



Internal Mammary Lymph Nodes Involvement in Patients With Breast Cancer: Anatomical Characteristics and Implication for Target Delineation

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Disclosures

No relevant disclosures



Background

- IMN is a primary lymphatic draining site of breast cancer:
- 13-37% of BC patients have primary IMN drainage
- Patients with IMN metastases had a worse prognosis than patients who did not, independent of their axillary status
- Established data support IMN irradiation:
 - EBCTCG meta-analysis,
 - EORTC 22922-10925,
 - MA.20,
 - DBCG-IMN



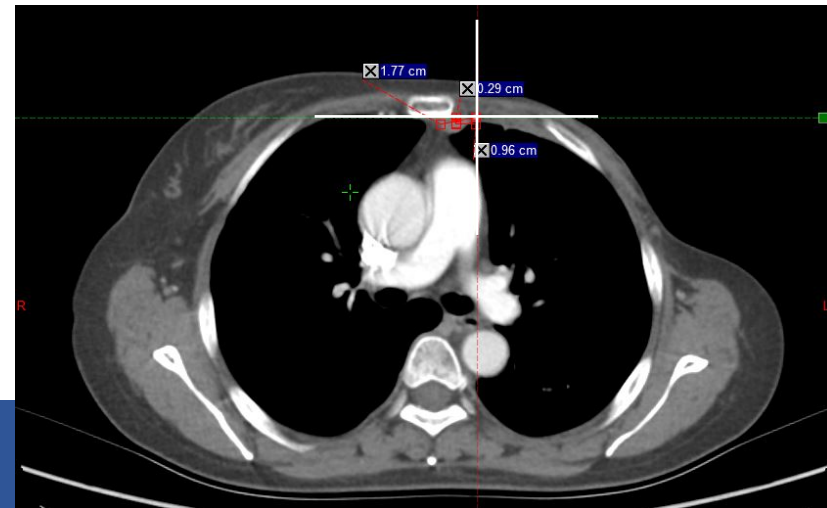
Background

- IMNs locate immediately adjacent to heart and lung
- Lack of effective diagnostic method
- Difficulty in imaging and histology diagnosis
- Optimal definition of target volume is critical in balancing target coverage and toxicity to normal tissues
- The current study aims to collect and analyze the imaging characteristics of IMN involvement so as to provide information for optimizing IMN delineation



Method

- Patients with IMN involvement were identified from single-center imaging database
- Thoracic CT, breast MRI, ultrasound and PET/CT
- Anatomical characteristics from axial imaging were collected
 - Distribution of involved ribs
 - Distance from the IMV(vessels)
- Natural expansion of the IMNs progression
 - measure the distance from the farthest point of the lesion to the vessel
- Analysis of diagnostic rate according to documentation of IMN disease on imaging report



*IMN greater than 5 mm in short axis was defined as metastasis



Results

70 patients with 83 metastatic IMNs located on axial CT imaging.

14 patients had pathologically confirmed IMN disease

- ✓ 4 via extend radical mastectomy
- ✓ 10 via FNA

Table 1. General characteristics of study group

CHARACTERISTICS	INITIAL WITH IMN (N=34)	DIAGNOSIS INVOLVED	RECURRENCE WITH IMN INVOLVED (N=36)	ALL PATIENTS (N=70)*
ER status, n(%)				
Positive	20(58.8)		25(69.4)	45(64.3)
Negative	12(35.3)		10(27.8)	22(31.4)
Unknown	2(5.9)		1(2.8)	3(4.3)
PR status, n(%)				
Positive	13(38.2)		19(52.8)	32(45.7)
Negative	18(52.9)		15(42.7)	33(47.1)
Unknown	3(8.8)		2(5.6)	5(7.1)
HER2 status, n(%)				
Positive	12(35.3)		11(30.6)	23(32.9)
Negative	20(58.8)		22(61.1)	42(60.0)
Unknown	2(5.9)		2(5.6)	4(5.7)
T stage, n(%)				
Tis	1(2.9)		0(0)	1(1.4)
T1	4(11.8)		10(27.8)	14(20.0)
T2	13(38.2)		17(47.2)	30(42.6)
T3	4(11.8)		2(5.6)	6(8.6)
T4	8(23.5)		1(2.8)	9(12.9)
Tx	4(11.8)		6(16.7)	10(14.3)
N stage, n(%)				
N0	0(0)		19(52.8)	19(27.1)
N1	0(0)		6(16.7)	6(8.6)
N2	1(2.9)		3(8.3)	4(5.7)
N3	33(97.1)		6(16.7)	39(55.7)
Nx	0(0)		2(5.6)	2(2.9)
M status, n(%)				
M0	20(58.8)		15(41.7)	35(50.0)
M1	14(41.2)		21(58.3)	35(50.0)



