The Breast 29 (2016) 8–13

Contents lists available at ScienceDirect

The Breast

journal homepage: www.elsevier.com/brst

Original article

Efficacy of localization of non-palpable, invasive breast cancer: Wire localization vs. Iodine-125 seed: A historical comparison

B.A. in 't Hout [a, *], K.E. Schenk [a], A.N. van der Linden [b], R.M.H. Roumen [a, c]

[a] Department of Surgery, Máxima Medical Centre, P.O. Box 7777, 5500 MB Veldhoven, The Netherlands
[b] Department of Radiology, Máxima Medical Centre, P.O. Box 7777, 5500 MB Veldhoven, The Netherlands
[c] Maastricht University Medical Centre, School GROW, P.O. Box 616, 6200 MD Maastricht, The Netherlands

ARTICLE INFO

Article history:
Received 13 September 2015
Received in revised form
18 April 2016
Accepted 11 June 2016
Available online 1 July 2016

Keywords:
Breast cancer
Iodine-125 seed
Wire localization

ABSTRACT

Background: To achieve radical tumour excision in non-palpable breast cancer accurate tumour localization is essential. Historically, this has been achieved by wire localization (WL). Recently, new techniques like Iodine-125 seeds (IL) have become available. The aim of this study was to determine whether the results in case of IL are better than when WL is used.
Method: A consecutive series of patients operated on because of non-palpable breast cancer was analysed. Between January 2007 and April 2011 WL was method of choice. From April 2011 till January 2013 IL was introduced and became the standard procedure.
Primary outcomes were: success rate of (peri-) operative localization and radicality of the excision. Secondary outcomes were duration of operation and volumes of the excised tissue specimen.
Results: A total of 236 women were included; 149 women underwent WL and 87 women IL. The overall success rate for WL was 93.3%. In 10 patients (6.7%) WL failed because of peri-operative dislocation of the wire compared to only one failure to locate the seed in de postoperative specimen in the IL-group (1.1%, $p = 0.098$).
Radical resection was obtained in 126/149 (84.6%) of the WL-patients, in comparison with 81/87 (93.1%) in the IL-group ($p = 0.054$).
Median operation time and volume of the specimen was not significantly different between both groups.
Conclusion: Localization of non-palpable breast cancer using Iodine-125 seeds is, at least, as good as the standard wire localization procedure.

Introduction

Due to the widespread implementation of screening programs and improvements in diagnostic techniques breast cancer is being detected in an earlier stage [1,2]. In 25–35% of early breast cancers the lesion is classified as non-palpable [3–5]. Biopsies can be taken under ultrasound or stereotactic guidance. However, surgical removal of non-palpable tumours is still challenging. Achievement of irradical resection varies from 13 to 58% [4–10]. To facilitate resection with minimal yet sufficient margin, several localization procedures can be used. The oldest and gold standard is wire localization (WL[1]) [11]. Under ultrasound or stereotactic guidance a metal hooked wire is placed in, or near the tumour by an expert radiologist (Fig. 1a). Position of the tumour compared to the tip and windings of the wire on mammogram guide the surgeon during resection. Several disadvantages of this technique have been reported. For example, the inability to confirm the exact site of a lesion in the breast by the surgeon, or microscopic positive margins requiring additional operations. Next planning conflicts between the surgical and the radiological departments can occur, resulting in complex coordination of multiple procedures on the same day. This makes the wire localization procedure not suitable in case a patient should be planned as first operation on the morning programme [6]. The last aspect often results in wires being placed the day before the actual breast surgery. Besides discomfort for the patient, this adds to the risk of dislocation of the wire [8]. Dislocation of wires has been reported to occur between 0.4 and 3% [4,12].

* Corresponding author. Tel.: +31 40 8886230.
E-mail address: bainthout@hotmail.com (B.A. in 't Hout).
[1] WL: Wire localization, IL: Iodine-125 seed localization

