

Nipple-sparing mastectomy (NSM) for oncologic surgical management: Tumor-to-nipple distance (TND) on preoperative MRI aids patient selection and predicting outcomes

Jiyon Lee MD¹, Kristin Harris DO, Jordan Frey MD, Ara Salibian MD, Mihye Choi MD, Nolan Karp MD, and Deborah Axelrod MD
¹jiyon.lee@nyumc.org. New York University School of Medicine, New York, NY



BACKGROUND PURPOSE CONCLUSION

• NSM preserves nipple-areola complex (NAC) with mastectomy and is associated with higher patient satisfaction and aesthetic outcomes. Majority of NSM are performed in patients with lower cancer stages. Oncologic outcomes of therapeutic NSMs appear similar to traditional mastectomy; locoregional recurrence ranges 0.0%- 25.7%.

• Current USA National Comprehensive Cancer Network (NCCN) guidelines recommend NSM be reserved for biologically favorable, early stage cases with no nipple discharge, Paget's disease, or nipple involvement on imaging; >2cm FN distance of invasive or in situ cancer; and clear intraoperative nipple margin biopsy.

• Expanding indications for NSMs. However, there is lack of data on risk factors for overall locoregional recurrence, such as TND.

• To examine oncologic trends and outcomes to evaluate risk factors for locoregional recurrence in therapeutic NSM cases

• To measure TND on prep MRI as potential variable to predict outcomes

• In this group of early stage and in situ breast carcinoma, therapeutic appears to be oncologically safe with locoregional recurrence rate of 2.0%.

• TND ≤1cm and TND ≤2cm trended to higher rates of recurrence

• TND ≤1cm was a significant predictor on univariate analysis

METHODS

• Retrospective institutional review of 2/2006- 7/2017

• 496 therapeutic mastectomies in 312 women

• Mean follow up time 48.25 months

• Demographics, outcomes, trends, cancer recurrences reviewed

• 171 preoperative MRI exams available for review

• TND measured on MRI axial, sagittal, or MPR according to nipple-tumor plane, from nipple base to anterior aspect of lesion

• Univariate analysis to identify independent risk factors for cancer recurrence. p-values <0.05 significant

SUMMARY STATEMENT

• Nipple-sparing mastectomy is oncologically safe in appropriately selected patients

• Tumor-to-nipple distances of ≤1cm and ≤2cm on preoperative MRI may help with patient selection and predicting outcomes

RESULTS

Variable	Value
N	496 (40.9%)
Age (Years) [SD]	48.66 [9.20] (range 23-65y)
BMI (kg/m ²) [SD]	23.95 [4.51]
Mastectomy Laterality	Unilateral: 128 (25.8%) Bilateral: 368 (74.2%)
Tumor Size (cm) [SD]	1.47 [1.41]
Histologic Type	IDC: 260 (52.4%) ILC: 48 (9.7%) DCIS: 250 (50.4%) LCIS: 58 (11.7%) Other: 10 (2.0%)
Multifocal/Multicentric Dz	126 (25.4%)
Positive Frozen Subareolar Bx (N=362)	25 (6.9%)
Positive Permanent Subareolar Bx (N=496)	34 (6.9%)
ER Positive	297 (59.9%)
PR Positive	278 (56.0%)
HER 2-neu Positive	211 (42.5%)
Pathologic Cancer Stage	Stage 0: 157 (31.7%) Stage IA: 209 (42.1%) Stage IB: 9 (1.8%) Stage IIA: 78 (15.7%) Stage IIB: 20 (4.0%) Stage IIIA: 15 (3.2%) Stage IIIB: 2 (0.4%) Stage IIIC: 2 (0.4%) Stage IV: 3 (0.6%) Unavailable: 1 (0.2%)
Adjuvant Radiation	39 (7.9%)
Adjuvant Chemotherapy	109 (22.0%)
Follow-Up (Months) [SD]	48.25 [35.72]

Variable	Therapeutic (N=496)
Overall Locoregional Recurrence (Per Breast)	10 (2.0%)
Overall Local Recurrence (Per Breast)	8 (1.6%)
Regional Recurrence (Per Breast)	3 (0.6%)
Therapeutic (N=312)	
Overall Locoregional Recurrence (Per Patient)	9 (2.9%)
Overall Local Recurrence (Per Pt)	8 (2.6%)
Regional Recurrence (Per Pt)	3 (1.0%)
Distant Metastasis (Per Pt)	4 (1.3%)

Variable	Value
Tumor Histology	IDC: 6 (75.0%) ILC: 1 (12.5%) DCIS: 5 (62.5%)
Tumor Size (cm) (N) [SD]	1.62 (7) [1.66]
Multifocal Disease	3 (37.5%)
Sentinel LN Biopsy Performed	6 (75.0%)
Positive Sentinel LN Biopsy	3 (50.0%)
Positive Frozen Subareolar Biopsy(N=4)	0 (0.0%)
Positive Perm Subareolar Biopsy (N=8)	1 (12.5%)
Initial Pathologic Cancer Stage	Stage 0: 2 (25.0%) Stage IA: 3 (37.5%) Stage IB: 1 (12.5%) Stage IIA: 2 (25.0%)

Variable	Overall	Locoregional Recurrence	No Locoregnl Recurrence	p-Value
N	171	5	166	--
Average TND [SD] (cm)	4.78 [2.31]	4.62 [3.90]	4.78 [2.27]	0.8758 *0.9317