Results

Table 2. Involved ribs location and local-regional relapse of study group

Involved region	Initial diagnosis n=34		Recurrent n=32*		Summary n=66(%)
	M0	M1	M0	M1	
IMN (pts/No)	20	14	14	18	66
1 st intercostal	5	10	6	7	28(42.4)
2 nd intercostal	17	13	11	17	58(87.9)
3 rd intercostal	3	4	4	9	20(30.3)
4 th intercostal	0	2	0	2	4(6.1)
Single intercostal	15	4	7	9	35(53.0)
≥1 intercostal	5	10	5	8	31(47.0)
Local recurrence	-	-	9	8	17(53.1)**
ALN I	19	13	0	3	35(53.0)
ALN II	13	10	1	7	31(47.0)
ALN III	9	8	1	6	24(36.4)
SC	5	5	4	9	23(34.8)

*4 cases lack of primary diagnostic imaging data, not included in the statistics

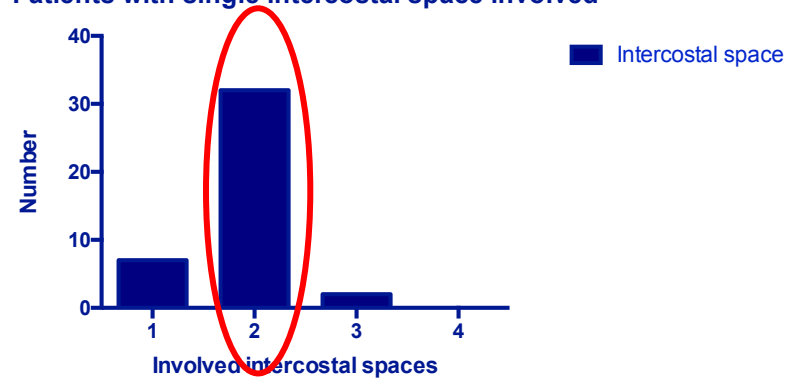
** Proportion of IMN in combination with local recurrence in relapsed population



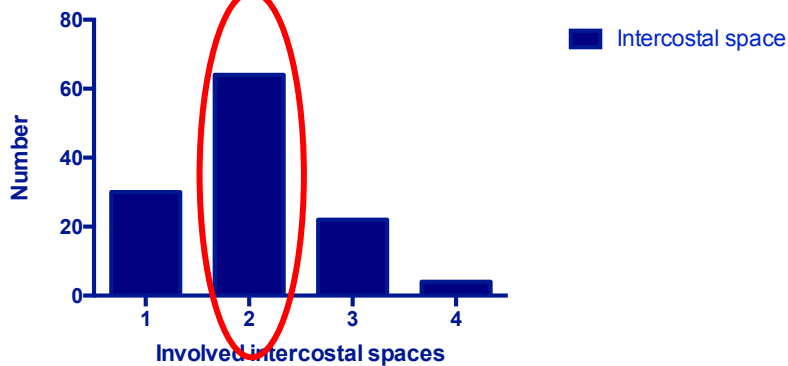
Results

The second intercostal space was the most likely involved among patients with single or multiple intercostal space involvement.

