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## CONVEGNO NAZIONALE GISMa 2011

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Palazzo Steri - Rettorato Università degli Studi

## Valutazione degli esiti estetici del trattamento conservativo : la Radioterapia

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FONDAZIONE IRCCS  
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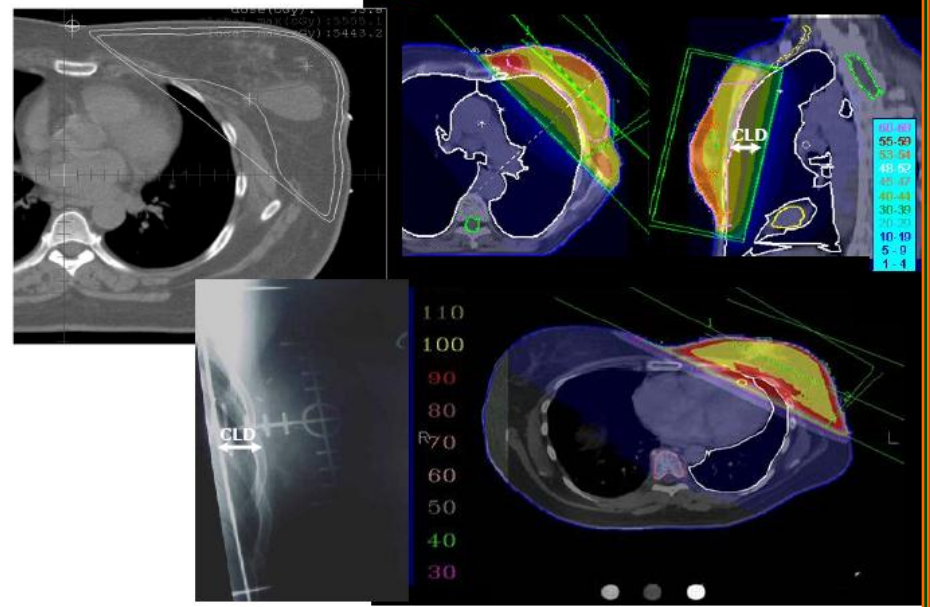
# **Necessity for Radiation Therapy**

- **No subset of patients has yet been identified that can conclusively be treated with surgery alone**
- **WBI after conservative surgery remains the “standard of care”**

## Whole breast irradiation: conventional treatment

- Total dose: 50 Gy/2 Gy x 25 daily fractions
- Tangential fields with 4-6 MV photons
- Boost on operative bed: 10-16 Gy in 5-8 fractions (electrons)

### Conventional tangential fields



# Breast RT : effetti collaterali

## ACUTI

Eritema cutaneo, epiteliosi

Mastodinia

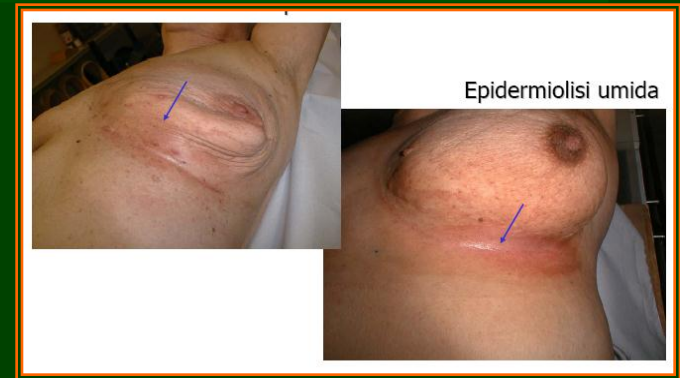
Edema mammario

Astenia

## RARI

Polmonite

Pericardite



## TARDIVI

Fibrosi

Ipo,iperpigmentazione cutanea

Teleangectasie

## RARI

Fibrosi polmonare

Cardiotossicità

Fratture costali



# Latenza

**Gli effetti collaterali tardivi sono caratterizzati da un periodo di latenza, anche di anni, dal tempo dell'irradiazione alla loro completa manifestazione**



**Sottostima degli eventi**

**Necessità di follow up prolungati**

## Reazioni cutanee acute

- Si manifestano generalmente tra la seconda e la quarta settimana di trattamento e possono permanere per circa 2 mesi dal termine
- L'iperpigmentazione avviene dopo 2 – 4 settimane di trattamento
- A 30 – 40 Gy iperemia, edema
- A 45-60 Gy depilazione, desquamazione umida, esposizione del derma con secrezioni sierose e formazione di croste di fibrina

# Reazioni cutanee acute

Coinvolgono circa il 95% delle pz

- Eritema cutaneo ed epiteliosi
- Flogosi dei tessuti sottocutanei
- Edema mammario

**Sintomi:** irritazione superficiale con arrossamento, prurito, sensazione di bruciore locale, mastodinia, ipersensibilità, vescicole ed essudati

Sono eventi frequenti, rapidamente e facilmente recuperabili con adeguata terapia topica, pulizia della cute, prevenzione delle infezioni e dei traumi locali, trattamento degli essudati

# Reazioni cutanee acute

## Fattori condizionanti dipendenti dalla pz

- **Caratteristiche ed integrità della cute ( esposizione al sole, esiti di ustioni, stato della ferita...)**
- **Concomitanti terapie**
- **Comorbidità (diabete, insuff renale, stato nutrizionale)**
- **Età**
- **Abitudine al fumo**
- **Condizioni ambientali**

# Reazioni cutanee acute

## Fattori condizionanti dipendenti dal trattamento

- **Dimensioni dei campi**
- **Dose totale**
- **Frazionamento**
- **Energia del fascio (Linac vs  $^{60}\text{Co}$  vs  $e^-$ )**
- **Tecnica di irradiazione (3DCRT, IMRT)**

## **Secchezza della cute**

**“Roentgen rays could reduce the activity of the sweat gland without causing any visible alteration of the skin” (J. Borak, 1936)**

**Le ghiandole sebacee e sudoripare possono essere definitivamente danneggiate alla dose di circa 30 Gy / 15 fr con conseguente ridotta lubrificazione della cute, secchezza e prurito**

## Reazioni cutanee tardive

- **Edema mammario**
- **Distrofia, atrofia cutanea**
- **Discromie**
- **Teleangectasie**
- **Fibrosi del sottocute**

