

XXV CONGRESSO NAZIONALE  
**AIRO 2015**

PALACONGRESSI - Rimini, 7-10 novembre

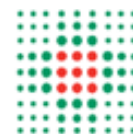


**Simposio**  
**Ricostruzione mammaria ed implicazioni radioterapiche**

**Volumi e dosi**

**Bruno Meduri**

Azienda Ospedaliero-Universitaria di Modena



SERVIZIO SANITARIO REGIONALE  
EMILIA-ROMAGNA  
Azienda Ospedaliero - Universitaria di Modena  
Policlinico





## **DICHIARAZIONE**

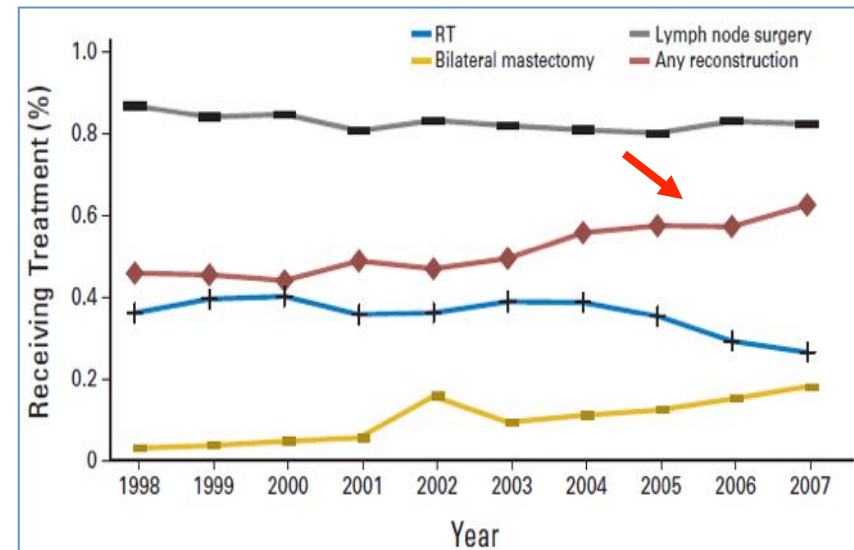
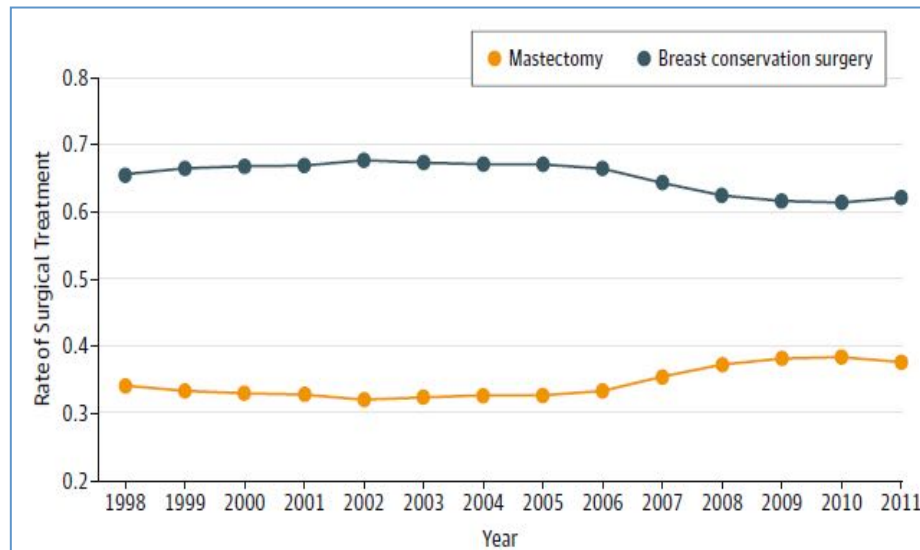
Relatore: Bruno Meduri

Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- Posizione di dipendente in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Consulenza ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Fondi per la ricerca da aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazione ad Advisory Board **(NIENTE DA DICHIARARE)**
- Titolarità di brevetti in compartecipazione ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazioni azionarie in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**

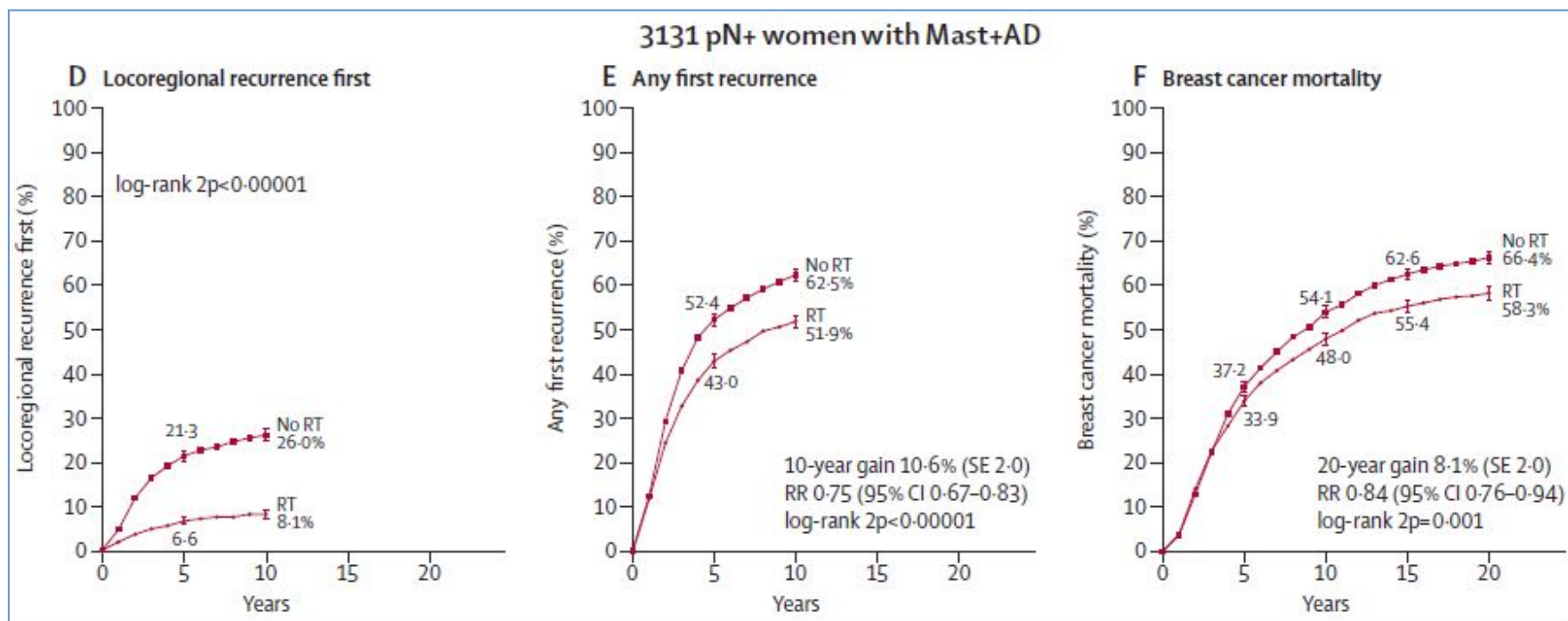
# Post mastectomy radiotherapy (PMRT)

Sharp Rise in Mastectomy with reconstruction  
in Early-Stage Breast Cancer in USA



