Open surgical biopsy for nonpalpable breast lesions detected on screening mammography

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Summary

The aim of this retrospective clinical study was the analysis of histologic findings of nonpalpable breast lesions managed by open surgical biopsy.

A series of 630 women underwent 664 preoperative localizations of nonpalpable, mammographically detected breast lesions during the last 10-year period. Indications for biopsy were (1) clustered microcalcifications, (2) solid mass, and (3) radiologic parenchymal distortion. The lesions were localized preoperatively using hook-wire methods, and all biopsies were performed under general anesthesia.

Histopathology revealed carcinoma in 172 (25.9%) cases; noninvasive in 114 (66.3%) cases and infiltrating in 58 (33.7%) cases. The highest malignancy rate was found in cases with microcalcifications (112 carcinomas out of 323 cases, 34.7%). Lymph node invasion was present in 25% of patients with invasive cancers.

The hook-wire localization of nonpalpable breast lesions is a simple, accurate and safe method for detection of early breast cancers. Frozen section is feasible and accurate in the majority of these lesions, and therefore, diagnostic and therapeutic one-step surgical procedures could be performed.

Key words: Breast cancer; Nonpalpable; Stereotactic biopsy; Localization; Mammography; In situ carcinoma.

Introduction

Early detection of breast malignancies remains the best way to achieve a favorable prognostic outcome and mammography is still the best mainstay of early diagnosis, revealing occult breast lesions [1]. As a result, breast surgeons often face the problem of the management of such nonpalpable mammographically detected breast lesions. The main questions arising are the diagnostic procedure of choice, the methods of localization and the indications for breast biopsy.

The purpose of our retrospective clinical study was to evaluate and analyze the histologic findings of nonpalpable breast lesions managed by open surgical biopsy in our Unit.

Patients - Methods

During a 10-year period from November 1994 to October 2004 a total of 630 women, aged 31-78 years old (mean age: 45 years), admitted to our Breast Unit, underwent 664 preoperative localizations of nonpalpable mammographically detected breast lesions.

Twenty-two patients had two separate localizations at the same time on the same breast (n: 9) or on both breasts (n: 13), while six patients underwent three separate localizations at the same time on the same breast (n: 2) or on both breasts (two localizations on one side and one on the other side, n: 4).

Data pertaining to the type of mammographic findings, accuracy of the localization, operative procedure employed, complications and histologic diagnosis were recorded and analyzed.

Indications for biopsy were (1) a cluster of more than five fine microcalcifications, (2) a nonpalpable mass, and (3) a radiologic distortion of the mammary gland. Mass characteristics dictating biopsy were the absence of benign-type calcifications, the solid structure of the mass by ultrasound, the absence of a lump in previous mammograms and an increase in size compared to previous mammograms.

In 355 cases the hook-wire freehand localization procedure described by Frank *et al.* was used [2]; the exact location of the radiologic abnormality was judged based on lateral and craniocaudal mammography, and the needle was introduced into the breast under local anesthesia. In the remaining 309 cases (most of the cases since January 1998 when our Unit was equipped with stereotactic instrumentation) the needle and the wire were placed using a stereotactic device (Stereotix 2, General Electric, France, 1997). Care was taken so the entry point of the needle would allow a cosmetically acceptable incision, usually close to the areola. When the needle tip was in optimal position, the sheath was withdrawn, leaving the wire hook in place. The accuracy of the localization was checked with lateral and craniocaudal mammograms, which were then sent to the operating room with the patient.

With reference to the wire, an excisional biopsy was performed under general anesthesia and the specimen was sent to the Radiology Department to confirm radiologically that the lesion had been removed (specimen mammogram), and then to the Pathology Department for histologic examination. Frozen section was available in most of our cases (n: 490), while in the remaining 174 cases frozen section was not performed because the specimen was inadequate for frozen section; either very small size of the lesions (a few mm) or their specific nature (small area of calcification, parenchymal distortion). After obtaining the results of frozen section, the patient either returned to the ward (benign cases) or underwent further excision, as informed consent of the patient to the operative options according to all possible diagnoses was always obtained preoperatively.

Final decisions for the group of patients with frozen section, based on the report of the permanent sections, were made in 16 cases due to additional findings to those of frozen sections (n: 5) and to the patient's wish for a two-step surgical procedure (n:

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11). Sixteen cases of the group of patients without frozen section underwent additional surgery due to either invasive cancer results (n: 7) or inadequate resection of an in situ carcinoma (n: 9).

Statistical analysis was based on one-way variant analysis.

Results

In 323 of our cases (48.7%) the lesion that required biopsy was an area of clustered microcalcifications, in 95 cases (14.3%) it was a radiological abnormality of the breast parenchyma, and in 246 cases (37%) it was a solid lump.

The accuracy of the wire localization was determined by the distance of the wire-tip from the lesion, measured on both mammograms (lateral and craniocaudal). In 208 cases (31.3%), the wire-tip was on the target, in 329 (49.6%) it was less than 1 cm away from the lesion, in 105 (15.8%) the distance was 1-2 cm, and in 22 cases (3.3%) the hook-wire was more than 2 cm off the target.

