

An evaluation of nondiagnostic fine needle aspiration biopsy results: the importance of having an experienced cytopathologist

Demet ETİT¹, Nüket TUĞYAN², Arzu AVCI¹, Deniz ALTINEL³, Ayça TAN³, Seçil ARSLANOĞLU⁴

Aim: To compare nondiagnostic fine needle aspiration biopsy cytology results between pathologists and clinicians. Fine needle aspiration biopsy has proven to be a safe, economical, accurate, and rapid diagnostic technique. A successful aspiration biopsy requires a specimen with adequate cellularity, high-quality preparation, an experienced physician, and a cytopathologist. Up to 32% of fine needle aspiration biopsies of various organs (thyroid, breast, etc.) may ultimately be nondiagnostic due to scant cellularity and poor preparation.

Materials and methods: A total of 2247 reports of fine needle aspiration biopsies were reviewed, all obtained from files in the Pathology Laboratory of the İzmir Atatürk Training and Research Hospital. The reports included specimens from thyroids, breasts, lymph nodes, and salivary glands. Data from the fine needle aspiration biopsies were reviewed by physicians; for each case, both clinicians and cytopathologists were consulted in order to determine the clinical utility and the cost-effectiveness of the evaluation of aspiration biopsies.

Results: Our database showed that nondiagnostic cytology results obtained by clinicians alone were higher (34.1%) than those of cytopathologists (2.8%).

Conclusion: We conclude that the evaluation of fine needle aspiration biopsies involving cytopathologists not only substantially increases the adequacy of cytology specimens and decreases the number of nondiagnostic specimens, but it also increases the cost-effectiveness of the procedure.

Key words: Fine needle aspiration biopsy, cytopathologist, nondiagnostic cytology

Tanısal olmayan ince iğne aspirasyon biyopsi sonuçlarının değerlendirilmesi: deneyimli sitopatolog varlığının önemi

Amaç: İnce iğne aspirasyon biyopsisi, güvenli, ekonomik, duyarlı ve hızlı olduğu kanıtlanmış bir tanı tekniğidir. Başarılı bir aspirasyon, yeterli hücresellikte, iyi nitelikte bir preparasyon ile deneyimli klinisyen ve sitopatolog gerektirir. İnce iğne aspirasyon biyopsileri çeşitli organlarda (tiroid, meme vb.) % 32'ye varan oranda sellülarite azlığı ve kötü preparasyona bağlı olarak tanısal olmayabilir. Bu çalışmada amacımız, kendi deneyimimizde, klinisyenler ve sitopatologlar arasında tanısal olmayan sitoloji sonuçlarını karşılaştırmaktır.

Yöntem ve gereç: Bu çalışmada, İzmir Atatürk Eğitim ve Araştırma Hastanesi Patoloji Laboratuvarı kayıtlarından (tiroid, meme, lenf nodu ve tükürük bezlerini içeren) 2247 ince iğne aspirasyon biyopsisi raporu yeniden gözden geçirildi. Hem klinisyenler hem sitopatologlar tarafından yapılan ince iğne aspirasyon biyopsi bilgileri klinik yararlanım ve maliyet etkinliğini tayin etmek için karşılaştırıldı.

Received: 16.04.2010 – Accepted: 11.10.2010

¹ Department of Pathology, Atatürk Training and Research Hospital, İzmir - TURKEY

² Urla State Hospital, İzmir - TURKEY

³ Department of Pathology, Tepecik Training and Research Hospital, İzmir - TURKEY

⁴ Department of 1st Ear-Nose-Throat, Head and Neck Surgery Clinics, Atatürk Training and Research Hospital, İzmir - TURKEY

Correspondence: Demet ETİT, 2040 Sokak, Pamukkale 6. Blok 102. Giriş No: 3, Mavişehir, 35540 İzmir - TURKEY

E-mail: demetetit@yahoo.com

Bulgular: Veri tabanımız sadece klinisyenler tarafından yapılan tanısal olmayan sitoloji oranının (% 34,1), sitopatologlar ile birlikte yapılanlara göre (% 2,8) daha yüksek olduğunu gösterdi.

Sonuç: Çalışmamızdan sitopatologların ince iğne aspirasyon biopsisine katılımı; materyallerin yeterli oranını artırıp tanısal olmayan sitoloji oranını düşürmesi yanı sıra aynı zamanda, maliyet etkinliğine de katkıda bulunduğu sonucuna vardık.