# Post mastectomy radiotherapy (PMRT)

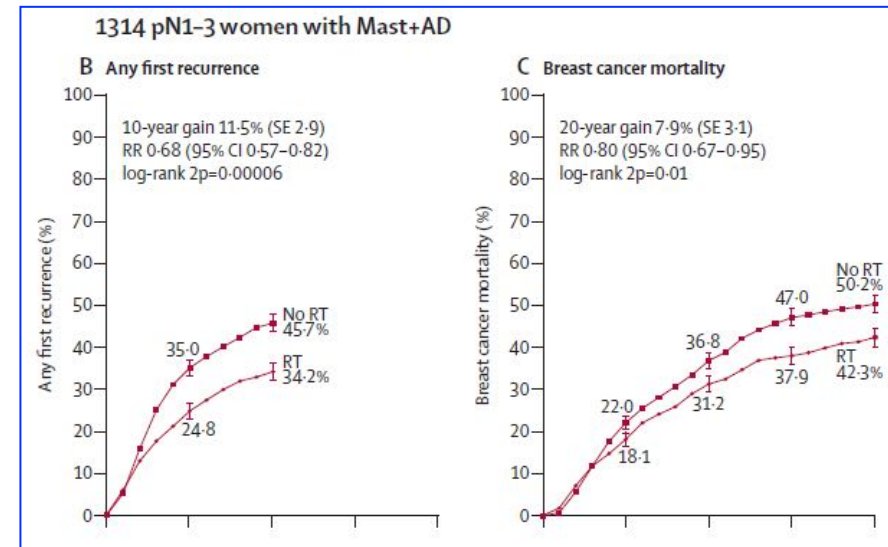
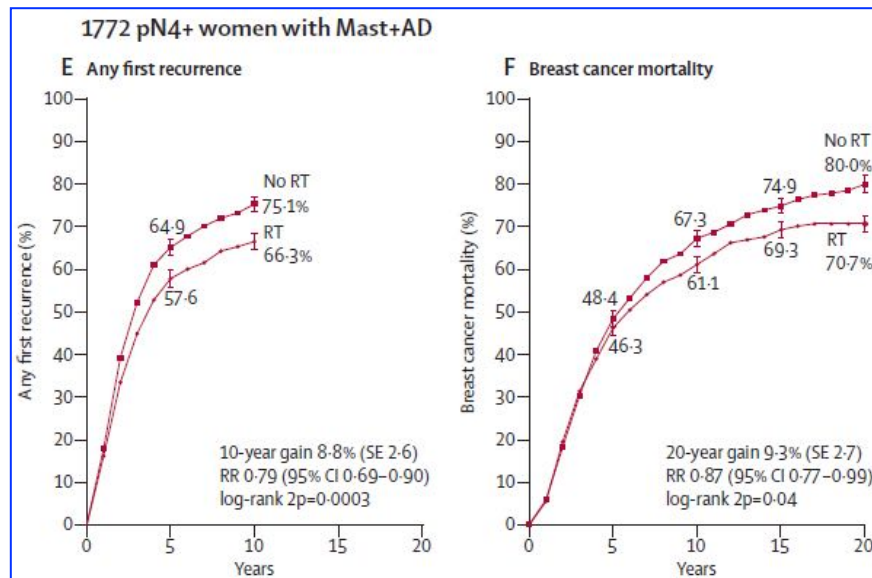
PMRT **reduced** in pN+ the  
**10-year risk of a recurrence** of any type by **10,6%** (62.5% vs 51.9%)  
**20-year risk of death** from breast cancer by **8,1%** (66.4% vs 58.3%)



About **one breast cancer death** was **avoided** in the 20 years **for every 1,5 recurrences** of any type avoided during the first 10 years after radiotherapy

# Post mastectomy radiotherapy (PMRT) Indications

Patients with **high risk for LRR**:  
pT3N+, pT4, N+  $\geq$  4



Patients with **intermediate risk  
for LRR**: pN+ 1-3

EBCTCG, *Lancet* **2014**; 383: 2127-35  
Clarke M et al., *Lancet* **2005**; 366:2087-106

Ragaz J et al., *J Natl Cancer Inst* **2005**; 97:116-26  
Overgaard M et al., *Lancet* **1999**; 353:1641-8

# Post mastectomy radiotherapy (PMRT)

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**Target Volume**

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# Post mastectomy radiotherapy (PMRT)

## Target volume

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**Chest wall**

**Axillary nodes**

**Supra/infraclavicular nodes**

**Internal mammary nodes**

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# Post mastectomy radiotherapy (PMRT)

## Target volume

---

**Chest wall**

Axillary nodes

Supra/infraclavicular nodes

Internal mammary nodes

---



# PMRT: Target volume

## Chest wall

The most common site of locoregional relapse: **50-75%**

Table 2. Sites of LRR

Site	Median Interval (months)	Isolated LRR		Total LRR	
		No.	%	No.	%
Chest wall	27	122	98	122	68
Supraclavicular	35	41	33	71	40
Axilla	29	23	17	25	14
Infraclavicular	27	11	9	17	7
Internal mammary	27	11	9	17	8
Any site	27	124	100	177	100

NOTE. Percentages represent fraction of LRRs including the specific site as a component of failure. Individual patients may have experienced more than one site of failure, so percentages do not total 100%.

With CHT (doxorubicin-based) and without RT

### Risk factors for LRR:

Grade, lymphovascular invasion, nodal ratio, T size, R+, age

# PMRT: Target volume

## Chest wall in pN0 patients

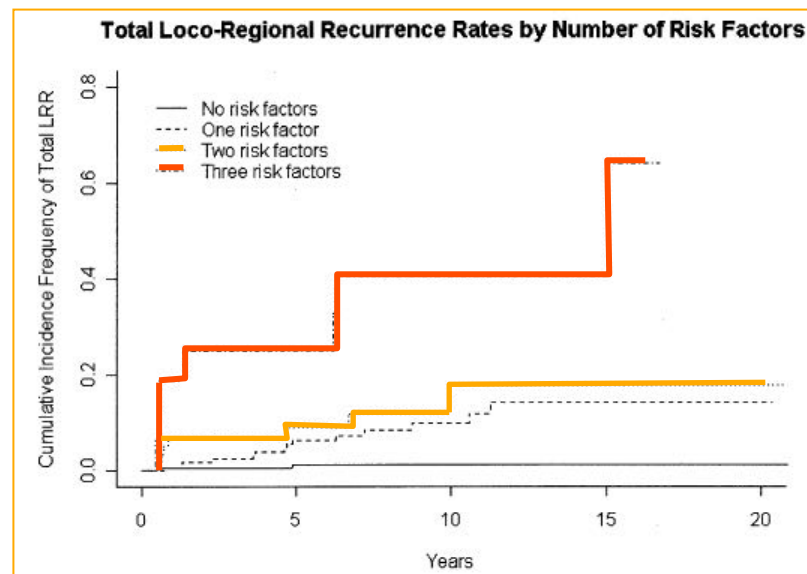
<b>% recurrences &gt; 80%</b>	Number of isolated locoregional recurrences (%)	Number of total locoregional recurrences (%)
Chest wall	28 (87.5%)	37 (80%)
Axilla	2 (6%)	3 (7%)
Supraclavicular region	1 (3%)	5 (11%)
IMC	1 (3%)	1 (2%)
Total	32 (100%)	46 (100%)

### risk factors on LRR multivariate analysis:

	Hazard ratio	p Value
Margin ( $\geq 2$ mm vs. $< 2$ mm)	2.6	0.0210
Menopausal status (pre vs post)	2.8	0.0051
Size ( $> 2$ cm vs. $\leq 2$ cm)	3.8	0.0024
Lymphovascular invasion (positive vs. negative)	3.2	0.0088

### LRR rate (10-year):

1.2%  $\pm$  0.9% with 0 risk factors  
 10.0%  $\pm$  2.9% with 1 risk factor  
 17.9%  $\pm$  7.5% with **2 risk factors**  
 40.6%  $\pm$  13.8% with **3 risk factors**