**Sono prevalentemente distribuite su sedi di sovradosaggio**

## **Reazioni cutanee tardive**

### **Edema mammario**

**Spesso è esito di dissezione ascellare, che viene accentuato con la RT della mammella**

- 6% senza dissezione**
- 25% con sampling**
- 79% dopo dissezione completa**

**Raramente sintomatico, si risolve generalmente entro 18 - 36 mesi nella maggior parte delle pz**

**Nel 10-20% permane oltre 3 aa**

**Eccezionalmente è fattore peggiorativo del risultato cosmetico**



# Reazioni cutanee tardive

## Discromie

**iper-ipopigmentazione, depigmentazione dell'areola-capezzolo, teleangectasie**

**Il 90% delle teleangectasie severe si osserva a circa 5 aa, ma è segnalata progressione fino a 15 aa (G3)**

# Reazioni tardive

## Teleangectasie

**Sono manifestazioni progressive nel tempo**

**Nelle pz trattate a dosi più elevate hanno un tempo di latenza più breve**

**Sono più frequenti dopo trattamenti ipofrazionati**

**Il rischio è superiore per le pz che hanno manifestato tossicità acuta di grado maggiore**

## **Reazioni tardive**

### **Fibrosi**

**E' la sequela più importante per le conseguenze sulla cosmesi**

**Si manifesta a 6-18 mesi dal termine della RT e può progredire nel tempo**

**Può essere diffusa a tutta la mammella o limitata ad alcuni settori (disomogeneità)**

**E' stabilizzata generalmente a 3 aa, ma può ancora peggiorare a 10 aa**

# Situazioni particolari: macromastia

- **Irradiazione tecnicamente più complessa**
- **Difficoltà di set up**
- **Disomogeneità nella distribuzione della dose, difficile risparmio della cute (pliche, solco sottomammario)**
- **Effetti cutanei acuti e tardivi di maggior entità**
- **Risultati cosmetici spesso insoddisfacenti**

# Situazioni particolari: collagenopatie

- **Segnalata in letteratura un'incidenza maggiore (seppure non definita) di fibrosi e radionecrosi nelle pazienti sottoposte a RT (casistiche limitate e reports clinici)**
- **Danno ischemico amplificato in una coesistente patologia vascolare**
- **Ipotesi di attivazione di antigeni con risposta autoimmune**
- **Maggiormente a rischio pz affette da LES e sclerodermia, soprattutto se in fase attiva**
- **Suggerito frazionamento a 1.8 Gy/die**

## Rischio di linfedema dopo chirurgia ascellare e radioterapia sull'ascella

- **No chir no RT** 0%
- **Sampling ascella + RT** 6 - 9%
- **Dissezione o sola RT** 2 - 27%
- **Linfadenectomia (parziale o tot) + RT** 9 - 44%

**Si scoraggia la RT sull'ascella dopo dissezione completa**

# Impatto della RT sul risultato cosmetico

## Valutazione del risultato cosmetico

- Eccellente 55-65%
- Buono 25-35%
- Mediocre 5-10%
- Scarso 5%

La fibrosi peggiora il risultato cosmetico determinando retrazione dei tessuti mammari, distorsione del profilo, deviazione del capezzolo, asimmetria rispetto alla mammella controlaterale

# Impatto della RT sul risultato cosmetico

## Fattori dipendenti dalla RT

- Dose totale: trattamenti whole breast > 50 Gy sono associati a sequele di maggior entità ( 33% dopo 60 Gy, 91% dopo 70 Gy)
- Qualità del fascio
- Frazionamento (> 2 Gy)
- Disomogeneità della distribuzione (ampi volumi sovradosati)
- **Boost**
- Trattamento quotidiano di tutti i campi
- Giunzione con campi per le aree linfonodali
- Interazione con terapie sistemiche



# **Impatto della RT sul risultato cosmetico**

**Ottimizzazione della tecnica di irradiazione  
Pianificazione scrupolosa**

## **The double trouble (Withers, 1992)**

**Omogeneità della dose con attenzione ad evitare hot spots,  
dove un volume di tessuto riceve una dose totale  
maggiore, con dose/frazione maggiore**

# BCS + RT: logistic difficulties

*is it possible to shorten the treatment time?*

## Non conventional fractionation schedule

- **Hypofractionation (dose / fraction >2.0 Gy)**
- **Hypefractionation (more than 1 fraction/day)**

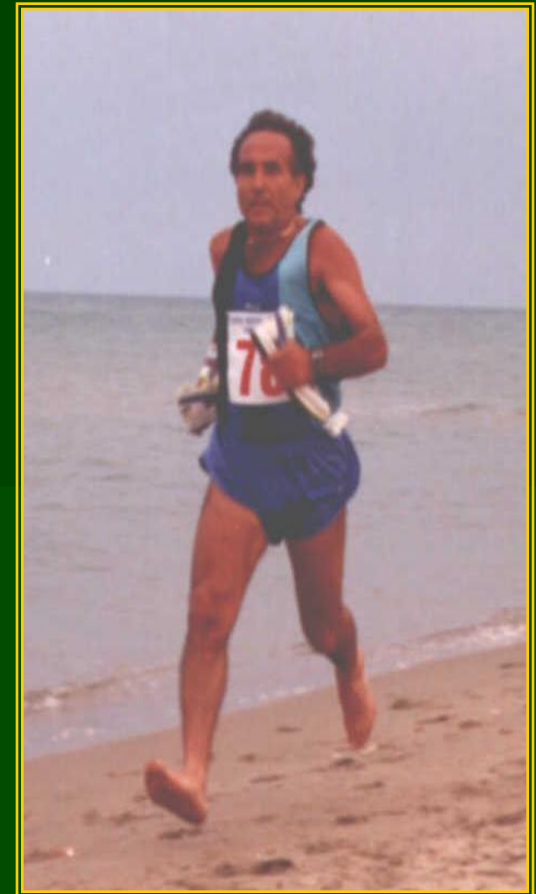
## Critical aspects

- **Possible increase of side effects**
- **Possible impact on poor cosmetic outcome**

# Frazionamento e durata del trattamento

## Regimi di ipofrazionamento

Quando la dose / frazione aumenta è necessaria una riduzione della dose totale



# Predictive factors for late normal tissue complication following RT for breast cancer

(Lilla C et al, 2007)

