Stereotactic-guided localisation before open biopsy of occult breast lesions

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Objective: **To evaluate the accuracy of stereotactic coal injection and wire localisation followed by excisional biopsy for occult breast lesions.**
Experimental design: **Prospective study**
Setting: **University Hospital**
Patients: **Forty-five patients with abnormal mammographic findings out of 6543 women undergoing screening mammography. Patients with palpable or ultrasonographically detectable lesions were excluded from the study.**
Interventions: **Pre-biopsy stereotactic coal injection and stereotactic wire localisation of the suspicious mammographic lesions. Microcalcifications were the most common indication for biopsy (58%). Stereotactic localisation was accomplished by using vertical, lateral and oblique projections. Surgery was carried out under local anaesthesia and on an outpatient basis. Radiological study of the specimen was performed for each patient.**
Results: **Overall, radiological studies of the specimens showed complete removal of the lesions in 44 patients (98%). In 1 patient with deep doubtful microcalcifications marked only with coal, a partial excision was performed (fibrocystic disease with ductal hyperplasia). The positive predictive value of mammography for cancer was 49%. Microcalcifications were associated with cancer in 10 patients.**
Conclusions: **Preoperative stereotactic localisation proved to be an effective and accurate procedure, allowing a complete excision of the lesion in 98% of patients and a correct histologic diagnosis in all patients.**

KEY WORDS: Breast cancer - Non-palpable lesion- Mammography- Stereotactic coal injection - Stereotactic wire localisation - Breast biopsy

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The widespread utilization of screening mammography has led to an increased observation of suspicious breast lesions such as non-palpable breast mass or clustered microcalcifications, that require accurate diagnosis to achieve early detection of cancer.[1] Complete removal of the lesion associated with radiological study of the specimen appears to be critical to avoid false negative findings and to provide precise histopathologic diagnosis.[2]

The aim of the study was to evaluate our experience with an original method of stereotactic coal injection and/or wire localisation followed by excisional biopsy for occult breast lesions.

Materials and Methods

Between October 1995 and November 1997, 6543 patients underwent screening mammography in our Institution. Forty-five (0.7%) patients with abnormal mammographic findings underwent pre-biopsy stereotactic coal (Sterylab, Rho, Italy) injection of the suspected lesions (Fig.la). 25 of these patients had also stereotactic wire (Sterylab, Rho, Italy)
localisation. The mean age was 55 years (range 38-77). Patients with palpable or ultrasonographically detectable lesions were excluded from the study.

Indications for excisional biopsy and dimensions of the lesions are listed in Table I. Detection of microcalcifications was the most common indication for biopsy. The microcalcifications were classified as suspicious, including clustered, branched or linear, comma-shaped, polymorphus, punctuate, faint or coarse, and doubtful, including few punctuate or slightly polimorphus microcalcifications.[3] Seventeen patients had undergone previous stereotactically guided fine-needle aspiration with inconclusive findings, i.e. discordant imaging/cytology correlation or inadequate sampling.

Localisation was accomplished by means of a dedicated stereotactic device (Siemens Mammomat 3, Germany)

