La Radioterapia post-mastectomia nel carcinoma della mammella

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LA RADIOTERAPIA POST-MASTECTOMIA

I QUESITI

- perchè
- in quali pazienti
- sempre dopo chemioterapia neoadiuvante ?
- entro quanto tempo dalla CH
- quali volumi trattare
- con quale tecnica
- a che prezzo - gli effetti collaterali

RT post-mastectomia:

Sites of LRF at 10 years in 2016 node-positive patients treated in ECOG Trials by modified radical mastectomy and adjuvant chemotherapy (with or without tamoxifen), but without PMRT

Site of LRF	*N* (%)
Chest wall	244 (12%)
Supra/infraclavicular	158 (8%)
Axilla	82 (4%)
Internal mammary	4 (0.2%)

Perché ?

25% recidive loco regionali nei pz. pN+

nei pT3 se N+ ma anche nei pT1-2 se > 3 ln

Positive nodes	% LRF		
	T1	T2	T3
1–3	12	12	31
4–7	20	27	45
> 7	33	33	33

Kurtz EJC 2002,
EUSOMA guidelines

RT post-mastectomia:

Perché ? miglior controllo locale e sopravvivenza con la PMRT

Truong, JAMC, 2004

Table 1: Summary of locoregional failure and overall survival rates by nodal status in 6 randomized trials of locoregional post-mastectomy radiotherapy (PMRT)

Study	Chemotherapy	Median duration of follow-up	Patients	No. of patients	Nodal status	Locoregional failure* PMRT, %	Locoregional failure* No PMRT, %	Locoregional failure* *p* value	Overall survival PMRT, %	Overall survival No PMRT, %	Overall survival *p* value
Overgaard et al (Danish 82b trial), 1997[5]	CMF	114 mo	Premenopausal	135	Negative	3	17	NR	82†	70†	NR
				1061	1–3 positive	7	30	NR	62†	54†	NR
				510	≥ 4 positive	14	42	NR	32†	20†	NR
Overgaard et al (Danish 82c trial), 1999[7]	Tam	119 mo	Postmenopausal	132	Negative	6	23	NR	56†	55†	NR
				794	1–3 positive	6	31	NR	55†	44†	NR
				448	≥ 4 positive	11	46	NR	24†	17†	NR
Ragaz et al (British Columbia trial), 1997,[6] 1999[38]	CMF	150+ mo	Premenopausal	183	1–3 positive	8	20	0.066	64†	53†	0.07
				112	≥ 4 positive	17	51	0.004	35†	28†	0.20
McArdle et al (Glasgow trial), 1986[29]	CMF	63 mo	Pre- and postmenopausal	141	1–3 positive	NR	NR	NR	76‡	68‡	0.76
				72	≥ 4 positive	NR	NR	NR	54‡	46‡	0.01
Vélez-Garcia et al (SECSG trial), 1992[30]	CMF	120 mo	Pre- and postmenopausal	270	≥ 4 positive	13	25	0.067	55*	46*	NR
Griem et al (Dana Farber trial), 1987[28]	CMF or MF	53 mo	Pre- and postmenopausal	83	1–3 positive	2	5	0.61	77‡	85‡	0.39
	CA	45 mo		123	≥ 4 positive	6	20	0.03	59‡	63‡	0.27

Note: SECSG = South-Eastern Cancer Study Group, NR = not reported, C = cyclophosphamide, M = methotrexate, F = fluorouracil, A = adriamycin, Tam = tamoxifen.
*Cumulative proportion.
†10-year actuarial survival estimate.
‡5-year actuarial survival estimate.

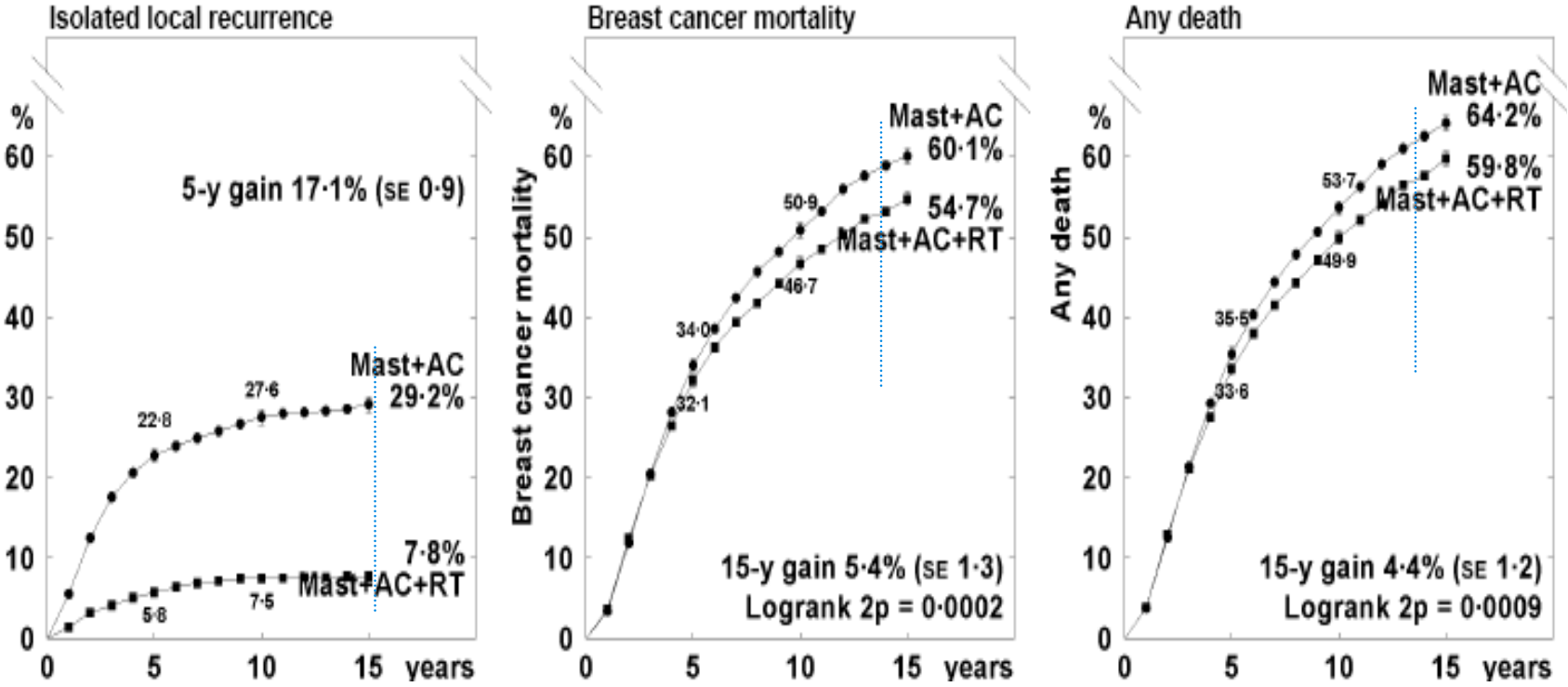
NR: not reported

RT post-mastectomia:

In quali pazienti ?

- n° di linfonodi interessati
- dimensione del tumore
- età / stato menopausale
- aggressività biologica
  - grading
  - invasione linfovascolare
  - profilo recettoriale
  - genomica ???

Mastectomia & AC ± RT



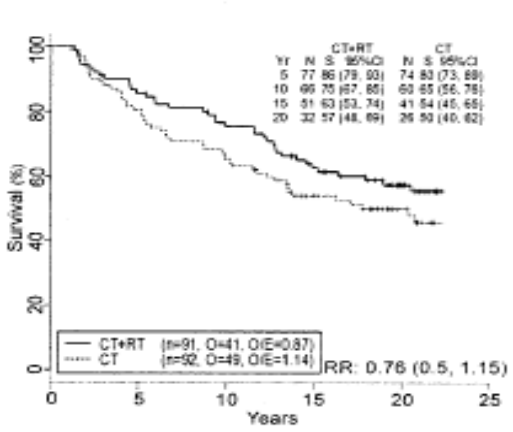
8505 pts

EBCTCG,
Lancet, 2005

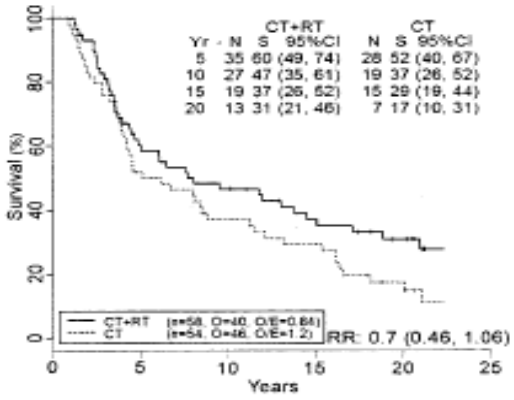
VANTAGGIO ALTAMENTE SIGNIFICATIVO:
CONTROLLO LOCALE (+20%)
MORTALITA' CANCRO-CORRELATA (-6%)
E CANCRO NON CORRELATA

N +

Mastectomia & CMF ± RT



pN 1-3



pN > 3

British Columbia
Randomized Trial

318 pN+ premenopausal pts
20 years follow-up

median of 11 lymph nodes removed

CT (CMF) ± IPO PMRT (37.5Gy)