416 pts treated with conventional regimen median fu 51 months

31.4% teleangiectasia

6.7% fibrosis

5% both

**Increasing age** (age –related accumulation of mutations and decline of DNA repair capacity increase sensitivity to ionizing radiation)

**Acute skin toxicity** (damage to superficial capillaries caused by moist desquamation)

**Hypertension** (medication used: diuretics and inhibitors of angiotensin-converting enzyme exert phototoxic effect and may increase radiosensitivity)

**Allergy** (inflammatory process with increased expression of several cytokines)

**Long term smoking** ( formation of DNA adducts, damage add to cytotoxic effect of radiation)

# Hyperbaric oxygen therapy for late sequelae in women receiving RT after BCS ( Carl et al, 2001)

Ossigenoterapia iperbarica: promuove la formazione di matrice collagene e angiogenesi

32 pz con sintomatologia persistente (eritema, edema, mastodinia, fibrosi, teleangectasie, liponecrosi)

## Trattamento

25 sedute di ossigenoterapia iperbarica (5/settimana) ad un intervallo mediano di 13 mesi dalla RT (2-149 mesi)

## Risultati

Riduzione del dolore, dell'eritema e dell'edema

Nessun effetto su fibrosi e teleangectasie

# Clinical treatment of radiotherapy tissue damage by lipoaspirate transplant: a healing process mediated by adipose-derived adult stem cells

( G. Rigotti, 2007)

## Danno da RT (analisi ultrastrutturale)

- Causa ischemica, con pattern sovrapponibile alla sclerodermia
- **Microangiopatia e ipovascolarizzazione** ( duplicazione della membrana basale dei capillari, ectasia del lume, abbondante citoplasma nelle cellule endoteliali, spazi tra cellule endoteliali e periciti. Lisosomi e cluster di mitocondri negli adipociti. Accumulo di collagene e detriti cellulari, frammenti di lamina esterna, nel tessuto connettivo)
- **Fibrosi**: perfusione sostenuta solo da pochi vasi con segni di aumentato trasporto trans endoteliale
- Strati concentrici di membrana basale generati nelle fasi di riparazione , come si nota in molte patologie croniche del microcircolo)

# Clinical treatment of radiotherapy tissue damage by lipoaspirate transplant: a healing process mediated by adipose-derived adult stem cells

( G. Rigotti, 2007)

## Break the vicious circle

- Vascular lesion
- Ischemia
- Hyperpermeability
- Fibrosis
- Increased ischemia

## Favour the growth of a microvascular bed with a correct ratio of adipocytes to capillaries

Adipose-derived stem cell transplant

- Tissue mesenchymalization
- Large extracellular spaces
- New microvessels





Fig. 3. (Above, left) Grade 4 patient (2) ulcerative phase with osteonecrosis of the ribs. (Above, right) First result after one treatment with adipose-derived adult stem cells showing good granulation tissue. (Below, left) Result after skin grafting with these residual ulcers and osteonecrosis. (Below, right) Note the healing of the residual ulcers and osteonecrosis after three consecutive adult stem cell injections.



Fig. 5. Severe irradiation performed after expander insertion with dramatic capsular contracture (above, left) with a high risk area laterally. (above, right) Result after expander insertion. (below, left) Severe capsular contracture. (below, right) Result after treatment.



Fig. 6. One case following stem cell therapy after a severe outcome of quadrantectomy irradiation. Scarring and asymmetry resolved enormously. This follow-up is 1 year after the last treatment.



Fig. 8. An implant covered only by undamaged periprosthetic capsule and skin with initial necrosis (above). Liposuction was used between the two layers four times. Notice the newly formed adipose tissue exactly in the treated area that allowed nipple reconstruction with local flaps and reduction of the capsular contracture (below). No additional surgery was performed.



# Concludendo

**Le pz sottoposte a RT sulla mammella devono essere seguite nel tempo per il monitoraggio degli effetti collaterali tardivi**

**I danni possono essere progressivi**

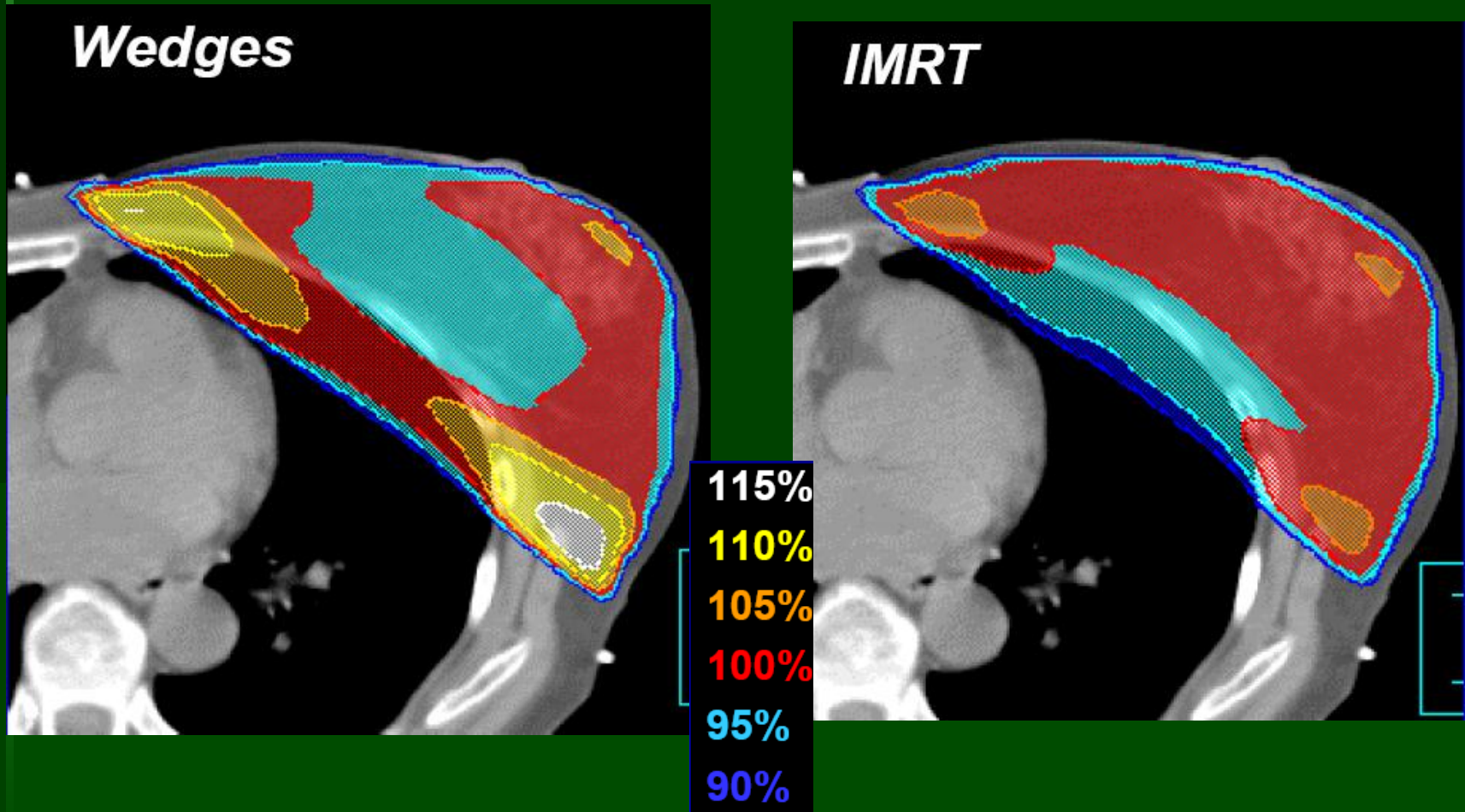
**Particolare attenzione ai regimi ipofrazionati**

