

Interpectoral Nodes as the Initial Site of Recurrence in Breast Cancer

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Hypothesis: Interpectoral nodes can be the initial site of recurrent breast cancer.

Design: Retrospective review.

Setting: Comprehensive breast center, located in a university-based tertiary care center.

Patients: All patients undergoing operations for breast cancer at our breast center from 1995 to 2002 were reviewed.

Main Outcome Measures: Patients with interpectoral node recurrence as the initial site of recurrent breast cancer were identified.

Results: During the 8-year period, 4097 patients underwent surgical management for breast cancer. During

this time, 4 patients (0.1%) had recurrence at the interpectoral nodes. Three of the 4 patients were node-negative at the original operation. All lesions were mammographically occult. Preoperative needle biopsy was effective in the confirmation of malignancy. All 4 underwent excision without complications.

Conclusions: Recurrence at the interpectoral nodes can be the initial site of surgical failure. These nodes may represent the site of primary drainage in a percentage of patients. The sentinel node identification technique, therefore, should diminish the number of patients affected by recurrence at this site. In patients with a palpable mass in the infraclavicular location, however, a high index of suspicion should be maintained. Workup should include additional breast imaging and needle biopsy prior to operation.

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THE MODERN APPROACH TO breast cancer treatment has steadily moved toward a more selective and individualized management scheme. The classical Halsted radical mastectomy has given way to less-extensive procedures. In the 1980s, breast-conserving operations demonstrated equivalent overall survival to the modified radical mastectomy.^{1,2} Not only has the extent of the surgical resection changed, but the technique of managing the axillary lymph nodes has also evolved. The findings of the National Surgical Adjuvant Breast and Bowel Project-B04 trial demonstrated that although local control was improved with axillary lymph node dissection, there was no significant improvement in overall survival.³ Patients who were clinically node-negative were randomized to management by observation, axillary dissection, or radiation therapy. All 3 groups demonstrated similar overall survival after an average follow-up of 126 months. Involvement of nodes and the number of nodes

involved, however, were important determinants of prognosis. As a result, evaluation of the axillary lymph nodes is considered an assessment of prognosis rather than a treatment of disease. There is, however, a 21% risk of developing axillary recurrence in patients not undergoing treatment of the axilla.⁴ For this reason, the level I and II axillary lymph node dissection has been considered the standard of care in early-stage, node-negative cancer.

The interpectoral nodes are not routinely removed in the level I and II axillary dissection.⁵ They therefore represent a potential site for lymphatic spread either with axillary metastasis or as a site of locally disseminated disease. Although there is some controversy regarding the percentage of patients that may develop metastases to these nodes, as many as 14% of cases of operable breast cancer have positive interpectoral nodes at the time of operation.⁶⁻⁸ The incidence of patients with initial recurrence in these nodes, however, is not known. Because surgeons have moved away from performing radical resections,

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Table 1. Characteristics of the Primary Breast Cancer

Patient	Age, y	Primary Location	Size, cm	Primary Histologic Diagnosis	Lymph Nodes	ER/PR
1	30	L UOQ	1.5	IDC	0/11	-/-
2	55	L LOQ	2.5	IDC	1/8	+/+
3	62	R UOQ	2.0	DCIS	0/11	-/-
4	62	L CEN	2.5	IDC	0/16	-/-
Median	58		2.3			

Abbreviations: CEN, central; DCIS, ductal carcinoma in situ; ER/PR, estrogen receptor and progesterone receptor–positive; IDC, invasive ductal carcinoma; LOQ, lower outer quadrant; UOQ, upper outer quadrant.

Table 2. Treatment of the Primary Cancer and Recurrence at Rotter Nodes

Patient	Surgical Procedure	Adjuvant Therapy	Time to Recurrence, y	Method of Diagnosis	Status (Survival Since Recurrence, y)
1	MRM	AC	1	PE, US, CBx	Alive (3.0)
2	L+AD	CMF+T	3	PE, US, CBx	Alive (2.0)
3	L+AD	None	7	PE, MRI, CBx	Alive (1.5)
4	SSM+AD	CMF	1.5	PE, US, FNA	Alive (1.0)
Median			2.3		1.8

Abbreviations: AC, doxorubicin, cyclophosphamide; AD, axillary lymph node dissection; CBx, core-needle biopsy; CMF, cyclophosphamide, methotrexate, 5-fluorouracil; FNA, fine-needle aspiration; L, lumpectomy; MRI, magnetic resonance imaging; MRM, modified radical mastectomy; PE, physical examination (palpable mass); SSM, skin-sparing mastectomy and axillary lymph node dissection; T, tamoxifen; US, ultrasound.

metastases to the interpectoral nodes represent a source for recurrent disease. We have retrospectively reviewed our breast cancer tumor registry to identify patients with recurrence at the interpectoral nodes.

