

Radioguided occult lesion localisation in combination with detection of the sentinel lymph node in non-palpable breast cancer tumours

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Summary

Purpose of the investigation: The aim of study was to determine the efficacy of radioguided occult lesion localisation (ROLL) for non-palpable invasive breast cancer combined with sentinel lymph node biopsy (SLNB) and to compare the amount of tissue excised by radioguided navigation versus the hook-wire technique.

Methods: We injected 45 MBq of radiolabelled technetium intratumourally and 15 MBq subdermally 18 hours before surgery in 21 women with bioptically verified non-palpable breast cancer. We identified by gamma probe non-palpable tumours, which were excised, followed by identification and excision of the sentinel lymph node. We compared our results with a group of 12 women with non-palpable lesions marked by hook-wire localisation.

Results: ROLL combined with SLNB was successful in 100%; volume of excised tissue was smaller in the hook-wire group but expressed higher variability in volume than in the ROLL group although the difference was not statistically significant.

Conclusion: The method of ROLL combined with SLNB is technically possible and safe, resulting in minimisation of the surgical intervention and a decrease in postoperative morbidity. ROLL was more precise than the hook-wire procedure even though the amount of tissue excised was the same in both groups.

Key words: Radioguided occult lesion localisation; Sentinel lymph node biopsy; Breast cancer; Surgery.

Introduction

Experience with radioguided navigation involving dissection of the sentinel lymph node led to a new protocol in the detection and excision of non-palpable or small breast cancer tumours [1-3]. The introduction of mammographic screening resulted in an increase in the number of small and non-palpable breast tumours. This group of tumours has a low rate of lymph node metastasis and can profit most from the sentinel lymph node detection procedure. The frequency of sentinel lymph node involvement in our department is given in Table 1. The fact that 10% of tumours of a size smaller than 10 mm exhibited lymph node involvement confirms the need for lymph node staging.

The aims of this study were twofold: to determine the efficacy of radioguided occult lesion localisation (ROLL) in breast cancer in combination with the detection of the sentinel lymph node and to compare the amount of tissue excised by radioguided navigation versus the hook-wire technique.

Materials and Methods

ROLL with sentinel lymph node biopsy (SLNB) was performed in 21 patients with bioptically verified non-palpable breast cancer between the years 2003 and 2005. We injected 0.2-0.5 ml MBq of radiocolloid (^{99m}Tc Senti-scit, Fodor Jozef NCPH, Fed. J. Curie, NRI, Radiob, Budapest) intratumourally and 0.1-0.2 ml subdermally to the quadrant of the tumour under sonographic guidance. Lymphoscintigraphy was performed three hours after the application. The next day, approximately 18-20 hours after the application, a lesion was identified during the surgical procedure using a hand-held gamma probe. A small incision was made above the tumour, followed by surgical excision with a healthy margin that expressed much lower radioactivity. The tissue sample was oriented and sent for routine histopathologic examination. From a separate incision in the frontal axillary line the sentinel lymph node was identified using the gamma probe. The lymph node was then sent for frozen-section histopathologic examination using a two-section technique. In case of a negative result from the frozen section total axillary lymphadenectomy was abandoned.

Histopathologic examination: the sentinel lymph node was cut into two halves in the greatest diameter, snap-frozen in liquid nitrogen and sectioned for peroperative histopathologic examination. The rest of the tissue was then defrosted, and together with the other half, fixed in 10% purified formol for 24 hours and finally fixed in paraffin. The paraffin embedded sections were stained with hematoxylin-eosin. Next, 0.2 mm serial sectioning of the paraffin block was performed, followed by immunohistochemical examination: polyclonal antibodies cyto-ceratin large spectrum (Immunotech), anti-human cyto-ceratin AE1/AE3 (Dako), monoclonal antibodies anti-human cyto-cera-

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Table 1. — Frequency of sentinel lymph node involvement as a function of tumour size.

Tumour size cm	Cases		Involved SLN	
	number	%	number	%
≤ 1	61	36	6	12
1 - 2	63	37	20	42
≥ 2	45	27	22	46
Total	169	100	48	100

tine – clone MNF 116 (Dako) and monoclonal antibodies anti-human epithelial membrane antigen (EMA) (Dako). The reactions were visualized by diaminobenzidin - DAB (Fluka).

We compared our results with the group of 12 women with non-palpable lesions that were localised using the hook-wire technique. Hook-wire localization was performed on the day of surgery using stereotactic mammographic guidance (wire placed into the centre of the lesion). After excision of the non-palpable lesion, a specimen mammography was performed, followed by regular histopathologic examination.

All histologic samples were measured in three directions (A,B,C) and the volume was calculated for both samples using the ellipsoid formula $(\pi/6)*A*B*C$. The F test was used to test equal population variances. The two-sample t-test (for equal variances according to the result of the F test) was applied to compare mean volumes of the ellipsoids. The normality of the ellipsoid volumes can be assumed based on the Kolmogorov-Smirnov test.