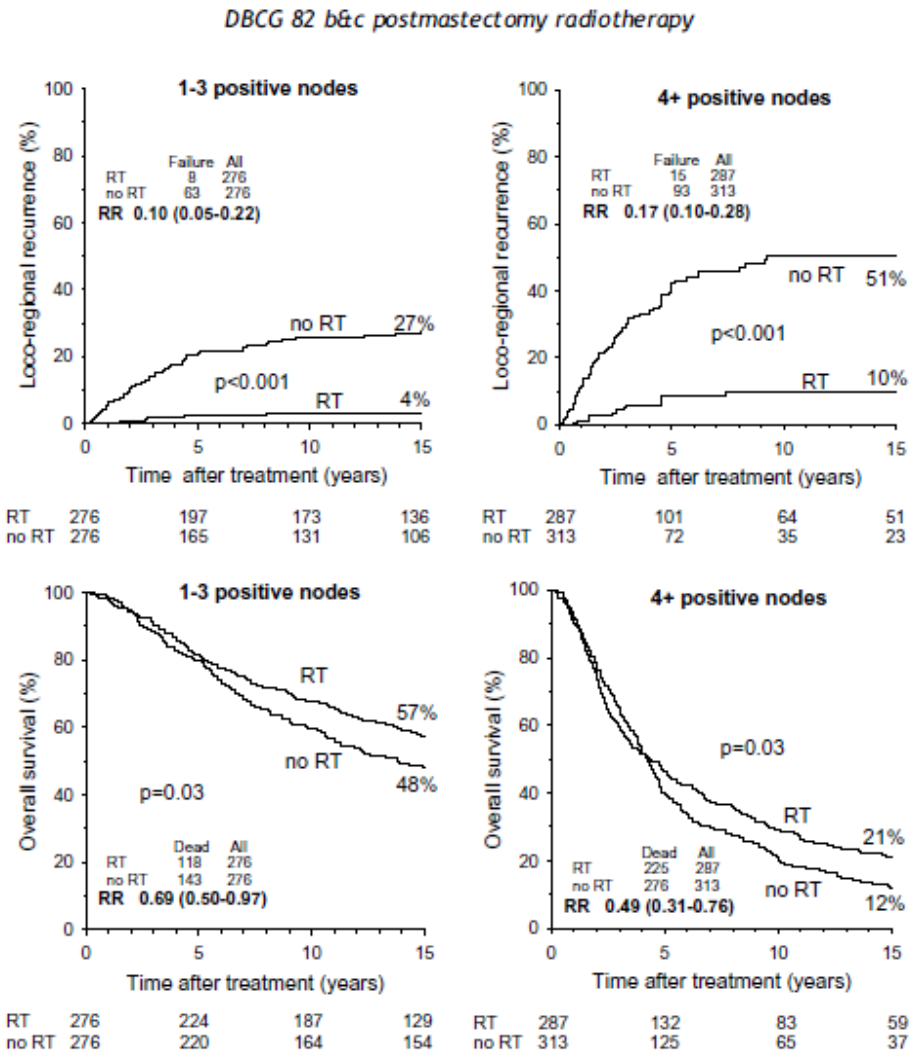
RT su ascella, sovraclaveare ed ambedue le catene mammarie interne

Ragaz JNCI, 2005

(183 pz) 3ln ≥ N+ > 3ln (112 pz)

VANTAGGIO ALTAMENTE SIGNIFICATIVO:
CONTROLLO LOCALE (+18 %)
Diffusione sistemica di malattia (-17%)
OVERALL SURVIVAL (+15%)

N +



(552 pz) 3ln ≥ N+ < 3ln (600 pz)

VANTAGGIO ALTAMENTE SIGNIFICATIVO:
CONTROLLO LOCALE (+23 / 40 %)
OVERALL SURVIVAL (+9%)

Mastectomia & CMF / TAM ± RT

1152 pN+ pts with 8 or more lymph nodes removed

Overgaard RO, 2007

N +

Mastectomia $_{p}T_{3/4}$ oppure $_{p}N+$ >3 ln

La RT è sempre INDICATA:
riduce le recidive locali e
migliora la sopravvivenza

SELECTING BREAST CANCER PATIENTS WITH T1-T2 TUMORS AND ONE TO THREE POSITIVE AXILLARY NODES AT HIGH POSTMASTECTOMY LOCOREGIONAL RECURRENCE RISK FOR ADJUVANT RADIOTHERAPY

Analisi multivariata per la recidiva locoregionale

Variable	*p*	Hazard ratio (95% CI)
Age (<45 vs. ≥45 y)	0.001	3.44 (1.68–7.07)
Positive nodes (>25% vs. ≤25%)	0.05	2.00 (0.99–4.05)
Tumor location (medial vs. lateral)	0.002	2.46 (1.15–5.26)
ER status (negative vs. positive)	0.01	2.02 (1.16–3.54)
Grade (3 vs. 1–2)	0.11	
Tumor stage	0.15	
Histologic type	0.69	
LVI	0.31	
Surgical margin status	0.16	
Positive nodes	0.74	
Dissected nodes	0.24	
Systemic therapy	0.92	

Età < o > 45aa = LRR 29% vs 14%

Età < 45aa e N+ ≥ 25% = LRR 58% vs 24%

Età >45aa e N+ ≥ 25% = LRR 27% vs 11%

Studio retrospettivo su 1505 pts pT1-2 N+ (<4)

Mastectomia non seguita da PMRT

Terapia sistemica: 97%

La probabilità di recidiva locoregionale è funzione principalmente dell'età

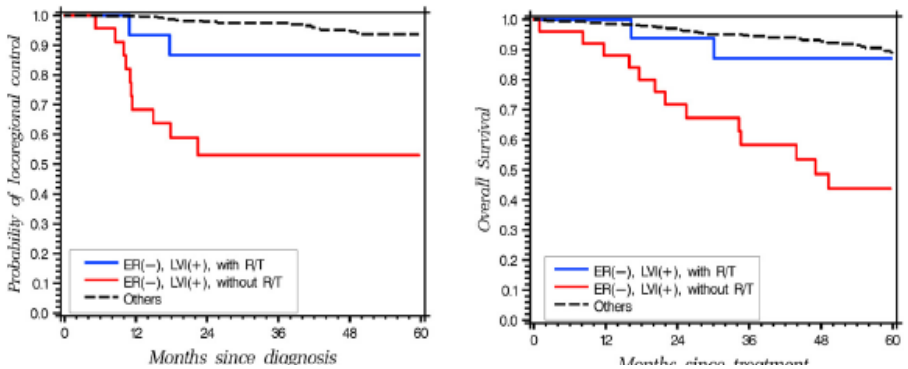
Truong, IJROBP,2005

RADIOTHERAPY CAN DECREASE LOCOREGIONAL RECURRENCE AND INCREASE SURVIVAL IN MASTECTOMY PATIENTS WITH T1 TO T2 BREAST CANCER AND ONE TO THREE POSITIVE NODES WITH NEGATIVE ESTROGEN RECEPTOR AND POSITIVE LYMPHOVASCULAR INVASION STATUS

Analisi multivariata per la recidiva locoregionale

Factor	Hazard ratio	95% confidence interval
Age ≥40 vs. <40 y	0.604	0.304–1.202
Nuclear Grade 1, 2 vs. 3	1.003	0.46–2.188
Estrogen receptor negative vs. positive	4.764	1.812–12.522
Progesterone receptor negative vs. positive	0.641	0.265–1.55
LVI positive vs. negative	2.129	1.066–4.251
T2 vs. T1	1.88	0.966–3.661

Abbreviation: LVI = lymphovascular invasion.



Studio retrospettivo su 544 pts pT1-2 N+ (<4)

Mastectomia seguita da PMRT in pazienti a maggior rischio (30%)

Terapia sistemica: 97%

La > probabilità di recidiva locoregionale è significativa in pz ER- o LVI+

Yang, IJROBP, 2010

Indicazioni: $_pT_{1-2}$ N+ ≤ 3ln

- Mastectomia + RT su parete e svc ???:

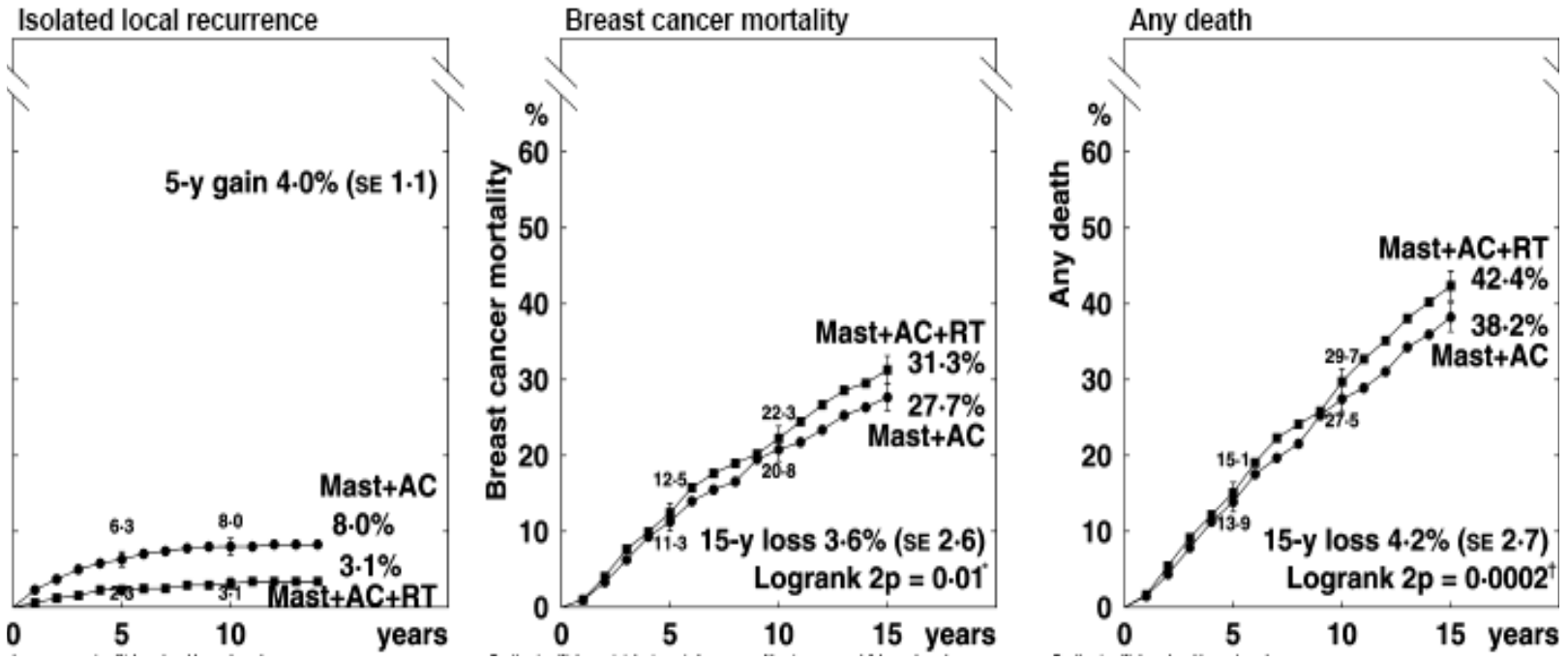
La RT migliora il controllo loco-regionale e sopravvivenza specie nelle pazienti con età <40-45 aa.,con più del 25% dei linfonodi asportati sede di malattia, ER-, LVI+

vantaggio nella sopravvivenza globale ~10%

(Overgaard, 2007; Truong 2005; Yang 2010)

discutere col paziente in funzione di numero dei fattori di rischio, lato, comorbidità

