 patients (7.6%). Inadequate material (a cellular smear) was obtained with FNAC in 14 (9, 7%) patients who included into the study (Table III).

The sensitivity, specificity, accuracy, PPV and NPV for FNAC are shown in Table IV. It is observed that the sensitivity and specificity values of the FNAC are 83.1% and 91.9%, respectively (Table IV). The diagnostic accuracy of FNAC is found to be 85.8% in our study.



Table I. Distribution of the head and neck masses

Location of the mass	No	%
Level I*	10	6.9
Level II	53	36.6
Level III	37	25.5
Level IV	0	0.0
Level V	10	6.9
Level VI	0	0.0
Submandibular region**	28	19.3
Others	7	4.8
Total	145	100

* submental region

** excluded glandular pathologies according to specimen result

Table II. Pathology results of the specimens.

Pathology	No	%
Malign		
Metastasis of squamous cell carcinoma	35	24.1
Metastasis of carcinoma	9	6.2
Metastasis of undifferentiated carcinoma	11	7.6
Diffuse large B cell lymphoma	12	8.3
Hodgkin lymphoma	13	9.7
Follicular lymphoma	3	2.1
Thyroid papiller carcinoma metastasis	1	0.7
Gastrointestinal tract malignancy metastasis	1	0.7
Thyroid anaplastic carcinoma metastasis	1	0.7
Small lymphocytic lymphoma	1	0.7
Seminoma metastasis	1	0.7
Malignant mezenchymal ca	1	0.7
Malign melanom metastasis	1	0.7
Adamantinoma	1	0.7
Mantle cell lymphoma	2	1.4
Total	93	65
Benign		
Chronic lymphadenitis	10	6.9
Reactive lymphoid hyperplasia	11	7.6
Inflammatory granulation tissue	7	4.8
Tuberculosis lymphadenitis	6	4.1
Lipoma	8	5.5
Neurofibroma	2	1.4
Epidermal inclusion cyst	2	1.4
Foreign body reaction	1	0.7
Thyroglossal ducts cyst	1	0.7
Squamous cyst	1	0.7
Branchial cyst	1	0.7
Others	2	1.3
Total	52	35



Table III. Results of the fine-needle aspiration cytology

Results of the FNAC	No	%
Malign		
Malignant	26	17.9
<i>Squamous cell carcinoma</i>	25	17.2
<i>Hodgkin lymphoma</i>	5	3.4
Suspected malignancy		
<i>Atypical lymphoid cells</i>	16	12.0
Non-diagnostic material		
<i>Acellular smear (inadequate material)</i>	14	9.7
<i>Blood cells, lymphocytes, macrophages</i>	11	7.6
Benign		
<i>Reactive lymphoid hyperplasia</i>	8	5.5
<i>Lymphoid cells</i>	20	13.8
<i>Abscess</i>	9	6.2
<i>Lipid tissue</i>	6	4.1
<i>Benign</i>	1	0.7
<i>Fibro vascular tissue</i>	1	0.7
<i>Granulomatous inflammation</i>	1	0.7
<i>Others</i>	2	1,3
<i>Totally</i>	145	100

Table IV. FNAC performance in our study

Sensitivity	83.1% (69/83)
Specificity	91.9% (34/37)
Positive Predictive Value (PPV)	95.8% (69/72)
Negative Predictive Value (NPV)	70.8% (34/48)
Diagnostic Accuracy	85.8% (103/120)

DISCUSSION

FNAC is the most widely accepted procedure for the diagnosis of neck mass. It uses are listed as follows: (a) making the differential diagnosis of benign and malignant lesions (b) verify the recurrence of neoplastic disease (c) verify a suspected malignancy (d) in patients with inoperable to document malignancy (e) determine the extent of

disease or metastases of malignant (f) for the show infectious agents and to obtain material for culture¹. It is not a surgical procedure, but it helps to differentiate between a cancerous and noncancerous diseases.

FNAC is a quick procedure which requires only a small amount of equipment, basic clinical conditions and performed easily in most cases; it is



completed at the first outpatient visit. FNAC have wide usage area but the user has difficulty in the following cases: any masses close to vital structures, non-palpable lesions only monitored radiological and, tissue lesions located with area treated via surgery or radiotherapy previously¹⁰. Small and deep-seated masses is reduces the success of FNAC technique. However, in such cases, ultrasonography or magnetic radiological imaging technique increases the FNAC's success¹¹. Even so, FNAC is routinely applied in patients who had palpable neck mass in our clinic. Although the cause of any neck mass is usually benign a lot of series, majority of our patients are malign in our hospital. So, FNAC results were reported as malignant in 49.7% of patients and also specimen results are reported as malignant in 64.1% of patients in our study.