# Post mastectomy radiotherapy (PMRT)

## Target volume

### Chest wall



**High Risk for LRR:** pT3N+, pT4,  $\geq 4$  pN+



**Intermediate Risk for LRR:** 1-3 pN+ (depending on *risk factors*)



**Low Risk for LRR:** pT2-3 N0 (depending on *risk factors*)

Access Keys | Skip Navigation



Selective Use of Postoperative Radiotherapy After Mastectomy



pT1-2 N1M0 - pT2N0M0 (if G3 and/or LVI+) - pT3N0M0  
RT (CW  $\pm$  (SSC  $\pm$  IMN) vs No RT

# Post mastectomy radiotherapy (PMRT)

## Target volume

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Chest wall

**Axillary nodes (I-II)**

Supra/infraclavicular nodes

Internal mammary nodes

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# PMRT: Target volume

## Axillary nodes

Absolute risk of recurrence after complete dissection of level I and II: **<5%**

Risk factor	No. (%) of patients	Local percent (SE)	Axillary percent (SE)	Supraclavicular percent (SE)
<b>Age, years</b>				
<40	949 (12)	16.1 (1.2)	5.1 (0.7)	6.3 (0.8)
40-49	2607 (32)	10.5 (0.6)	2.7 (0.3)	6.1 (0.5)
50-59	2452 (30)	9.6 (0.6)	2.4 (0.3)	6.3 (0.5)
≥60	2098 (26)	10.8 (0.7)	2.5 (0.3)	3.5 (0.4)
<b>Nodes involved</b>				
None	2555 (32)	6.8 (0.5)	1.3 (0.2)	2.2 (0.3)
1-3	3260 (40)	10.3 (0.5)	2.6 (0.3)	4.8 (0.4)
4-10	1744 (22)	15.4 (0.9)	4.9 (0.5)	8.8 (0.7)
≥11	547 (7)	19.9 (1.7)	4.9 (0.9)	14.8 (1.5)
<b>Tumor size, cm</b>				
≤2	3200 (39)	8.7 (0.5)	2.4 (0.3)	3.5 (0.3)
>2	4623 (57)	12.4 (0.5)	3.0 (0.3)	7.0 (0.4)
Unknown	283 (3)	12.9 (2.1)	5.2 (1.4)	3.8 (1.2)
<b>Tumor grade</b>				
1	1126 (14)	8.2 (0.8)	1.3 (0.4)	2.0 (0.4)
2	3520 (43)	10.7 (0.5)	2.6 (0.3)	4.3 (0.3)
3	3036 (37)	12.3 (0.6)	3.5 (0.3)	8.4 (0.5)
Unknown	424 (5)	11.1 (1.6)	3.8 (0.9)	4.5 (1.0)

Risk factor	No. (%) of patients	Local percent (SE)	Axillary percent (SE)	Supraclavicular percent (SE)
<b>Peritumoral vessel invasion</b>				
No	3823 (47)	8.6 (0.5)	2.0 (0.2)	3.8 (0.3)
Yes	2754 (34)	14.1 (0.7)	3.8 (0.4)	7.5 (0.5)
Unknown	1529 (19)	11.3 (0.8)	3.3 (0.5)	6.2 (0.6)
<b>Nodes uninvolved</b>				
0-7	1925 (24)	15.1 (0.8)	5.2 (0.5)	9.3 (0.7)
8-11	1953 (24)	11.4 (0.7)	2.9 (0.4)	5.6 (0.5)
12-16	2126 (26)	9.8 (0.7)	2.2 (0.3)	4.3 (0.4)
≥17	2102 (26)	7.9 (0.6)	1.3 (0.2)	3.2 (0.4)
<b>Nodes examined</b>				
≤10	1940 (24)	12.5 (0.8)	3.8 (0.4)	5.7 (0.5)
11-14	2076 (26)	9.4 (0.6)	3.5 (0.4)	6.0 (0.5)
15-19	2053 (25)	11.7 (0.7)	2.2 (0.3)	5.3 (0.5)
≥20	2037 (25)	10.3 (0.7)	2.0 (0.3)	5.1 (0.5)
<b>Estrogen receptor status</b>				
Negative	2383 (29)	10.6 (0.6)	3.1 (0.4)	7.7 (0.5)
Positive	4760 (59)	11.3 (0.5)	2.5 (0.2)	4.4 (0.3)
Unknown	963 (12)	10.0 (1.0)	3.6 (0.6)	5.5 (0.7)

# Post mastectomy radiotherapy (PMRT)

## Target volume

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**Axillary nodes**



# Post mastectomy radiotherapy (PMRT)

## Target volume

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Chest wall

Axillary nodes

**Supra/infraclavicular nodes (III)**

Internal mammary nodes

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# PMRT: Target volume

## Supra/infraclavicular nodes (III)

**20%-40%** of all locoregional relapses (absolute risk 5-15%)

Table 2. Univariate analysis for 10-year actuarial failure

Characteristic	SCV/ICV	p value
T stage		
T1	7% (20/337)	NS
T2	10% (40/510)	
T3	7% (7/102)	
TX	9% (8/78)	
Tumor size		
≤1.0 cm	2% (1/45)	NS
1.1–2.0 cm	7% (18/270)	
2.1–3.0 cm	8% (19/270)	
3.1–4.0 cm	15% (18/160)	
4.1–5.0 cm	8% (4/69)	
>5.0 cm	7% (7/103)	
Unknown	8% (10/105)	
No. involved nodes		
0	5% (3/142)	<0.0001
1–3	5% (20/465)	
4–9	15% (34/263)	
≥10	15% (20/157)	
No. nodes examined		
<10	8% (6/113)	NS
≥10	8% (71/918)	
LVSI		0.0008
Absent	6.1% (35/644)	
Present	12.2% (39/364)	
Percentage nodes		
≤20%	5% (21/453)	<0.0001
>20%	15% (52/424)	
Size of largest node		
≤1 cm	5% (7/148)	NS
1.1–2 cm	8% (19/222)	
2.1–3 cm	11% (12/126)	
>3 cm	13% (6/58)	
Unknown	8% (33/477)	
Extranodal extension*		
None	6% (43/711)	0.0012
Present, NOS, or focal	11% (13/151)	
Gross	19% (20/142)	

In **multivariate analysis**:

*lymphovascular invasion* (HR 1.89;  $p$  0.007)

*percentage of positive nodes* (HR 1.01;  $p$  0.0017)

**For T1/T2 and pN+ 1-3:**

Only *n. of N+* predicted for increased failure  
(10-year recurrence with 3 N+ vs 2N+: 10% vs. 2%,  $p$  0.004)

No statistically significant difference:

>20% involved axillary lymph nodes (9% vs. 4%,  $p$  0.15)

ECE (11% vs. 4%,  $p$  0.21)

largest axillary node 2 cm (6% vs. 4%,  $p$  0.26)

