Original article

Sentinel lymph node biopsy in patients with operable breast cancer treated with neoadjuvant chemotherapy

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A B S T R A C T

Aim: To evaluate the accuracy of sentinel lymph node biopsy (SLNB) in operable breast cancer patients treated with neoadjuvant chemotherapy (NAC).

Material and methods: Between January 2008 and 2011, 88 women, mean age 49.4 years, with infiltrating breast carcinoma, were studied prospectively. Patients were T1–3, N0–1, M0. Prior to surgery, the patients received chemotherapy (epirubicin/cyclophosphamide, docetaxel), and trastuzumab in Her2/neu-positive patients. Axillary status was established by physical examination, ultrasound-guided core needle biopsy of any suspicious lymph node. The day before surgery, 74–111 MBq of 99mTc-albumin nanocolloid was injected periareolarly. All patients underwent breast surgery, with SLNB, followed by complete axillary lymph node dissection (ALND). Sentinel lymph node (SLN) was examined by frozen sections, hematoxylin–eosin staining and immunohistochemical analysis or One Step Nucleic Acid Amplification (OSNA).

Results: Mean tumor size: 3.5 cm, histologic type: 69 invasive ductal, 16 invasive lobular and 3 others. Thirty-seven patients had clinical/ultrasound node-positive at presentation. Clinical response of primary tumor to NAC: complete in 38, partial in 45, and stable disease in 5 patients. A pathological complete response was achieved in 25. All patients were clinically node-negative after NAC. SLN identification rate was 92.0%. Six of 7 patients in whom SLN was not found had clinical/ultrasound positive axilla before NAC. SLN accurately determined the axillary status in 96.5%. False negative rate was 8.3%. In 69.4% of patients, SLN was the only positive node. The mean number of SLN removed was 1.7 and nodes resected from the ALND were 13.2.

Conclusion: SLN biopsy after NAC can predict the axillary status with a high accuracy in patients with breast cancer, avoiding unnecessary ALND.

Biopsia del ganglio centinela en pacientes con cáncer de mama operable tratadas con quimioterapia neoadyuvante

R E S U M E N

Objetivo: Validar la biopsia selectiva del ganglio centinela (BGC) en pacientes con cáncer de mama tratadas con quimioterapia neoadyuvante.

Material y métodos: Estudio prospectivo de enero de 2008 a enero de 2011, 88 pacientes con una edad media de 49.4 años, con cáncer de mama infiltrante T1-3, N0-1, M0, tratadas con epirubicina/ciclofosfamida, docetaxel y trastuzumab en Her2/neu positivas. El estatus axilar se estableció por exploración física, ecografía axilar y punción ecoguiada de ganglios sospechosos. El día antes de la cirugía se inyectaron periareolarmente 74-111 MBq de 99mTc-albumin nanocolloide de albúmina. En todas se realizó cirugía mamaria, BGC y linfadenectomía axilar. El ganglio centinela (GC) se analizó por cortes de congelación, hematoxilina-eosina, inmunohistoquímica u OSNA.

Resultados: El tamaño medio del tumor fue de 3.5 cm. Según el tipo histológico, 69 se clasificaron como ductal infiltrante, 16 como lobulillar infiltrante y 3 como de otro tipo. Treinta y siete pacientes tenían axila clínica/ecográfica positiva al diagnóstico. La respuesta clínica del tumor primario fue: 38 completa,
Introduction

Breast cancer is the most frequent tumor in Western women, with the probability of developing the disease before the age of 75 years having been estimated at 8%. This incidence is increasing at an annual rhythm of 1–2% due to the progressive ageing of the population. However, a continued reduction has been observed in the mortality by this disease and 76% of Spanish women with breast cancer remain alive 5 years after diagnosis. This reduction in mortality is due to two fundamental pillars: early diagnosis and the advances in surgical and oncological treatment.1

There are two fundamental premises in breast cancer surgery: acceptance of conservative surgery as the standard treatment and the doubts related to the therapeutic efficacy of axillary lymphadenectomy. In addition, lymphadenectomy produces marked morbidity, with severe and definitive complications such as lymphedema. At present increasingly more breast cancers are diagnosed in early stages, questioning the role of the lymphadenectomy, since most of these patients do not have axillary involvement.2

