Fine-Needle Breast Aspiration Biopsy

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Fine-needle aspiration biopsy of breast lesions is a safe, accurate, well-tolerated procedure that can easily be done in the family physician's office. It has a specificity and positive predictive value of virtually 100 percent, a sensitivity of 53 to 99 percent (median of 89 percent), and a negative predictive value of 80 to 99 percent (median of 93 percent). It is limited by the nature of the lesion, which must be easily palpable, the physician's technical ability, and the availability of a reference cytopathologist. Complications are rare and usually very benign, such as local hematoma. With proper training and understanding of the procedure, many family physicians could easily introduce the procedure into their office practice.

Breast cancer is the second leading cause of cancer death among American women, causing 120,000 new cases and 39,000 deaths each year.[1] Justifiably, finding a breast lump often creates considerable anxiety. Prompt, accurate diagnosis of new breast lesions is therefore critical for the physical as well as emotional well-being of these patients. One such tool that helps provide this information is fine-needle aspiration biopsy.

Fine-needle aspiration biopsy is a safe, reliable, rapid, relatively inexpensive test with high patient acceptance, which may easily be done in the physician's office.[2–4] With all these advantages, one might expect such a test to gain rapid acceptance. Such has not been the case in this country; however, it has been widely employed in Scandinavia for almost two decades.[5,6] Sweden and Denmark in particular have relied on fine-needle aspiration for the assessment of palpable breast masses since 1968. The procedure has slowly gained acceptance in the United States, primarily among general surgeons. Recently, the American College of Physicians endorsed fine-needle biopsy as part of a position statement that said: "In the evaluation of most breast masses, mammography or ultrasound, or both and fine-needle aspiration can be used to decide whether to proceed to surgery."[4]

PERFORMING THE PROCEDURE

The principle of fine-needle aspiration is to aspirate cells into a fine-gauge needle and then express the needle contents onto a frosted slide for cytologic interpretation. Fine-needle breast aspiration can be done following the technique described by Bennington.[7]

The procedure is well tolerated and often can be done without local anesthesia. Local anesthesia will make the procedure less painful, however, especially if multiple attempts are anticipated or the lump to be aspirated is near the areola. If the operator chooses local anesthesia, a 30-gauge needle and lidocaine without epinephrine should be used to infiltrate the dermis and subcutaneous fat, avoiding the dense tissue to be biopsied.

To perform fine-needle aspiration on a solid mass, the skin should be prepared with alcohol or provine iodine solution. The mass should be secured with the nondominant hand. A 22- or 23-gauge needle attached to a 20-mL syringe (which may or may not be in an aspiration gun—Figure 1) is then inserted into the mass. Once the tip of the needle is in the mass, negative pressure is applied. Maintaining negative pressure, the needle is moved in and out five to ten times, keeping the tip of the needle within the mass. The negative pressure is then released before removing the needle. There should be little or no contents within the syringe, as the needle content is that which is used for cytopathology. The needle is then removed from the syringe, air drawn into the syringe, the needle replaced on the syringe, and the contents expressed onto a frosted slide.

Alternatively, the operator may start with 5 mL of air in the 20-mL syringe, thus avoiding the step of removing the needle and replacing it; however, if this technique is used, greater care must be taken when releasing the negative pressure or the needle contents will be expressed back into the mass, resulting in an inadequate specimen. For very small masses and for inexperienced operators, a needle with a short piece of attached intravenous con-

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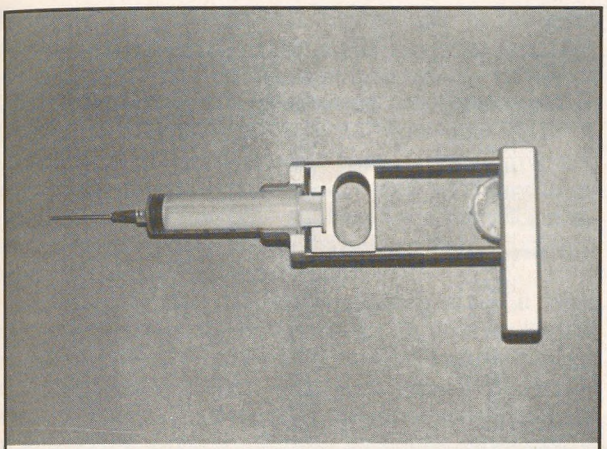

Figure 1. Aspiration gun used for fine-needle aspiration with 20-mL syringe and 22-gauge needle

necting tubing may be used, allowing greater control over the needle than with the aspiration gun.