Mastectomia & AC ± RT



VANTAGGIO SIGNIFICATIVO ma minimo (+4%) SU:
CONTROLLO LOCALE
MORTALITA' CANCRO-CORRELATA
E CANCRO NON CORRELATA

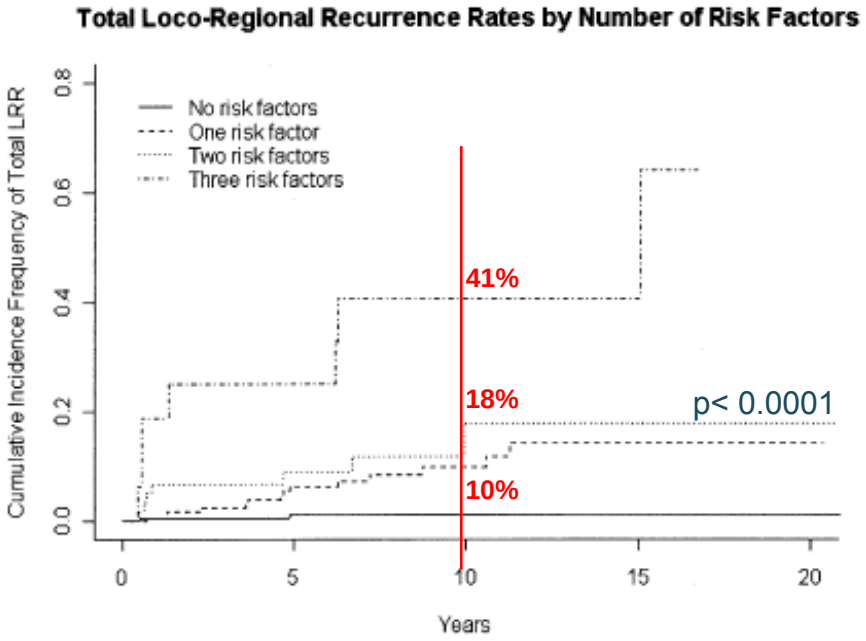
EBCTCG,
Lancet, 2005

N0

LOCOREGIONAL RECURRENCE RATES AND PROGNOSTIC FACTORS FOR FAILURE IN NODE-NEGATIVE PATIENTS TREATED WITH MASTECTOMY: IMPLICATIONS FOR POSTMASTECTOMY RADIATION

Table 3. Multivariate analysis

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



Studio retrospettivo su 877 pts pNo (757 pT1-2)

Mastectomia non seguita da PMRT

HT 148 pts

CT 74 pts

Obs 601 pts

Probabilità di recidiva (87% parete toracica) a 10 anni in funzione dei fattori di rischio

Jagsi, IJROBP, 2005

PATIENT SUBSETS WITH T1-T2, NODE-NEGATIVE BREAST CANCER AT HIGH LOCOREGIONAL RECURRENCE RISK AFTER MASTECTOMY

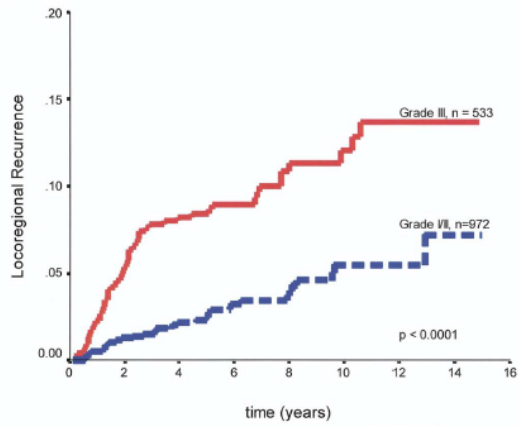


Fig. 2. Kaplan-Meier locoregional recurrence (LRR) rate in patients with pT1-T2N0 breast cancer stratified by histologic grade.

G1-2 vs G3

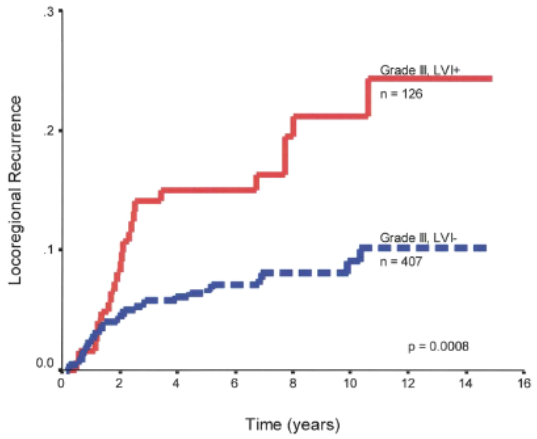


Fig. 3. Kaplan-Meier locoregional recurrence (LRR) in patients with Grade 3 histologic findings stratified by lympho-vascular invasion (LVI) status.

G3

LVI- vs LVI+

Studio retrospettivo su 1505 pts pT1-2 N0

Mastectomia non seguita da PMRT

HT	30%
CT	14%
CT+ HT	7%
Obs	49%

La probabilità di recidiva locoregionale è funzione di grading ed invasione linfovascolare (LVI) indipendentemente dalla aver fatto terapia sistemica

Truong, IJROBP, 2005

Triple Negative & Local Recurrence

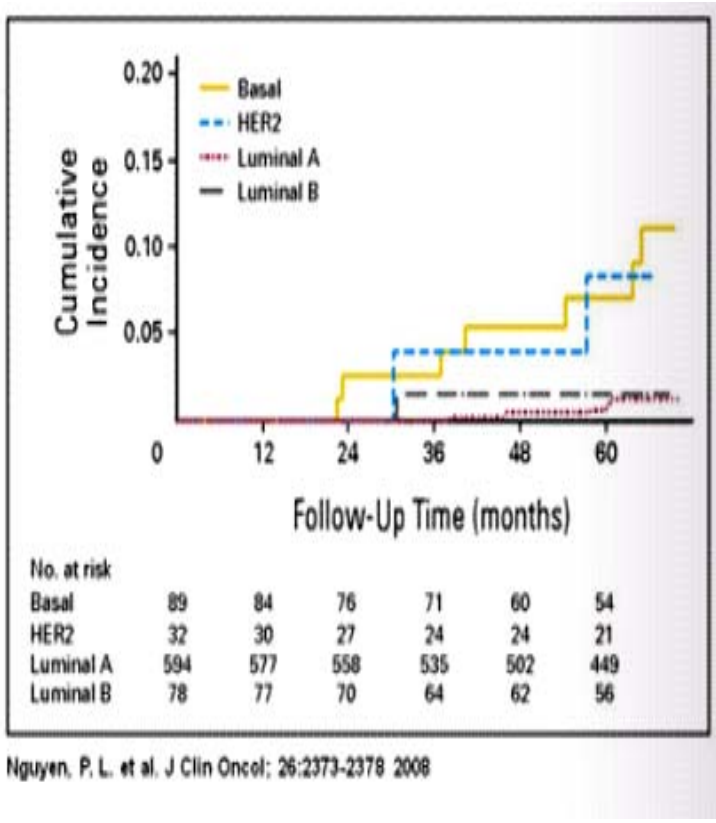
Triple Negative CS+RT

- Additional Studies in progress
- Evaluation by actual profiling-not just ER/PR/Her2 testing
- Recent Study from Harvard Group: 5 Year Local relapse in Luminal A 0.8%, Luminal B 1.5%, Her2 8.4%, Basal 7.1%

Robert Wood Johnson Medical School

ASTRO Refresher
September, 2008

The Cancer Institute of New Jersey



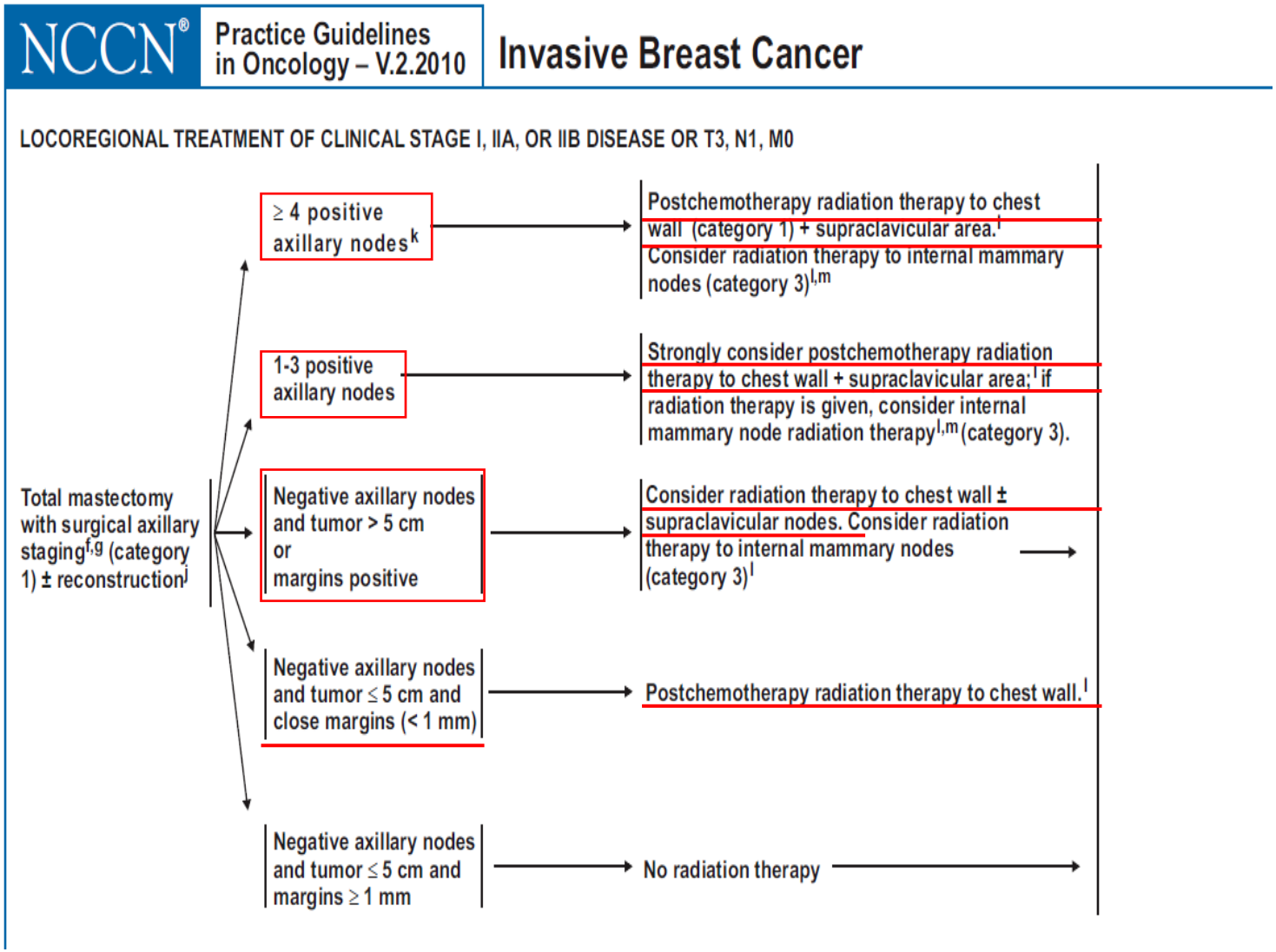
Nguyen, P. L. et al. J Clin Oncol; 26:2373-2378 2008