**La maggior esperienza sui danni tardivi fa riferimento a vecchie serie di pz trattate con tecniche ormai obsolete**

**Le moderne tecniche di pianificazione e di trattamento (3D CRT, IMRT...) dovrebbero ridurre l'incidenza delle complicazioni**

# IMRT

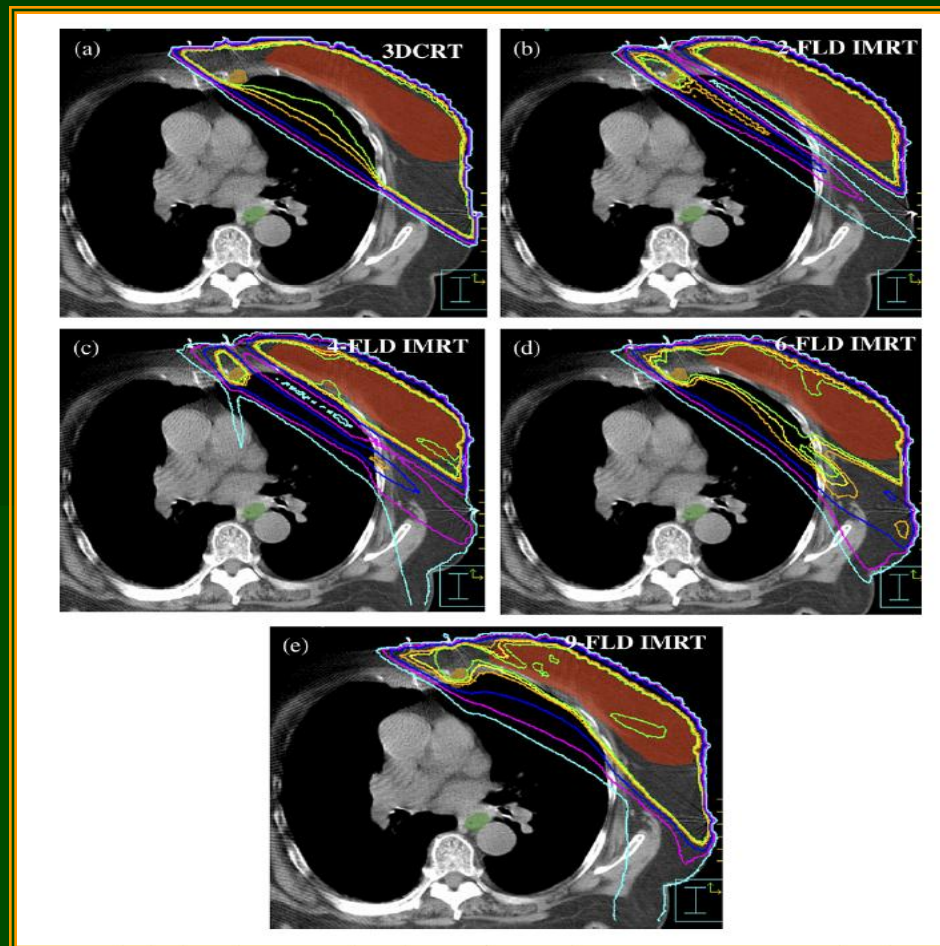
## advantages in dose distribution



# OPTIMIZED DOSE COVERAGE OF REGIONAL LYMPH NODES IN BREAST CANCER: THE ROLE OF INTENSITY-MODULATED RADIOTHERAPY

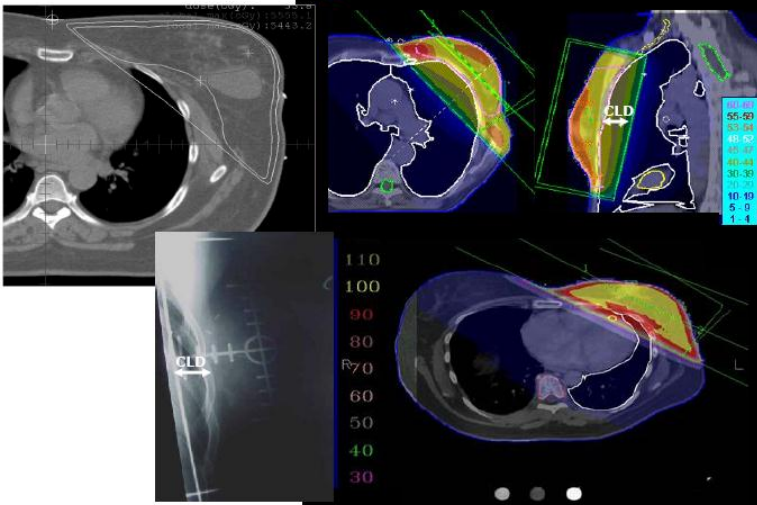
NESRIN DOGAN, PH.D., LAURIE CUTTINO, M.D., RICK LLOYD, C.M.D.,  
EDWARD A. BUMP, C.M.D., AND DOUGLAS W. ARTHUR, M.D.