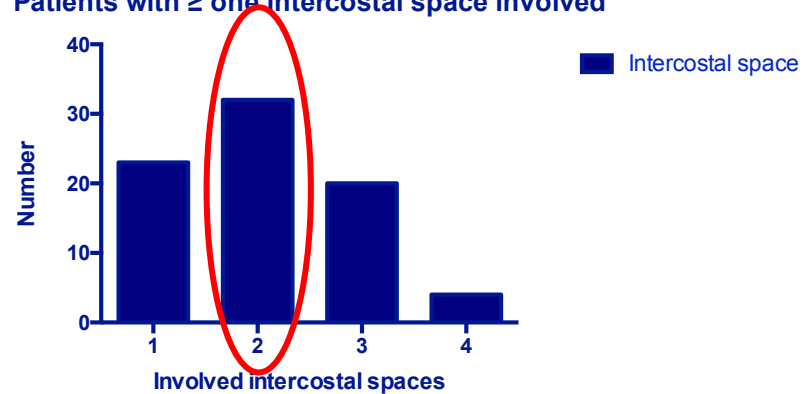
Patients with single intercostal space involved



All patients



Patients with \geq one intercostal space involved





Results

Table 3. The maximal radial distance from center of metastatic nodes to the IMV

	Medial/Lateral n =83	Dorsal/Ventral n =83
Mean(cm)	0.39	0.15
95% CI	0.34-0.44	0.10-0.20
4mm	45 (54.2%)	73(88.0%)
5mm	63(75.9%)	76(91.6%)
6mm	74(89.2%)	80(96.4%)
7mm	77(92.3%)	82(98.8%)
9mm	81(97.6%)	83(100%)

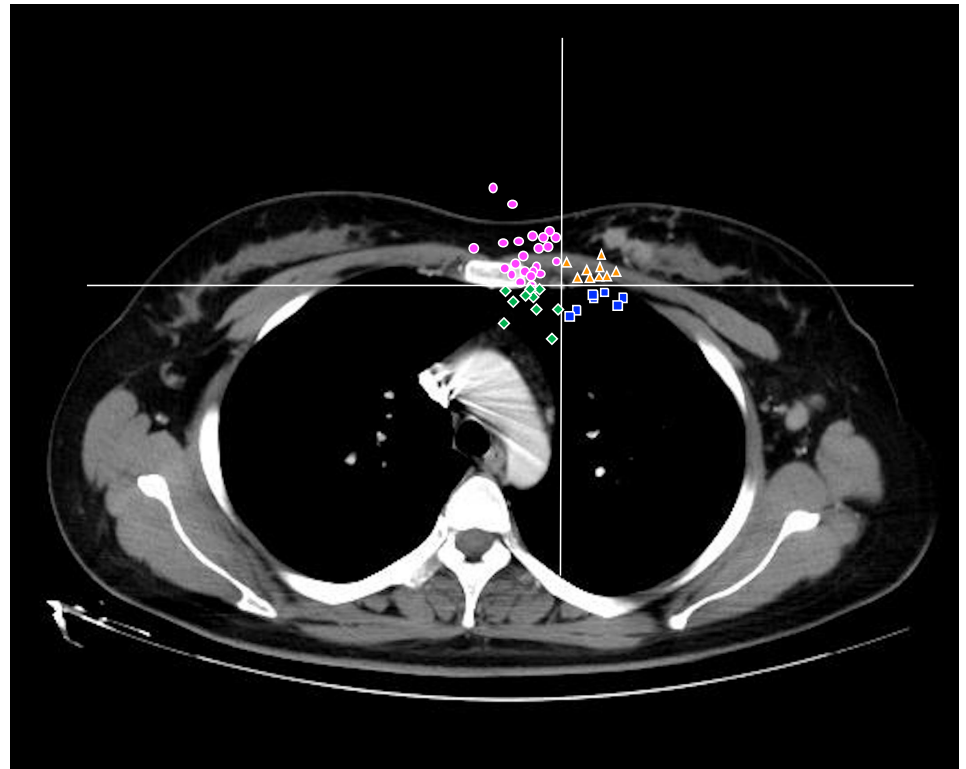
Expanding the medial/lateral to IMV as large as **7 mm** would encompass over 90% IMNs, while **5mm** would include over 90% cases in the dorsal or ventral direction.