Results

The patients' average age was 60 years (range 44-78 years). In the ROLL group of 21 patients a conservative procedure was performed in 16 (76%) patients and mastectomy in five (24%). In the hook-wire group of 12 patients a conservative procedure was performed in ten (83%) patients and mastectomy in two (17%). The indications for mastectomy were the multifocality of breast cancer or the excessive intraductal component of the cancer.

Tumour-free margins were achieved in all cases greater than 3 mm in both groups. The sentinel lymph node was identified in all 21 (100%) patients in the ROLL group, expressing macrometastasis (tumour greater than 2 mm) in two of these patients (9.5%). Axillary lymph node dissection was performed in two (9.5%) patients in the ROLL group. The indication for axillary lymph node dissection was frozen section positive lymph nodes in all patients. After regular histopathologic examination using serial sectioning micrometastasis (metastasis smaller than 2 mm) in originally frozen section negative lymph nodes, metastasis was revealed in one patient (4.7%) in the group with the ROLL procedure.

The histopathologic findings revealed ductal invasive carcinoma in 13 (62%) patients in the ROLL group and in all 12 (100%) patients in the hook-wire group. Furthermore, in the ROLL group lobular invasive carcinoma was found in five (24%) patients and ductolobular carcinoma in three (14%) patients.

The descriptive characteristics according to the volume of tissue excised for the two procedures (i.e. ROLL and

hook-wire) are presented in Table 2. Although the patients in the hook-wire group expressed higher variability in volume than the patients in the ROLL group, the difference did not reach statistical significance ($p = 0.1$). The average volume was found to be higher in the patients in the ROLL group but again the difference was not statistically significant ($p = 0.86$). Confidence limits for the mean volumes are depicted in Figure 1. In the figure the higher variability and greater number of observations in the hook-wire procedure correspond to the lower occurrence of the estimated mean and wider confidence interval for this procedure.

Table 2. — Descriptive statistics for ellipsoid volumes.

Procedure	n	Mean mm ³	SD mm ³	Lower limit mm ³	Upper limit mm ³
Hook-wire	12	18,990	15,935	8,865	29,114
ROLL	21	19,813	10,446	15,058	24,568

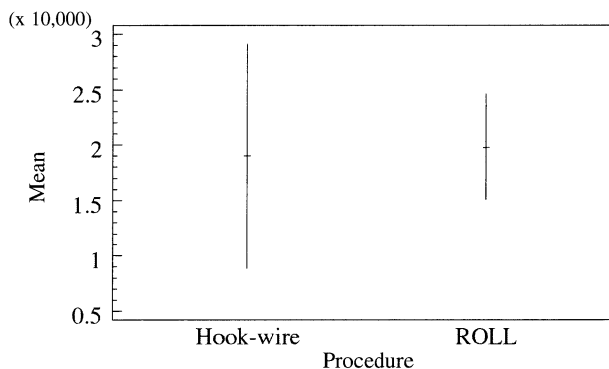


Figure 1. — 95% confidence limits for the mean volume of the ellipsoid.

Discussion

In comparing both procedures of non-palpable lesions we found ROLL to be more precise than the hook-wire procedure in preventing abundant tissue loss. The tumour was always excised completely. In accordance with Audisio *et al.* [4], Patel *et al.* [5] and Ronka *et al.* [6], the tumour-free margins were always achieved with the ROLL procedure as was the case with the hook-wire method.

The main advantage of the ROLL method is the combination of the detection of a non-palpable lesion and the sentinel lymph node in one procedure [7]. In our original set of 169 patients with SLNB followed by complete axillary dissection agreement between the negative results of SLN and the rest of the axillary lymph nodes was 100% [8]. In addition, the method of frozen section proved sufficient in estimating lymph node status. Consistent with other authors we found a one-third reduction in surgery time as well as smaller tissue loss and thus a better cosmetic result [9]. According to the literature the length of hospitalisation stay is shorter and morbidity is reduced [10].

The method of ROLL combined with SLNB is easy, more precise and more effective than other methods. The main disadvantages are the cost of the procedure and the necessity to co-ordinate several departments. The hook-wire procedure, on the other hand, presents a high number of failures in that the top of the wire may fail to be placed in the centre of the lesion or it may be dislocated during the transportation of the patient. In these cases greater volume is needed to excise the tissue.

Conclusion

ROLL of non-palpable tumours is a simple, fast and tissue-sparing procedure. It is more precise than the hook-wire procedure. The method of ROLL combined with SLNB as described in the article proves to be technically possible and safe. ROLL combined with SLNB provides better results in terms of destruction of the tissue and amount of tissue excised. A negative result of the sentinel lymph node enables us to leave out lymphadenectomy, leading to minimalization of the surgical intervention, a reduction in postoperative morbidity and better cosmetic results.

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