Scintigraphic and intraoperative detection of the sentinel lymph node (SLN) is currently considered as a standard technique in the surgical treatment of breast cancer with the aim of avoiding unnecessary axillary lymph node dissection at the time of disease staging thereby decreasing the morbidity of this procedure and allowing a more extensive histopathological study. In the last years there has been a clear trend to an increase in the number of patients who may benefit from SLNB in breast cancer, including different indications from those initially considered.3–6

Neoadjuvant chemotherapy (NCT) (preoperative, induction, primary systemic therapy) has been the standard treatment in women with inoperable, locally advanced or inflammatory, breast cancer, with evidence supporting its use in early stages.7,8 The indication of NCT is adequate in patients with tumors of 3 cm or even smaller when conservative surgery is not possible. Patients with operable breast cancer have tumors in stages I to III-A (T1–T3, N0–N1, M0) and may be treated with multiple therapeutic strategies.7 The administration of NCT has the following possible advantages: it converts an initially non-surgical breast cancer into one that is operable, increases the number of conservative surgeries, evaluates the sensitivity of the tumor to chemotherapy in vivo, initiates systemic treatment early and is a model for clinical or translational investigation. The potential disadvantages include: delay in local treatment, the risk of progression during treatment and imprecise axillary staging.8

Neoadjuvant chemotherapy has classically been considered a contraindication for SLNB since the fibrotic changes produced in the primary tumor and in the axillary region (in both the lymph nodes and the lymph channels) and the presence of cellular material or metastatic emboli in the lymph channels of patients with tumors in more advanced stages could cause obstruction of lymph flow or deviation to other lymph node stations. Likewise, the response of the lymph nodes to chemotherapy may not be uniform, not being the sentinel lymph node (SLN) in these cases and reflecting axillary status. Nonetheless, numerous groups have reported their experience with SLNB after NCT, albeit with contradictory results.9–12

At present the convenience of performing SLNB prior to or after primary systemic treatment is under question, as are the advantages or disadvantages of when it should be performed. If the fundamental objectives of SLNB are correct staging and avoidance of unnecessary lymphadenectomies in patients without lymph node involvement, it seems logical that both objectives may be achieved if this diagnostic procedure is selectively carried out prior to or after NCT.12–13

The main objective of this study was to attempt to validate SLNB with periareolar injection of a radiotracer in patients with operable breast cancer previously treated with primary systemic chemotherapy.

Materials and methods

Study design

We performed a descriptive study of a series of prospective cases. The method followed for accreditation of the procedure is statistical validation of a consecutive registry of cases. The relationship between the histological results of the SLN and its correspondence with axillary lymph node status was analyzed as were the main clinical characteristics of the patients: age, menopausal status, size and localization of the tumor in the breast, axillary status at diagnosis, histological tumor type, clinical and pathological response of the tumor. We also compared the results obtained with our values in the SLNB validation phase in patients with breast cancer in early stages without primary systemic treatment.16

Patients

From January 2008 to January 2011 we prospectively studied 93 women consecutively selected from among patients referred to the Functional Oncologic Breast Cancer Unit of the University Hospital Virgen de las Nieves in Granada who fulfilled the following inclusion criteria: operable breast cancer histologically confirmed by thick needle biopsy puncture who had undergone preoperative primary systemic chemotherapy, breast cancer surgery and SLNB with immediate axillary lymphadenectomy. We excluded women with inflammatory breast carcinoma, previous breast surgery or axillary or breast radiotherapy, multifocal or multicentric tumors, systemic metastatic disease or second neoplasm, women who were pregnant or in lactation, under 18 years of age, with a history of allergy to human albumin or who withdrew consent at any time during the study. A total of 88 patients (Fig. 1) were finally included.

Axillary status was established by physical examination, axillary ultrasonography and ultrasound-guided puncture of the suspicious lymph nodes at both diagnosis and at the end of chemotherapy. Evaluation of the grade of clinical response to NCT was made from the changes produced in tumor size by physical examination and conventional imaging techniques, being classified as: complete response (cCR), partial response (cPR) or no response (cNR).
Patients fulfilling the inclusion criteria (n = 93).

Withdrawal of consent for transfer to another hospital center (n = 3).

Patients completing neoadjuvant chemotherapy (n = 90).

Patients without complete surgery:
- Refusal of surgery
- Anesthesia complications (n = 2).

Patients evaluated (n = 88).

Fig. 1. CONSORT flow diagram of the patients.