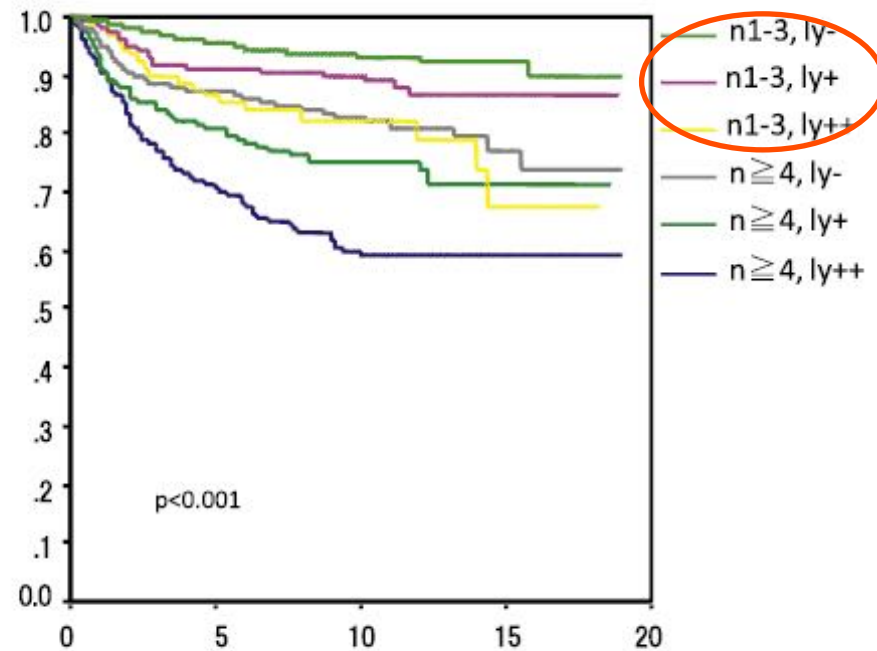
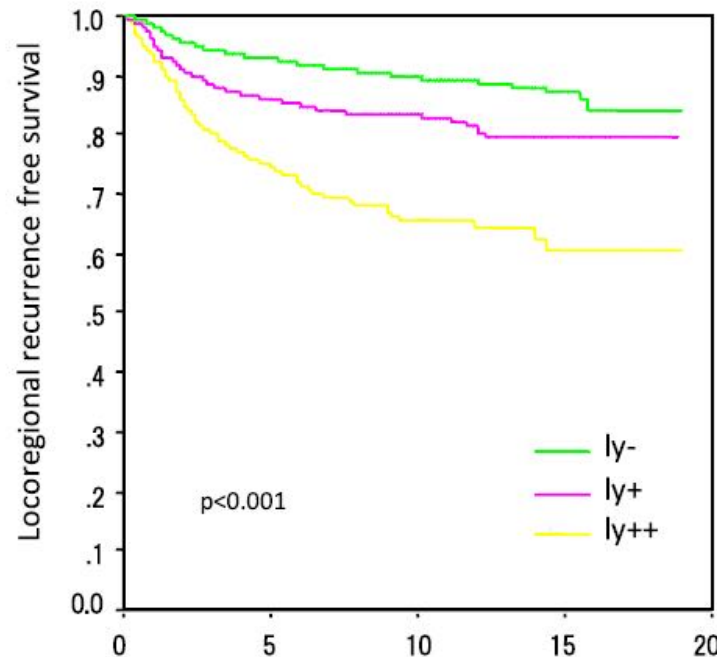
LVI (4% vs. 5%,  $p$  0.65)

*4 factors: 40%*; 3 factors: 9%; 2 factors, 6%;  $p$  0.001.



# PMRT: Target volume

## Supra/infraclavicular nodes in pN+ 1-3



**Ly++** level was associated with a *very high LRR*

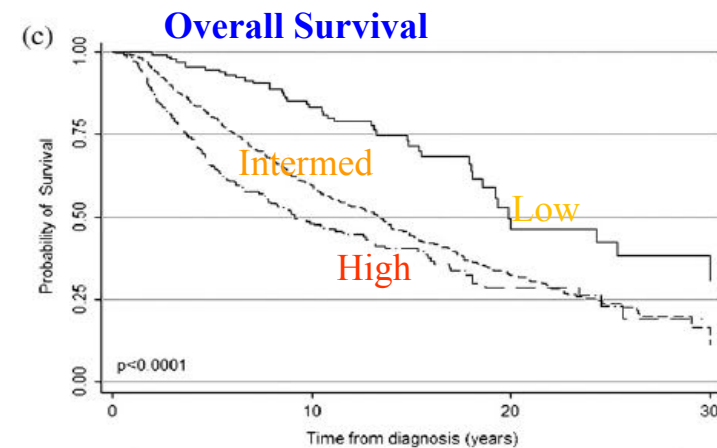
*Ly++ subgroup of N1-3* patients showing a **higher LRR** than the *ly-* subgroups of N4

# PMRT: Target volume

## Supra/infraclavicular nodes in pN+ 1-3

In **multivariate analysis**: *n. of N+* (1 N+ vs 2 N+ [HR = 1.9] and 3 N+ [HR = 3.1],  $p < 0.001$ ) and *grade* (G1: HR = 1, G2: HR = 12.2, G3, HR = 20.8 [ $p < 0.001$ ])

No. LNs		Grade		
		1	2	3
1	5 y	1.4	4.9	6.5
	10 y	1.4	8.9	8.9
2	5 y	0	7.6	12.1
	10 y	0	11.8	19.4
3	5 y	0	10.9	21.1
	10 y	0	14.8	29.6



Risk group

	G1	G2	G3
1 N	Low	Interm	Interm
2 N	Low	Interm	High
3 N	Low	High	High

Table 4b. 5- and 10-year SCFR rate and hazard ratios according to the three risk\* groups

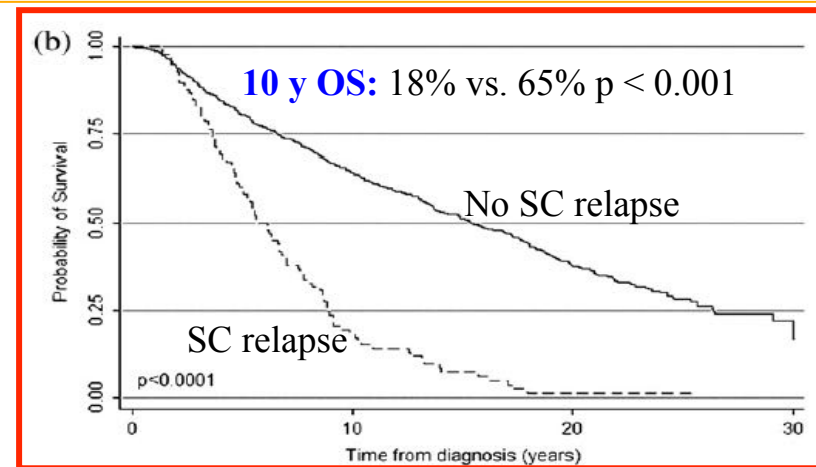
Risk Group	Number (%)	5-y SCFR (%)	10-y SCFR (%)	HR (95% CI)	<i>p</i> Value
Low	131 (14)	0.8	0.8	1.0	<0.001
Intermediate	580 (60)	6.0	9.6	13.5 (1.9–97.9)	
High	252 (26)	14.6	21.0	30.3 (4.2–220.3)	

# PMRT: Target volume

## Supra/infraclavicular nodes in pN+ 1-3

In **multivariate analysis**: *n. of N+* (1 N+ vs 2 N+ [HR = 1.9] and 3 N+ [HR = 3.1],  $p < 0.001$ ) and *grade* (G1: HR = 1, G2: HR = 12.2, G3, HR = 20.8 [ $p < 0.001$ ])

No. LNs		Grade		
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3	5 y	0	10.9	21.1
	10 y	0	14.8	29.6



Risk group

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1 N	Low	Interm	Interm
2 N	Low	Interm	High
3 N	Low	High	High

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# Post mastectomy radiotherapy (PMRT) Target volume

