

# MARKING OF NONPALPABLE BREAST LESIONS USING A CUSTOM CARBON SUSPENSION

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## Abstract

*Purpose:* To review results of carbon marking in non-palpable breast lesions using a different type of a carbon suspension containing 0.5% polyoxyethylene sorbitan monooleate (PSM).

*Material and Methods:* Sixteen lesions of 16 patients with indeterminate or suspicious mammographic findings underwent stereotaxic carbon marking. With the aid of tracing of the carbon stains surgery was then performed.

*Results:* Pathology revealed malignancy in 26% of the cases and the missed rate by carbon marking was 6% (1 lesion). Carbon marking is an easier application compared to hook-wire systems in localizing occult breast lesions. PSM added to a 4% carbon suspension results in a more homogeneous suspension, prevents early precipitation and eases injection. Animal studies have shown that no local or peripheral tissue reactions are elicited with either pure PSM or in a mixture with carbon.

*Conclusion:* We recommend addition of PSM to carbon marking suspensions.

*Key words:* Breast, mammography; stereotaxis; carbon suspension.

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The incidence of non-palpable breast lesions has greatly increased with the widespread use of mammography in breast cancer screening programs. Two methods, wires and carbon marking, are recommended for localizing these non-palpable lesions (8, 10, 11). This study evaluates the technique and results of carbon marking using a custom 4% carbon suspension containing 0.5% polyoxyethylene sorbitan monooleate (PSM). PSM reduces the surface tension of the suspension, thus a more aqueous suspension with a more homogeneous structure is achieved.

## Material and Methods

Sixteen lesions of 16 patients with suspicious or indeterminate lesions on mammography were marked using a 4% carbon suspension under stereotaxic guidance (600T General Electric mammography device and GE Stereotix). Patient age varied between 34 and 67 years (mean 53

years). Eleven patients were in the postmenopausal and 5 premenopausal periods (Table). Ten of the postmenopausal women were referred to mammography for routine screening before hormone replacement therapy and 1 woman for a suspicious nipple retraction. One patient in the premenopausal period complained of nipple discharge, 3 patients of pain and the last 1 was referred for screening due to a family history of breast cancer. All patients had non-palpable lesions.

After localizing the lesion stereotaxically, a 0.7- to 0.9-mm Chiba needle was inserted. The needle was then slowly retracted while a continuous carbon injection was performed. Care was taken to place the needle tip at the periphery of the lesion. A small amount of carbon was injected subcutaneously at the entrance point on the skin. Following surgical excision, histopathological evaluation was performed. Complete excision of the lesion was considered as a successful result in terms of carbon marking.

**Table***16 cases with non-palpable breast lesions*

Case/Age	Hormonal status	Mammography findings	Biopsy results
1/53	Postmenopausal	Pleomorphic microcalcifications	<i>In situ</i> breast cancer, comedo type
2/67	Postmenopausal	Pleomorphic microcalcifications	Microinvasive breast cancer, <i>in situ</i> breast cancer, comedo type
3/54	Postmenopausal	Mass lesion with spicular contour	Proliferative fibrocystic changes
4/58	Postmenopausal	Mass lesion with spicular contour	Proliferative fibrocystic changes
5/67	Postmenopausal	Mass lesion with spicular contour	Invasive ductal cancer
6/44	Postmenopausal	Mass lesion with spicular contour	Proliferative fibrocystic changes and radial scar
7/45	Postmenopausal	Mass lesion with moderate opacity	Fibroadenoma
8/55	Postmenopausal	Mass lesion with ill-defined borders	Lesion not excised, failure
9/49	Postmenopausal	Mass lesion with ill-defined borders	Fibrocystic changes
10/68	Postmenopausal	Pleomorphic microcalcifications	Fibrocystic changes
11/49	Postmenopausal	Mass lesion with moderate opacity, partially lobulated contours	Invasive ductal cancer
12/42	Premenopausal	Microcalcification and mass lesion	Intraductal papilloma and fibrosis
13/36	Premenopausal	Asymmetrical density	Proliferative fibrocystic changes
14/34	Premenopausal	Asymmetrical density	Non-proliferative fibrocystic changes
15/39	Premenopausal	Asymmetrical density	Proliferative fibrocystic changes
16/38	Premenopausal	Mass lesion with moderate opacity	Fibroadenoma

### Results

Overall evaluation revealed that malignancy could be detected in 4 of 15 lesions (26%). The missed rate was 6% (1 lesion) due to unsuccessful carbon marking. In this lesion, probably during injection of the carbon suspension, a gap occurred along the needle route and excision was performed at this gap point.

### Discussion

The needle-wire systems recommended for localization of non-palpable lesions have some disadvantages, such as the possibility of wire migration, the necessity to perform the procedure soon before surgery, the risk of cutting the needle during operation and a relatively high cost (3, 9).

Carbon marking of non-palpable breast lesions was first introduced by SVANE (11), who used a pure carbon suspension. All studies performed afterwards also applied pure suspensions. However, we have encountered difficulties in the injection of this material due to precipitation within the needle and therefore added PSM to the carbon suspension. PSM reduces the surface tension of suspensions and helps to acquire a more homogeneous nature after vigorous shaking of the suspension (2, 4, 12). Thus, precipitation of the suspension is delayed until a continuous and uninterrupted injection can be performed and needle obliteration during injection is prevented.

Animal studies have previously been conducted to evaluate local tissue reactions (1). In this study, pure carbon suspension, carbon-PSM suspension

and pure PSM suspension were injected subcutaneously in the abdominal area of Wistar albino rats. Compared to pure carbon, carbon-PSM suspension showed a milder degree of tissue reaction for all histological parameters; however, none of these were significant enough to interfere with the evaluation of tissue structure.

In the breast biopsy specimens in our study, the injected suspension caused no distortion or additional pathologic changes that could mask the major pathology.

The missed rate for needle-wire systems has been reported as 1–10% (5–7). In our current study, the missed rate for carbon marking was 6% (1 lesion). In this patient, the probable cause for failure was interruption of the carbon tract during injection and the lesion was localized deeper than the area of excision. Reporting the length of the injection path, starting from the point of needle insertion, may help in preventing such errors.

*In conclusion*, though the number of patients in our study is limited, carbon suspension mixed with PSM suspension adds to the advantages of carbon marking that have previously been reported.

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