Indicazioni: $_{p}T_{1\text{-}2}$ $_{p}N0$

- La RT su parete toracica non è in genere indicata per la bassa incidenza di recidive locali, ma può essere considerata in caso di <u>concomitante</u> presenza di fattori di rischio quali:
  - margini close (≤2mm)
  - T >2 cm
  - eta <45aa / premenopausa
  - Grading >2
  - Assetto recettoriale
  - LVI +

Jagsi, Truong – IJROBP, 2005

INDICAZIONI ALLA PMRT

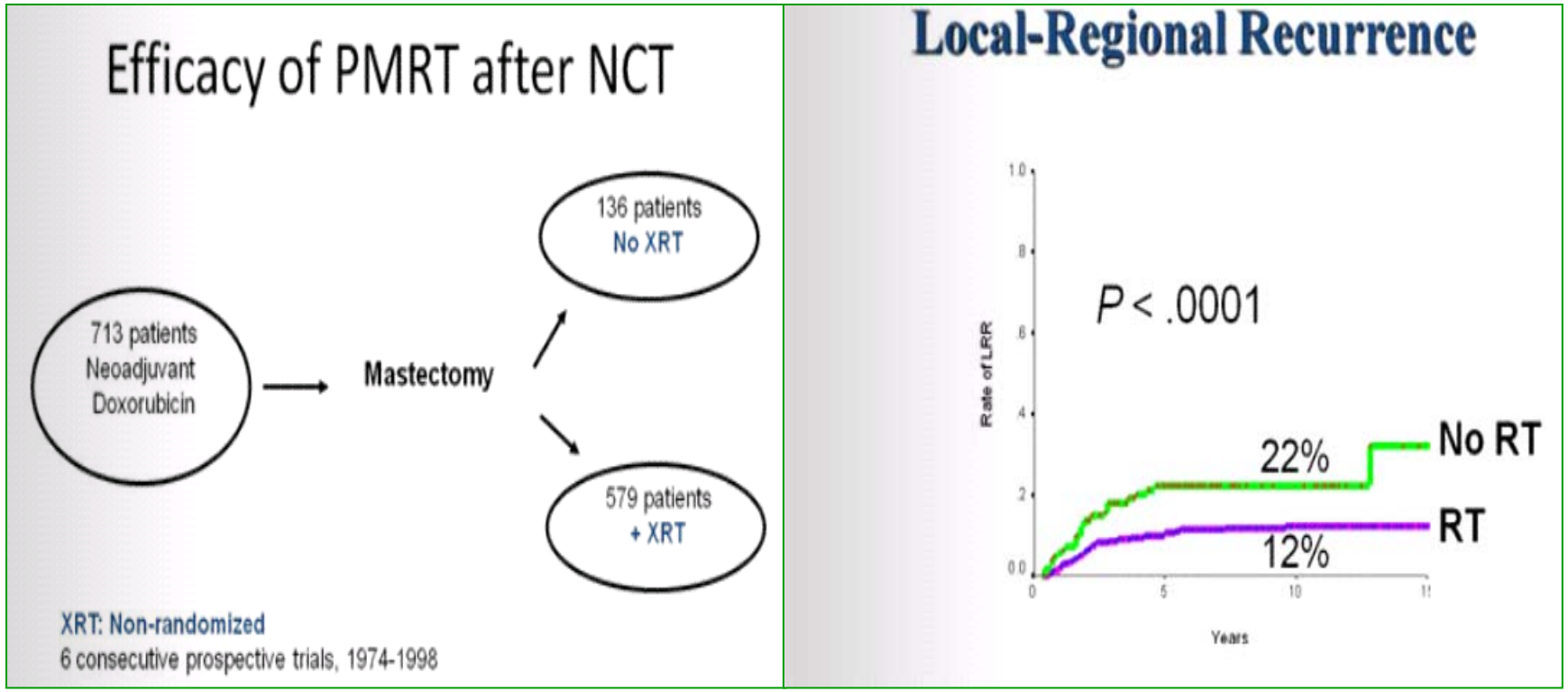


RT post-mastectomia:

Dopo CT neoadiuvante

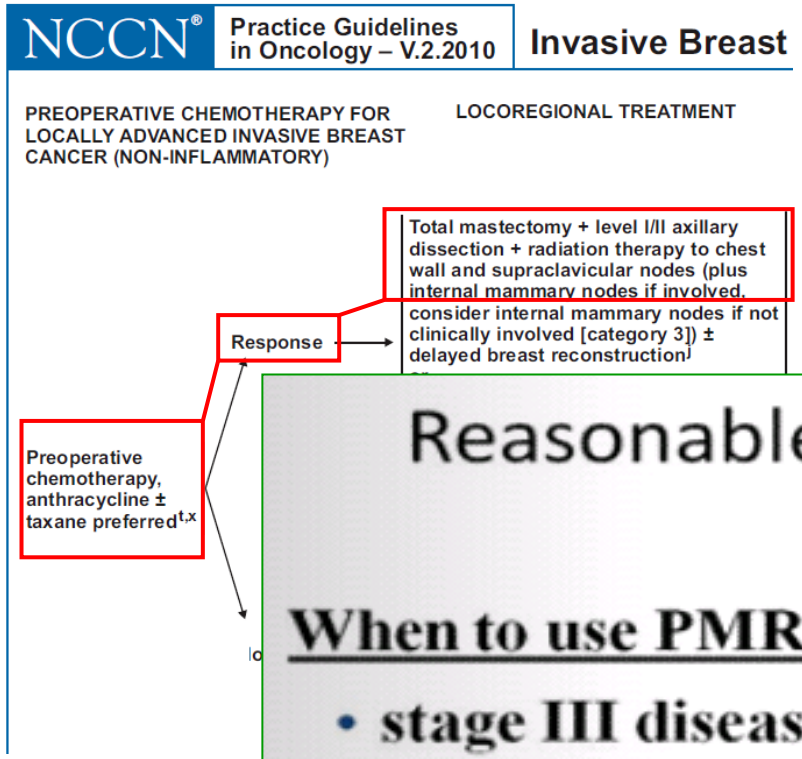
- In caso di persistenza di malattia pCR-
- In remissione completa patologica pCR+

RT e CT neoadiuvante



Huang JCO 2005

RT e CT neoadiuvante



Reasonable Indications for PMRT

When to use PMRT XRT

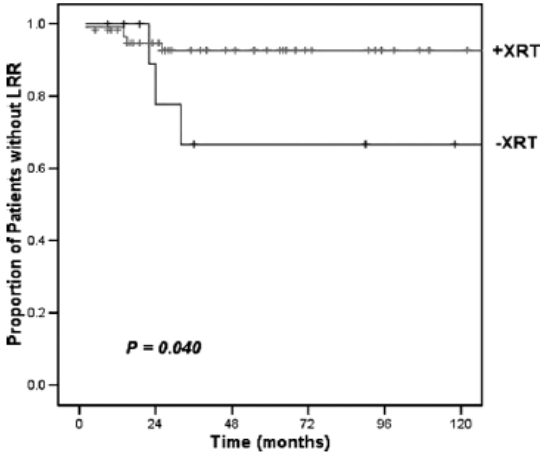
- **stage III disease - yes**
- **higher risk stage II disease – yes**
  - **>2 cm, LVSI, extracapsular extension**
  - **margins, ≥20% + LN**
- **lower risk stage II –discuss risks/benefits**
- **stage II with pCR - no**

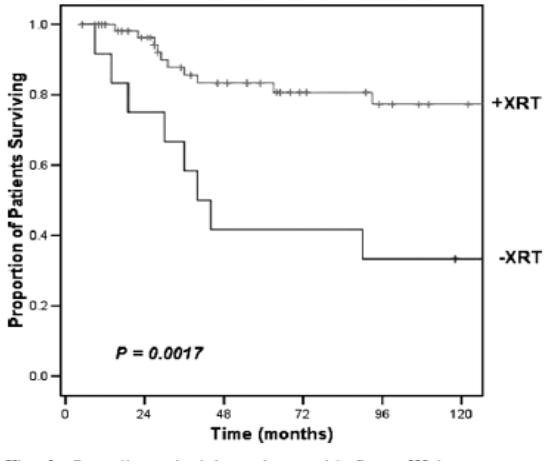
Huang JCO 2005

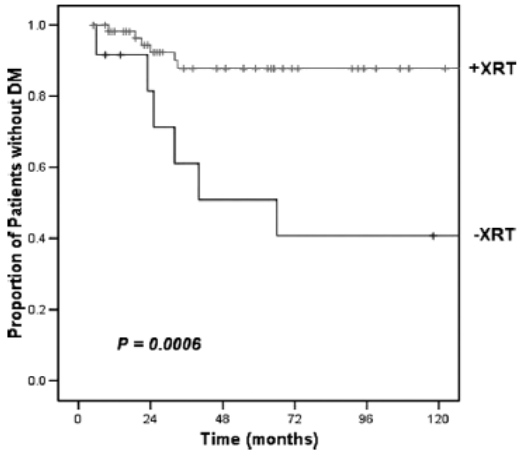
POSTMASTECTOMY RADIATION IMPROVES THE OUTCOME OF PATIENTS WITH LOCALLY ADVANCED BREAST CANCER WHO ACHIEVE A PATHOLOGIC COMPLETE RESPONSE TO NEOADJUVANT CHEMOTHERAPY

Studio retrospettivo su 226 pz in pCR dopo CT neoadiuvante e mastectomia

…. nessun vantaggio negli stadi I e II in pCR x controllo locale a 10 aa, ma nello stadio III pCR …







McGuire, IJROBP, 2007

RT post-mastectomia:

Dopo quanto tempo ?