Results

Figure 2. Natural expansion of the IMNs progression

Natural expansion of the IMNs progression			
	Ventral	Dorsal	
Toward-sternum	23	9	32 (65.3%)
Off-sternum	10	7	17 (34.7%)
p=0.523	33	16	49



All cases of IMNs were mapped manually using CT imaging of a female patient who had left-sided IMN relapse . Her CT scan of the chest with intravenous contrast acquired with both arms abducted overhead and uploaded onto the Eclipse planning system.

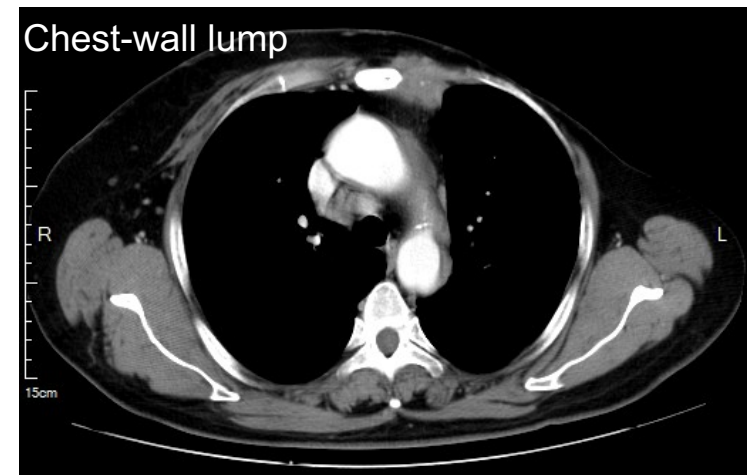
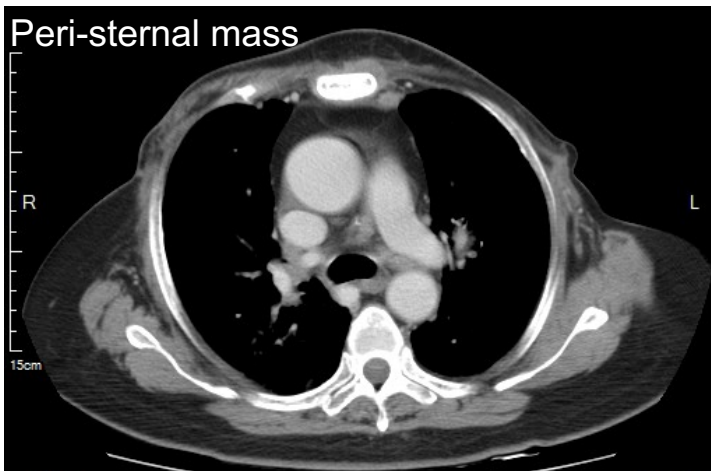


Results

Diagnostic rates of IMN metastases:

US	36.0% (18/50)
CT	34.9% (22/63)
MR	90.3% (28/31)
PET-CT	13.0% (3/23)

Multi-imaging mode 67.4%



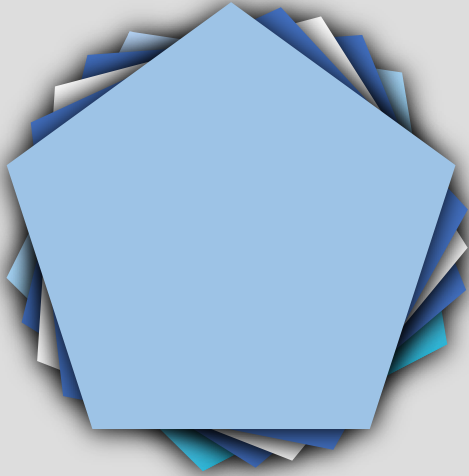


Conclusion

- Among patients indicating for prophylactic IMN irradiation, the clinical target volume of IMN can be delineated with a 7mm medial/lateral and 5mm dorsal/ventral distance to the IMV of the first three intercostal spaces on axial CT.
- It would be reasonable to extend CTV coverage towards sternum for patients with definite IMN disease for we observed most of the lesions expanded towards the sternum side.
- The multi-imaging mode is recommended to help improve the diagnostic rate in IMN metastasis.
- Further study with larger sample size and fundamental or translational researches are needed to validate our findings.



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THANK YOU