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Radicality effect of adding an interpectoral to a subpectoral approach for dissection of level III axillary lymph nodes in breast cancer

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ABSTRACT

Aims and background. The extent of axillary lymph node dissection for breast cancer treatment is tailored to each patient. When the surgeon assumes that full dissection, including level III, is needed, there are basically two ways for reaching the apical nodes while preserving the pectoralis muscles: a subpectoral approach, below the joined pectoralis muscles, and another that includes an additional interpectoral dissection between the muscles. We conducted a study to evaluate the radicality of dissection using these two approaches.

Methods. To determine whether the harvest of level III axillary lymph nodes is equivalent with the different approaches, we prospectively studied 75 patients with breast cancer. Careful axillary lymph node dissection was done to as radical an extent as possible, first below the lateral edge of the joined pectoralis muscles (subpectoral approach) and sequentially after opening the space between the muscles (additional interpectoral approach). The number of patients with extra level III nodes retrieved by the addition of an interpectoral dissection as well as the number of complementary nodes obtained in such patients were determined.

Results. We excised 1701 axillary lymph nodes in 75 patients (mean, 22.7). Using first the subpectoral approach, we resected 259 level III nodes in 68 patients (mean, 3.8); in 56 patients, we removed 132 additional level III nodes using the supplementary interpectoral approach (mean, 2.4). In 7 patients (9.3%), we found at least one metastatic node with the interpectoral approach. Two of these patients had positive level III nodes that were discovered only by addition of the interpectoral dissection.

Conclusions. The dissection of level III axillary nodes is more radical when an additional interpectoral dissection is performed after a subpectoral approach has been used. The exclusive subpectoral approach frequently leaves residual nodes at the apex of the axilla.

Key words: axillary dissection, breast cancer, lymph nodes.

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Introduction

Tailored management of the axillary lymph nodes (ALN) is an important component of local-regional treatment for breast carcinoma (BC), because adequate excision of nodes with metastatic involvement reduces the chance of axillary recurrences and avoids radiotherapy to this draining pathway[1]. Moreover, pathologic assessment of the ALN remains an important prognostic factor and guides the selection of adjuvant systemic therapy[2,3].

A selective approach to the axilla based on sentinel lymph node (SLN) biopsy has gained acceptance as an effective way of staging and directing the extension of ALN dissection in early infiltrating BC (T_{1-2}, N_0), and upfront ALN clearance is the current standard regional treatment only for patients in whom SLN biopsy is not appropri-

ate[4-6]. Conversely, complete ALN dissection is generally recommended in patients with SLN pathologic involvement[7], although this practice has been questioned[8]. When ALN removal is indicated, the dissection of levels I and II is considered sufficient for staging and local control in most of the cases. The current practice is to endorse full ALN resection, including level III lymph nodes, solely in patients with extensive gross disease or suspicious apical adenopathy encountered before or during surgery[9].

Proper exposure is necessary with the aim of reaching the apical contents of the axilla. Since the conservation of pectoralis major and minor muscles allows for improved upper-limb function and favorably affects the esthetics of the thoracic wall, both muscles are left in place in most operations[10,11]. However, the technique for maintaining the two muscles requires special care and skill by an expert surgeon, especially at the point of saving all innervation to avert muscular atrophy when harvesting the highest axillary nodes[12].

Definition of the extent of ALN dissection for each patient is beyond the scope of this article. Instead, for specific situations in which the surgeon assumes that full ALN dissection is needed, we have addressed the choice between two surgical maneuvers for level III ALN dissection, preserving both pectoralis muscles. Basically, there are two approaches: a subpectoral, lifting up the joined muscles, and the combination of an initial subpectoral with an additional interpectoral, opening the interpectoral space. To our knowledge, the increase in radicality caused by the addition of an interpectoral dissection has never been analyzed. We conducted a prospective study to evaluate whether the addition in the same surgery of an interpectoral to a subpectoral dissection of level III ALN leads to an increase in the number of nodes removed.

Methods

Patient selection

Our study was conducted at the Mastology Department of Hospital Sírio-Libanês, São Paulo, Brazil, after it was approved by the hospital's Ethics Committee.

Seventy-five women who were surgically treated for BC were consecutively assigned to receive level III ALN dissection sequentially by two approaches in the same operation. In step 1, a local breast operation was performed (mastectomy or quadrantectomy). In step 2, the patient underwent full axillary clearance, with the axillary apex (level III) harvested by a subpectoral approach and with the joined pectoralis major and minor muscles being spared. In step 3, the surgeon performed an additional dissection at the top of the axilla (level III) using an additional interpectoral approach between both muscles.

