

## Diagnostic Cytology of Small Mammary Carcinomas

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**Abstract** This brief article summarizes the historical background of the thin needle aspiration technique as it applies to diseases of the breast. The technique and the achievements of this method in the diagnosis of small breast cancers are reported. A brief note on the value of nipple secretions in the diagnosis of carcinoma of the mammary ducts is appended. © 1993 Wiley-Liss, Inc.

**Key words:** Aspiration biopsy, carcinoma of mammary ducts, mammary carcinoma, mammography, nipple secretions

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There are several records of microscopic examination of aspirated material for diagnostic purposes in the 19th century, summarized in a brilliant book by Grunze and Spriggs [1]. According to Webb [2], Sir James Paget, after whom Paget's disease of the breast was named, was the first to use cytologic samples of breast tumors for microscopic examination. Webb cited Paget's description of mammary cancer cells, written in 1853, which is remarkable for its accuracy:

Many of the cells of cancer, for example, may be somewhat like glandular cells, yet a practised eye can distinguish them even singly and much more plainly their grouping distinguishes them; they are heaped together disorderly and seldom have any lobular or laminar arrangements such as exists in the natural glands or epithelia.

It is generally acknowledged, however, that a major contribution to the aspiration biopsy was made by two British military surgeons, Greig and Gray [3], serving in Uganda. In 1904, they

described the use of material from lymph nodes aspirated by means of a needle attached to a syringe for the identification of living trypanosomes for the diagnosis of sleeping sickness. In reference to human cancer, there were several observers in the early days of the 20th century who used smears obtained by means of the needle-and-syringe aspiration technique for diagnostic purposes [summarized in 4]. The most significant contribution, however, was made by Martin and Ellis [5] who, working at the Memorial Hospital for Cancer in New York City, first used this technique on a large scale for the diagnosis of human cancer. The history of the events leading to the aspiration biopsy has been summarized elsewhere [6]. Although the method has been in constant use at the Memorial Hospital (today the Memorial-Sloan Kettering Cancer Center) since 1930, it had not received much attention in the United States until modified in Sweden, where Franzén and his colleagues developed a single-grip syringe holder and advocated the use of small caliber needles for purposes of securing diagnostic material [7]. This "new" method of securing cell samples received an enthusiastic endorsement in the United States.

In the ensuing years, a very large body of literature appeared in the American and European medical press, describing the efficacy and

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performance of aspiration cytology in the diagnosis of cancer of various organs, including the breast [4].

### APPLICATION TO BREAST LESIONS

Recognition of mammary carcinoma in aspirates is comparatively easy in competently obtained and processed material. In most cancers, a large population of readily recognizable cancer cells may be observed. Typical cancer cells vary in size, and are dispersed or arranged in disorderly clusters; the nuclear features include irregular contours and large nucleoli. Some forms of mammary carcinomas have special features, such as the accumulation of mucus in colloid carcinomas, orderly cell clusters in tubular carcinomas, or the presence of intracytoplasmic, mucus-containing vacuoles with a central condensation in lobular carcinomas [4].

The diagnosis of mammary carcinomas may be difficult if the aspirate is scanty or if cells derived from a benign breast lesion show one or more features usually associated with breast cancer. Among the chief sources of error, one must list lactating adenomas, fat necrosis, and fibroadenomas with atypical features [4].

For palpable cancers of the breast, a sensitivity of about 90% and a specificity of about 99% can be expected, provided the aspiration is competently performed and the sample competently interpreted [8]. False negative errors usually occur when the lesions are very small, hence difficult to sample, or very large with a necrotic center, from which no adequate diagnostic material can be secured [9].

If small mammary carcinomas are defined as lesions measuring 1 cm or less in their largest parameter, the success of the aspiration biopsy procedure will depend on several factors:

- (1) Is the lesion palpable or has it been discovered by mammography?
- (2) Is the lesion accessible to aspiration, either by direct approach or under stereoscopic guidance?
- (3) Is the operator skilled in the performance of the aspiration procedure?
- (4) Is the cytologic sample adequate for interpretation?
- (5) Is the pathologist competent in the interpretation of this type of sample?

The most difficult aspect of this procedure is securing an adequate sample. When dealing with small lesions, the tip of the needle may either not reach the lesion or go beyond the lesion. In either case, the aspirate will fail [10].

There are no good statistical data on the efficacy of aspiration biopsy diagnoses of small palpable breast lesions. In an important paper from Sweden, Azavedo *et al.* [11] reported the results of aspirations on 2594 lesions discovered by mammography. Of 429 documented cancers, the aspiration failed in 144 cases (33%). The failure rate is likely to be much smaller in palpable lesions.

Another aspect of cytologic diagnosis of small carcinomas is the examination of nipple discharges. In some cases, intraductal or minimally invasive carcinomas may be diagnosed [12]. These events are so uncommon that their application as a routine procedure is not likely. Many years ago, cannulation of breast ducts for the diagnosis of occult breast cancer was advocated by Sartorius [13]. Although some successes were reported, this tedious and time consuming method of diagnosis has not been considered a valid diagnostic option. It has been replaced by mammography. Still, the failure rate of mammography in the identification of small breast cancers is variously estimated at 10–20%.

There is no method of diagnosis that will detect small breast cancers in all women at all times. The failure rate varies with the method used. It is not likely to be less than 10%. The consequences of diagnostic failure are today the most common reason for legal malpractice proceedings against medical personnel [14].

Still, aspiration biopsy of the breast probably represents the best option in follow-up of at-risk women in chemopreventive trials.

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