Anahtar sözcükler: İnce iğne aspirasyon biopsisi, sitopatolog, tanısal olmayan sitoloji

Introduction

Fine needle aspiration biopsy (FNAB) is becoming a standard first-line diagnostic approach for lesions in various anatomical locations (1,2). It is well recognized as being simple, safe, cost-effective, and essentially diagnostic in most cases (3). Adequate specimens, experienced physicians, high-quality technical cytology preparations, and accurate result interpretation are all requirements for a successful FNAB. FNABs can be performed on both palpable and deep-seated lesions and can be sampled by image guidance. Sensitivity, specificity, and diagnostic accuracy are variable and depend on multiple factors that include sampling and interpretation (1,3).

Among the various organs, up to 32% of FNABs may be nondiagnostic due to scant cellularity or poor preparation (4-13). The on-site evaluation of patients can be useful in ensuring adequacy, and the triage of specimens for secondary studies, if necessary, can also be aided by rapid clinical decision making (14-16).

One of the most important essentials is the presence of an experienced cytopathologist on-site, who can improve the quality of direct smears by performing proper smearing techniques. This will decrease the number of artifacts and, as a result, the number of nondiagnostic cytology results (17-20).

The current study was designed to compare nondiagnostic FNAB results based on whether the procedure was done by a clinician or by a cytopathologist.

Materials and methods

The pathology files of İzmir Atatürk Training and Research Hospital provided FNAB cases for a 2-year period. A total of 2247 cases were retrieved, including 583 FNABs of breast tissue, 330 of lymph nodes, 1203 of thyroids, and 131 of salivary glands (Table 1).

Specimens were obtained using a 23- or 25-gauge needle; air-dried smears were stained with Giemsa stain and smears were fixed in ethyl alcohol for subsequent hematoxylin-eosin and Papanicolaou staining.

The FNAB results were grouped by organ/site and according to whether they were performed by a cytopathologist or a clinician. The diagnoses were reported by experienced cytopathologists. The proportions of the nondiagnostic aspirates for cytopathologists and clinicians were determined and the results were noted.

Results

Out of a total of 2247 FNABs, 628 were performed by cytopathologists and the remaining 1619 were done by clinicians. As divided according to biopsy site, 118 out of 583 fine needle aspirations of breast tissue were performed by cytopathologists, as were 234 out of 1203 thyroid aspirations, 201 out of 330 lymph nodes aspirations, and 75 out of 131 salivary gland aspirations (Table 1).

Table 1. Numbers and sites of fine needle aspiration biopsies (FNAB) performed by clinicians and cytopathologists.

	Breast	Thyroid	Lymph Nodes	Salivary Glands
Cps	118	234	201	75
Cs	465	969	129	56
Total	583	1203	330	131

Cps: cytopathologists; Cs: clinicians

Overall, 25.4% of aspirates were reported to be nondiagnostic (571 out of 2247). When examined by the organ or tissue type being aspirated, the nondiagnostic results were highest for breast aspirates (31.3%), whereas the lowest rates were revealed among salivary gland aspirates (12.2%) (Table 2). Out of 183 nondiagnostic breast aspirates, 181 of them were performed by clinicians (98.9%), a percentage that was mirrored in the thyroid results, for which clinicians collected 313 of the 325 nondiagnostic specimens (96.3%) (Table 3).

Of aspirates obtained by clinicians, 34.1% were nondiagnostic, compared to 2.8% of those obtained by cytopathologists (Table 4). While the nondiagnostic rate for cytopathologists was found to be highest for thyroid glands (5.1%), it was breast tissue that proved most difficult for clinicians, with a nondiagnostic rate of 38.9% (Table 5).

Table 2. Overall nondiagnostic rates of FNAB by organ.

Organ	Nondiagnostic/Total (%)
Thyroid	325/1203 (27%)
Breast	183/583 (31.3%)
Lymph Nodes	47/330 (14.2%)
Salivary Glands	16/131 (12.2%)

Table 3. Nondiagnostic FNAB results according to organ.

Thyroid		Breast		Lymph Nodes		Salivary Glands	
Cp	C	Cp	C	Cp	C	Cp	C
12 (3.7%)	313 (96.3%)	2 (1.1%)	181 (98.9%)	3 (6.4%)	44 (93.6%)	1 (6.2%)	15 (93.8%)

Table 4. Overall nondiagnostic rates for FNAB as performed by clinicians and cytopathologists.

Nondiagnostic Rate (Total)	
Cps	2.8%
Cs	34.1%

Table 5. Comparison of nondiagnostic cytology rates according to organ for both groups.