CHEN, RO 2008: metanalisi di studi osservazionali

1% di minor controllo locale x mese di attesa tra CH e RT

impatto non significativo sulla metastatizzazione

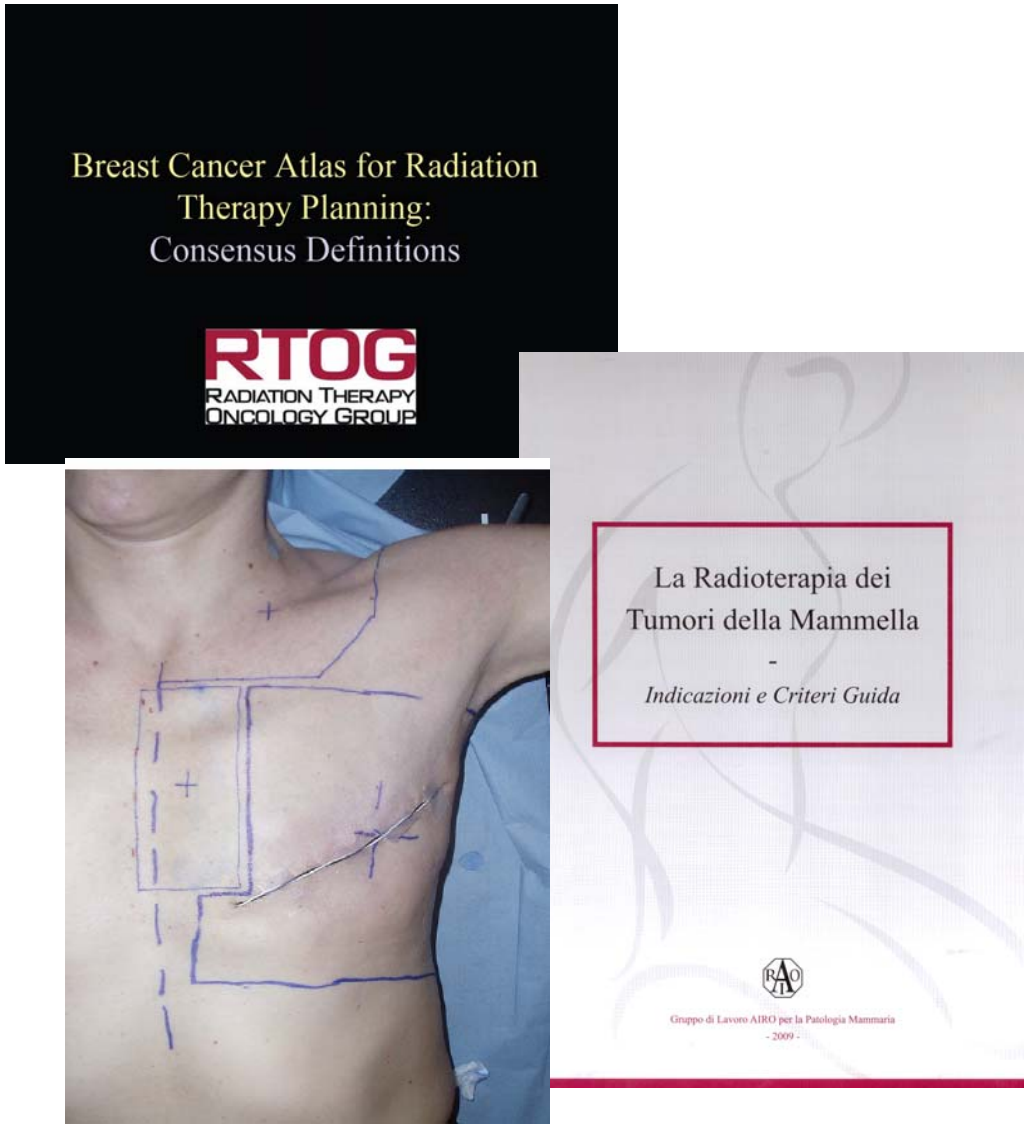
impatto non significativo sulla sopravvivenza

maggioranza dei pazienti sottoposti a intervento conservativo
quindi dati non direttamente estensibili al subset delle mastectomie

RT post-mastectomia:

Quali volumi ?

- Parete toracica
- Sovraclaveare
- Ascella
- Mammaria interna



Volumi e dosi $_{p}$T1-2 , N0

- dopo mastectomia RT in casi molto selezionati (molteplici fattori di rischio)
  - CTV = parete toracica, 2 Gy x 25 sedute
  - boost su cicatrice 10 Gy se margini positivi
  - ± Regione sovraclaveare 2 Gy x 24 sedute
  - RT su ascella no
  - Mammaria interna no

Volumi e dosi $_{p}$T1-2 , N+ ≤3

- dopo mastectomia RT in casi selezionati
  - CTV = parete toracica, 2 Gy x 25 sedute
  - boost su cicatrice 10 Gy se margini positivi
  - Regione sovraclaveare 2 Gy x 24 sedute
  - RT su ascella 2Gy x 25 se N asportati < 7
  - Mammaria interna no

Volumi e dosi $_{p}T_{3\text{-}4}$, ogni N

- Dopo mastectomia RT sempre
  - CTV = parete toracica, 2 Gy x 25 sedute
  - boost su cicatrice 10 Gy, ± 5 Gy se margini +
  - Regione sovraclaveare 2 Gy x 24 sedute
  - RT su ascella se N asportati < 7
  - Mammaria interna 2 Gy x 25 sedute se sono interessati il QC o QI ???

Breast Cancer Atlas for Radiation Therapy Planning: Consensus Definitions

RTOG
RADIATION THERAPY ONCOLOGY GROUP

Table 2 Regional Nodal Contours: Anatomic Boundaries

	Cranial	Caudal	Anterior	Posterior	Lateral	Medial
Supraclavicular	Caudal to the cricoid cartilage	Junction of brachioceph.-axillary vns./caudal edge clavicle head	Sternocleido mastoid (SCM) muscle (ns.)	Anterior aspect of the scalene m.	Cranial: lateral edge of SCM m. Caudal: junction 1st rib-clavicle	Excludes thyroid and trachea
Axilla-level I	Axillary vessels cross lateral edge of Pec. Minor m.	Pectoralis (Pec.) major muscle insert into ribs	Plane defined by: anterior surface of Pec. Maj. ms. and Lat. Dorsi m.	Anterior surface of subscapularis m.	Medial border of lat. dorsi m.	Lateral border of Pec. Minor m.
Axilla-level II	Axillary vessels cross medial edge of Pec. Minor m.	Axillary vessels cross lateral edge of Pec. Minor m.	Anterior surface Pec. Minor m.	Ribs and intercostal muscles	Lateral border of Pec. Minor m.	Medial border of Pec. Minor m.
Axilla-level III	Pec. Minor m. insert on cricoid	Axillary vessels cross medial edge of Pec. Minor m.	Posterior surface Pec. Major m.	Ribs and intercostal muscles	Medial border of Pec. Minor m.	Chestwall
Internal mammary	Superior aspect of the medial 1st rib	Cranial aspect of the 4th rib				

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Table 3 Heart and Lung Contours: Anatomic Boundaries

	Cranial	Caudal	Anterior	Posterior	Lateral	Medial
Heart[a]	Inferior aspect of the left pulmonary artery	Loss of CT apparent heart	Pericardium	Excludes descending aorta, esophagus, and vertebral body	Pericardium	Pericardium
Lung[b]	Pleura	Pleura	Pleura	Pleura	Pleura	Pleura

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[a]Heart caudal border: the heart blends with the diaphragm and liver at its caudal end-adjusting the window/level can assist in discerning the heart versus these other organs.

[b]Lung volumes: the lung volume within the pleural surface excluding ribs, mediastinum, and diaphragm can be auto-contoured by most planning systems.

Table 1 Breast and Chest Wall Contour: Anatomic Boundaries

	Cranial	Caudal	Anterior	Posterior	Later
Breast	Clinical reference + second rib insertion	Clinical reference + loss of CT apparent breast	Skin	Excludes pectoralis muscles, chestwall muscles, ribs	Clinical referer axillary line t excludes latt (Lat.) dorsi r
Breast + chestwall[a]	Same	Same	Same	Includes pectoralis muscles, chestwall muscles, ribs	Same
Chestwall[b]	Caudal border of the clavicle head	Clinical reference + loss of CT apparent contralateral breast	Skin	Rib-pleural interface (includes pectoralis muscles, chestwall muscles, ribs)	Clinical reference/mi line typically lattismus do

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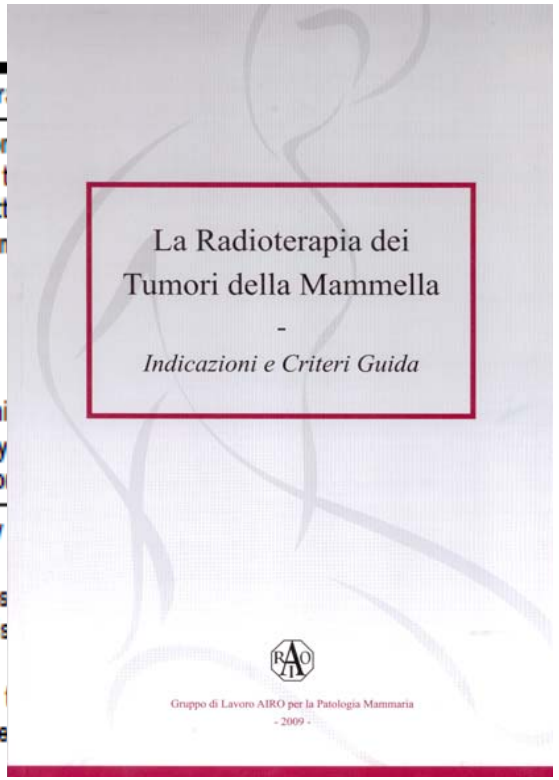
[a]Breast + chestwall CTV definitions should be utilized after appropriate lumpectomy for more locally advanced cases clinical stage IIb/III who receive neoadjuvant chemotheraphy and lumpectomy, who have sufficient high risk dis mastectomy radiation if a mastectomy had been performed.