Pathologists differ on how to best prepare the slide. The operator should communicate with the reference laboratory to find out which preparation method is preferred. Most pathologists recommend putting the needle on the slide, bevel up, and gently expressing the contents on the frosted side of the slide. Blowing the sample out of the needle using slight force results in better cell yield, but may result in artifact from air drying. While some pathologists recommend against this method, many operators, including the authors, prefer it and have had no problems. If the sample is blown onto the slide, usually no further spreading is needed, and the slide is then quickly placed into fixative. When the contents are gently placed onto the slide, another slide may be touched to it, again using the frosted side, and both slides placed in fixative. Fix the slide with either slide fixative or 95 percent alcohol, whichever the cytopathologist prefers.

Fluid will often be obtained when aspirating breast masses. If fluid returns, aspirate as a cyst, and if any residual mass exists after the cyst has been aspirated, it should be treated as a primary mass, and fine-needle aspiration may be repeated on the mass as described above. Cyst fluid may be sent for pathology also, but the yield is very low, and some authors do not recommend it unless the fluid has specific characteristics.[7]

Fine-needle aspiration has several advantages over open biopsy or true-cut needle biopsy. The cost for the procedure is far less than either of the above, as it requires less time, fewer supplies, and no anesthesia.[2,3,7] Fine-needle aspiration leaves no cosmetic changes in the breast. It is a rapid procedure, thus it can often be done when the patient first presents with a breast lump. Because it employs a fine-gauge needle, fine-needle aspiration is a very safe procedure, and the complications that most often occur are relatively benign.

COMPLICATIONS AND LIMITATIONS

The most common complications include hematoma and localized infection.[2,5,8,9] While a small amount of bleeding often occurs, resulting in a small area of ecchymosis, significant bleeding rarely occurs and can be controlled with direct pressure. One result of bleeding the physician must be aware of, however, is that it can temporarily alter the mammogram for up to three weeks, causing a false-positive mammogram.[8] Although mammographic changes have been reported in up to one fourth of cases, in the authors' experience, the incidence has been much lower. Infection also should be very infrequent if sterile technique is used. Another complication that has been listed is pneumothorax.[2]

There is often a concern that passing a needle into a malignant lesion may spread the tumor. First, the operator who has attempted to aspirate breast lesions to find out whether they are cystic has already accepted this possible risk. Second, the proof thus far is to the contrary; needle aspiration does not spread cancer or worsen the survival of patients exposed to this procedure.[10,11]

Fine-needle aspiration does have several limitations. The breast lesion must be palpable and clearly defined, so the operator knows the needle is within the mass. There is currently a limited number of physicians trained to perform the procedure and to interpret the slides.[3] The growth of training in fine-needle cytopathology in pathology postgraduate training is addressing the latter, but the training of family physicians to perform the procedure needs to be expanded. The lack of persons trained to perform fine-needle aspiration has been identified in the literature[3]; in an informal survey of local family physicians, lack of training was the major reason given for not doing fine-needle aspiration biopsy. Although the technique appears very simple, adequate training is essential for reliable results. The better trained the physician, the more reliable results, and the more useful the procedure.[13,14]

The accuracy of fine-needle aspiration is shown in Table 1. The specificity and positive predictive value are very good, whereas the sensitivity and negative predictive value are good, but not good enough to rely solely on the result of a negative fine-needle biopsy result, considering the seriousness of the disease. For many patients fine-needle aspiration may be an intermediate step in the evaluation of breast lesions.

