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## Predicting invasion in mammographically detected microcalcification: a preliminary report

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### Abstract

**Background:** With the increased use of mammography for breast cancer screening, the diagnosis of ductal carcinoma in situ (DCIS) too has increased. This study was carried out to identify clinical and radiological factors that may predict the presence of invasive disease within mammographically detected microcalcification.

**Materials and methods:** A retrospective analysis of 13 vacuum-assisted breast biopsies (Mammotome®) of mammographic calcification, which were reported to be either DCIS or invasive disease on final histopathology, was carried out. Final surgical pathology was correlated with pre-operative features (clinical, radiological and core histology) to predict the presence of an invasive component.

**Results:** The overall sensitivity of Mammotome® was 81.8%, while for invasion it was 50%. Small size, granular morphology, increased number and area of calcification cluster may help in predicting invasion on mammography.

**Conclusions:** Mammotome® biopsy fails to detect invasion correctly in half the cases despite ascertaining correctness of biopsy with post biopsy x-ray.

### Introduction

The diagnosis rate of ductal carcinoma in situ (DCIS) has increased markedly in recent years due to increasing use of mammography and the widespread introduction of breast cancer screening. Typically, 15 to 30% of lesions detected through screening programs are DCIS [1], and most of these present as mammographic microcalcification.

To establish a preoperative diagnosis, stereotactic automated core needle biopsy (SCNB) has been used [2-4]. However up to 20% of the lesions diagnosed as DCIS by

SCNB show foci of invasion on histopathological examination after surgical resection of these lesions [2-4]. In an attempt to overcome shortcomings of SCNB, vacuum-assisted needle devices such as the Mammotome® have been introduced [5,6].

This study was performed in order to determine the value of radiological and core biopsy features obtained using Mammotome® in predicting invasive disease in patients with non-palpable microcalcifications.

**Table 1: Malignant Mammotome® biopsies and prediction of invasive disease**

	Definitive diagnosis		
	DCIS	Invasive	Total
Mammotome® Diagnosis			
ADH	0	2	2
DCIS	5	2	7
Invasive	0	4	4
Total	5	8	13

**Table 2: Calcification morphology and risk of invasion**

Calcium morphology	DCIS	Invasive
Linear	1	0
Granular	2	6
Punctate	2	2

P = 0.29

## Material and methods

A retrospective analysis of 95 patients undergoing vacuum-assisted breast biopsy (Mammotome®, Johnson & Johnson, USA) for mammographic microcalcifications without an associated mammographic or clinically palpable mass was performed. Two-view mammography and magnified view of the calcification clusters were available for review in each case. The maximal diameter of the lesion was measured from standard mammography and the number of calcifications and morphology of the most suspicious calcification within the cluster (punctate, granular or linear) were recorded from magnified views.

The lesions were biopsied with a combination of Mammotome® and GE Stenographer DMR® (GE Medical Systems, Buck, France) as an upright type stereotactic mammography unit between May 2000 and December 2002. Age ranged from 28 to 77 years, with a mean of 46.9 years. Biopsy was normal in 82 (86.3%) and these subjects were excluded from further analysis. The rest 13 case forms the basis of this report. The procedure was described previously [5,6] and the tissues obtained were examined radiographically to determine whether the lesions had been correctly biopsied.

All of these 13 patients underwent either therapeutic wide local excision or simple mastectomy. Surgical histology was reviewed and notation was made of the pathological grade of the DCIS and the presence of invasion. Microinvasion, defined as the presence of invasive cells extending

less than 1 mm beyond the basement membrane, was recorded as DCIS. The clinical, radiological and core histological features of the lesions were correlated with final surgical histology. Sensitivity of Mammotome® biopsy was calculated.

## Results

Mammotome® biopsy diagnoses are shown in Table 1. Of the 13 cases, 7 were diagnosed as DCIS and 4 as invasive carcinoma, while the final diagnosis was DCIS in 5 cases and DCIS with invasive disease in 8 cases. The sensitivity of Mammotome® diagnosis was 81.8%, while it was 50% for predicting invasion. The specificity cannot be calculated as the study sample constituted only histology positive cases and hence there were no true negative diagnoses.

Out of 8 cases with invasion, 6 showed granular microcalcifications; however no significant relationship between the morphology of the calcifications comprising the cluster and risk of invasion could be established (Table 2). Punctate clusters showed similar rates of invasive disease as that of DCIS. No invasive disease was found in predominantly linear clusters. The mean size of the clusters was 9 mm ranging from 1 to 30 mm. Five cases of invasive carcinoma had clusters <11 mm in size (Table 3), similarly 6/8 invasive carcinoma had more than 40 clusters (Table 4). No correlation was demonstrated between risk of invasive disease and increasing size and number of cluster. However, there was a significant trend of increased risk of inva-

**Table 3: Calcium cluster size and risk of invasion**

Cluster size (mm)	DCIS	Invasive
<11	2	5
11–30	3	3

P = 0.82

**Table 4: Number of calcification clusters and risk of invasion**

Number	DCIS	Invasive
1–40	3	2
>40	2	6

P = 0.49

**Table 5: Area of calcification and risk of invasion**

Area of calcification (mm <sup>2</sup> )	DCIS	Invasive
<500	5	2
>500	0	6

P = 0.03

sion with small size, number, and increased area of the calcification clusters (Table 5). All the cases of DCIS had clusters <500 mm<sup>2</sup> (P = 0.03), while only 2 cases of invasive cancer were associated with <500 mm<sup>2</sup> clusters.

## Discussion

It is important to diagnose invasive disease preoperatively as this allows patients the opportunity to undergo a single therapeutic operation with appropriate staging and treatment of the axilla. As axillary metastases without demonstrable invasion in the primary tumor are rare, and axillary surgery is associated with significant morbidity, routine axillary lymph node dissection is not recommended for DCIS [7]. Mammotome<sup>®</sup> biopsy too is found to be poor for detecting invasion as 4/8 invasive carcinomas were missed.

Lagios *et al.*, [8] have suggested that the incidence of occult invasion in preoperatively detected DCIS is negligible in mammographic clusters below 25 mm in size, but showed a 44% risk of invasive disease in clusters larger than 25 mm. This has not been the case in our series where some small mammographically detected foci of malignant calcification have shown invasive tumors at histology. This discrepancy may arise from the differing

sampling methods used to diagnose DCIS prior to definitive surgery. Currently, the majority of microcalcifications are assessed percutaneously. However, the area of calcifications was a good method of estimating invasive disease, although calcification morphology and size, or numbers of cluster calcification were not found to be useful predictors of occult invasion. deRoos *et al* too reported no strict association of mammographic appearance with histopathological grade in patients with DCIS [9]. However, use of a poor study design and absence of final histology on 82 cases found to be normal on Mammothome<sup>®</sup> biopsy preclude generalization of these results.

With this limited number of cases it is noted that Mammothome<sup>®</sup> biopsy misses 50% of invasive disease despite ascertaining the correctness of biopsy and hence cannot be recommended as method of choice in non-palpable mammographically detected microcalcification. All the cases found to have DCIS on mammogram should undergo wide local excision and axilla should be treated as per institutional protocol if invasive disease is documented at final histology.

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