[b]CTV after mastectomy, lateral border to estimate the lateral border of the previous breast. Typically extends beyond t pectoralis muscles but excludes the lattismus dorsi muscle. Should encompass the lateral and medial extent of the



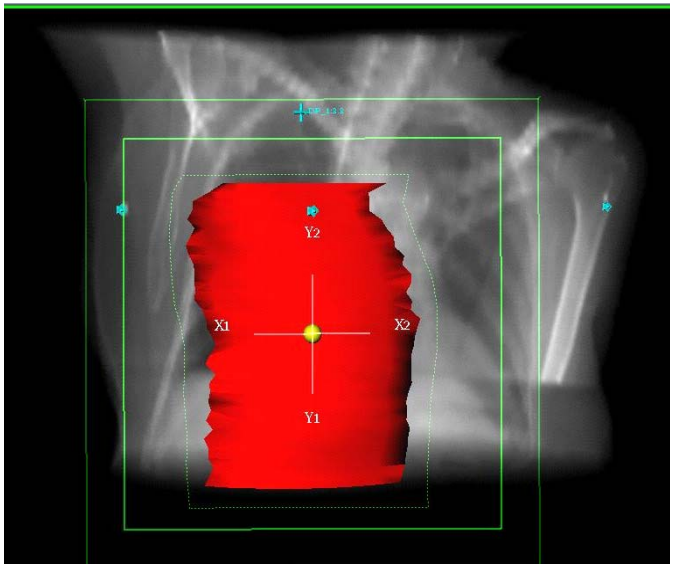
RT post-mastectomia:

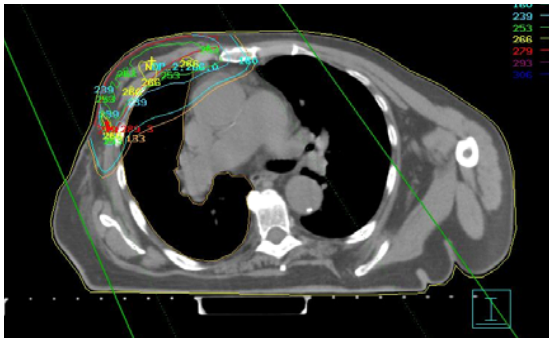
Con quale tecnica ?

Curare la immobilizzazione

PARETE TORACICA

FOTONI / ELETTRONI





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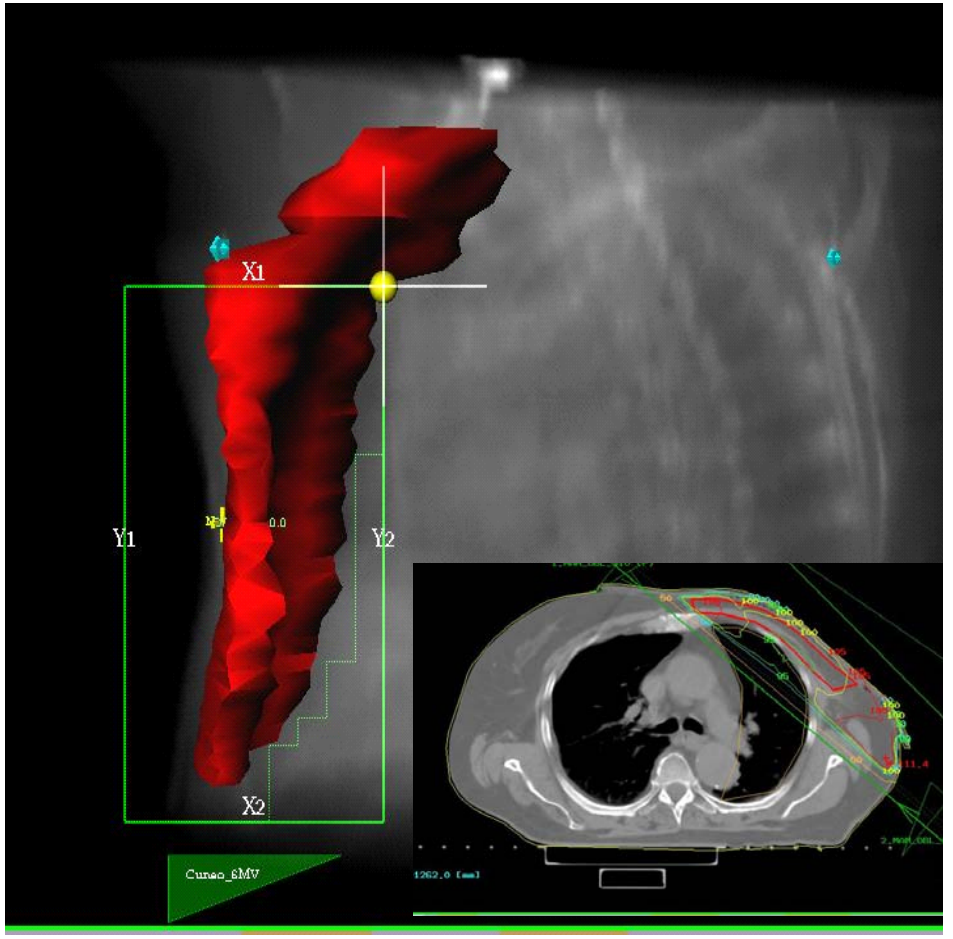


POSTMASTECTOMY ELECTRON-BEAM CHEST-WALL IRRADIATION IN WOMEN WITH BREAST CANCER

ELIAHU GEZ, M.D., NURIT ASHAF, M.D., RACHEL BAR-DEROMA, M.D., EDWARD ROSENBLATT M.D., AND ABRAHAM KUTEN, M.D.

Table 4. Postmastectomy radiotherapy using electron or photon chest-wall irradiation*

			LRR (%)				SRR (%)			
			Lymph nodes metastases				Lymph nodes metastases			
Reference	Number of patients	Modality	T	0	1–3	4+	T	0	1–3	4+
(2)	852	Electron	9%	3%	7%	14%	34%	19%	30%	46%
(11)	156	Electron	5%	0	2%	11%	48%	UN	UN	UN
(15)	268	Electron	9%	9%	5%	14%	41%	27%	25%	55%
Rambam	144	Electron	10%	0	13%	17%	40%	14%	45%	50%
(4)	164	X-ray	11%	—	10%	21%	46%	—	35%	60%
(21)	268	X-ray	9%	9%	5%	14%	49%	20%	425	605
(22)	646	X-ray	9%	6%	14%		37%	31%	43%	

Abbreviations: LRR = local-regional recurrence; SRR = systemic relapse rate; UN = unknown; e = electron; x = x-ray.
* Local-regional and systemic vs. by number of lymph nodes metastases and type of radiotherap

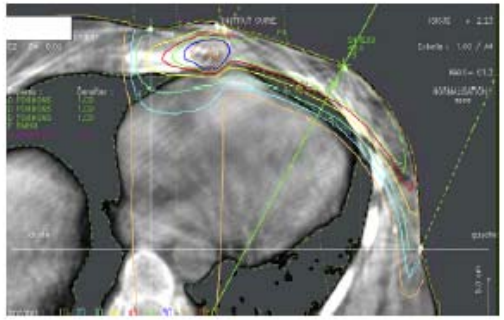
Nessuna differenza tra terapia con fotoni o elettroni in termini di recidive loco-regionali e metastasi

Gez, IJROBP, 2004

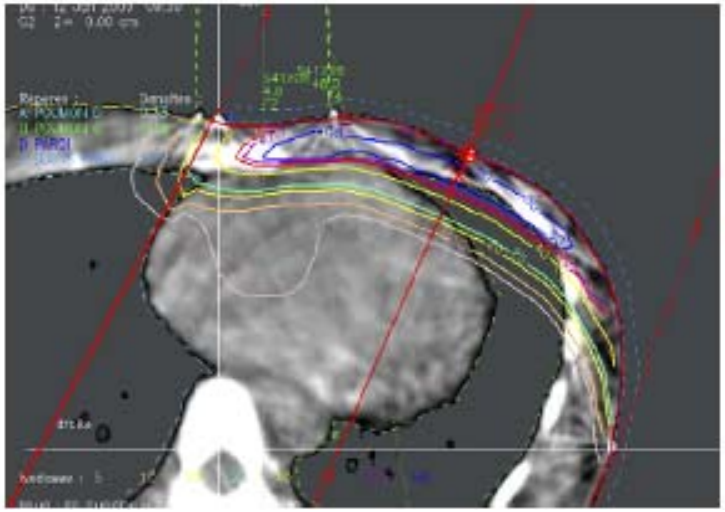
Table 3. Long-term toxicity

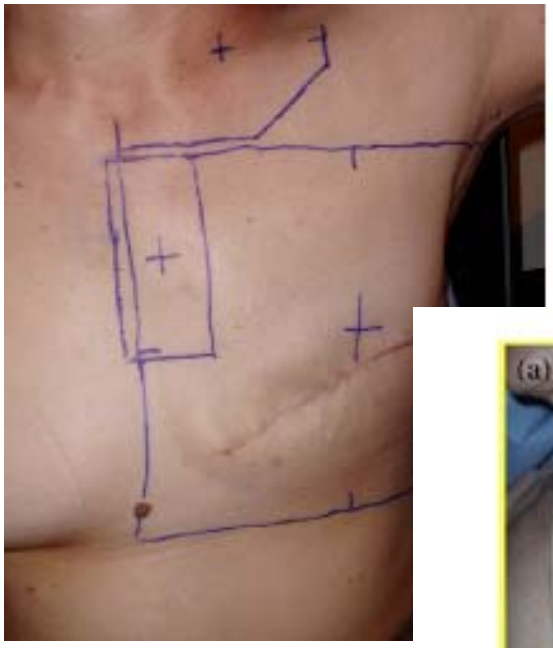
Long-term toxicity event	Number of patients (%)
Lung fibrosis	20 (14%)
Subcutaneous fibrosis	19 (13%)
Hyperpigmentation	21 (14%)
Lymph edema of arm	10 (7%)
Radiation pneumonitis	3 (2%)
Heart disease	5 (3.5%)
Brachyplexia	2 (1%)
Telangiectasia	2 (1%)
Rib fracture	1 (1%)