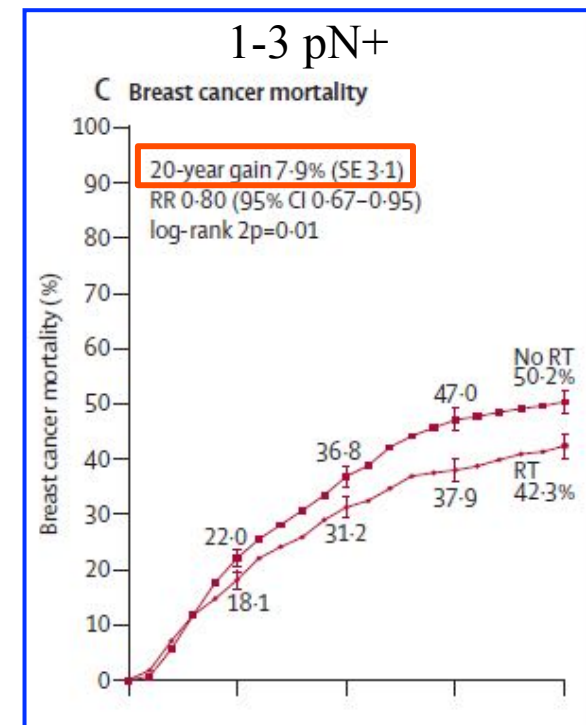
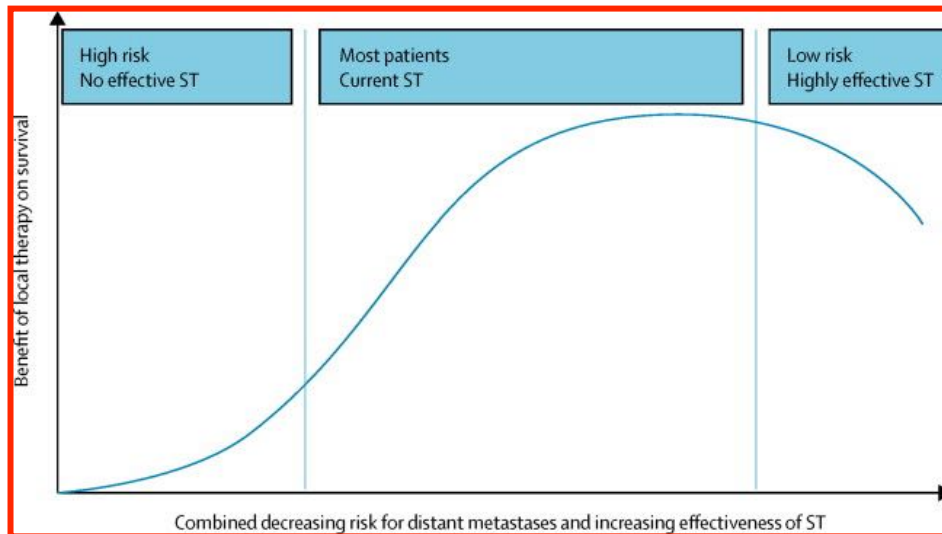
## Supra/infraclavicular nodes



**High Risk for LRR:** pT3N+, pT4,  $\geq 4$  pN+



**Intermediate Risk for LRR:** 1-3 pN+ (*.. risk factors..*)



# Post mastectomy radiotherapy (PMRT)

## Target volume

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Chest wall

Axillary nodes

Supra/infraclavicular nodes

**Internal mammary nodes**

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# PMRT: Target volume

## Internal mammary nodes

Retrospective studies have shown that recurrence in the IMNs is rare (<5%)

**Table 2. IMN Involvement Based on Primary Tumor Location and Axillary Status in Surgical Series**

Study	No. of Patients	IMN-Positive Rate Among Ax-Positive Patients (%)				IMN-Positive Rate Among Ax-Negative Patients (%)			
		Overall	Medial	Central	Lateral	Overall	Medial	Central	Lateral
Handley <sup>21</sup>	1,000	40	50	46	22	11	12	7	4
Donegan <sup>17</sup>	113	34	55	29	31	6	12	0	4
Caceres <sup>20</sup>	500	28	44	31	18	6	8	0	6
Urban and Marjani <sup>24*</sup>	725	52	65	48	42	16	20	12	13
Livingston and Arlen <sup>23*</sup>	583	32	59	46	23	8	14	8	5
Huang et al <sup>25</sup>	1,679	28	32	36	24	4	7	2	3

Multiple series of surgical IMN evaluation were reported that consistently identified *medial tumors* and *positive axillary nodes* to be strongly associated with a **higher rate of IMN +**

# PMRT: Target volume

## Internal mammary nodes

A significant proportion (13%-37%) of patients have **primary IMN drainage** and that *medial tumors* are more likely than lateral tumors to drain to the IMN chain

**Table 4.** Lymphoscintigraphy Identification of IM SN

Study	No. of Patients	% of Patients With IM SN Visualized*				IM SN Only (%)	IM SN Biopsy-Positive Rate (%)
		Overall	Medial	Central	Lateral		
Shahar et al <sup>49</sup>	297	21	25	28	16	1	—
Madsen et al <sup>36</sup>	506	22	42	18	14	1	24
Carcoforo et al <sup>45</sup>	741	13	20	13	5	—	15
Byrd et al <sup>48</sup>	220	17	20	29	15	1	—
Estourgie et al <sup>44</sup>	700	21	34	23	14	2	13
van der Ent et al <sup>47</sup>	256	25	39†	—	16	0	27
Lamonica et al <sup>46</sup>	132	13	18	14	11	4	—
Park et al <sup>38</sup>	83‡	17	28	17	13	—	—
Paganelli et al <sup>41</sup>	200‡	37	63	—	10	8	8

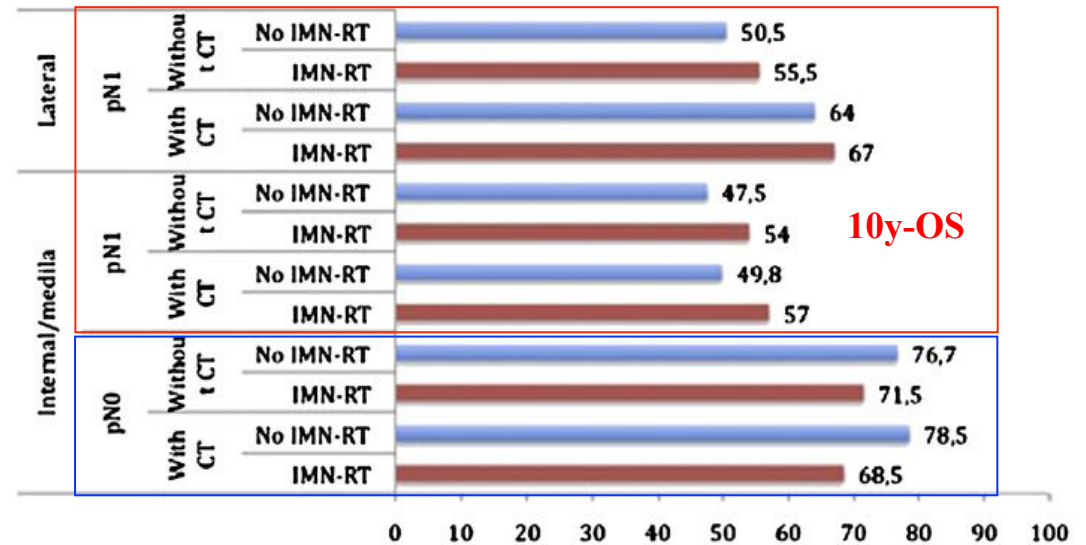
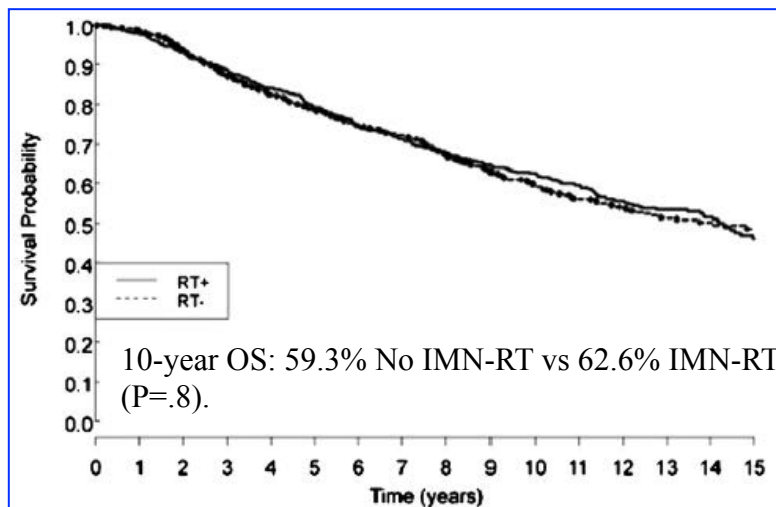
*Up to 8%* of patients had **only IM sentinel nodes** (not axillary sentinel nodes)