METHODS

The breast cancer tumor registry at Columbia-Presbyterian Medical Center (New York, NY) was reviewed for the period of 1995 to 2002. A total of 4097 patients underwent surgical treatment for primary operable breast cancer. During this period, patients with initial recurrence at the infraclavicular region were identified. The characteristics of the primary cancer as well as the management and time to recurrence were reviewed. Until 1998, level I and II axillary lymph node dissection was performed for all patients with invasive breast cancer at our center. Starting in 1998, there was a gradual transition to the sentinel node technique for early breast cancer (T1 N0).

RESULTS

A total of 4097 patients underwent surgical management for breast cancer from 1995 to 2002. Four patients (0.1%) had initial recurrence at the interpectoral lymph nodes dur-



Figure 1. The palpable mass in the infraclavicular location.

ing this period. All patients underwent operations for primary breast cancer at Columbia-Presbyterian Medical Center. The characteristics of the primary malignancies are presented in **Table 1**. The primary histologic diagnosis in 3 of the 4 patients was invasive ductal carcinoma. The 1 patient who was estrogen receptor and progesterone receptor positive was the only patient with a positive axillary node at the time of the initial operation. Two of the patients underwent breast conservation at the primary operation (**Table 2**). All patients with invasive disease underwent level I and II axillary node dissection. Patient 3, whose primary cancer was ductal carcinoma in situ, had a level I node dissection.

The median time to recurrence was 2.3 years. All 4 recurrences were discovered as palpable masses in the infraclavicular location (**Figure 1**). None of the lesions were demonstrated on diagnostic mammography. All patients were free of metastatic disease at the time of recurrence. Ultrasound was used in 3 patients and in each was able to confirm the presence of a solid mass. Computed tomography (CT) was performed in 2 patients, and both were equivocal. Magnetic resonance imaging (MRI) clearly identified the site of recurrence in the 1 patient in which it was used. Core-needle biopsy confirmed adenocarcinoma in the palpable mass in 3 of 3 patients. Fine-needle aspiration demonstrated malignancy on cytologic analysis in patient 4. All 4 patients underwent resection, and the nodes were found between the pectoralis muscles (**Figure 2**). Pathologic analysis demonstrated adenocarcinoma in interpectoral nodes in all 4 patients. Two patients had additional lymph nodes removed. One patient had 1 of 5 level III nodes involved. All 4 patients are alive and have survived a median of 1.8 years (Table 2).

ANATOMY

Grossman first identified interpectoral nodes in 1896 after describing their location along the thoracoacromial artery on the underside of the pectoralis major muscle in 4 of 25 cadaveric dissections.⁹ Three years later, Rotter described finding these nodes in half of 33 radical mastectomy surgical specimens from patients with breast carcinoma.¹⁰ The interpectoral nodes are located between

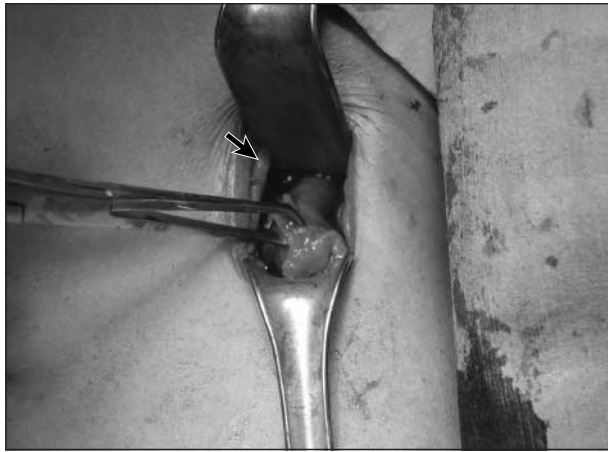


Figure 2. Recurrence at Rotter nodes. The arrow points to the cut edge of the pectoralis major muscle, demonstrating the interpectoral location.

the pectoralis major and minor muscles in the interpectoral fascia along the pectoral branches of the thoracoacromial vessels. They vary from 1 to 4 in number¹¹ and comprise a nodal cluster separate but not necessarily discontinuous from the level I, II, and III nodal basins. Interpectoral nodes represent a pathway by which skip metastasis may occur to level III nodes without disease to levels I and II.¹² Interpectoral nodes are distinct from the prepectoral node, which is a single lymph node found in the subcutaneous tissue or high and lateral in the axillary tail of the breast. The prepectoral node is superficial to the deep fascia covering the upper portion of the pectoralis major muscle and separate from the axilla.

COMMENT

Traditionally, breast cancer was thought to spread in a systematic fashion. In the 1980s, 2 reviews demonstrated that discontinuous or “skip” metastases to level III nodes occurred in less than 1% of patients when a level I and II axillary node dissection was performed.^{13,14} As a result, the level I and II axillary node dissection has been considered the standard of care for the clinically negative axilla. The findings of our study, however, support the hypothesis that the interpectoral nodes directly drain portions of the breast parenchyma in a selective percentage of patients.^{10,15} Three (75%) of our patients were node negative at their original surgery. It was previously hypothesized that interpectoral node involvement would be more common in primary cancer located in the upper outer quadrant. Our series did not support this contention, as 2 of the primary cancers were located centrally and in the lower outer quadrant. Because of the lack of predictability of involvement, many authors agree that it is a potential site of recurrence and a source of local or systemic treatment failure.^{6,16,17} At least one group has recommended removal of the interpectoral nodes in all axillary dissections.¹⁷ The very small number of patients (0.1%) we observed with recurrence at this site would argue against this practice as a routine.