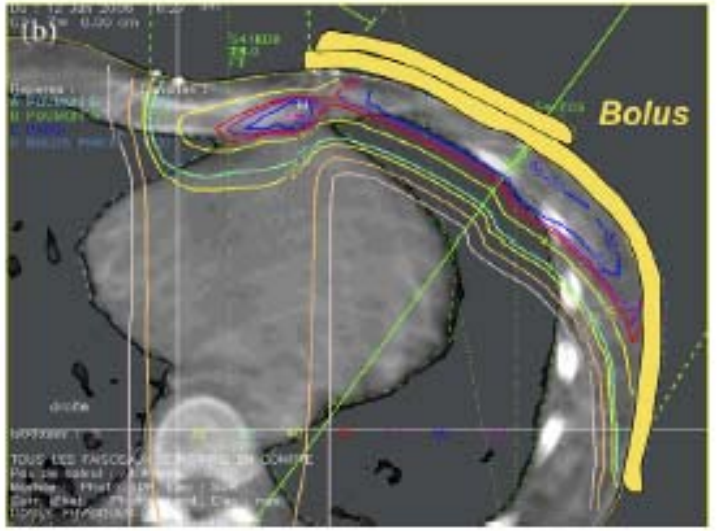
Electron therapy



50 Gy tecnica standard







Kirova, IJROBP, 2007

Tomotherapy

Table 1. Summary comparison of TomoTherapy plans to mixed-beam plans

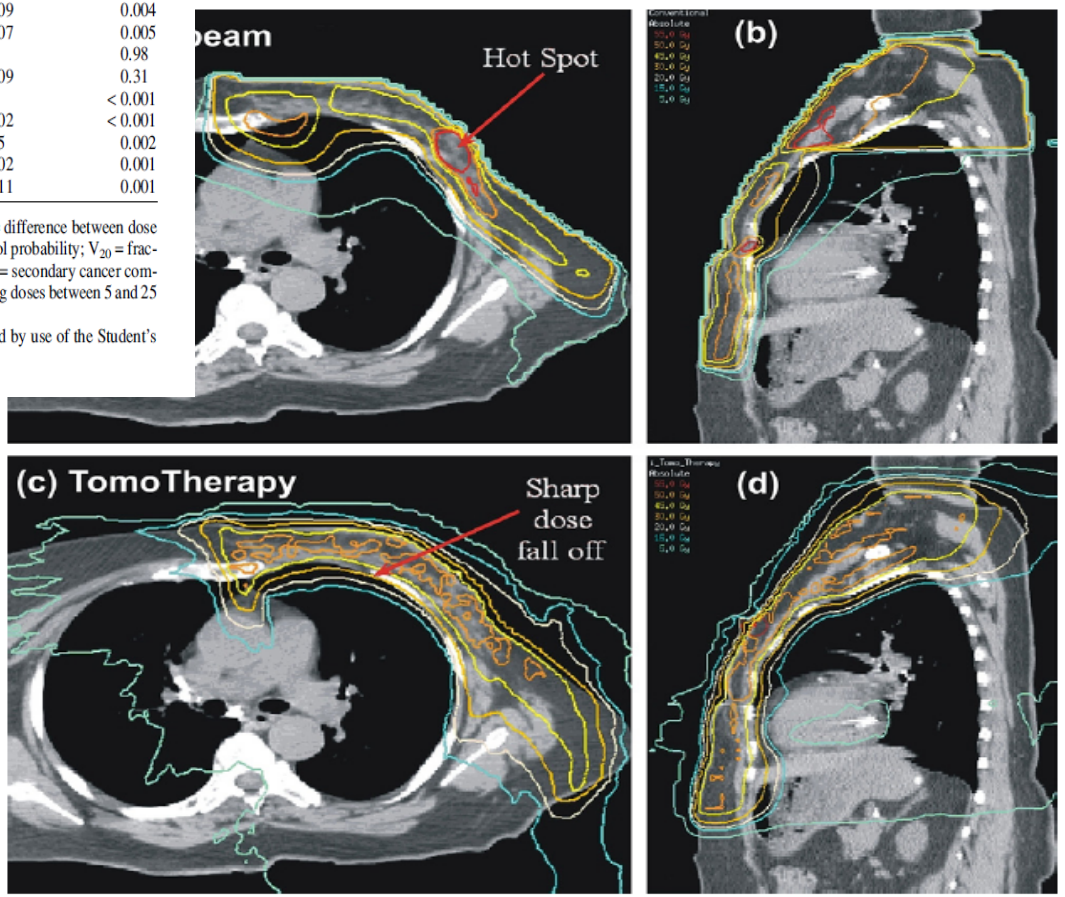
Structure	Metric	TomoTherapy	Mixed beam	*p* Value
CW/IMN PTV	$D_{90\%} - D_{10\%}$ (Gy)	2.9 ± 1.1	11.8 ± 2.3	0.001
	TCP	0.994 ± 0.002	0.988 ± 0.007	0.11
Ipsilateral lung	V_{20} (%)	17.6 ± 7.8	21.5 ± 8.5	0.05
	NTCP	0.003 ± 0.002	0.012 ± 0.011	0.13
	SCCP	0.052 ± 0.009	0.037 ± 0.004	0.016
Contralateral lung	SCCP	0.047 ± 0.011	0.014 ± 0.009	0.004
Total lung	SCCP	0.050 ± 0.009	0.025 ± 0.007	0.005
Heart*	V_{15} (%)	9.5 ± 4.6	9.5 ± 6.2	0.98
	NTCP	0.003 ± 0.003	0.007 ± 0.009	0.31
Contralateral breast	Mean dose (Gy)	2.9 ± 0.8	0.4 ± 0.3	< 0.001
	SCCP	0.016 ± 0.003	0.002 ± 0.002	< 0.001
Nonspecific normal tissue	V_5–V_{25} (cm^3)	84.6 ± 26.7	23.4 ± 15.5	0.002
	SCCP	0.010 ± 0.003	0.003 ± 0.002	0.001
All normal tissue	SCCP	0.076 ± 0.014	0.030 ± 0.011	0.001

Abbreviations: CW = chest wall; IMN = internal mammary nodes; PTV = planning target volume; $D_{90\%} - D_{10\%}$ = difference between dose received by 90% of planning target volume and dose received by 10% of planning target volume; TCP = tumor control probability; V_{20} = fractional volume receiving dose greater than or equal to 20 Gy; NTCP = normal tissue complication probability; SCCP = secondary cancer complication probability; V_{15} = fractional volume receiving dose greater than or equal to 15 Gy; V_5–V_{25} = volume receiving doses between 5 and 25 Gy.

The mean values of the 5 patients (± 1σ) are shown, with the exception of the heart. The *p* values were computed by use of the Student's paired *t* test.

* Patient with right-side mastectomy excluded.

Ashenafi, IJROBP, 2010



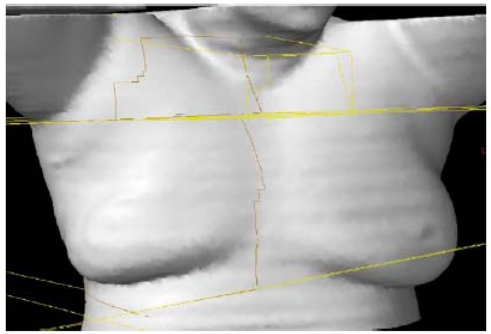
Tomotherapy:

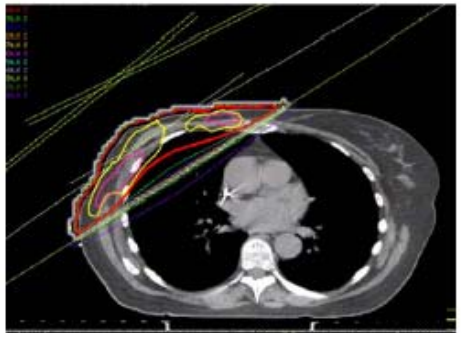
dose al PTV più omogenea

V20 polmone omolaterale migliore

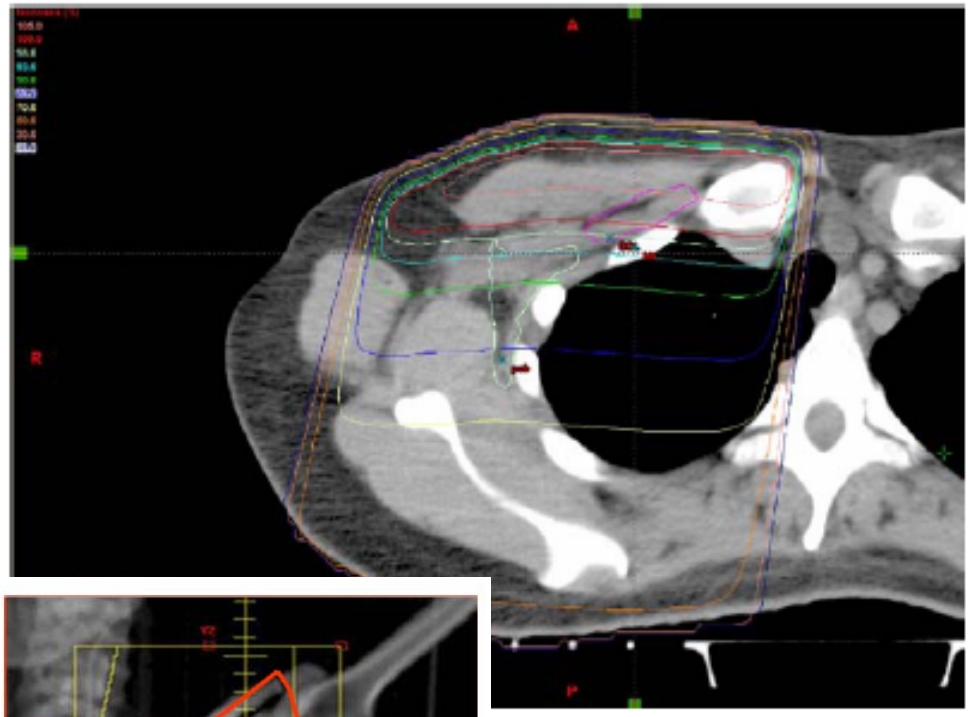
dose maggiore controlaterale

maggiore probabilità di II neoplasie





Moran, SRO 2009



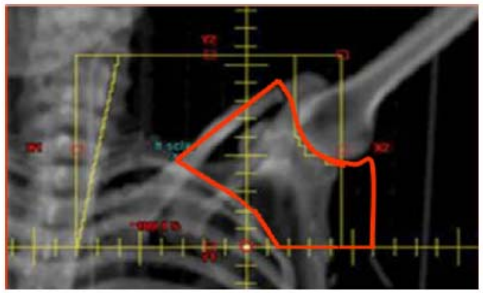


Figure 2 The supraclavicular/axillary field (SAF) in yellow and the posterior axillary boost (PAB) in red. (Color version of figure is available online.)

SOVRACLAVEARE e ASCELLA

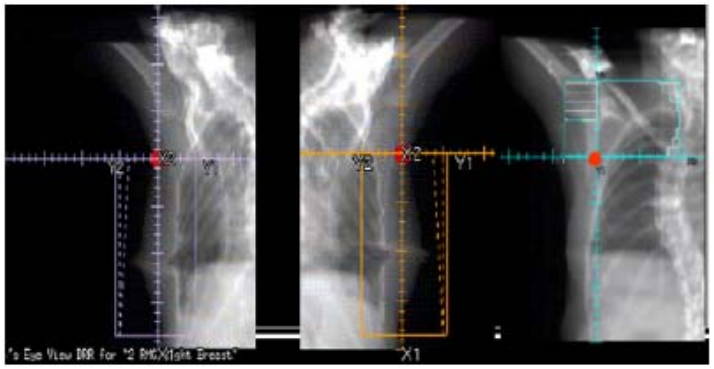


Figure 4 Digital reconstructions of the beam's eye view of the single isocentric technique to match SAF to the tangents. The isocenter is depicted by the large dot. The 3 fields are treated in succession, and matching does not require blocks or a couch shift. Normal tissue structure blocking can be used as in the SAF above. (Color version of figure is available online.)