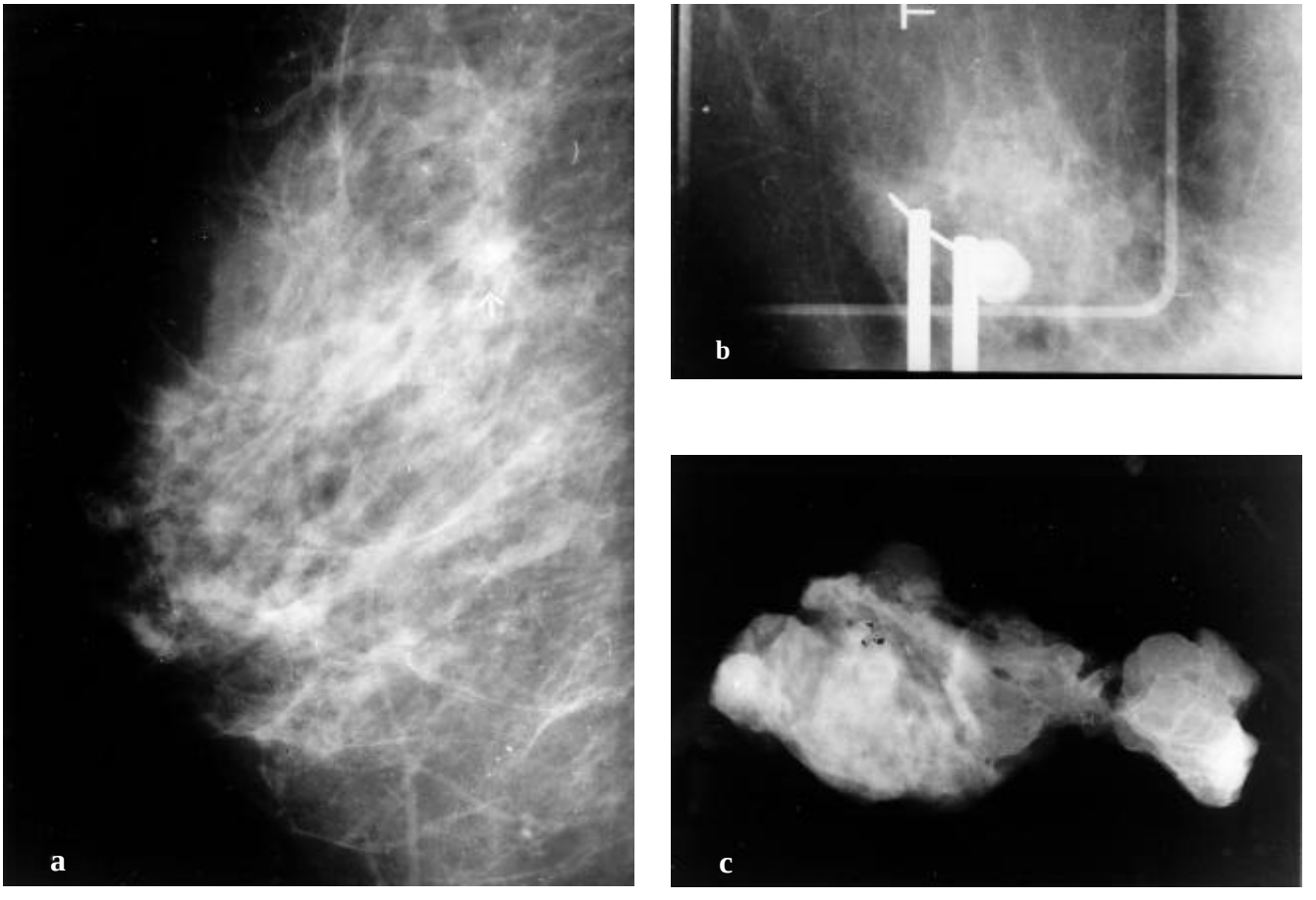

Fig.la. - Non-palpable asymmetric density (diameter 10 mm) detected at screening mammography in a 60 year old female.
Fig.lb. - Stereotactic localisation with coal injection of the suspicious lesion.
Fig.1c. - Post-bioptical radiological study of the specimen showed a complete removal of the lesion (ductal carcinoma, diameter 12 mm).

using vertical, lateral and oblique projections. Coal was injected through a 20 gauge needle inserted for1 ml in the lesion and 1 ml along the planned surgical pathway (Fig.lb). A hook-wire was inserted for deep lesions along the shortest tract between the skin and the lesion.

Surgery was performed shortly after radiology in order to avoid diffusion of coal. All procedures were carried out under local anaesthesia and on an outpatient basis. Radiological studies of the specimen were performed for each patient to confirm complete removal of the lesions to submit to the pathologist. The positive predictive value of mammography for carcinoma was calculated. Chi-square test was used for comparison of groups.

Results

The mean time required for the radiological procedure was 30 minutes (range 20-40 min.). The mean time required for the surgical procedure was 35 minutes (range 25-55 min.). No complication was recorded.

Overall, radiological studies of the specimens showed complete removal of the lesions in 44 patients (98%). In 39 (87%) patients this was achieved at the first attempt (Fig.1c); while in six patients an incomplete excision of the suspected images was shown at the first radiological exam of the specimen; five patients of these had a complete surgical removal of the lesion during the same session. In three individuals of the latter group histology showed carcinoma. In 1 (2%) patient with deep doubtful microcalcifications localised only with coal it was not possible to perform a complete excision of the suspected lesion; however, the histology of the removed specimen showed fibrocystic disease with ductal hyperplasia.