**Mismatch low rate recurrence:** seed and soil phenomenon ... recurrences less likely than other sites to be detected as *the first site of recurrence* (CT vs PET).

# PMRT: Target volume

## Internal mammary nodes

Patients (1407) pN+ or central/medial tumors with or without pN+. RT CW/SCN ± IMN



Not show a significant difference in OS according to the use or not of IMN-RT

It was designed to demonstrate a 10% benefit in overall survival → underpowered  
 In **subgroups** with a particular high risk of IM nodes involvement a slight but not significant difference was observed

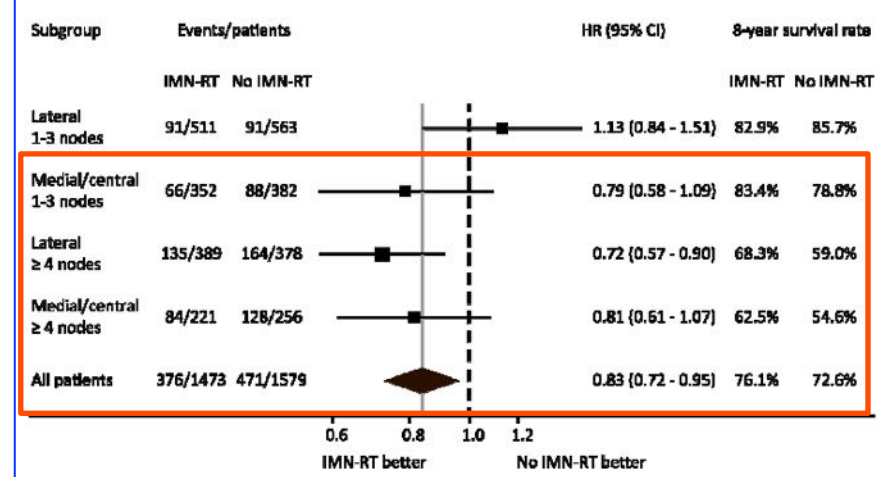
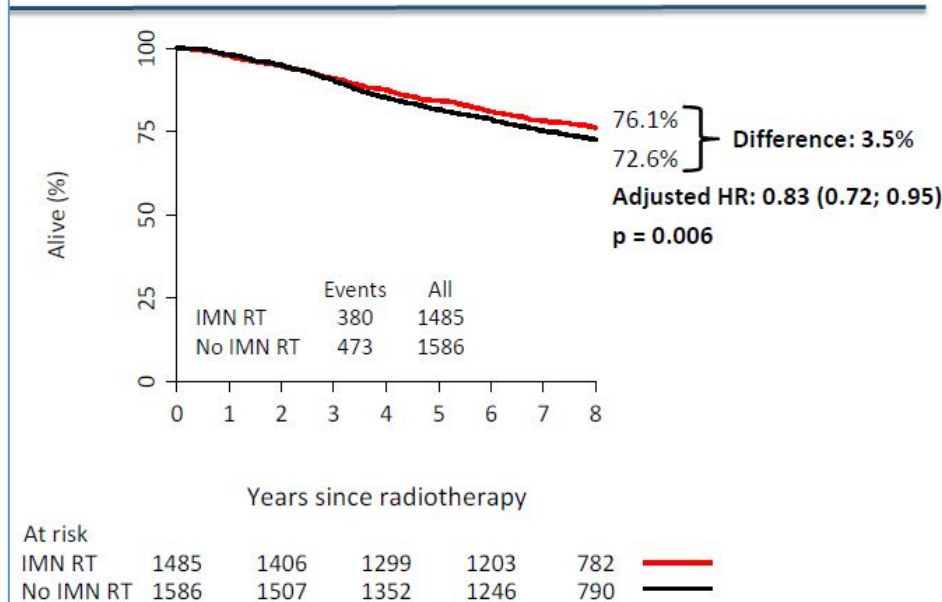


# PMRT: Target volume

## Internal mammary nodes

Patients (3072) with operable unilateral BC with macrometastases to one or more axillary LNs, prospectively allocated to adjuvant RT +/- IMN-RT depending on BC laterality

### Primary endpoint: Overall Survival



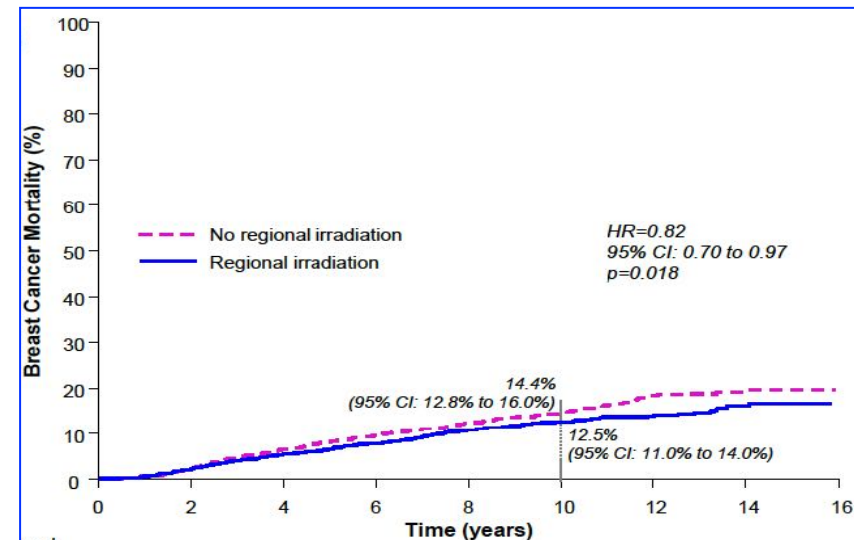
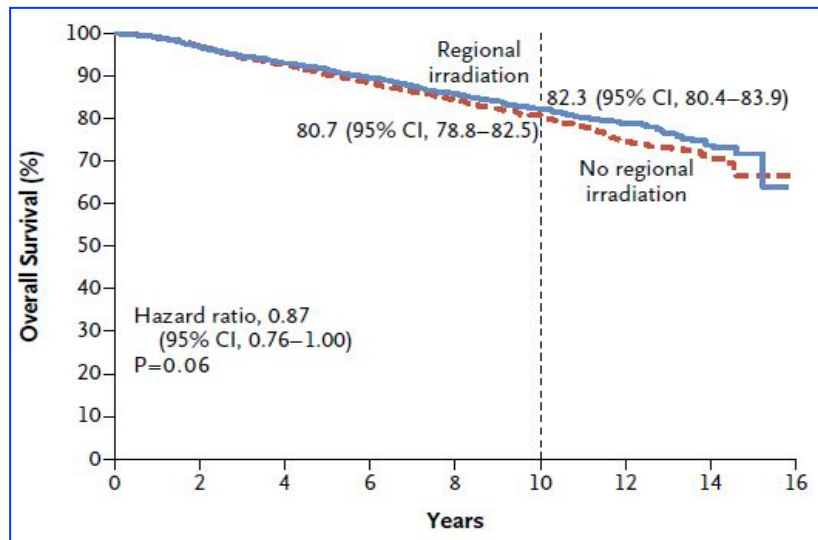
Overall survival improved with IMN-RT