Study inclusion criteria were as follows: histopathologic diagnosis of primary infiltrating BC, a clinical stage of T_{1-4} N_{1-3a}, and surgical planning with a curative intent and complete ALN removal regardless of surgery type and of nodal swelling during the operation[13]. Eighteen patients whose disease was clinically staged as N_0 and in whom SLN biopsy revealed positive findings on intraoperative imprint cytology were also included. Previous axillary surgery was an exclusion criterion.

Surgical procedure

In preparation for surgery, patients were placed in the supine position with the ipsilateral arm draped and kept free on an armboard to facilitate its mobilization. Immediately after the local surgery (55 mastectomies, 16 segmental resections, and 4 subcutaneous mastectomies), axillary lymphadenectomy was performed. The first maneuver in the axillary dissection was the sectioning of the pectoralis minor lateral sheath upwards, to enable cutting the costocoracoid fascia close to the axillary vein, thereby exposing the contents of the axilla. Conventional lymphatic dissection then proceeded along the inferior surface of the axillary vein. Thin vascular tributaries were divided and ligated. The long thoracic and intercostobrachial nerves were preserved, along with the thoracodorsal and thoracoacromial neurovascular bundles. Level II nodes underneath the superior extension of the pectoralis minor muscle were removed, together with the basal level I nodes, by careful dissection and gentle downward traction on the lymphoadipose tissue. Level I and II identification plaques were used to guide the pathologist.

For level III node dissection by a subpectoral approach, a long Doyen retractor was placed just below the lateral edge of the pectoralis minor, and the upper portions of both pectoralis muscles were strongly retracted upwards and medially (Figure 1). This level III

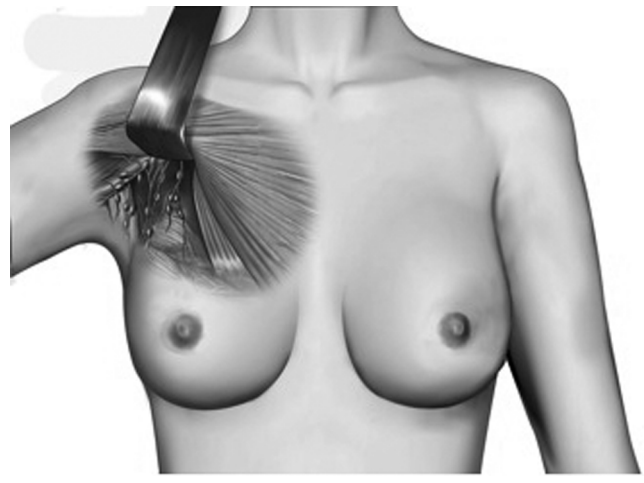

Figure 1 - Level III axillary lymph node dissection using the subpectoral approach.

subpectoral approach is made easier, especially in breast-conserving surgeries in which the dissection is technically more difficult, by adequate elevation of the corresponding arm, thereby reducing the tension of the pectoralis muscles. Meticulous axillary dissection was done with the intent to remove as much potentially affected tissue as possible. Great effort was made to dissect all of the lymphoadipose tissue at level III, which was identified as a separate specimen using a small metallic plaque marked as 3A.

After completion of tissue removal inside the predefined margins, the pectoralis muscles were divided for the maneuver of the second approach, the additional interpectoral dissection. A Richardson retractor was placed on the medial border of the pectoralis minor muscle, which was then retracted inferiorly and laterally. At that point, a long Doyen retractor was placed behind the upper portion of the pectoralis major muscle, which was then retracted superiorly and medially (Figure 2). Elevation of the pectoralis major off the chest wall and lateral displacement of the pectoralis minor with small retractors allows for clear access to the apex of the axillary fossa. If remaining tissue was found in this area, it was dissected and marked as 3B. The complementary dissection generally took only a few minutes. The thoracoacromial vascular pedicle in the posterior surface of the pectoralis major is cautiously identified and preserved to avoid muscle atrophy.

Once the retrieval of specimens was finished, all of the topographically identified lymphoadipose tissue was examined for pathology (Figure 3).