A second wire was required in nine cases, where the distance of the first wire-tip from the lesion was unacceptable. In another patient, the wire was inserted into the pectoralis major muscle, while in eight cases the wire hook was broken during the biopsy procedure. In all of these cases the hook was found intraoperatively and removed without additional mammograms and with no further complications.

Successful excision of the lesion was achieved at the first attempt in 598 cases (90%). In 57 cases (8.6%), a wider excision followed at the same operation as the lesion was not seen in the specimen mammography or it was partially removed. In seven cases (1.1%) three attempts were required and in two patients (0.3%) the lesion was excised only after the fourth attempt.

All of our patients underwent mammography six months after the operation. In four of them the lesion (3 cases with solid mass and 1 with radiological distortion) proved to still be in place. In all these patients, the specimen radiograph was false-positive, as it wrongly confirmed successful excision of an area of abnormal breast architectural configuration.

Pathologic examination revealed carcinoma in 172 (25.9%) of the 664 needle localized breast biopsy specimens. In the remaining 492 cases (74.1%), benign breast disease was diagnosed, among which adenosis (123 cases, 18.5%), fibroadenoma (106 cases, 16%), and fibrocystic changes (50 cases, 7.5%) were the most common findings (Table 1).

The relationship between breast cancer and mammographic findings is shown in Table 2. Lesions with microcalcifications carried a greater risk of malignant disease (34.7%) than those without microcalcifications (17.6%). Furthermore, in this series we performed 370 biopsies in patients ≤ 50 years old and we found 60 cancers (16.2%), while in the remaining 294 cases, in patients > 50 years old, we found 112 cancers (38.1%); it is prominent that as age increases the percentage of malignancy also rises.

Among the 172 cancers, 114 (66.3%) were in situ and 58 (33.7%) invasive, ranging in tumor diameter from 0.3 to 2.0 cm (mean diameter ± 1 SD = 0.84 ± 0.25) (Table 3). There were two patients with synchronous bilateral ductal carcinoma in situ (DCIS) and in two other patients two invasive carcinomas in different quadrants of the same breast were detected by performing two separate localizations.

Table 1. — *Histology of 664 lesions in 630 patients.*

Findings histologic	Number of lesions	%
Cancer	172	25.9
Adenosis	123	18.5
Fibroadenoma	106	16.0
Fibrocyctic disease	50	7.5
Sclerosing adenosis	48	7.2
Ductal epithelial hyperplasia	47	7.1
Papilloma	22	3.3
Duct ectasia	17	2.6
Fibrosis	15	2.2
Cyst	15	2.2
Radial scar	14	2.1
Lobular hyperplasia	10	1.5
Fat tissue necrosis	9	1.4
Lymph node	8	1.2
Adenosis tumor	5	0.8
Amartoma	3	0.5
Total	664	100

Surgical procedures performed following the positive-for-malignancy frozen section or the final histologic report, included 20 mastectomies and 150 wide local excisions (WLE). Axillary lymph node dissection was performed in 101 patients; in all invasive cancer cases (n: 58) and in 43 cases with DCIS when histology showed microinvasion or comedo type of cancer or large size of the tumor. Positive lymph nodes were found in 14 (8.2%) cancer patients, all of which had invasive tumors. The percentage of lymph node involvement among patients with invasive carcinomas was 25%.

A few complications were reported in our series; wound infection (n: 4), axillary seroma (n: 4), hematoma (n: 2), deep venous thrombosis (n: 2), and pulmonary embolism (n: 1). All these complications were successfully managed by conservative treatment.

Table 2. — *Malignancy rate related to mammographic finding.*

Mammographic findings	Number of cases	Number of cancers	Malignancy rate (%)
Microcalcifications	323	112	34.7
Parenchymal distortion	95	18	19.0
Solid mass	246	42	17.1
Total	664	172	25.9

Table 3. — *Specific histologic characteristics of the 172 cancer cases.*

Histologic types of cancer	Number of cases
Lobular carcinoma in situ (LCIS)	6
Ductal carcinoma in situ (DCIS)	93
Ductal carcinoma in situ with microinvasions	15
Ductal invasive cancer with negative axilla	42
Ductal invasive cancer with invaded lymph nodes	14
Lobular invasive cancer (with negative axilla)	1
Papillary invasive cancer (with negative axilla)	1
Total	172

Discussion

Increasing numbers of women undergoing screening mammography have led to an increasing number of nonpalpable breast lesions being detected. Besides the surgical biopsy following needle localization techniques, which is diagnostic and also therapeutic as it is followed by appropriate local surgical management, other diagnostic strategies have been developed; Ultrasound-guided or stereotactic fine needle aspiration cytology [3, 4], stereotactic or image-guided large-core needle biopsy [5-9], vacuum assisted breast biopsy on digital stereotactic table [10], and advanced breast biopsy instrumentation (ABBI) [11] have been reported to be cost saving, less invasive and could prevent unnecessary surgery [5, 7].