Benefit increased with increasing number of N+ and medial or central tumor location

# PMRT: Target volume

## IMN: EORTC 22922

Patients (4004) with centrally or medially located primary tumor, *irrespective of axillary involvement*, or an externally located tumor with axillary involvement



Regional nodal irradiation was beneficial to women with early stage BC  
It improved the rates of DFS, DMFS and reduced the rate of death from BC  
**Side effects were modest.** Rate of death from causes  $\neq$  BC not increased  
**FUP for a median of 20 years is ongoing**

# Post mastectomy radiotherapy (PMRT)

## Target volume

### Internal mammary nodes



pN+ and centrally or medially located primary tumor  
(depending on *risk factors*)

Tab. 1 Meta-analysis of survival data from two randomized trials			
	MA-20 [58]	EORTC [40]	Meta-analysis [6]
Design	WBI + IM + MS + Ax level III vs. WBI alone	WBI/CWI + IM + MS vs. WBI/CWI alone	
n	1832	4004	Total 5836
OAS	HR 0.76 (95% CI 0.75–0.96) p=0.07	HR 0.87 (95% CI 0.76–1.00) p=0.056	<b>HR 0.85</b> (95% CI 0.75–0.96) <b>p=0.011</b>
DFS	HR 0.67 (95% CI 0.52–0.87) p=0.003	HR 0.89 (95% CI 0.80–1.00) p=0.044	<b>HR 0.85</b> (95% CI 0.77–0.94) <b>p=0.002</b>
MFS	HR 0.64 (95% CI 0.47–0.85) p=0.02	HR 0.86 (95% CI 0.73–0.92) p=0.02	<b>HR 0.82</b> (95% CI 0.73–0.92) <b>p=0.001</b>

WBI whole breast irradiation, IM internal mammary nodes, MS medial/supraclavicular nodes, Ax axillary nodes, CWI chest wall irradiation, OAS absolute overall survival, HR hazards ratio, CI confidence interval, DFS disease-free survival, MFS metastasis-free survival.

#### Comments and conclusions of the DEGRO panel

Medial tumor location should regain relevance among decision criteria for IMN-RT as part of RNI.

# PMRT: Target volume

## Contouring

**Breast Cancer Atlas for Radiation  
Therapy Planning:  
Consensus Definitions**

**RTOG**  
RADIATION THERAPY  
ONCOLOGY GROUP



Associazione Italiana  
di Radioterapia Oncologica  
Gruppo di lavoro AIRO per la Patologia Mammaria

**La Radioterapia  
dei Tumori  
della Mammella**  
Indicazioni e Criteri Guida

# PMRT: Target volume

## Contouring

Loco-regional conformal radiotherapy of the breast: delineation of the regional lymph node clinical target volumes in treatment position

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Jan J. Battermann<sup>a</sup>, Berend Hillen<sup>b</sup>

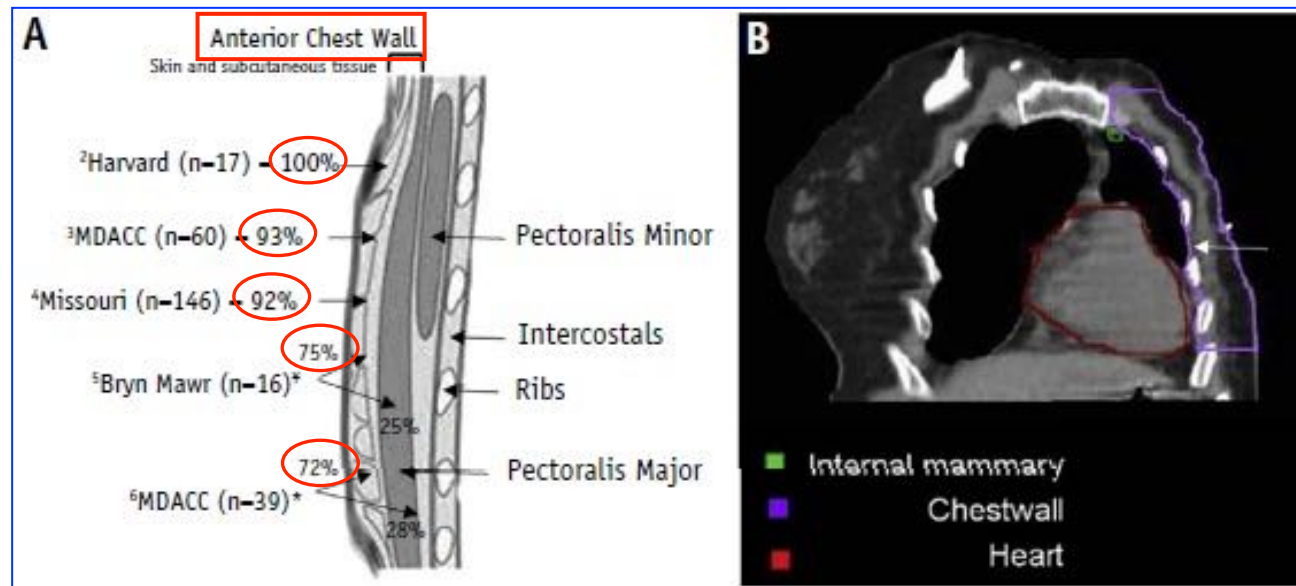
ESTRO consensus guideline on target volume delineation for elective radiation therapy of early stage breast cancer



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Karolien Verhoeven<sup>j</sup>, Caroline Weltens<sup>j</sup>, Meritxell Arenas<sup>k</sup>, Dorota Gabrys<sup>l</sup>, Neil Kopek<sup>m</sup>,  
Mechthild Krause<sup>n</sup>, Dan Lundstedt<sup>o</sup>, Tanja Marinko<sup>p</sup>, Angel Montero<sup>q</sup>, John Yarnold<sup>r</sup>, Philip Poortmans<sup>s</sup>

# PMRT: Target volume

## Contouring



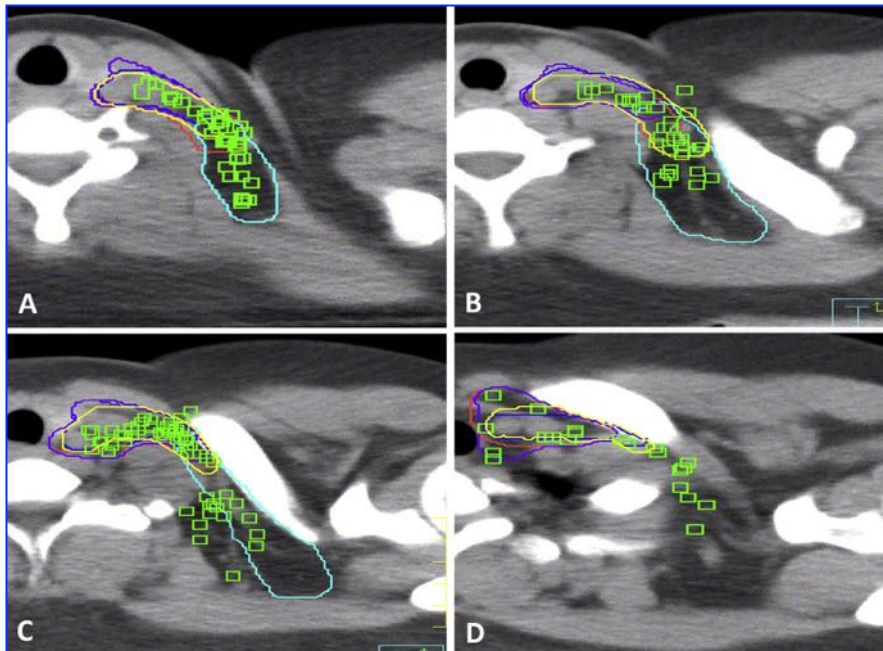
Most common site of CW recurrence (72%-100%) is within **skin** and **subcutaneous tissues** anterior to the pectoralis musculature. No significant isolated recurrences in the intercostal muscles or ribs.