http://dx.doi.org/10.1016/j.breast.2016.06.011
0960-9776/

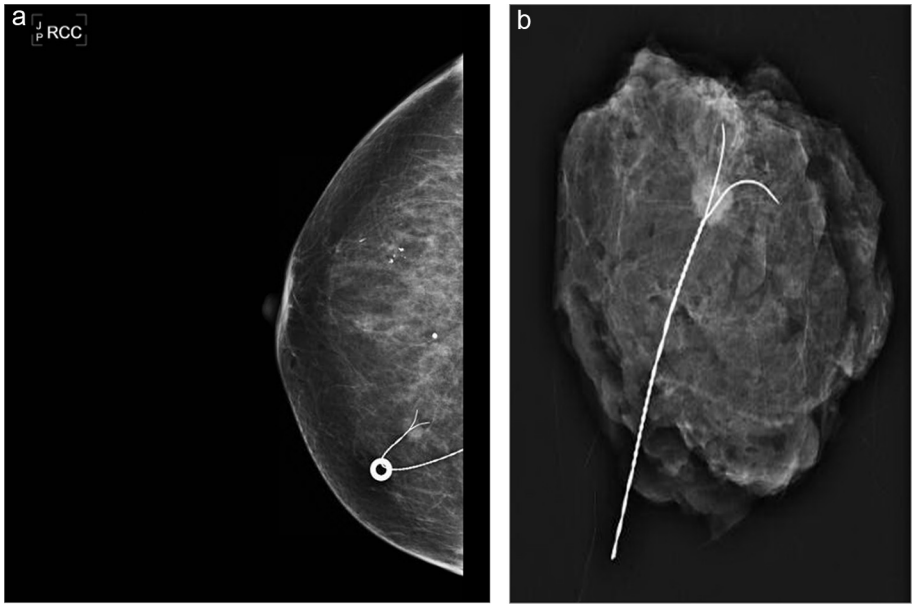

Fig. 1. a. Mammogram showing a non-palpable lesion localized with a guidewire (the ring is located on the surface of the skin). b. Radiography illustrating the resected specimen.

Currently, other methods of localization have been described, such as ROLL (radio guided occult lesion localization) and IL (Iodine-125 seed localization) [3–8,12–16].

The aim of the present study was to determine whether the clinical success rate, operative aspects and the radicality of tumour removal of the iodine-125 seed guided excisions of non-palpable breast cancer, was at least equal or superior to the guidewire procedure.

Patients and methods

All patients who underwent a lumpectomy for non-palpable breast cancer between January 2007 and January 2013 were identified from our prospective electronic hospital patient database. Diagnosis of breast cancer was made by either fine needle aspiration (FNA) cytology or histological core needle biopsy. Final confirmation of breast cancer was by histology of the resected specimen. Due to the nature of DCIS and its spread within the breast tissue and consequent resection margin problems, we excluded patients in whom final pathologic analysis of the specimen showed DCIS only. All other patients diagnosed with non-palpable breast cancer were included in this study.

Technique of localization

The tumour was marked either by a hooked wire or an Iodine-125 seed using radiological guidance, either by ultrasound or stereotactically. The wire was placed following the description by Frank et al. [11]. The radioactive seed is a titanium seed containing 3.7–10.7 MBq of ^{125}I, emitting 27 keV of gamma radiation (Bard Brachytherapy, Inc, 295 E Lies Road Carol Stream, IL 60188 US, United States). The Iodine-125 seed is introduced through an 18-gauge needle. The tip of the needle is occluded with bone wax, the radioactive seed loaded, and a stilette loosely placed into the needle. Once guided in or near the breast lesion, the seed is deployed into the breast parenchyma through the bone wax by advancing the stilette. In both cases the appropriate placement was confirmed by mammography (Figs. 1 and 2a).

Surgical technique

In the wire localization group (WL-group) a lumpectomy was performed guided by the wire. In the Iodine-125 seed localization group (IL-group) the location of the seed in the breast was determined using a gamma-probe. A lumpectomy was performed under continuous guidance of the gamma-probe. With the gamma-probe it is possible to determine the deepest border of the seed and thus of the lumpectomy itself, since the location of the seed, in relation to the tumour, can be known pre- or perioperatively by the post localization mammogram.

From the operating room all specimen were first taken to the radiology department, for radiographical confirmation of presence of the lesion and the locator in the specimen (Figs. 1 and 2b). Afterwards the specimen was sent to the pathology department, for histopathological analysis. For safety reasons the Iodine-125 seed-containing specimen was always transported in a lead container.

Definitions

Success or failure of localization procedure was defined by reported presence (or absence) of the locator in the specimen, by the radiologist or the pathologist, or by the surgeon, in case of specific perioperative complications (like dislocation).

Time between tumour localization by the wire or seed and operation was recorded in days.

Operating time, in minutes, was defined as time between start of skin incision and closure of the last wound. Our electronic hospital patient database does not support timing of multiple procedures per patient. As the average time needed for the sentinel lymph node biopsy (SLN) is not depending on the method used for localization of the breast tumour, we only included patients in whom a lumpectomy and SLN were done during the same session, for comparison of duration of operating time. For this comparison therefore patients with lumpectomy only and those with an axillary lymph node dissection (ALND) in the same operation, were excluded concerning this item only.

Definitive determination of type of tumour, as well as the tumour size, in millimetres, and its margins was performed by