An interesting concept was raised by Bale et al.⁷ They considered the possibility that interpectoral nodes could be sentinel lymph nodes. In 35 consecutive patients, after completion of the axillary dissection, interpectoral

nodes were removed and labeled separately. Four had involvement of interpectoral nodes. In 3 of the 4 patients, none of the axillary nodes was involved. They postulated that interpectoral nodes can act as the primary drainage site of lesions without involvement of the level I nodes, and therefore can act as the sentinel lymph nodes. In the current era, the sentinel lymph node identification technique could shed light on this hypothesis. If the interpectoral nodes are the initial draining sites in a percentage of patients, they should be identified as the sentinel nodes with lymphoscintigraphy and/or the isosulfan blue dye. Although “hot” nodes would be demonstrated readily by lymphoscintigraphy, additional dissection and exposure of the nodes to assess their potential involvement would be necessary if mapping were done using the blue dye alone. Once identified, they would be removed and no longer pose an undisclosed threat of recurrence.

In all 4 of our patients, the recurrence was discovered as a palpable mass, and of note, mammography did not identify the mass in any case. Ultrasound was able to confirm the presence of the solid mass in all 3 patients in whom it was used. Oran et al¹⁸ also found ultrasonography to be useful in imaging interpectoral nodes in 4 (33%) of 12 patients with breast cancer. In our fourth patient, the involved lymph nodes were adherent to the subclavian vein. This finding suggests that duplex sonography could be particularly helpful to avoid the potential morbidity of unexpected injury to the subclavian vessels. Computed tomography has traditionally not been used to differentiate muscle and lymphatic soft tissue. Our series also demonstrated a lack of efficacy. In 1 of the 2 patients where CT was not able to identify the recurrence, MRI was able to clearly identify the location of the recurrence. The fact that preoperative needle biopsy was helpful in all of our patients suggests that it should be used for confirmation of diagnosis and preoperative planning.

Recurrence at the interpectoral nodes may represent an initial site of surgical failure. All recurrences occurred in the setting of previous axillary node dissection. The sentinel node identification should, at least in theory, diminish the number of patients affected by recurrence at this site. Although it is uncommon, when an infraclavicular mass is observed, a high index of suspicion should be maintained, as it may represent the initial site of recurrence. Because mammography has not been tremendously helpful, additional imaging should be used. Needle biopsy seems to be accurate for confirmation of disease and preoperative planning.

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Treatment Response of Keloidal and Hypertrophic Sternotomy Scars: Comparison Among Intralesional Corticosteroid, 5-Fluorouracil, and 585-nm Flashlamp-Pumped Pulsed-Dye Laser Treatments

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Objective: To compare the clinical response of keloidal and hypertrophic scars after treatment with intralesional corticosteroid alone or combined with 5-fluorouracil (5-FU), 5-FU alone, and the 585-nm flashlamp-pumped pulsed-dye laser (PDL).

Design: Prospective, paired-comparison, randomized controlled trial.

Setting: A private ambulatory laser facility.

Patients: Ten patients with previously untreated keloidal or hypertrophic median sternotomy scars at least 6 months after surgery that were considered problematic by the patients.

Interventions: Five segments were randomly treated with 4 different regimens: (1) laser radiation with a 585-nm PDL (5 J/cm²); (2) intralesional triamcinolone acetonide (TAC) (20 mg/mL); (3) intralesional 5-FU (50 mg/mL); and (4) intralesional TAC (1 mg/mL) mixed with 5-FU (45 mg/mL). One segment of each scar received no treatment and served as a control.

Main Outcome Measures: Scar height, erythema, and pliability were evaluated before and every 8 weeks after treatment. Patients' subjective evaluations were tabulated. Histologic sections of segments were examined in 1 biopsy sample per segment at week 32.

Results: There was a statistically significant clinical improvement in all treated segments. No significant difference in treatment outcome vs method of treatment was noted. However, intralesional formulas resulted in faster resolution than the PDL: scar induration responded better to intralesional formulas, scar texture responded better to the PDL, and scar erythema responded the same as the control with all treatments. Adverse sequelae, including hypopigmentation, telangiectasia, and skin atrophy, were observed in 50% (5/10) of the segments that received corticosteroid intralesionally alone. No long-term adverse sequelae were demonstrated in the segments treated with other modalities.

Conclusions: Clinical improvement of keloidal and hypertrophic scars after treatment with intralesional corticosteroid alone or combined with 5-FU, 5-FU alone, and PDL seemed comparable, with the exceptions of the incidence of adverse reactions, which were most common with intralesional corticosteroid. Intralesional 5-FU is comparable to the other therapies. (2002; 138:1149-1155)

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