TABLE 1. ACCURACY OF FINE-NEEDLE BREAST ASPIRATION

Study	Year	Sample Size	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Franzen and Zajicek[5]	1968	1680	94	100	100	91
Dixon et al[13]	1984	360	81	100	100	87
Zajdela et al[14]	1975	2772	96	100	100	84
Koivuniemi[15]	1976	503	89	100	100	93
Wilson and Ehrmann[16]	1978	332	53	100	100	95
Duguid et al[17]	1979	294	96	100	100	99
Klein et al[18]	1979	2151	86	100	100	95
Gardecki et al[19]	1980	149	90	100	100	89
Strawbridge et al[20]	1981	861	85	99	99	93
Bell et al[21]	1983	1145	82	100	100	96
Ulanow et al[22]	1984	278	83	99	99	80
Wanebo et al[23]	1984	247	99	100	100	94
Grant et al[24]	1986	100	92	100	100	85

CYTOPATHOLOGY

The results of the specimen may be reported as unsatisfactory, acellular, negative, atypical, suspicious for malignancy, or positive for malignancy.[25,26] Clinically, an unsatisfactory slide is generally one that is improperly prepared, usually as a result of too much air drying. An acellular slide has no breast epithelial cells, although it may have fat or foam cells present. Unless such a slide came from a lesion known to be a cyst, and no residual mass is present, the fine-needle aspiration should be repeated. Most authors include unsatisfactory and acellular slides together when reporting results.

Negative on a clinical report implies no atypical cells are present. In the literature and for some pathologists, this classification includes only those with normal epithelial cells or in which a specific lesion can be diagnosed such as fibroadenoma, intraductal papilloma, or fibrocystic change. Other pathologists include acellular specimens and those without epithelial cells present in the negative group. These differences heighten the value of understanding the cytologic results, not just the classification of the specimen, and highlight the importance of good communication between the operating physician and the pathologist.

An atypical specimen has abnormal, though not necessarily malignant, cells present. Often there will be further comment by the pathologist. In any event, excisional biopsy is recommended for these lesions.

A specimen for which malignancy is suspected generally has some cancerous type cells, but often has too few cells or lacks enough changes to make a definite statement of malignancy.

Positive slides usually will be returned with some comment such as "consistent with breast carcinoma" and mention will frequently be made as to whether the cells are of ductal or lobar origin. The cytologic features that indicate a malignant breast lesion are large numbers of cells (highly cellular smears); numerous single cells with accompanying cytoplasm, or loosely cohesive cell clusters with irregularly arranged nuclei; cellular pleomorphism; malignant nuclear criteria (large, irregular nuclei, hyperchromasia, irregular nuclear contour, coarse chromatin, thick nuclear membrane); or necrotic background.[26]

CONCLUSIONS

Despite the limitations listed above, fine-needle aspiration has a role in the management of breast lesions. A conservative approach would be to use fine-needle aspiration only as a preoperative assessment. For positive results this approach would allow the physician and patient to discuss treatment options and decide on a definite plan of action prior to the removal of any tissue. Positive needle biopsy results would allow the surgeon to plan appropriately, and if the patient has a general anesthesia, she would know fully what to expect when she wakes up. For a negative result, it may be most appropriate to plan only a biopsy at the time of surgery unless there are other strong indicators that the lesion is malignant. Some physicians very experienced in fine-needle aspiration may elect to follow some breast lesions when the fine-needle aspiration result is benign without an open biopsy; however, it is recommended that any remaining mass be biopsied for negative and acellular fine-needle biopsy results. In all instances the attending physician and pathologist must have good communication.

A problem that still remains is the appropriate way to train family physicians in the technique of fine-needle

aspiration. One method that may be used in residency training is described by Abele et al.[3] For practicing physicians who would find the technique useful, workshops followed by analysis of each physician's results may suffice, with the goal being to achieve no more than 20 to 30 percent of acellular specimens. Since false-negative and acellular specimen findings (nearly always the way an inexperienced operator errs) still require a pathologic diagnosis in persistent breast masses, such an approach would not jeopardize patient safety.