However the results are less accurate than those achieved by open surgical biopsy [5, 12]. Moreover, as stereotactic equipment is expensive, the cost of stereotactic needle aspirations or core biopsies depends on the extent of the centralization of the facility [13]. Most importantly, however, these above-mentioned minimally invasive techniques, in case of cancer, can not provide accurate data about the tumor size and the clear margins of the specimen. Additionally they all have limitations due to the position of the lesion in the breast in relation to the skin, the nipple-areola complex and the thoracic wall [5, 11]. Specifically, the ABBI system, which could provide more accurate information of the excised breast lesion than the other methods, has limitations related to the size of the instrument compared to tumor size [11]. Finally they all lack sufficient experience in follow-up considering local recurrences.

Excising a nonpalpable breast lesion without a localizing procedure could lead either to resection of an excessive amount of breast tissue or to an unsuccessful excision. On the contrary, preoperative needle localization offers the opportunity of a quick, accurate excision, with minimal trauma and less tissue disruption [14, 15].

Controversy exists about what we consider as successful preoperative localization. Generally distances between the hook wire and the lesion of < 1 cm are also considered as "successful" localization and distances of 1-2 cm are considered "acceptable" [16]. With > 80% of the hooks being within 1 cm of the target and > 95% within 2 cm, the surgeon can successfully excise the lesion in > 90% of the cases [14, 16].

Specimen mammography will almost always confirm the success of the biopsy. False-positive results are rarely encountered [14, 17], and concern areas of architectural abnormalities or lumps, while microcalcifications are more easily identified on the specimen radiograph. A follow-up mammogram a few months (usually six) after the biopsy is necessary in order to exclude false-positive results of specimen mammogram or residual abnormalities.

Many breast surgeons perform needle localized biopsies on an ambulatory basis under local anesthesia [14, 15, 18, 19], do not send the specimen for a frozen section [18, 20, 21], and postpone definite surgery until the pathologic report of permanent sections is available [15, 18, 20, 21]. Our policy is to perform the biopsies under general anesthesia and proceed to definite surgery at the same time in most of our cases, according to the results of frozen section examination. The comparison between frozen and permanent paraffin section diagnoses justified our strategy, proving that frozen section examination was accurate in all of our cases in terms of positivity for malignancy. Reports in the literature verify our results, documenting the accuracy and reliability of frozen section diagnosis in nonpalpable breast lesions [21, 22].

The hook-wire localizing breast biopsies of our series did not encounter factors responsible for biopsy failure; unsuccessful excisions are referred to be more likely with two or more lesions per breast, small lesions, small surgical specimens and small clusters of microcalcifications [23].

Several large series of nonpalpable lesions have been reported with 10-50% of biopsy specimens proven to be malignant [15, 17, 20, 23-29]. An important factor influencing the malignancy rate is the proportion of the patients who had an open breast biopsy because of suspicious microcalcifications, that carry a higher risk of cancer (> 20%) compared to other nonpalpable lesions (7-12%) [15, 17, 30]. Our results of an increased cancer rate among patients with microcalcifications are being reported by the present and other series of our Unit [31]. Another parameter related to cancer rate is the degree of suspicion required for a lesion to be excised. Highly suspicious mammographically detected lesions have proven to be malignant in > 60% of the cases, while probably benign lesions were malignant in only 5-10% of the cases [14, 25].

It is remarkable that a large proportion of the nonpalpable cancers are non invasive [14, 15, 18, 20, 22, 29, 32, 33]. This is extremely important because mammographically detected DCIS is not related to axillary node metastases [18, 33-35]. However, it is our policy to treat DCIS of large size, comedo type or with multiple microinvasions in the same way as any invasive cancer of the same size.

Our malignancy rate of 25.9% and our 66.3% rate of in situ carcinomas are similar with those of other reports [25-27,30]. The belief that nonpalpable DCIS is almost never accompanied by axillary node metastases is confirmed by our study, where axillary lymph node dissection (level I) was performed in 43 patients with DCIS, yielding a negative result in all of them.

Among 56 patients with invasive tumors who all underwent axillary lymph node dissection, only 14 (25%) had axillary node metastases. This number is similar to those reported in other series (5-30%) [15, 17, 18, 24, 25, 33, 34], and much lower than the overall 40-50% incidence of axillary metastases for women with breast cancer [14, 25]. The prognostic significance of axillary node invasion is obvious. However, a nonpalpable cancer should not be considered as a "harmless" cancer because of its small size. It has been shown that the incidence of axillary lymph node metastases is significant, even for cancers less than 1 cm [18, 24], which was also observed in our previous series [34]. Nevertheless, it is an indisputable fact that the smaller the primary cancer the lower the incidence of positive axillary lymph nodes [34, 35].

In this context, the ability of screening mammography in combination with needle-localization surgical procedures to detect a high percentage of in situ and small invasive breast cancers justifies its use. We therefore believe that the benefits of early diagnosis and proper surgical treatment in a one-step procedure of breast cancer in about 25-30% of patients undergoing needle localized breast biopsy greatly outweighs the physical and psychological costs of benign breast biopsy in the majority (about 70-75%) of patients.

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