SD=Standard Deviation
*Welch approximation t-test

Variable	Locoregional Recurrence	No Locoregnl Recurrence	p-Value
TND ≤2 cm	2 (8.7%)	21 (91.3%)	
TND >2 cm	3 (2.0%)	145 (98.0%)	0.0218 *0.1345
TND ≤1 cm	1 (25.0%)	3 (75.0%)	
TND >1 cm	4 (2.4%)	163 (97.6%)	0.0031 *0.1129

*Fisher's exact test (two-tailed)

Variable	Value
Tumor Histology	IDC: 2 (66.7%) DCIS: 3 (100.0%)
Tumor Size (Centimeters) (N) [SD]	1.54 (3) [1.56]
Multifocal Disease	2 (66.7%)
Sentinel Lymph Node Biopsy Performed	3 (100.0%)
Positive Sentinel Lymph Node Biopsy	0 (0.0%)
Positive Frozen Subareolar Biopsy (N=2)	0 (0.0%)
Positive Permanent Subareolar Biopsy (N=3)	0 (0.0%)
Initial Pathologic Cancer Stage	Stage 0: 1 (33.3%) Stage IA: 2 (66.7%)

Variable	Value
Tumor Histology	IDC: 3 (42.9%) DCIS: 3 (42.9%) ALH: 1 (14.3%) No Residual Disease: 1 (14.3%)
Tumor Size (Centimeters) (N) [SD]	1.55 (4) [0.98]
Multifocal Disease	2 (28.6%)
Sentinel Lymph Node Biopsy Performed	2 (28.6%)
Positive Sentinel Lymph Node Biopsy	0 (0.0%)
Positive Frozen Subareolar Biopsy (N=4)	0 (0.0%)
Positive Permanent Subareolar Biopsy (N=7)	0 (0.0%)
Initial Pathologic Cancer Stage	Stage 0: 3 (42.9%) Stage IA: 2 (28.6%) Stage IIB: 1 (14.3%) Stage IIIC: 1 (14.3%)

Table 6. Univariate analysis for risk factors for locoregional recurrence

Variable	Total NSMs	NSMs w/ Locoregional Recurrence/Occurr (%)	Unadjusted OR (95% CI)	p-Value
No.	496	10 (2.0%)		
Age				
<50 years	278	10 (3.6%)		
≥50 years	218	0 (0.0%)	17.0894 (0.9958 to 293.2894)	0.0503
BMI				
<30 kg/m ²	399	7 (1.8%)		
≥30 kg/m ²	40	0 (0.0%)	0.6461 (0.0362 to 11.5209)	0.7663
Current Smoking				
Yes	22	0 (0.0%)		
No	474	10 (2.1%)	0.9831 (0.0558 to 17.3118)	0.9907
Tumor Size				
<2 cm	380	6 (1.6%)		
≥2 cm	116	3 (2.6%)	1.6549 (0.4073 to 6.7230)	0.4812
Invasive Histology				
Yes	305	8 (2.6%)		
No	191	2 (1.0%)	2.5455 (0.5348 to 12.1159)	0.2405
Multifocal/ Multicentric Dz				
Yes	126	5 (4.0%)		
No	370	5 (1.4%)	3.0165 (0.8586 to 10.5979)	0.0850
Positive Frozen SLN Bx				
Yes	65	3 (4.6%)		
No	431	7 (1.6%)	2.9309 (0.7384 to 11.6329)	0.1263
Positive LN on perm path				
Yes	80	3 (3.8%)		
No	416	7 (1.7%)	2.2764 (0.5760 to 8.9969)	0.2407

Variable	Total NSMs	NSMs w/ Locoregional Recurrence/Occurr (%)	Unadjusted OR (95% CI)	p-Value
ER positive				
Yes	297	7 (2.0%)		
No	199	3 (1.0%)	2.0309 (0.4057 to 10.1656)	0.3886
PR positive				
Yes	278	4 (1.4%)		
No	218	6 (2.8%)	0.5158 (0.1437 to 1.8511)	0.3099
HER 2-neu positive				
Yes	211	4 (0.9%)		
No	285	6 (2.1%)	0.8986 (0.2504 to 3.2249)	0.8697
Initial Path stage				
<IIA	376	8 (2.1%)		
≥IIA	120	2 (1.7%)	0.7797 (0.1633 to 3.7226)	0.7550
Positive Frozen Bx				
Yes	25	0 (0.0%)		
No	337	6 (1.8%)	1.000 (0.0548 to 18.2572)	1.000
Positive Perm Bx				
Yes	34	2 (5.9%)		
No	462	8 (1.7%)	3.5469 (0.7230 to 17.4007)	0.1187
Adjuvant Radiation				
Yes	39	0 (0.0%)		
No	457	10 (2.2%)	0.5395 (0.0310 to 9.3796)	0.6719
Adjuvant Chemo				
Yes	109	1 (0.9%)		
No	387	9 (2.3%)	0.3889 (0.0487 to 3.1037)	0.3728
TND ≤ 2 cm				
Yes	23	2 (8.7%)		
No	148	3 (2.0%)	4.6032 (0.7261 to 29.1825)	0.1052
TND ≤ 1 cm				
Yes	4	1 (25.0%)		
No	167	4 (2.4%)	13.5833 (1.1477 to 160.7574)	0.0385