The patients received the following sequential chemotherapy regimen: 4 cycles of epirubicin (90 mg/m^2) and cyclophosphamide (600 mg/m^2) every 21 days, followed by 4 cycles of docetaxel (100 mg/m^2) combined with trastuzumab (6 mg/kg, 8 mg/kg day 1) in patients with overexpression of HER-2 every 21 days.

Written informed consent was obtained from all the patients. The study was approved by the Ethical Committee of Clinical Trials of our hospital.

**Scintigraphic and intraoperative detection of the sentinel lymph node**

The afternoon prior to surgery, 99mTc-albumin nanocolloid (Nanocoll®) was administered by four intradermic/subdermic injections at the positions of 3, 6, 9 and 12 o’clock around the areola of the affected breast. The volume of each injection was 0.2–0.3 ml with a total activity administered ranging from 74 to 111 MBq (2–3 mCi). Immediately after injection of the radiotracer a scintigraphy was carried out with planar acquisition of static images at least in two projections (anterior and lateral or anterior oblique at 45°) until visualization of the SLN, with the following technical parameters of acquisition: low energy and general purpose collimator, energy window: 140 ± 10% keV, matrix 256 × 256, 180 s per image. The SLN was considered the lymph node(s) visualized, especially if connected to a lymphatic channel. Once the SLN has been identified its location is marked with a waterproof ink felt pen on the skin of the patient who is placed in a position similar to that of the surgical intervention. At the time of surgery, the SLN was considered the lymph node identified in the territory determined by the lymphoscintigraphy presenting the greatest activity with the gamma probe in the surgical bed and those surpassing 10% of the activity of the lymph node with greatest uptake (rule of 10%).

**Anatomopathologic study**

The SLN was analyzed by two techniques throughout this study. In the first 32 patients intraoperative histological analysis of the SLN was performed with slices by freezing and deferred analysis with hematoxylin–eosin (H–E) staining and immunohistochemistry with anti-cytokeratin antibodies (clone AE1/AE3). The SLN was classified as: negative for metastasis, isolated tumoral cells (ITC, size less than 0.2 mm), micrometastasis (from 0.2 to 2 mm) or macrometastasis (size greater than 2 mm).

In the remaining 49 patients the OSNA (one-step amplification of nucleic acid) molecular procedure was applied. The results were expressed semi-quantitatively in three different categories according to the correlation between the number of tumoral cells per volume of tissue and the number of mRNA copies of cytokeratin 19 (CK19) per tumoral cell: macrometastasis (more than 5000 copies/μl), micrometastasis (from 250 and 5000 copies/μl) or absence of metastasis (less than 250 copies/μl).

The lymph nodes of the lymphadenectomy were analyzed with H–E staining and immunohistochemistry when considered necessary. Pathological response of the primary tumor to NCT was evaluated in the breast piece, being classified as: complete pathological response (pCR) or persistence of infiltrating residual disease (pNR).

**Statistical analysis**

In the descriptive analysis the quantitative variables were expressed as mean, typical deviation, minimum and maximum and for the description of the qualitative variables we calculated the frequency and relative percentage in the population. Contingency tables were designed (table 2 × 2) to calculate the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and the diagnostic precision of the technique, accompanied by estimation of the confidence interval of 95% (CI).

For the analysis of the differences in the categoric variables we used the Pearson Chi-square test, the Fisher exact test with a bilateral perspective or the Mann–Whitney U-test and for the differences in the mean values of the continuous values we used the Student’s t-test. A P value < 0.05 was considered as statistically significant. Data were analyzed with the EpiDat version 3.1 and SPSS version 13.0.

**Results**

The main clinical and pathological characteristics at diagnosis of the patients included in the study are summarized in Table 1. Anatomopathologic confirmation was obtained in 24 of the 37 patients clinically and/or ultrasonographically axilla-positive at diagnosis. Of the remaining 13 women, the biopsy was negative in 3 and could not be performed in 10 due to technical difficulties related to the anatomical localization of the suspicious lymph node or its proximity to vascular structures.

Following the NCT 38 patients (43.2%) presented cCR at the level of the primary tumor, 45 patients (51.1%) had cPR and 5 patients (5.7%) showed cNR. All the patients were clinically and echographically axilla-negative after treatment.