In summary, fine-needle aspiration is a useful office technique for assessing breast masses. Its utility is limited by a sensitivity of 70 to 80 percent, which often makes it an intermediate rather than a definitive diagnostic method. The main obstacle to the more widespread use of fine-needle aspiration biopsy by family physicians is lack of training in the technique. Education as to its usefulness, limitations, and actual training in the performance of fine-needle breast aspiration is needed.

References

1. Facts and Figures. New York, American Cancer Society, 1985
2. Mushlin AI: Diagnostic tests in breast cancer: Clinical strategies based on diagnostic probabilities. Ann Intern Med 1985; 103:79–86
3. Abele AS, Miller TR, Goodson WH, et al: Fine-needle aspiration of palpable breast masses. Am J Surg 1983; 118:859–863
4. Health and Public Policy Committee, American College of Physicians: The use of diagnostic tests for screening and evaluating breast lesions. Ann Intern Med 1985; 103:143–146
5. Franzen S, Zajicek J: Aspiration biopsy in diagnosis of palpable lesions of the breast: Critical review of 3479 consecutive biopsies. Acta Radiol Ther Phys 1968; 7:241–262
6. Fox CH: Innovation in medical diagnosis—The Scandinavian curiosity. Lancet 1979; 1:1387–1388
7. Bennington JL: Thin-Needle Aspiration Biopsy. Philadelphia, WB Saunders, 1983, pp 20–36
8. Sickles EA, Klein DL, Goodson WH, Hunt TK: Mammography after needle aspiration of palpable breast masses. Am J Surg 1983; 145:395–397
9. Klein TS, Neal HS: Needle aspiration biopsy: A critical approach: Eight years and 3267 specimens later. JAMA 1978; 239:36–39
10. Berg JW, Robbins GF: A late look at the safety of aspiration biopsy. Cancer 1962; 15:826–827
11. Engzell U, Episito PL, Rubio C, et al: Investigation on tumor spread in connection with needle aspiration biopsy. Acta Radiol Ther Phys Biol 1971; 10:385–398
12. Dixon JM, Lamb J, Anderson TJ: Fine-needle aspiration cytology of solid breast lumps: The importance of the aspirator. Lancet 1983; 2:564
13. Dixon JM, Anderson TJ, Lamb J, et al: Fine needle aspiration cytology, in relationship to clinical examination and mammography in the diagnosis of solid breast mass. Br J Surg 1984; 71:593–596
14. Zajdela A, Ghosein 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
15. Koivuniemi AP: Fine-needle aspiration biopsy on the breast. Ann Clin Res 1976; 8:272–283
16. Wilson SL, Ehrmann RL: The cytologic diagnosis of breast aspirations. Acta Cytol 1978; 22:470–475
17. Duguid HLD, Wood RAB, Irving AD, et al: Needle-aspiration of the breast with immediate reporting of material. Br Med J 1979; 2:185–187
18. Klein TS, Joshi LP, Neal HS: Fine-needle aspiration of the breast: Diagnosis and pitfalls; a review of 3545 cases. Cancer 1979; 44: 1458–1464
19. Gardecki TIM, Hogbin BM, Melcher DH, Smith RS: Aspiration cytology in the preoperative management of breast cancer. Lancet 1980; 2:790–792
20. Strawbridge HTG, Passett AA, Foldes I: Role of cytology in management of lesions of the breast. Surg Gynecol Obstet 1981; 152:1–7
21. 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; 51:1182–1189
22. Ulanow RM, Galblum L, Canter JW: Fine needle aspiration in the diagnosis and management of solid breast lesions. Am J Surg 1984; 148:653–657
23. Wanebo HJ, Feldman PS, Wilhelm MC, et al: Fine needle aspiration cytology in lieu of open biopsy in management of primary breast cancer. Ann Surg 1984; 199:569–578
24. Grant CS, Goellner JR, Welch JS, Martin JK: Fine-needle aspiration of the breast. Mayo Clin Proc 1986; 61:377–381
25. Schondorf H: Aspiration Cytology of the Breast. Philadelphia. WB Saunders, 1978
26. Frable WJ: Fine-needle aspiration biopsy: A review. Human Pathol 1983; 14:20–73