**ESTRO guidelines:** *Unless invasion was demonstrated (T4a and T4c), there is no reason for routinely including the major pectoral muscle and the ribs in the CTV CW*

A revision in the RTOG and AIRO guidelines may be warranted.

# PMRT: Target volume

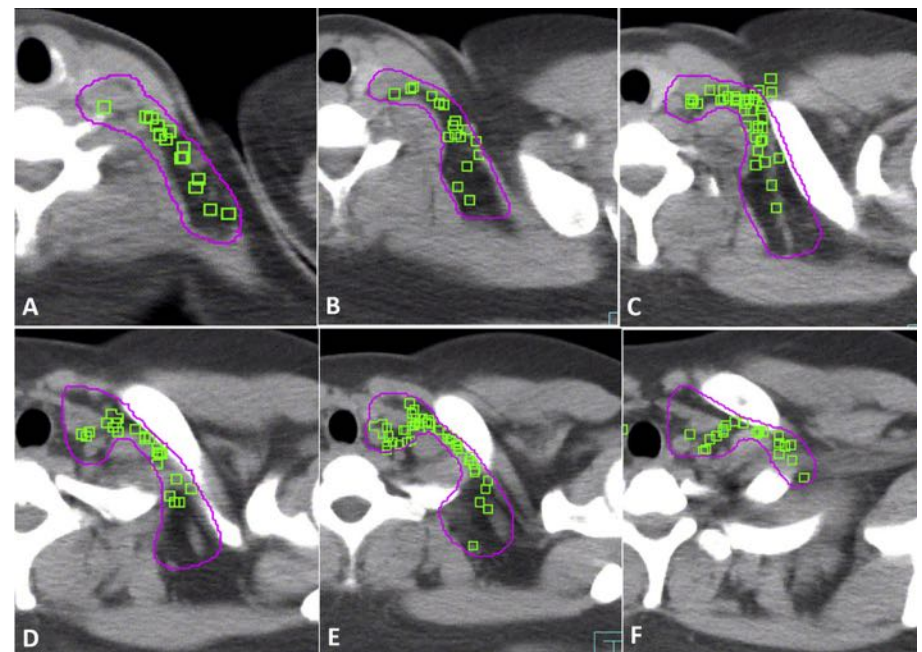
## Contouring



None of the atlases could fulfill  
>85% of coverage

CTV modification according to the results

Lateral: trapezius, clavicle, subclavicular m.  
Dorsal: trapezius and subclavicular m.  
Caudal: cranial edge of the sternum



# Post mastectomy radiotherapy (PMRT)

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**Dose**

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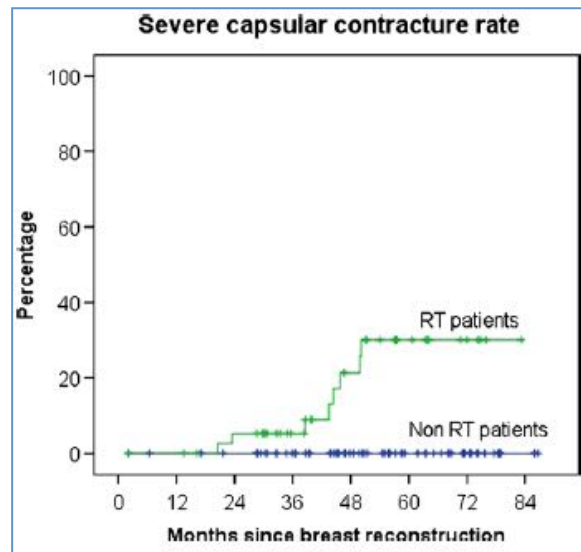


# PMRT: Dose

The majority of studies: **50-50,4 Gy (1,8-2 Gy/fr)**

## Hypofractionation

Reconstructed breast/chest wall +/- SCN: **40 Gy** in 15 fractions (**2,66 Gy/fr**) over 3 weeks



Median follow-up of 50 months  
8/42 (19%) *severe capsule contracture*

High rate of severe capsule contracture  
but  
comparable to those with 5 week schedules

# PMRT: Dose

## Hypofractionation

*Limited data exist* with regard to hypofractionation in PMRT and regional nodal RT setting

UZ Brussels [15]	Randomized, prospective	2007–2011	70 (33% RNI)	50/25 v. 42/15	28	Reduced skin changes and lung function with hypofractionation at 2 years; no difference in fibrosis, lymphedema, or cardiac function.
Greece [32]	Prospective	2003–2010	112 (all PMRT, 73 RNI)	35/10	44	97% local control; no cases of pneumonitis. Acute toxicity- 23% Grade 2 + dermatitis in boost, 13% beyond field, No Grade 2 + chest pain, pneumonitis, edema, or erythema. Late toxicity- Grade 2 + edema 4.4%, Grade 2 + fibrosis, 7.1%, Grade 2 + chest wall pain 1.8%, No Grade 2 + plexopathy 4% CT changes in lung
Thailand [33]	Retrospective	2004–2006	215 (all PMRT; 67 conventional, 148 Hypofractionated)	50/25 v. 42.4–47.7.2.65	39	No difference in loco-regional control; no difference in chest wall appearance, fibrosis, appearance, plexopathy, lymphedema, cardiac, pulmonary, or rib fractures




Data are promising ...

...however, more data are needed to examining clinical efficacy as well as toxicity profiles

# Conclusions

## Volumes

### Chest wall

-  **High Risk for LRR:** pT3N+, pT4,  $\geq 4$  pN+
-  **Intermediate Risk for LRR:** 1-3 pN+ (depending on *risk factors*)
-  **Low Risk for LRR:** pT2-3 N0 (depending on *risk factors*)

### Axillary nodes

-  No ALN-RT after complete dissection of level I and II

### Internal mammary nodes

-  pN+ and centrally or medially located primary tumor (depending on *risk factors*)

# Conclusions

## Volumes

### Supra/infraclavicular nodes



**High Risk for LRR:** pT3N+, pT4,  $\geq 4$  pN+



**Intermediate Risk for LRR:** 1-3 pN+ (.. *risk factors*..)

### Contouring

**RTOG Chest Wall Contouring Guidelines  
for Post-Mastectomy Radiation Therapy:  
Is It Evidence-Based?**

John A. Vargo, MD, and Sushil Beriwal, MD

**Atlases**



Clinical Investigation

**Mapping Patterns of Ipsilateral Supraclavicular  
Nodal Metastases in Breast Cancer: Rethinking  
the Clinical Target Volume for High-risk Patients**

Hao Jing, MD,\* Shu-Lian Wang, MD,\* Jing Li, MD,† Mei Xue, MM,†

# Conclusions

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**Dose**

**Standard**

**Total dose: 50-50,4 Gy - Dose/fraction: 1,8-2 Gy**

**Hypofractionation**