Data analysis

The primary end point of our study was to estimate the frequency of cases in which an increase in the number of level III axillary lymph nodes was observed after using the additional interpectoral dissection in sequence of the subpectoral approach. The results are expressed in this report as percentages.

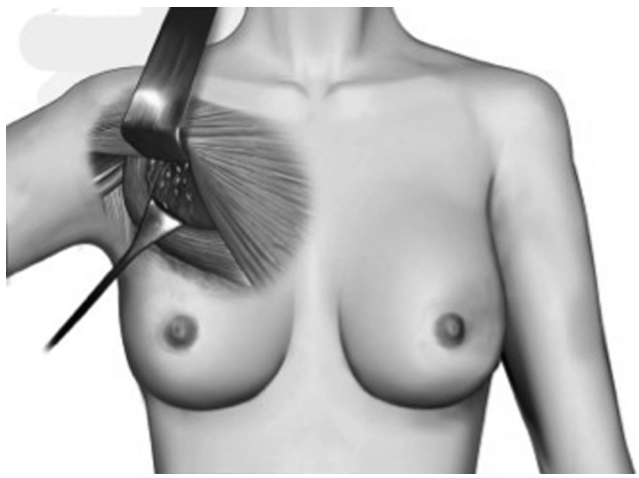

Figure 2 - Supplementary level III axillary lymph node dissection using the additional interpectoral approach.

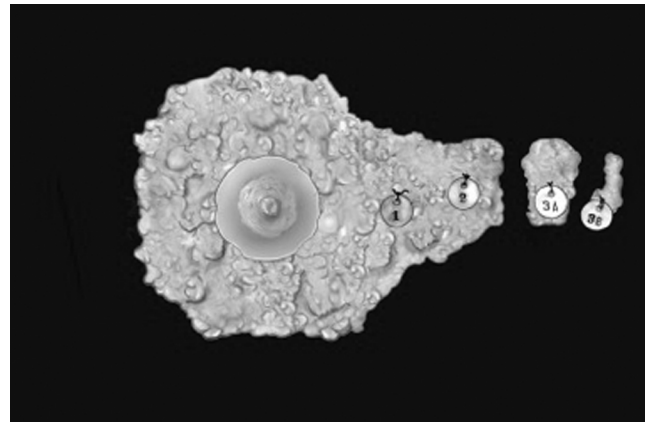

Figure 3 - The excised tissue from axillary level III: 3A, by the subpectoral approach; 3B, by the additional interpectoral dissection.

Results

Seventy-six patients with a median age of 51.0 years (range, 32-84) were registered, but one was considered ineligible because of a previous surgery for ectopic axillary breast tissue. As a result, data for 75 patients were analyzed. Tumor characteristics are summarized in Table 1.

A total of 1701 ALN were excised in the 75 eligible patients. The mean number of nodes retrieved per patient was thus 22.7. Using the subpectoral approach, we resected 259 nodes (level IIIA) in 68 (90.7%) patients (mean, 3.8 nodes per patient). In 7 patients, the level IIIA specimens revealed only adipose tissue without lymph nodes.

During the same surgery, an additional 132 nodes were removed using the additional interpectoral approach in 56 (74.7%) patients (mean, 2.4 additional nodes per patient). In 19 women undergoing the sup-

Table 1 - Tumor characteristics of eligible patients

Tumor type or stage	No.	%
Infiltrating ductal carcinoma	67	89.3
Infiltrating lobular carcinoma	5	6.6
Other carcinoma subtypes	3	4.0
T_1	14	25.3
T_2	47	62.6
T_3	11	14.6
T_4	3	4.0
N_0	18	24.0
N_1	45	60.0
N_2	10	13.3
N_{3a}	2	2.6

plementary interpectoral maneuver, only small amounts of fatty tissue without nodes were collected (Table 2).

Of note, at least one metastatic level III lymph node was harvested by the dissection with the supplementary maneuver (the interpectoral approach) in 7 (9.3%) patients, 2 of whom (2.7%) had positive level III B lymph nodes that were discovered solely by this approach, because their corresponding level IIIA nodes, obtained by the subpectoral way, were free of involvement.

Discussion

Breast lymphatics drain mainly to the ALN via a network of intramammary plexuses. Axillary dissection provides valuable information on lymphatic spread in breast cancer. According to the classic taxonomy proposed by Berg, the ALN below the axillary vein can be divided into three anatomic levels, considering their position in relation to the pectoralis minor muscle[14]. Level I nodes are situated between the anterior border of the latissimus dorsi muscle and the lateral margin of the pectoralis minor, level II corresponds to nodes located behind the muscle, and level III nodes are at the apex of the axilla, from the medial edge of the pectoralis minor up to the submergence of the axillary vein below the subclavius muscle at the costoclavicular (Halsted's) ligament.