The positive predictive value of mammography for cancer was 49%. Suspicious microcalcifications were associated with cancer in 8 (67%) individuals, while doubtful microcalcifications were detected in 2 (14%, $p<0.05$) patients. In the latter group, 7 patients (50%) had a typical hyperplasia. Additionally, pathologic examination showed carcinoma in 10 (59%) of the patients with previous inadequate cytology. Radiology/pathology correlation is reported in Table II.

Table I. - *Mammographic findings and median size of the suspicious lesions in patients undergoing pre-biopsy stereotactic localisation.*

	Patients N. (%)	Size (mm)
Doubtful microcalcifications	14 (31)	10 (ó-15)
Suspicious microcalcifications	12 (27)	6 (3-12)
Spiculated mass	11(24)	8 (5-10)
Mass	4 (9)	9 (4-12)
Mass+calcifications	2 (4)	5-6
Architectural distorsion	1 (2)	4
Asimmetric density	1 (2)	15
Total	45	8 (3-15)

TABLE II. - *Radiology/pathology correlation in patients undergoing pre-biopsy stereotactic localisation. Ca= carcinoma; FD= fibrocystic disease, including typical ductal hyperplasia, *sclerosing adenosis, adenosis; AH= atypical hyperplasia.*

	Ca (%)	FD (%)	AH(%)	Tot
Doubtful microcalcifications	2 (14)	5 (36)	7 (50)	14
Suspicious microcalcifications	8 (67)	2 (17) *	2 (17)	12
Spiculated mass	8 (73)	2(18)	1 (9)	11
Mass	2 (50)	2 (50)	-	4
Mass+ calcifications	1 (50)	1 (50)	-	2
Architectural distorsion	1 (100)	-	-	1
Asimmetric density	-	1 (100)	-	1
Total	22 (49)	13 (29)	10 (22)	45

Discussion

Breast cancer represents the most common malignancy in women.[4] Early diagnosis is critical to provide the patients with the best chances of cure.[5] A higher awareness of woman for early cancer detection, the wide use of screening programs, and the availability of high resolution mammography has led to an increasing observation of suspicious mammographic occult lesions, most of which are less than 1 cm in diameter.[6] Non-palpable lesions such as microcalcifications and stellate density may be associated with cancer in up to 30% of patients.[6, 7] Therefore, precise localisation and histopathologic examination seem to be mandatory to achieve the benefits of screening program.[8] However, negative results of histology from a core biopsy cannot definitively exclude cancer since it may be a sampling error (false negative).[2, 9] It has been shown that cancer may be present in up to 40-50% of patients undergoing further evaluation after a stereotactic core biopsy with inconclusive pathological findings, i.e. ductal atypia, discordant imaging/histology, or insufficient tissue removal.[10, 11, 12] In a large multi-institutional study, cancer was detected at 6-month follow-up in 5% of patients with a previous "benign" core biopsy histology.[13] Additionally, a recent report analysing the microscopic localisation of the microcalcifications in and around breast lesions showed that in 34% of patients with carcinoma microcalcifications they were present only in the benign breast tissue close to the tumour, raising the concern that small samples taken near the cancer may include such calcifications without showing the malignancy.[15] Excisional biopsy still represents the gold standard for diagnosis of non-palpable lesions to which other methods have to be compared.[16, 17] The stereotactic guidance to hook-wire insertion or coal injection for open biopsy provides an accurate localisation of the lesion to be removed.

It has been suggested that stereotactic core biopsy may be a reasonable first diagnostic step for suspicious lesions, in order to select patients to undergo open biopsy and to increase the positive predictive value of excisional biopsy.[18] Conversely, it has been reported that radiological criteria may help select the most adequate diagnostic procedure in the individual patient, i.e. core biopsy for low suspicious lesions, and needle localisation and surgical biopsy for highly suspicious lesions, and in patients with family risk.[18,19] In our series, the positive predictive value of mammography for cancer was 49%, but it increased for highly suspicious lesions such as suspicious microcalcifications (6 7%) and spiculated mass (72%).

There has not been any previous reports in literature about stereotactic-guided localisation before open surgical biopsy of occult breast lesions. This method allows surgery to be performed on an outpatient basis in a cost effective manner. Coal injection, alone or with wire insertion, is used to prevent the drawback of a possible wire displacement following breast decompression. In our experience, stereotactic guided localisation before open biopsy has proven to be safe and effective, allowing complete excision of the lesions in most of the patients and a correct and complete histologic diagnosis.

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