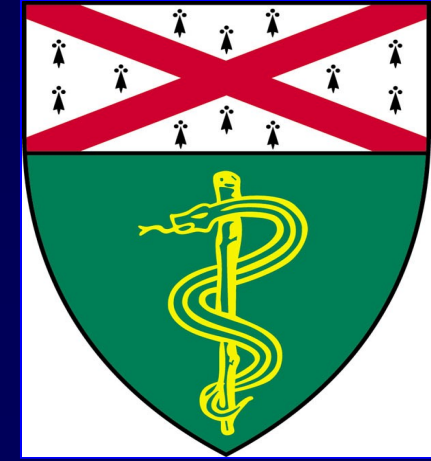


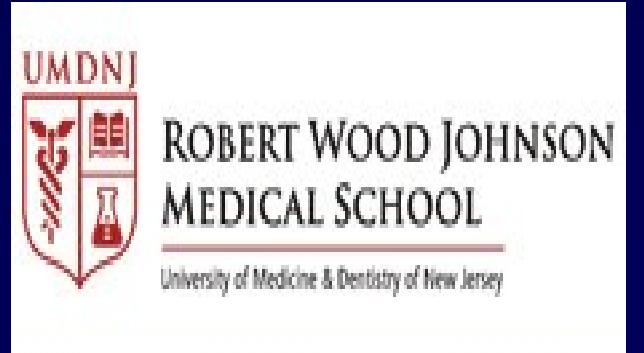
Using Nodal Ratios to Predict the Risk of In-Field Regional Recurrences in Patients Treated with Breast Conservation Therapy in Patients with ≥ 4 Positive Lymph Nodes



William A. Castrucci MD¹, Bruce G. Haffty, MD² and Meena S. Moran MD¹

¹Department of Therapeutic Radiology, Yale University School of Medicine, New Haven, CT; and

²Department of Radiation Oncology, UMDNJ-Robert Wood Johnson School of Medicine, New Brunswick, NJ



Introduction

The management of regional lymphatics in patients with positive lymph nodes undergoing breast conservation therapy (BCT) remains controversial. Despite inclusion of regional lymph nodes in the radiation treatment portals for patients with multiple positive nodes, some patients will develop in-field recurrences. The nodal ratio (NR) has previously been shown to provide prognostic information in terms of survival, where

$$NR = (\text{Number of positive lymph nodes}) / (\text{Total number of lymph nodes removed})$$

Purpose/Objective

To determine if the nodal ratio predicts for regional in-field recurrences in breast conservation therapy patients with ≥ 4 positive lymph nodes.

Materials/Methods

A retrospective review of our database (Yale) identified 1060 patients treated with breast conservation surgery, ≥ 8 lymph nodes dissected from the axilla, and adjuvant loco-regional external beam radiotherapy. 273 patients were lymph node-positive, and of these, 56 patients (20.5%) had ≥ 4 positive lymph nodes. These 56 patients were the focus of our study. 84% received adjuvant chemotherapy and 37% received hormonal therapy. All patients received whole-breast radiation therapy (median dose = 48 Gy) followed by a conedown to the surgical bed (median total dose = 64 Gy), and regional radiation (median dose to treated lymph nodes = 46 Gy) as follows:

Table 1: Regional radiation targets *

	n =	%
Tangents + SC	33	59
Tangents + SC + Ax	4	7
Tangents + SC + Ax + IM	4	7
Tangents + SC + IM	11	20
Tangents only	4	7