Surgery was performed from 17 to 23 h after the administration of the radiotracer, consisting in conservative breast surgery in 82 of the women studied (93.2%) and modified radical mastectomy in 6 (6.8%). Lymphadenectomy was performed at Berg axillary levels I and II in all the patients. The mean number of lymph nodes removed, including the SLN, was 13.2 (typical deviation: 4.4) with a range of 3–24 lymph nodes. The mean time from the date of the last NCT cycle to surgery was of 38.4 natural days (typical deviation: 11.3) with a minimum of 21 and a maximum of 80 days.

Table 2 shows the results of the SLN and the pathological axillary status in both the total population and the groups of patients with clinically/ultrasonographically axilla-negative (cN0) or -positive (cN1) patients at diagnosis. Table 3 depicts the main parameters of diagnostic validity of SLNB in the patients treated with NCT with the estimation of the CI 95%, percentage of identification of the SLN, rate of FN, NPV and diagnostic precision. In our experience, on
In our population, the SLN was identified in 15% of the women with micrometastasis and 38.5% in 96.9% of the cases with a rate of FN of 4.3%.

Validating the technique in patients with early stage breast cancer without primary systemic treatment, the SLN has been identified in 96.9% of the cases with a rate of FN of 4.3%. In 51.5% of the patients, the axilla was negative in the final pathologic examination. Only 14.8% of the patients showed pCR in both the primary tumor and the axilla.

On univariate analysis the percentage of identification of the SLN was significantly lower in cN1 compared with cN0 patients (83.8 and 98%, respectively, P = 0.015). In the remaining variables studied no statistically significant differences were found in either SLN identification or the rate of FN (Table 4).

On comparing the number of axillary lymph nodes removed in the patients who had received NCT and in women in the SLNB validation phase with early stage breast cancer without primary systemic treatment, no statistically significant differences were found in the mean number of SLN identified, the mean number of axillary lymph nodes resected or the number of patients with less than 10 lymph nodes removed in the lymphadenectomy (Table 5).

### Discussion

On analyzing the results obtained in our group of patients we observed that both the percentage of SLN identification and the rate of FN did not achieve the classically recommended values in the process of SLNB validation (rate of at least 95% identification of SLN with a rate of FN of 5% or less). In our population, the SLN was identified in 92% of the cases with a rate of FN of 8.3%. Nonetheless, these values are similar to those reported in the literature in the usual clinical conditions in both women with early stage breast cancer and in those treated with primary systemic chemotherapy.

Classé et al. obtained a percentage of SLN identification of 90.2% and a rate of FN of 11.5%. In our country, Duch et al. prospectively evaluated post-NCT SLNB in 30 patients with breast cancer in stages T2–3, N0–1, M0 before the initiation of treatment, with a rate of SLN detection of 90% and a rate of FN of 9%. In the systematic reviews of Xing et al., Kelly et al., and van Deurzen et al. the percentages of SLN identification were estimated to be 90% (CI 95%: 88–91%), 89.6% (CI 95%: 86.0–92.3%) and 90.9% (CI 95%: 88.0–93.1%) with a rate of FN of 12% (CI 95%: 9–16%), 8.4% (CI 95%: 6.4–10.9%) and 10.5% (CI 95%: 8.1–13.6%), respectively. In the 69 articles including 8059 patients with early stage breast cancer included in the meta-analysis by Kim et al., the mean percentage