	Cs	Cps
Thyroid	313/969 (32.3%)	12/234 (5.1%)
Breast	181/465 (38.9%)	2/118 (1.6%)
Lymph Nodes	44/129 (34.1%)	3/201 (1.4%)
Salivary Gland	15/56 (26.7%)	1/75 (1.3%)

Discussion

FNAB for lesions in various anatomic locations is becoming a standard first-line diagnostic approach (1,2). It is well recognized as a simple, safe, cost-effective procedure that is essential for diagnosis in most cases (3). Successful fine needle aspiration requires an adequate specimen, an experienced physician, high technical quality in cytology preparations, and the accurate interpretation of results. One of the most important factors is the presence of an experienced cytopathologist on-site, who can enhance the quality of direct smears by performing proper smearing techniques. This will decrease the amount of artifact and the number of inconclusive cytology results, successfully limiting the nondiagnostic specimens (17-20).

This study examined a large number and variety of FNAB cases and determined that having a cytopathologist on-site during FNAB led to significantly greater chances of obtaining a satisfactory specimen.

Obtaining a satisfactory specimen for diagnosis is the most crucial point for appropriate patient management. Considering this, the presence of an experienced cytopathologist is essential for the specimen triage function of the on-site FNAB service. Some believe that on-site adequacy assessment can result in measurable cost savings by reducing the chance of nondiagnostic aspirates. In one study, 5688 FNABs were performed in various organs with on-site adequacy assessment (21). Nasuti et al. compared their very low (<1%) nondiagnostic rate when the FNAB was performed with on-site evaluation with the reported rate of 20% for FNABs performed without on-site adequacy assessment. Similarly, in our study, FNAB aspirates from various organs were performed by both clinicians and cytopathologists. Of the 2247 total aspirates reviewed, 583 were fine needle aspiration biopsies of the breast, 330 were of lymph nodes, 1203 were of the thyroid, and 131 were of salivary glands. Of aspirates obtained by clinicians, 34.1% were nondiagnostic, compared to 2.8% of those obtained by cytopathologists with on-site assessment.

Although immediate stains are not routine in our practice, by simply providing an on-site visual evaluation of the slide or aspirate the experienced cytopathologist is able to significantly decrease the nondiagnostic rates. Furthermore, reports in the literature indicate that decisions regarding the necessity of ancillary studies such as flow

cytometry, immunocytochemistry, cultures, and electron microscopy can be made by an experienced cytopathologist during the FNAB management (9,22-27).

In our opinion, if an experienced cytopathologist is available to take part in the FNAB procedure, the diagnostic smear rates will be considerably higher, helping to avoid repeated aspirates and indirect costs to the patients such as additional time off work and longer hospital stays due to repeat biopsies. Moreover, the higher the percentage of cytopathologist-guided procedures (radiologic, endoscopic, etc.), the more cost savings will be attained as a result of reduced nondiagnostic rates provided by efficient on-site service.

Up to 32% of FNABs may be nondiagnostic due to scant cellularity or poor preparation (4-13). In a previous study, the nondiagnostic rates of cytopathologists and clinicians were reported as 29.5% and 4.6%, respectively (28). However, our investigation showed an overall rate of 25.4% for nondiagnostic results: 34.1% for clinicians and 2.8% for cytopathologists. One reason for this striking difference may be that physicians are not able to perform these procedures in their day-to-day practice. Experience is the most important factor in successful performance of FNABs.

In conclusion, FNAB is a safe and cost-effective procedure, but the rates of inadequate cytology specimens are important. Our study has shown that the on-site evaluation of cytology specimens by an experienced cytopathologist substantially increases the adequacy of cytology specimens and decreases the number of nondiagnostic results, which negatively influence cost-effectiveness.

References

1. Guyot JP, Auberson S, Obradovic D, Lehmann W. Fine-needle aspiration in the diagnosis of head and neck growths: the pitfalls of false-positive diagnosis. *Otorhinolaryngol Relat Spec* 1993; 55: 41-44.
2. Layfield LJ, Glasgow BJ. Diagnosis of salivary gland tumors by fine-needle aspiration cytology: a review of clinical utility and pitfalls. *Diagn Cytopathol* 1991; 7: 267-72.
3. Hesel JC, Bardales RH, Mukunyadzi P. Fine-needle aspiration biopsy cytology of malignant neoplasms of the sinonasal tract. *Cancer* 2003; 99: 105-12.
4. Cohen MB, Miller TR, Gonzales JM, Sacks ST, Bottles K. Fine-needle aspiration biopsy. Perceptions of physicians at an academic medical center. *Arch Pathol Lab Med* 1986; 110: 813-17.