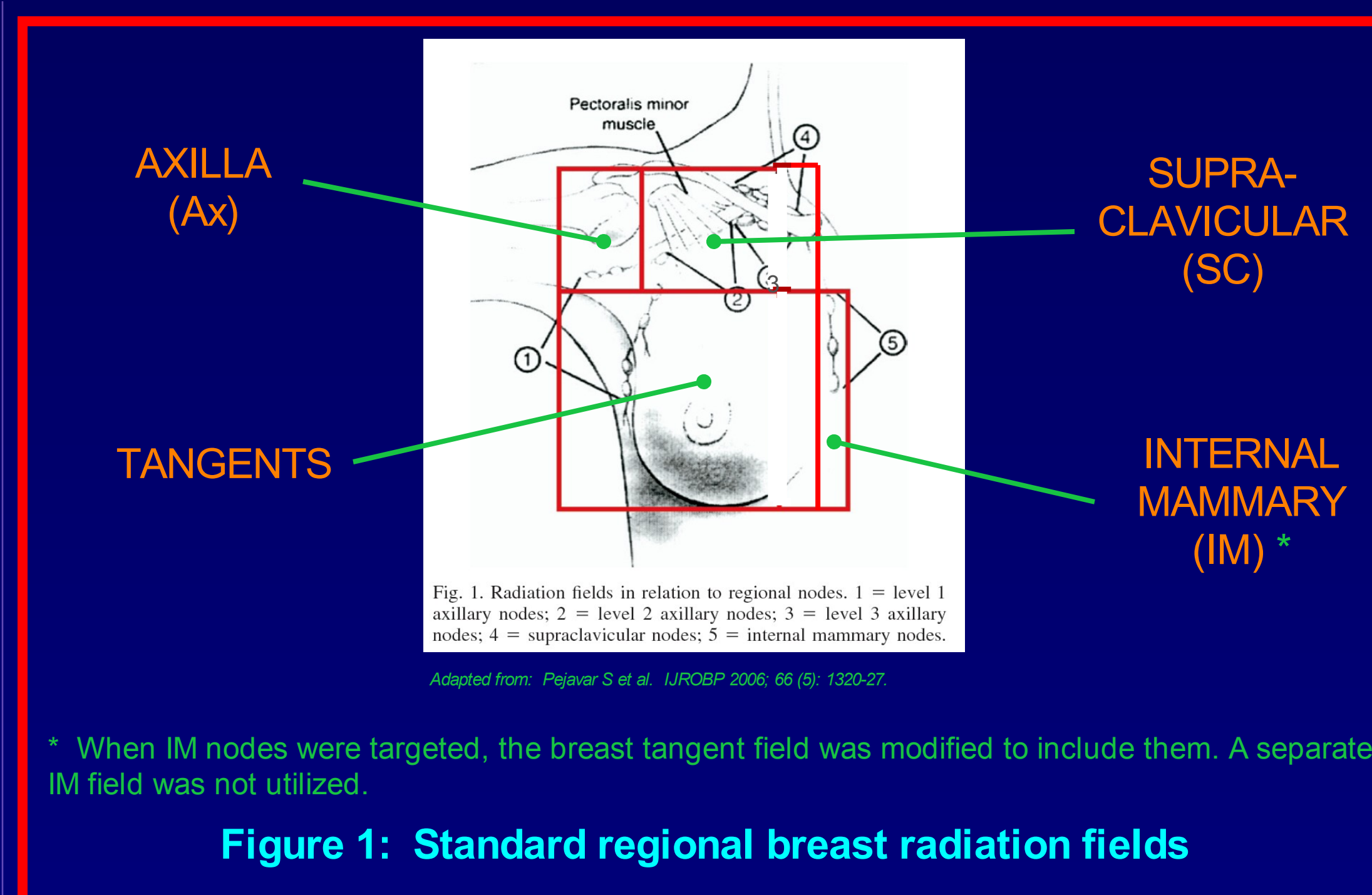
* All patients in the HNR group received SC radiation.

Nodal ratios were calculated for each patient and correlated with regional recurrence rates. Cases were grouped into three categories:

Table 2: Nodal ratio groupings

Definition	n =	%
Low Nodal Ratio (LNR)	16	29
Intermediate Nodal Ratio (INR)	22	39
High Nodal Ratio (HNR)	18	32

Patterns of local, regional, distant failures and overall survival were also analyzed as a function of nodal ratios.



* When IM nodes were targeted, the breast tangent field was modified to include them. A separate IM field was not utilized.

Figure 1: Standard regional breast radiation fields

Results

For the 56 patients evaluated, overall survival (OS) was 62%, disease-free survival (DFS) was 61%, breast relapse-free survival (BRFS) was 83%, and nodal relapse-free survival (NRFS) was 93%. Nodal ratio predicted for OS, DFS, and NRFS, but did not predict for BRFS. The results of axillary dissections were as follows:

Table 3: Results of axillary dissections as a function of nodal ratio

Nodal Ratio Grouping	LNR	Number of Positive LNs		
		4 - 9	≥ 10	Total
LNR	16	0	16	
INR	14	8	22	
HNR	6	12	18	
Total	36	20	56	

Of note, only three patients with four or more positive nodes had regional nodal relapses. All three regional nodal recurrences were in the supraclavicular fossa, in patients with high nodal ratios and ten or more positive nodes. All were treated with a single AP field prescribed to a dose of 46 Gy at 3 cm. In this group of patients (high nodal ratio & ≥ 10 positive nodes (n=12)) the regional relapse rate in the treated supraclavicular fossa at 5 years was 35%.

Table 4: Sites of nodal recurrence in the HNR group (N = 18)

Site	n =	%
Axillary	0	0
Supraclavicular	3	16.7
Infraclavicular	0	0
Internal Mammary	0	0

Table 5: Patient, tumor, and treatment features of patients with High Nodal Ratios

	n=	%	
Total Number of Patients	18	100	
Age (yr)	≤ 40	4 22	
	> 40	14 78	
Race	Cauc.	16 89	
	Afr. Amer.	2 11	
Family History	Strong	3 16	
	Moderate	5 28	
	None	10 56	
T-Stage	T1	11 61	
	T2	7 39	
Histology	Inf. Ductal	11 61	
	Inf. Ductal+DCIS	5 28	
	Inf. Lobular	1 6	
	Medullary	1 6	
Total Number of Patients	18	100	
	Estrogen Receptors	Positive	6 34
		Negative	9 50
Progesterone Receptors	Positive	5 28	
	Negative	9 50	
Margins	Unknown	3 56	
	Negative	4 22	
Adjuvant Chemo	Positive	11 61	
	Unknown	5 28	
Adjuvant Hormones	Yes	16 89	
	No	2 11	
	Unknown	1 1	

Conclusion

In patients with ≥ 4 positive axillary lymph nodes treated with breast conservation therapy, nodal ratios predicted for in-field regional recurrences. Although our numbers were limited, we were able to identify patients at high risk for in-field regional failure: nodal ratio $\geq 70\%$ + ≥ 10 positive lymph nodes. This group of patients may benefit from a higher dose to the supraclavicular fossa than that achieved with standard radiotherapy techniques.