Int J Radiat Oncol Biol Phys 2007



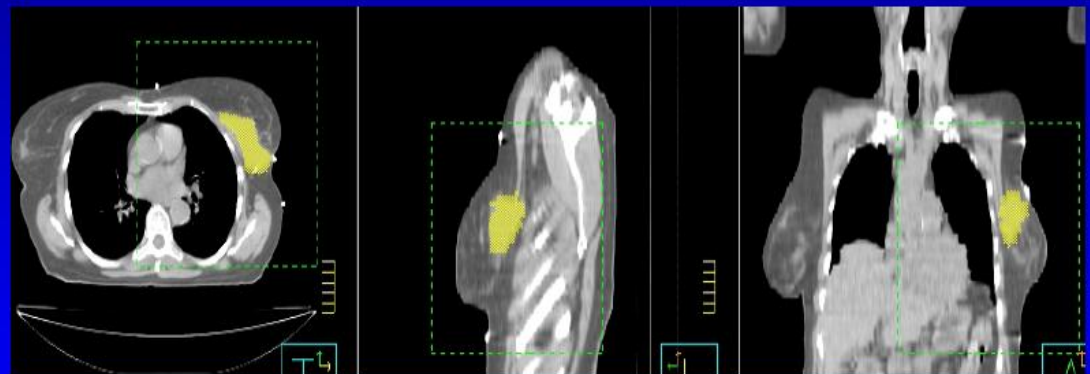
The use of **IMRT improves** breast and regional nodes coverage while decreasing doses to the lungs, heart and contralateral breast when compared with 3D-CRT

## Conventional tangential fields



## II boost

### *Delineate Lumpectomy Cavity*



# **BOOST: additional dose on the tumor bed**

## **RATIONALE**

- **>80% of local relapses in the same quadrant**
- **dose response for breast cancer**
- **no impact on cosmetic outcome and morbidity**
- **reduction of LR in several retrospective studies**

## **CONTROVERSIES**

- **1 more week of treatment (5-7 fractions)**
- **difficulty in localization of tumor bed**
- **no uniformity in results from retrospective studies**

# BCS + RT

*is it possible to avoid the boost ?*

## EORTC randomized study

*Cancer Radiother 2008;12:565-570.*

5318 pts T1-2, Nx, negative margins

### Random

- 50 Gy "whole breast"
- 50 Gy "whole breast" + boost (16 Gy)

### Local Relapses

- No boost 10.2%
- With boost 6.2% ( $p < 0.0001$ )



# BCS + RT

*is it possible to avoid the boost ?*

## Lyon randomized study

1024 pts, T < 3 cm, Nx

Random

- 50 Gy "whole breast"
- 50 Gy "whole breast" + boost (10 Gy)

### Local relapses (5 years)

- No boost 4.5%
- With boost 3.6% (p=0004)

# BCS + RT

*is it possible to avoid the boost?*

- With unknown margins retrospective studies show that **boost improves local control**
- With negative margins, 2 randomized studies show that **boost reduces the incidence of LR at 5 years**



## Cosmetic results with boost

- **EORTC** : modestly reduced ( **fibrosis 4.4%** )
- **Budapest**: increase in fat necrosis
- **Lyon**: doubling of teleangectasia

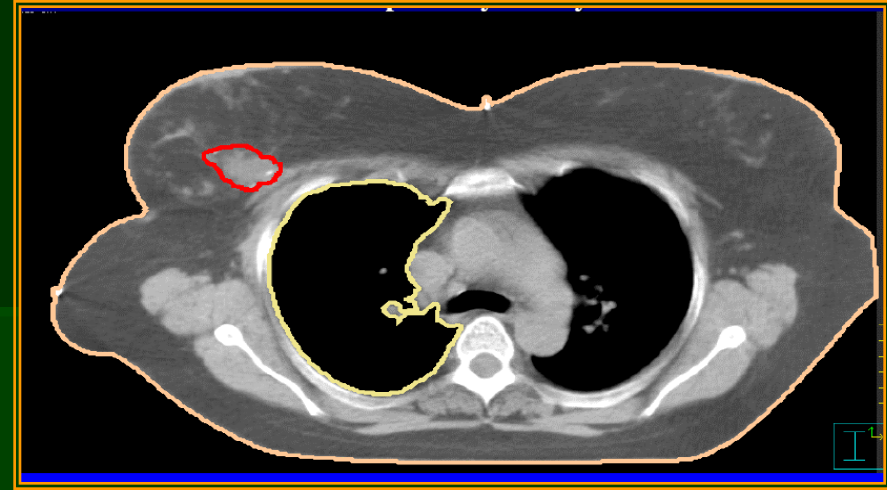
**Tumor location, size of excision, breast size, operative complications may influence cosmetic outcome**

# Localisation

- **Where do you apply the boost?**
- **When do you contour boost CTV?**
- **How can you define the target volume?**
- **Are you missing the target?**
- **To clip or not to clip...**
- **US ? CT ?**



# The target volume



- **CTV**

The volume of tissue within the surgical clips and /or showing any postsurgical disturbance plus a margin to include the microscopic extension (1 cm?)