5. Hall TL, Layfield LJ, Philippe A, Rosenthal DL. Sources of diagnostic error in fine needle aspiration of the thyroid. *Cancer* 1989; 63: 718-25.
6. Palombini L, Fulciniti F, Vetrani A, De Rosa G, Di Benedetto G, Zeppa P, Troncone G. Fine-needle aspiration biopsies of breast masses. A critical analysis of 1956 cases in 8 years (1976-1984). *Cancer* 1988; 61: 2273-77.
7. Austin JH, Cohen MB. Value of having a cytopathologist present during percutaneous fine-needle aspiration biopsy of lung: report of 55 cancer patients and metaanalysis of the literature. *Am J Roentgenol* 1993; 160: 175-77.
8. Pak HY, Yokota S, Teplitz RL, Shaw SL, Werner JL. Rapid staining techniques employed in fine needle aspirations of the lung. *Acta Cytol* 1981; 25: 178-84.
9. Miller DA, Carrasco CH, Katz RL, Cramer FM, Wallace S, Charnsangavej C. Fine needle aspiration biopsy: the role of immediate cytologic assessment. *Am J Roentgenol* 1986; 147:155-58.
10. Skaaning K. Fine needle biopsy as a routine examination. A histologically verified material of fine-needle biopsied tumors of the head and neck. *Ugeskr Laeger* 1981; 143: 814-17.
11. Barrows GH, Anderson TJ, Lamb JL, Dixon JM. Fine-needle aspiration of breast cancer. Relationship of clinical factors to cytology results in 689 primary malignancies. *Cancer* 1986; 58: 1493-38.
12. Pilotti S, Rilke F, Delpiano C, Di Pietro S, Guzzon A. Problems in fine-needle aspiration biopsy cytology of clinically or mammographically uncertain breast tumors. *Tumori* 1982; 68: 407-12.
13. Bell DA, Hajdu SI, Urban JA, Gaston JP. Role of aspiration cytology in the diagnosis and management of mammary lesions in office practice. *Cancer* 1983; 51: 1182-89.
14. Nasuti JF, Yu G, Boudousquie A, Gupta P. Diagnostic value of lymph node fine needle aspiration cytology: an institutional experience of 387 cases observed over a 5-year period. *Cytopathology* 2000; 11: 18-31.
15. Cha I, Goates JJ. Fine-needle aspiration of lymph nodes: use of flow cytometry immunophenotyping. *Pathology* 1996; 4: 337-64.
16. Ducatman BS, Hogan CL, Wang HH. A triage system for processing fine needle aspiration cytology specimens. *Acta Cytol* 1989; 33: 797-99.
17. Verma K, Tiwari MC, Agarwal J, Kapila K. Diagnostic accuracy of immediate interpretation of fine needle aspirates. *Indian J Med Res* 1991; 94: 197-99.
18. Silverman JF, Finley JL, O'Brien KF, Dabbs DJ, Park HK, Larkin EW et al. Diagnostic accuracy and role of immediate interpretation of fine needle aspiration biopsy specimens from various sites. *Acta Cytol* 1989; 33: 791-96.
19. Sauer T, Freng A, Djupesland P. Immediate interpretation of FNA smears from the head and neck region. *Diagn Cytopathol* 1992; 8: 116-18.
20. Zajdela A, Ghossein NA, Pilleron JP, Ennuyer A. The value of aspiration cytology in the diagnosis of breast cancer: experience at the Fondation Curie. *Cancer* 1975; 35: 499-506.
21. Nasuti JF, Gupta PK, Baloch ZW. Diagnostic value and cost-effectiveness of on-site evaluation of fine-needle aspiration specimens: review of 5688 cases. *Diagn Cytopathol* 2002; 27: 1-4.
22. Hatada T, Okada K, Ishii H, Ichii S, Utsunomiya J. Evaluation of ultrasound-guided fine-needle aspiration biopsy for thyroid nodules. *Am J Surg* 1998; 175: 133-36.
23. Yokozawa T, Miyauchi A, Kuma K, Sugawara M. Accurate and simple method of diagnosing thyroid nodules the modified technique of ultrasound-guided fine needle aspiration biopsy. *Thyroid* 1995; 5: 141-45.
24. Saleh H, Masood S. Value of ancillary studies in fine-needle aspiration biopsy. *Diagn Cytopathol* 1995; 13: 310-15.
25. Turbat-Herrera EA, Herrera GA. Electron microscopy renders the diagnostic capabilities of cytopathology more precise: an approach to everyday practice. *Ultrastruct Pathol* 2005; 29: 475-82.
26. Stanley MW, Lowhagen T. Basic techniques. In: *Fine needle aspiration of palpable masses*. Boston (MA): Butterworth-Heinemann; 1993. p.18-56.
27. Silverman JF, Frable WJ. The use of the diff-quick stain in the immediate interpretation of fine-needle aspiration biopsies. *Diagn Cytopathol* 1990; 6: 366-69.