The correct technique for performing FNAC is described elsewhere^{10,11,12,13}. The reliability and simplicity of FNAC is one of the important features of this technique. This technique is learned very easy by physician. It is performed without the need for local anesthesia outpatient conditions. The risk of complication is very low. None of the 145 patients was not bleeding problem. After the procedure, only packing in 1-2 minutes found sufficient to prevent the hematoma formation. Although FNAC has high accuracy rate and very sensitive, continued clinical suspicion is a problem in some patients with negative FNAC. If physician suspects malignancy clinically, FNAC repetition is made particularly for adults over the age of 40. In our study, the samples of 25 patients (17.2%) were reported as non-diagnostic material with FNAC. Blood cells, lymphocytes or macrophages were obtained with FNAC in 11/25 patients. Inadequate material (a cellular smear) was obtained with FNAC in 14/25 patients who included into the study. When the FNAC samples are reported as being non-diagnostic, then a repeat aspiration should be performed. An open biopsy is referred in only the absolute necessary cases to minimize the disadvantages of this process¹⁴. In our study, FNAC was repeated in these patients. Per cent 32.0 (8/25) of these patients were diagnosed malignity with the second FNAC. Our experiences suggest that repeating FNAC may lead to an increased likelihood of detecting existing carcinomas. In this patient group, 3/25 (12%) patients were diagnosed with lymphoma via open biopsy. The average age of these patients was 64.6 (43-83 years). Although there are omitting despite the 2 times FNAC, open biopsy should be performed.

Williams et al⁶ were reported of FNAC results in 384 patients. Although sensitivity,

specificity, PPV and NPV values were identified as 93%, 90%, 94% and 88 % respectively, non-diagnostic FNAC result was reported as 34 %. They also were reviewed FNAC results in patients with neck-lumps (15 studies) in the literature between 1979 and 2007. Average value of all non-diagnostic material results was 19.4 among 3068 cases. But their non-diagnostic material rates are higher than the average of literature (34% of 384 patients). Feldman et al¹⁵ were studied in 229 patients with neck lumps and they were discussed FNAC results. Non-diagnostic FNAC rate was reported as 9%. Draper et al¹⁶ were reported non-diagnostic rate as 20% in 192 patients with neck mass. In our study, non-diagnostic material rate was 17.2 %. But, acellular smear (inadequate material) rate was 9.7%. Our results were found to be consistent with the literature. We concluded that adequately trained physicians and also experienced cythopathologist with regular workload is essential to achieve good results with FNAC method. FNAC is applied routinely by specialists and assistants in our clinic.

The authors concluded that the use of FNAC for diagnosing lymphoma may misguide the treatment¹⁷. Pathology specimen results in 25 patients were reported as lymphoma in our study. In the FNAC results of these patients; two of them were malignant, 12 were atypical lymphoid cells, and four were considered as Hodgkin lymphoma (totally: 18/25, 72%). Even if the lymphoma identified by FNAC, it can be difficult to sub classify the type of lymphoma and open biopsy was performed in these groups to obtain the optimal oncologic outcome in our study. But incisional biopsy was sufficient in these group patients, further surgery had been unnecessary with the diagnosis of FNAC.

Considering of the results of English literature about this issue, it has been found that there is sensitivity from 86.4 % to 99.0 %, specificity from 90.0 % to 98.0%, PPV from 89.0 % to 97.0 %, NPV from 67.0 % to 98.0 %¹⁷⁻²¹. It has been found that there is sensitivity from 71,4 % to 93,8 %, specificity from 90.9 % to 100 %, accuracy from 81,9 % to 96,3 via non-guide FNAC in the several Turkish literature^{10,11,13,15}. In our study, we found the sensitivity and specificity values of the FNAC to be 83.1% and 91.9%, respectively. On the other hand, it was found that PPV was 95.8%, NPV was 70.8%, and diagnostic accuracy was 85.8%.The obtained values were consistent with the literature in our study.

FNAC has been confirmed to be a safe and effective technique with a high diagnostic accuracy for carcinomas and other lesions in this study. It is



easy to perform and is least invasive. The results are extremely satisfactory in good hands. The exact cytological diagnosis is available before definitive surgery is planned²². It is a cost effective procedure. So It is recommended as a first line of investigation in palpable neck masses. We believe that FNAC can be easily chosen instead of imaging-guided biopsy in ENT practice in patients had palpable masses, especially. The diagnosis is readily known to the clinician and appropriate treatment modalities can be discussed with the patient. FNAC should be performed in any patient considered to be at particular risk of carcinoma. To ensure that an accurate result is achieved, it is important that the ENT surgeon, pathologist or oncologist who performs continuously this procedure has experience in FNAC.