### Table 1
Clinical and pathological characteristics of the patients.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>NCT n (%)</th>
<th>Without treatment n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>88</td>
<td>64</td>
</tr>
<tr>
<td>Age (years)</td>
<td>49.4 (31–68)</td>
<td>56.5 (26–79)</td>
</tr>
<tr>
<td>Menopausal status</td>
<td>50 (56.8)</td>
<td>29 (45.3)</td>
</tr>
<tr>
<td>Tumor localization</td>
<td>Right breast</td>
<td>33 (51.4)</td>
</tr>
<tr>
<td></td>
<td>UEQ</td>
<td>53 (60.2)</td>
</tr>
<tr>
<td>Tumor size (mm)</td>
<td>Mean (range)</td>
<td>35.5 (18–60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17.9 (6–30)</td>
</tr>
<tr>
<td>Histological type</td>
<td>Infiltrating ductal</td>
<td>69 (78.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55 (85.9)</td>
</tr>
<tr>
<td>Hormone receptors</td>
<td>Estrogen</td>
<td>65 (73.8)</td>
</tr>
<tr>
<td></td>
<td>Progesterone</td>
<td>56 (63.6)</td>
</tr>
<tr>
<td>HER-2/neu expression</td>
<td>22 (25.0)</td>
<td>9 (14.1)</td>
</tr>
<tr>
<td>Ki-67 ≥ 20% expression</td>
<td>32 (36.3)</td>
<td>19 (29.7)</td>
</tr>
<tr>
<td>TNM classification</td>
<td>Primary tumor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1</td>
<td>2 (2.3) 39 (61.9)</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>78 (88.6) 25 (38.1)</td>
</tr>
<tr>
<td></td>
<td>T3</td>
<td>8 (9.1) –</td>
</tr>
<tr>
<td>Lymph nodes</td>
<td>N0</td>
<td>51 (58.0) 64 (100)</td>
</tr>
<tr>
<td></td>
<td>N1</td>
<td>37 (42.0) –</td>
</tr>
<tr>
<td>Stages</td>
<td>I</td>
<td>– 39 (61.9)</td>
</tr>
<tr>
<td></td>
<td>II-A</td>
<td>48 (54.6) 25 (38.1)</td>
</tr>
<tr>
<td></td>
<td>II-B</td>
<td>37 (42.0) –</td>
</tr>
<tr>
<td></td>
<td>III-A</td>
<td>3 (3.4) –</td>
</tr>
</tbody>
</table>

cN: clinical/ultrasonographic axilla at diagnosis; SLN: sentinel lymph node; pN: pathological axillary status.

### Table 2
Contingency tables: results of sentinel lymph node and pathological axillary status.

<table>
<thead>
<tr>
<th>Total population</th>
<th>N0</th>
<th>N1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pN (+)</td>
<td>pN (−)</td>
</tr>
<tr>
<td>SLN (+)</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>SLN (−)</td>
<td>3</td>
<td>45</td>
</tr>
</tbody>
</table>

N0: axillary lymph nodes resected or the number of patients with less than 10 lymph nodes removed in the lymphadenectomy.

### Table 3
Parameters of diagnostic validity of scintigraphic detection of the sentinel lymph node.

<table>
<thead>
<tr>
<th>Identification</th>
<th>FN</th>
<th>NPV</th>
<th>Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Total</td>
<td>81/88</td>
<td>92.0</td>
<td>3/36</td>
</tr>
<tr>
<td>cN0</td>
<td>50/51</td>
<td>98.0</td>
<td>2/21</td>
</tr>
<tr>
<td>cN1</td>
<td>31/37</td>
<td>83.8</td>
<td>1/15</td>
</tr>
</tbody>
</table>

cN: clinical/ultrasonographic axilla at diagnosis; FN: false negative; CI 95% confidence interval of 95%; NPV: negative predictive value.
In our patients the NCT did not produce a negative SLN result (51.1% of the cases). In addition, 69.4% of the patients with a truly negative SLN result (51.1% of the cases). In 6 of the 7 patients in whom the SLN was not identified, the axilla was cN1 prior to initiating treatment. The diagnostic precision of the SLNB was similar in both groups: cN0: 96% (CI 95%: 89.6–100%); and cN1: 96.8% (CI 95%: 88.9–100%). These results coincide with those of other authors who reported that a positive axillary status at diagnosis diminished the capacity of SLN identification but did not modify its diagnostic precision. Lee et al.21 studied 875 patients 219 of whom had received NCT for presenting positive axillary lymph nodes at diagnosis in either the clinical examination or by imaging techniques. The percentage of SLN identification was significantly lower in the group receiving chemotherapy compared with the group which did not undergo previous treatment 77.6% and 97%, respectively (P < 0.001). To the contrary, the rate of FN did not show significant differences between the patients with NCT (5.6%) and those without (7.4%) (P = 0.681).

In our case, on analyzing the criteria of evaluation and the standards of quality of the self-examination guidelines of the Spanish Society of Senology and Breast Disease (SESPM),22 of the three operative criteria considered essential for implementing SLNB post-NCT in the health care process for breast cancer, the sensitivity accredited corresponds to level I of the standard (90–95%, fulfills the minimum requisites, but the results can be markedly improved); the technical efficacy of SLN detection is associated with level II in the total population (85–95%, sufficiently fulfill the minimum requisites required); level III in N0 patients (>95%, completely fulfill the requisites) and level 0 in the N1 patients (>85%, do not fulfill the minimum requisites required); and the average axillary SLN per patient is related to level II (<2.2).