- **PTV**

Because of organ motion, daily set up error and patient motion another margin of 1 cm is required

A three-dimensional volume

## Localisation: The target volume

- It is not clear how to define the target volume
- The risk of leaving microscopic tumor behind is dependent on the distance of the resection margin from the primary tumor
- It is not always clear how much margin has to be covered, in what distance and in which direction
- Margin of 1.5 cm breast tissue (no skin, no muscle, no ribs) after complete resection and of 3 cm after incomplete

# Localisation: The target volume

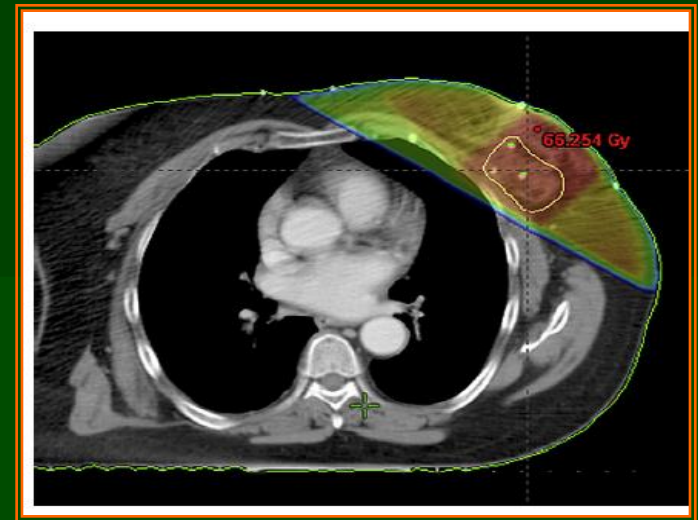
- **Preoperative clinical examination**
- **Preoperative Mx (approximate orientation, breast compression)**
- **Surgical scar**
- **Clips (how many?)**
- **Postoperative clinical examination**
- **US, CT, RMN to localise the scar inside the breast**
- **Seroma (all the tissue around or only one side?, risk of increasing the volume)**

# Localisation : To clip or not to clip...

- The “ideal “double pyramid

Six clips are the ideal number marking the upper, lower, left and right border, and the dorsal and ventral tumor bed limits

(Hammer J et al, 1999)



- 3 -4 clips, 2 or 1... and guess the target!

## Localisation :To clip or not to clip...

- No randomised comparisons exist to prove the importance of using clips to mark the tumor bed in terms of local control benefit or reduced toxicity
- Problems in placing clips
- Titanium clips do not alter the quality of MR images

## **Evaluation of “clinical fields”** (Harrington, 1996)

**50 pts with excision cavity boundaries marked by 5 clips**

**Boost planned first using clinical informations and then adjusted on clips**

**The field planned by “clinical” landmarks was inadequate in 68% of cases. The relative positions of the scar and clips may be widely disparate**



## **Boost planning: US vs CT (Smitt, 2001)**

- **CT performed at the time of whole breast simulation can be used to plan the boost and achieve cavity visualization**
- **The optimal time for planning CT appeared to be 31-60 days following surgery, with cavity volume relatively stable**
- **Cavity volumes decrease somewhat during whole breast irradiation**

## Goal: accurate target volume

- **The decision about the target is more an assumption**
- **Surgical report**
- **The scar alone is not necessarily sufficient for planning the boost**
- **Try to individualise (size of the breast, size and depth of the tumor...)**
- **CT planning and dose distribution**

# Localisation : the surgeon's contribution

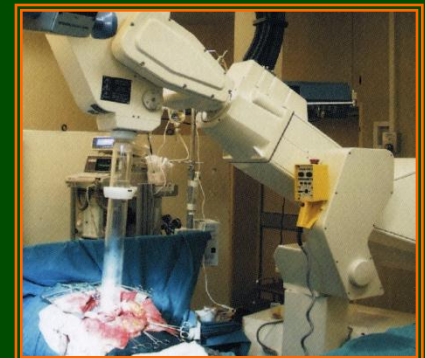
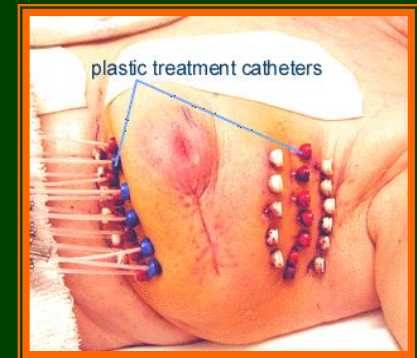
- **Multidisciplinary treatment decision-making**
- **Aim to free margins**
- **Skin incisions should be placed immediately over the tumor when possible**
- **Clip to guide the location of tumor bed**
- **Prevent hematoma**



# Technique

- **Electrons**
- **Reduced tangents photons**
- **IMRT photons**
- **BRT (intraop or delayed)**
- **IORT**

**The choice is often based on personal preference, training, available infrastructure**



# Technique : electrons vs BRT

## (non randomised studies)

- No major consistent advantages in local control or cosmetic results for one technique over the other
- Wide availability of electrons
- BRT: infrastructure, training, time
- BRT may have more cosmetic advantages in **deeply placed** tumors, reducing volume and skin dose ( skin is a critical factor even for BRT)

## **The impact on cosmetic outcome of two different boost techniques after conservative treatment of early breast cancer (INT- Milano IV)**

**To evaluate the influence of the aesthetical results of a radiotherapy boost to tumor bed with either photon beam or interstitial <sup>192</sup>Iridium implant in patients treated with tumorectomy, axillary dissection and 46 Gy whole breast irradiation (TART)**

**Twenty-nine consecutive patients, representative sample of a randomized study ( INT - Milan, 1990-1994) were evaluated for cosmetic outcome.**

# BOOST TECHNIQUE

**A boost dose of 14 Gy was delivered  
with photon beams in 15 patients  
(TART F)**

**and with Iridium 192 brachytherapy  
implants in 14 patients  
(TART Ir)**

# COSMETIC EVALUATION

- **Subjective judgement of a 3-members panel (1 surgeon, 1 radiation therapist, 1 nurse)**
- **Subjective judgement of patients with a simple self assessment questionnaire**
- **Objective judgement of photographs taken immediately before the start of whole breast irradiation and after 2 years or more during follow up, with computerized analysis of digitalized images to compare anthropometric parameters before and after the treatment assigned.**