Theoretically, nodal metastasis follows a regular lymphatic unidirectional flow, extending from lateral to medial locations. Thus, a worse prognosis is associated with involvement of level III nodes than with level I or II nodes[15]. Most often, levels II and III are involved only when level I is compromised. The risk of level II or III involvement without level I involvement (skip metastases) is very low (1-2%)[16]. Selective axillary lymphadenectomy plays a pivotal role in the local-regional treatment of invasive breast cancers, but full ALN dissection is unnecessary in most cases[8,9,17].

Traditionally, for full exploration of the axilla, the pectoralis minor was usually removed, as in the technique described by Patey and Dyson[18]. Madden[19] and Auchincloss[20], however, described techniques for modified radical mastectomies that preserve the integrity of the thoracic musculature. Preservation of the pectoralis minor is always desirable, except in rare cases with neoplastic infiltration. Keeping the muscle intact reduces the volume of seroma formed postoperatively, protects shoulder-arm mobilization, and allows for easier placement of prosthetic implants.

Muscolino *et al.*[12] were the first to propose a practical way to reach level III: splitting the pectoral muscles and mobilizing the minor. Despite the constraints of limited exposure, the technique was later praised by other authors[21]. The approach allows better exposure of the top of the axilla and also facilitates the clearance of nodes located above the axillary vein (infraclavicular nodes) that may be involved in locally advanced tumors. Alternatively, a transpectoral anterior approach to the axilla for dissection of lymph nodes while conserving the muscles has been suggested[22].

Currently, when ALN removal is indicated, a complete dissection, with level III resection, is not routine at most institutions. Generally, the dissection comprises only levels I and II and is performed for primary tumors measuring more than 3-4 cm in diameter, or for smaller tumors with involved SLN[23]. Level III dissection represents an overtreatment for most patients with BC[24,25].

Although it is worthwhile to point out that sparing patients from undergoing ALN resection in a more aggressive procedure is advantageous, there are specific situations in which complete ALN dissection, including the axillary apex, is advocated. In our opinion, the most important indication for level III harvesting is the intraoperative finding of extensive nodal involvement and/or suspicious apical axillary nodes. These situations occur especially in locally advanced BC, clinically staged as T_{3-4} or N_{1-2}. Many of these patients have lymph node involvement at presentation and undergo ALN dissection after completion of neoadjuvant chemotherapy[26]. In such cases, theoretically, besides better regional control and more accurate prognostic factors, the complete retrieval of involved nodes should also alter adjuvant chemotherapy and/or radiotherapy.

Our purpose was to determine the most efficient approach to the axillary apex that preserves the pectoralis major and minor muscles when the surgeon must perform a complete ALN dissection. In this context, the presence of residual level III nodes in most of the patients (74.7%) in our study after use of the upfront subpectoral approach, with an average of more than 2 lymph nodes in each patient and discovered only by the additional interpectoral approach, merits serious consideration. Although it might be tempting to carry out axillary clearance without splitting the pectoralis muscles, the maneuver itself is not very radical. Fortunately, the more effective procedure, the combination of the subpectoral approach with an additional interpectoral approach, is not complex, takes only a few minutes

Table 2 - Level III axillary lymph nodes harvested by subpectoral and by the supplementary interpectoral approaches in 75 patients

Approach	No. patients with level III nodes (%)	No. excised level III nodes (mean)
Subpectoral	68[a] (90.7)	259 (3.8)
Interpectoral after the subpectoral	56[b] (74.7)	132 (2.4)

[a]Level III nodes were not found in 7 patients. [b]Level III nodes were not found in 19 patients; 7 patients had at least one metastatic level III node retrieved only by the additional interpectoral approach.

more than the subpectoral approach alone, and does not produce in any significant immediate or late morbidity.

In summary, our findings indicate that when complete axillary level III lymph node harvesting – preserving the pectoralis major and minor muscles – is desired for BC treatment, the addition of nodal dissection through the interpectoral space to the subpectoral approach is advisable. We therefore conclude that subpectoral dissection performed alone, below both joined pectoralis muscles, frequently leaves residual lymph nodes at the top of the axilla.

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