Based on these results and review of the literature, although it is true that the lower percentage of SLN identification in the axilla-positive patients would not avoid lymphadenectomy in these cases, intraoperative analysis of the SLN preserves its diagnostic validity for decision making in relation to the surgical treatment and the staging of the axilla. In our series axillary lymphadenectomy could have been avoided in 45 patients with a truly negative SLN result (51.1% of the cases). In addition, 69.4% of the axilla-positive patients in the definitive anatomopathologic study, the SLN was the only lymph node affected. The performance of SLNB after NCT has the advantages that it allows identification of patients with axillary pCR (20–40% of the cases), it provides prognostic information for the selection of adjuvant therapies and reduces the number of unnecessary axillary lymphadenectomies, maintaining the conventional surgical sequence after chemotherapy.12,13

For years it has been considered that NCT produces a reduction in the number of lymph nodes resected in axillary lymphadenectomy.23 In our patients the NCT did not produce a reduction in the mean number of lymph nodes removed in the lymphadenectomy, in the proportion of emptying with 10 or more axillary lymph nodes or in the number of SLN identified during surgery. Straver et al.24 analyzed the results of lymphadenectomy in 191 women after NCT and 192 women undergoing primary surgery and axillary lymphadenectomy after one positive SLN. There were no differences between the two groups in the mean number of lymph nodes resected, 16.3 and 15.8 (P = 0.4) or in the proportion of patients with a retrieval of less than 10 lymph nodes (7 and 6%, P = 0.7).

In our case we used the periareolar injection for the administration of the radiotracer. One of the advantages of this technique is that the areola is rich in lymph vessels thereby facilitating the uptake of the radiotracer. Another possible advantage is that the tissue surrounding the areola is less likely to be affected by the secondary changes to NCT, provided that this is not the localization of...
In patients treated with NCT the superficial injection techniques may be greater those of deep injection since the response of the primary tumor to chemotherapy may alter or interrupt normal lymphatic drainage thereby hindering the uptake and migration of the radiotracer when deep routes of administration are used.  

This study has several methodological limitations. The first is related to axillary staging at diagnosis; although physical examination and axillary ultrasonography were performed in all the patients, pathological confirmation of axillary status was only obtained in 64.9% of the cN1 cases. There is currently consensus on the need to precisely know the lymph node status in women with breast cancer prior to performing SLNB, and axillary evaluation should include palpation and ultrasound-guided puncture of the suspicious lymph nodes. Thus, most protocols predetermine the interval between NCT and surgery as a maximum of 4–6 weeks, coinciding with the time of chemotherapy recuperation and maximum tumor reduction, and recommend a level of compliance with this indicator of 90%. In our series only 79.5% of the patients underwent surgery within 42 days after the finalization of chemotherapy. Moreover, two procedures were used for the anatopathological study of the SLN. The great advantage of the implementation of the OSNA procedure is probably that of achieving standardization of highly sensitive and specific results in order to compare really similar prognostic groups that do not depend on either the procedure of SLN study or the pathologist doing it. Lastly, the process of validation has limitations since axillary lymphadenectomy must be completed for its determination, thereby invalidating the practical use of SLNB, and its permanent nature does not allow periodical evaluation. New indicators of quality should be elaborated and applied to evaluate the aspects related to SLNB without the need to perform axillary lymphadenectomy.

Conclusions

In patients with breast cancer treated with NCT the use of SLNB with periareolar injection of albumin nanocolloid is a technically feasible procedure which fulfills the operative criteria essential for the implementation of SLNB in the health care process for breast cancer according to the self-examination guidelines of the SESPM, despite not achieving the classically recommended parameters in the process of SLNB validation. In our patients NCT did not reduce either the number of SLN identified or the axillary lymph nodes removed in the axillary lymphadenectomy. We consider that the inclusion of SLNB post-NCT in the systematic algorithms of the management of patients with breast cancer who are candidates for primary systemic therapy conduces to an important reduction in unnecessary axillary lymphadenectomies.

Financial support

This study was financially supported by the Consejería de Salud de la Junta de Andalucía, number PI-0080/2007, subventions for financing Biomedical Investigation and Health Sciences in Andalucía.

Conflict of interest

The authors declare no conflict of interest.

References