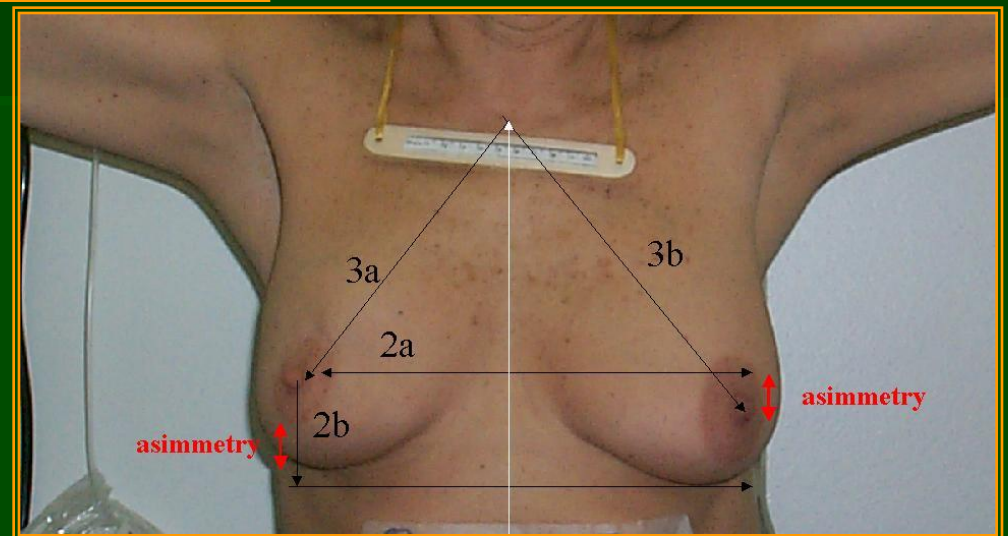
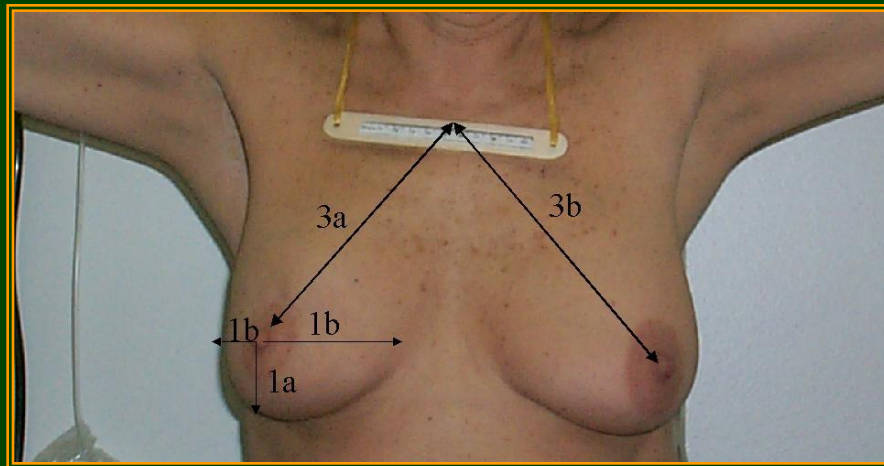


# Objective evaluation of breast asymmetry

## mesuraments

- 1 Distance → nipple-inferior breast profile **(1a)**  
→ nipple-inner/outer breast margins **(1b)**
- 2 Difference in level → between the nipples **(2a)**  
→ between lower breast profile **(2b)**
- 3 Jugular-nipple distance → in the treated breast **(3a)**  
→ in the contralateral breast **(3b)**
- 4 Median line- nipple distance → in the treated breast  
→ in the contralateral breast

# Example of the scoring system for measurements of breast contour and nipple asymmetries



## CONCLUSIONS

**A global satisfactory cosmesis was recorded in both groups. Patients' own evaluation and 3-member panel highlighted **better results in the TART F** group, while computerized analysis showed similar results in shape and simmetry.**

**Loss of cosmesis due to alteration of shape and simmetry seems to be related with surgical technique rather than radiotherapy procedure.**

**At the opposite teleangectasia and fibrosis rapresent failure due to radiation treatment, particularly when **iridium implants** are adopted**



**An excellent result  
after photon beam  
boost**

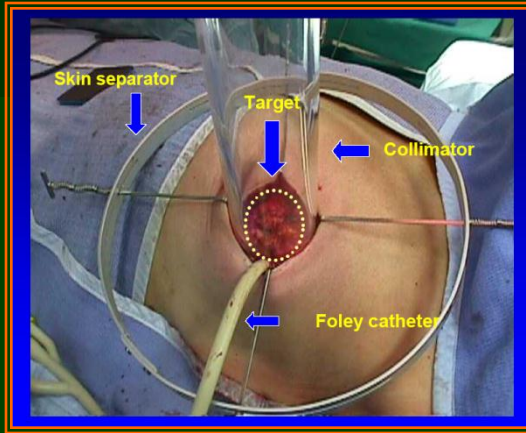


**Evidence of skin  
retraction and  
teleangiectasia after  
interstitial boost**

## Timing of the boost

- **At the end of external whole breast treatment**
- **During the course of external treatment**  
(hypofractionated WB irradiation with the addition of a simultaneous integrated boost –SIB)
- **Intraoperatively**

# Timing of the boost : intraoperatively



- The “ideal approach” because of the certainty of covering the tumor bed
- Lack of histologic information
- Time management between surgeons and radiation oncologists

# Ottimizzazione della localizzazione del tumor bed dopo tecniche di oncoplastica

- Il beneficio estetico derivante dalle tecniche di oncoplastica non deve essere condizionato dalla successiva RT
- Le tecniche di oncoplastica garantiscono più ampi margini chirurgici : è ancora necessario il boost ?
- Il rimaneggiamento ghiandolare effettuato con tecniche di oncoplastica rimette in discussione l'identificazione del target con approcci usuali