REFERENCES

1. Yılmaz I, Çağıcı CA, Caylaklı F, Akdoğan V, Özlüoğlu LN (2008) Utility of fine-needle aspiration biopsy in head and neck masses. *Kulak Burun Bogaz İhtis Derg.*; 18(4):211-5.
2. Jakobsen J, Aschenfeldt P, Johansen J, Jørgensen K (1992) Lymph node metastases in the neck from unknown primary tumour. *Acta Oncol.*;31(6):653-5.
3. Yıldırım M , Oktay MF, Topçu İ, Meriç F (2006) Neck Masses: Retrospective Analysis of 420 Cases. *Dicle Tıp Derg.*; 33(4):210-14.
4. Layfield LJ (2007) Fine-needle aspiration in the diagnosis of head and neck lesions: A review and discussion of problems in differential diagnosis. *Diagnostic Cytopathology.*; 35 (12): 798-805.
5. Karaman M, Tek A, Tuncel A, Habeşoğlu TE, Demir K, Habeşoğlu M. Diagnostic Accuracy of Fine Needle Aspiration Biopsy in and Neck Masses. *KBB ve BBC Dergisi* 18 (3):95-103, 2010.
6. Williams JA, Watkins D, Owen S, Williams N, Fielder C (2009) Non – thyroid neck lumps: appraisal of the role of fine needle aspiration cytology. *Eur Arch Otorhinolaryngol.*; 266:411-5.
7. Jin B, Saleh H (2009) Pitfalls in the diagnosis of adult rhabdomyoma by fine needle aspiration: report of a case and a brief literature review. *Diagn Cytopathol.*;37(7):483-6.
8. Alam K, Khan R, Jain A, Maheshwari V, Agrawal S, Chana RS, Harris SH (2009) The value of fine-needle aspiration cytology in the evaluation of pediatric head and neck tumors. *Int J Pediatr Otorhinolaryngol.*; 73(7):923-7.
9. Galen RS, Gambino SR: Beyond normality. The predictive value and efficiency of medical diagnosis. New York, NY, John Wiley & Sons, 1975.
10. Aygenç E, Çelikkanat S, Kaymakçı M, Fırat Y, Özdem. Diagnostic accuracy of fine needle aspiration biopsy. *C. K.B.B. ve BBC Dergisi*, (9) : 93-96, 2001
11. Karaman M, Tek A, Tuncel A, Habeşoğlu TE, Demir K, Habeşoğlu M. Diagnostic Accuracy of Fine Needle Aspiration Biopsy in Head and Neck Masses. *KBB ve BBC Dergisi* 18 (3):95-103, 2010.
12. Amedee RG, Dhurandhar NR (2001) Fine-needle aspiration biopsy. *Laryngoscope*; 111(9): 1551-7.
13. Çengel S, Bayraktar C, Aksoy A, Atmaca Sinan, Akpolat İ. Fine needle aspiration biopsy experiences of head and neck masses in a two years period in Ondokuz Mayıs University -50 cases. *J. Exp. Clin. Med.*, 2012; 29:131-133
14. Dilber M, Erişen L, Yerci Ö, Coşkun H, Basut O, Onart S, Hızalan İ. Tiroid dışı baş-boyun kitlelerinde ince iğne aspirasyon sitolojisi sonuçları: Uludağ deneyimi. *Türk Otolarengoloji Arşivi* 2005; 43(2): 86-95.
15. Feldman PS, Kaplan MJ, Johns ME, Cantrell RW (1983) Fine-needle aspiration in squamous cell carcinoma of the head and neck. *Arch Otolaryngol*; 109:735-42
16. Draper MR, Pfeleiderer AG, Smith W (2003) Assessment of a cytology grading system for head and neck masses. *Clin Otolaryngol Allied Sci*; 28(1):34-8
17. Hehn ST, Grogan TM, Miller TP (2004) Utility of fine-needle aspiration as a diagnostic technique in lymphoma. *J Clin Oncol*; 22: 3046-3052.
18. Florentine BD, Staymates B, Rabadi M, Barstis J, Black A (2006) Cancer Committee of the Henry Mayo Newhall Memorial Hospital. The reliability of fine-needle aspiration biopsy as the initial diagnostic procedure for palpable masses: A 4-year experience of 730 patients from a community hospital-based outpatient aspiration biopsy clinic. *Cancer*; 107:406–16
19. Knappe M, Louw M, Gregor RT (2000) Ultrasonography-guided fine-needle aspiration for the assessment of cervical metastases. *Arch Otolaryngol Head Neck Surg*; 126(9):1091-6.
20. Feldman PS, Kaplan MJ, Johns ME, Cantrell RW (1983) Fine-needle aspiration in squamous cell carcinoma of the head and neck. *Arch Otolaryngol*; 109:735-42.
21. Sheahan P, Fitzgibbon J, O'Leary G, Lee G (2004) Efficacy and pitfalls of fine needle aspiration in the diagnosis of neck masses. *Surg J R Coll Surg Edinb Irel*; 152-6
22. Demir D, Akçam MT, Karakoç Ö, Öngürü Ö, Yetişer S. Baş ve boyun kitlelerinde ince iğne aspirasyon biyopsisinin tanısal değeri. *KBB-Forum* 2006;5(1)