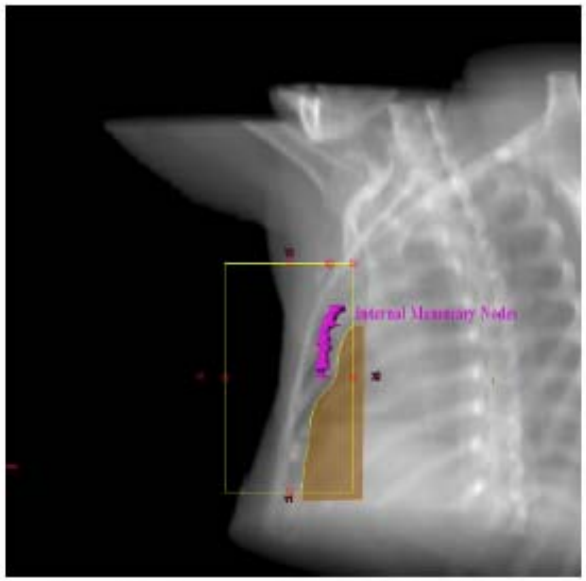


Figure 7 Partially wide tangential radiation field to include IM nodes in the first 3 intercostal spaces in the superior aspect of the tangent field, with a block to shield the lung and/or heart in the lower portion of the tangential field. (Color version of figure is available online.)

RT post-mastectomia:

A che prezzo ?

Effetti collaterali acuti e sequele

- Eritema cutaneo
- Epiteliolisi di vario grado ed entità

- Fibrosi dei tessuti irradiati:

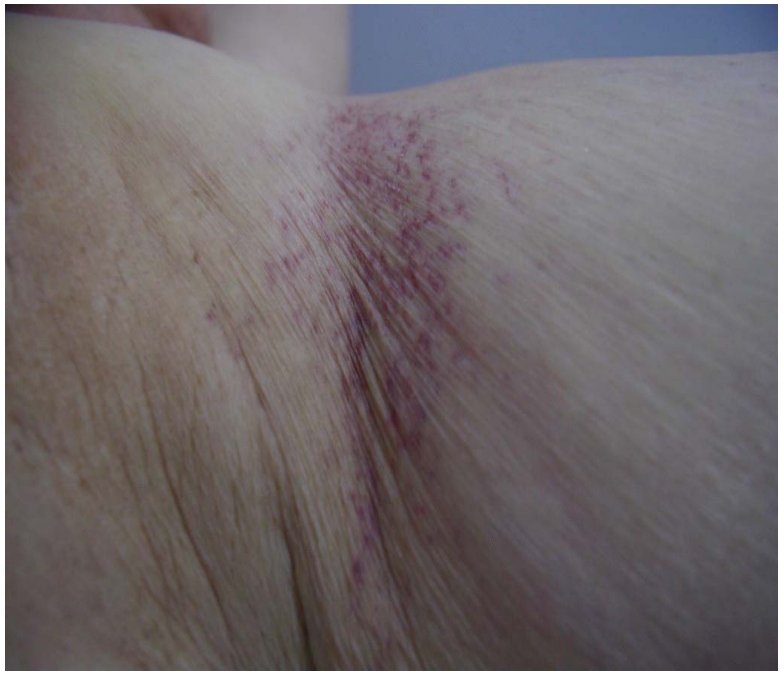
  teleangectasie, fibrosi polmonare, linfoedema, plessopatia brachiale
- Fratture costali
- Danno cardiaco
- Secondi tumori

Tossicità cutanea:

acuta

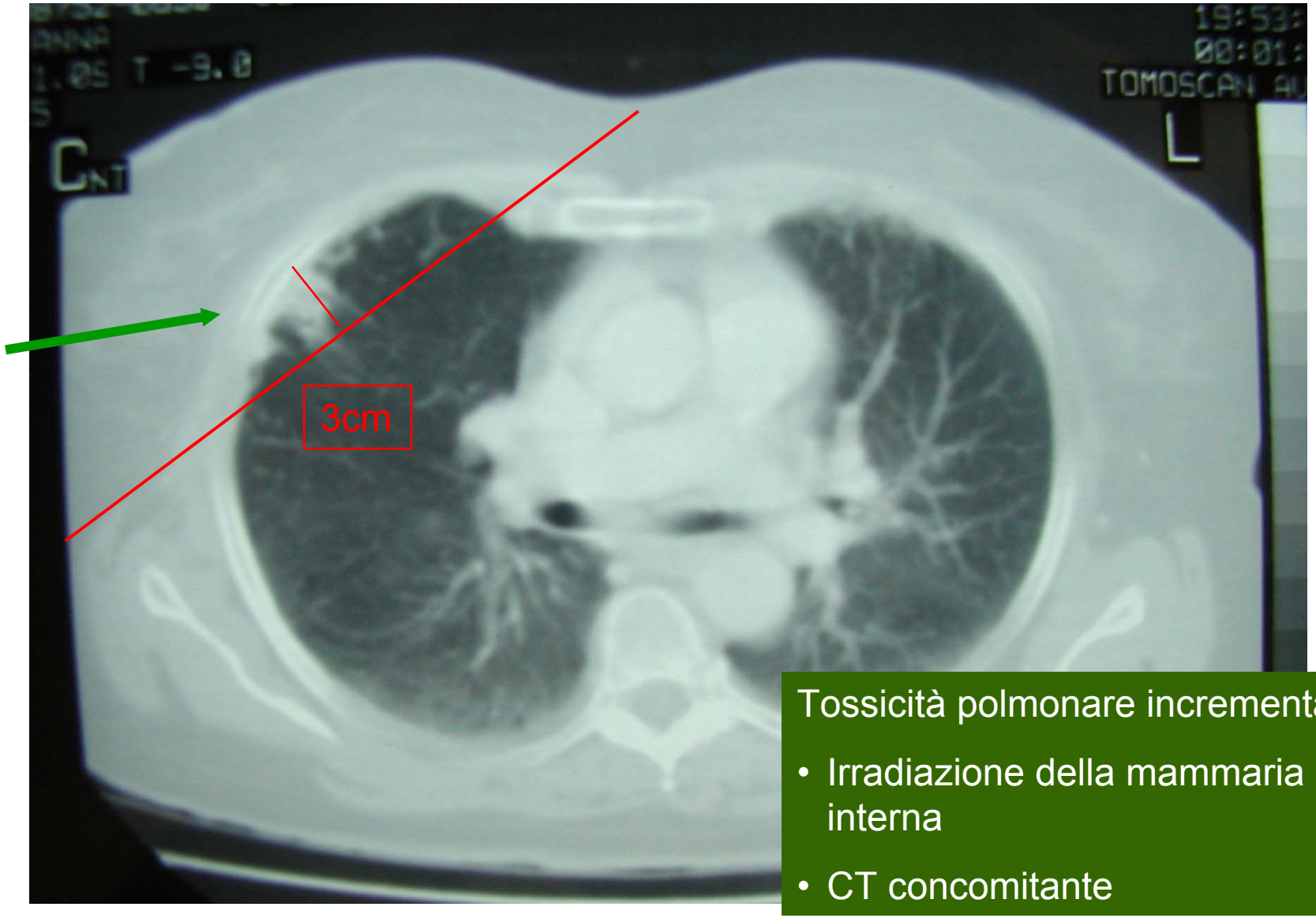
epiteliolisi severa acuta

tardiva



Teleangectasie e fibrosi sottocutanea

Tossicità tardiva: fibrosi polmonare <10%



Tossicità polmonare incrementata

- Irradiazione della mammaria interna
- CT concomitante

Linfoedema e plessopatia brachiale

- La probabilità di **linfoedema** dopo radioterapia aumenta tanto più è estesa la linfoadenectomia ascellare, l'età è avanzata e nelle pazienti obese – accorgimenti:
  - frazionamento convenzionale e dose complessiva max 50Gy
  - Lasciare un lembo di cute non compresa nel volume irradiato

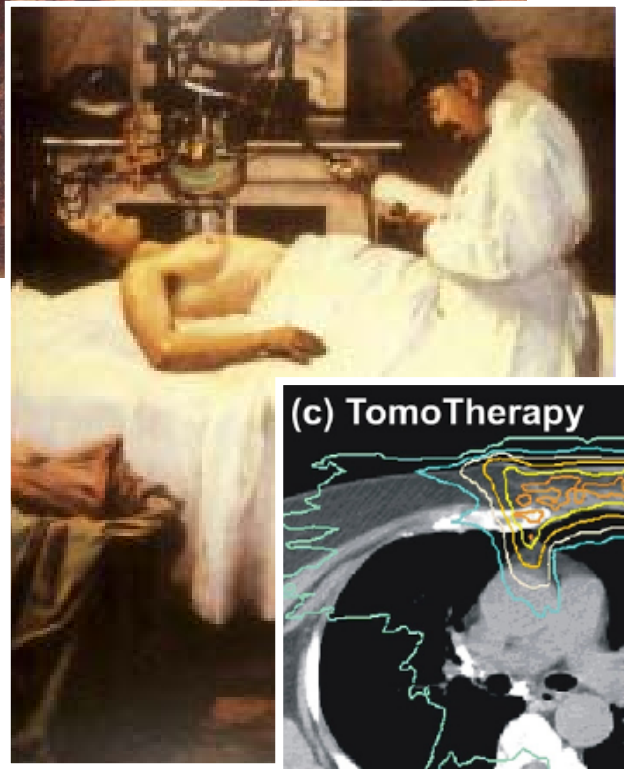
- La **plessopatia brachiale** è infrequente e legata a sovradosaggi sul plesso brachiale anche del 30% dovuti al rapido variare degli spessori in gioco – accorgimenti:
  - frazionamento convenzionale e dose complessiva max 50Gy
  - Planning 3D

Moran, SRO, 2010

Cardiotossicità

- Eventi cardiaci causa primaria del decesso dell'1,8% dei pazienti trattati dopo mastectomia con chemioterapia e radioterapia contro lo 0,6% riscontrato nei pazienti trattati con la sola chemioterapia (p=.62)
- Anche se è stata utilizzata una sorgente di ^{60}Co per la radioterapia, viene riscontrata netta differenza con i dati della metanalisi dell'EBCTCG verosimilmente legata alla tecnica (vecchi trials iniziati prima del 1975)
- Attenzione alla associazione con farmaci potenzialmente cardiotossici: antracicline, taxani, trastuzumab
- Spessore di miocardio nel volume irradiato <1cm = probabilità di danno < 1%

Ragatz, JNCI, 2005; Hurkmans, 2002, RO



...molta strada
è stata fatta,
ma molta ne
resta ancora
da fare…