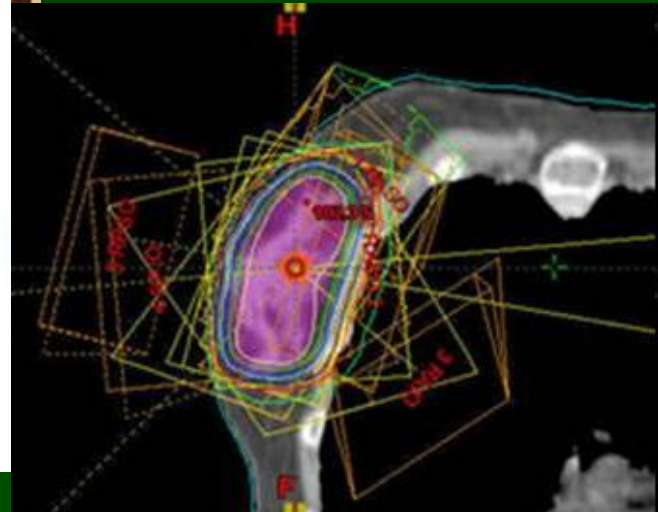
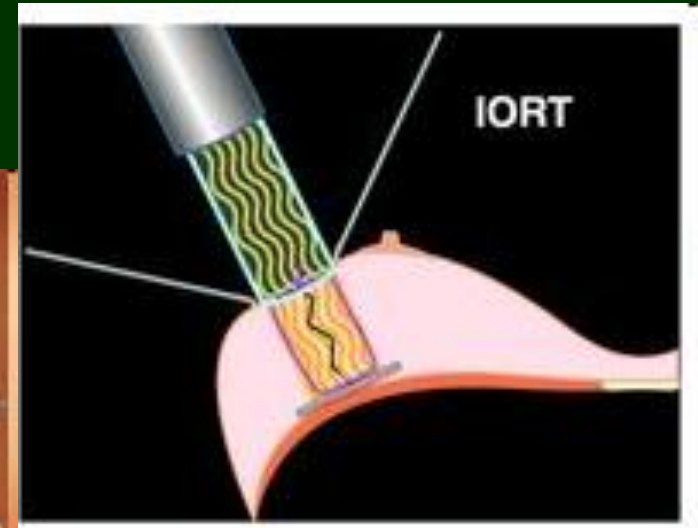
*New method for tumour bed delineation.*

Premier temps : repérage échographique	Patiente en position de traitement  La localisation tumorale doit comporter Le rayon horaire La distance par rapport au mamelon La profondeur tumorale (peau-centre de la tumeur et centre de la tumeur-plan profond)
Deuxième temps : repérage chirurgical	Clip profond sur le plan pectoral à l'aplomb du repère cutané, sein au repos ; trois ou quatre clips de berges sur les faces de la loge de tumorectomie avant remodelage
Troisième temps : repérage anatomopathologique	Évaluation de la distance de la tumeur par rapport au plan profond et au plan superficiel
Quatrième temps : repérage dosimétrique	Le CTV <i>boost</i> (volume cible anatomoclinique du complément d'irradiation du lit tumoral) est formé par une expansion volumétrique tridimensionnelle autour de chaque clip de berge. Le diamètre de l'expansion tridimensionnelle dépend de la taille tumorale et des marges chirurgicales. Il est étendu au plan profond vers le clip pectoral en cas de tumeur du tiers profond (évaluation échographique et anatomopathologique), ou bien étendu au plan cutané en cas de tumeur localisée dans le tiers superficiel. En l'absence de données permettant de définir la profondeur tumorale, on irradie le trajet cicatriciel de la peau au pectoral

CTV : *clinical target volume.*



# Accelerated Partial Breast Irradiation APBI



# Accelerated Partial-Breast Irradiation with Interstitial Implants

Analysis of Factors Affecting Cosmetic Outcome

Oliver J. Ott, Michael Lotter, Rainer Fietkau, Vratislav Strnad<sup>1</sup>

Strahlenther Onkol 2009;185:170-6  
DOI 10.1007/s00066-009-1943-6

171 pz, FU 52 mesi

## Risultato cosmetico

<b>Excellent</b>	<b>59.6%</b>
<b>Good</b>	<b>29.8%</b>
<b>Fair</b>	<b>9.9%</b>
<b>Poor</b>	<b>0.6%</b>

# Accelerated Partial-Breast Irradiation with Interstitial Implants

Analysis of Factors Affecting Cosmetic Outcome

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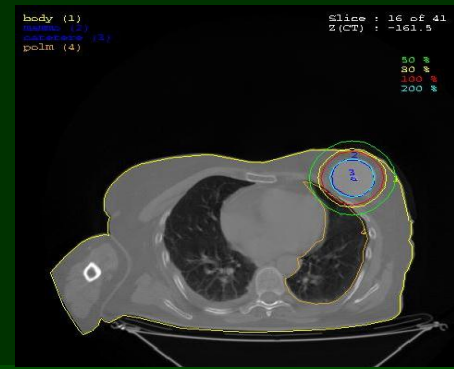
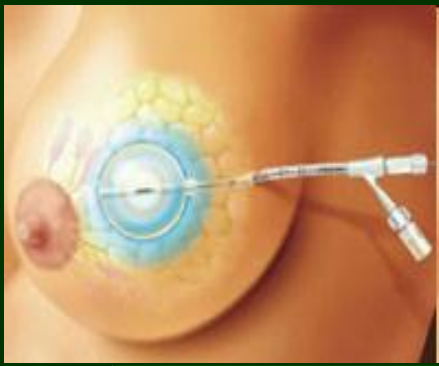
Strahlenther Onkol 2009;85:170-6  
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171 pz, FU 52 mesi

## No excellent cosmetic outcome

<b>Acute toxicity</b>	<b>24.6%</b>
<b>Late toxicity</b>	<b>65%</b>
<b>PDR</b>	<b>68%</b>

Le tossicità acute e tardive, nonché possibili volumi di sovradosaggio o movimenti delle sorgenti con la tecnica PDR (teleangectasie nel 25% e fibrosi nel 42% dei casi) condizionano il risultato cosmetico



## Mammosite

<b>Authors</b>	<b>N° of cases</b>	<b>Follow up (months)</b>	<b>Infection Rate</b>	<b>Recurrence %</b>	<b>Cosmetic outcome good/ excellent</b>
<b>Benitez 2007</b>	70	65,2 mean	9.3%	0 %	83 %
<b>Prestidge 2006</b>	234	24 median	4 %	0.4%	94 %
<b>Chao 2007</b>	80	22 median	11.3%	2.9% 3-year act.	97.2%
<b>Vicini 2010</b>	1449	54 median	seroma 13.0% fat necrosis 2.3%	2.6%	90.6%

# UNACCEPTABLE COSMESIS IN A PROTOCOL INVESTIGATING INTENSITY-MODULATED RADIOTHERAPY WITH ACTIVE BREATHING CONTROL FOR ACCELERATED PARTIAL-BREAST IRRADIATION

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34 pz, FU 2.5 aa tecnica IMRT –active breath control

L'aumento del volume irradiato causa una più elevata dose integrale alla ghiandola mammaria con più del 20% di **compromissione del risultato cosmetico**

	Volume di mammella che riceve 50 % della dose (V50)	Volume di mammella che riceve 100 % della dose (V100)
Good cosmesis	34.6 %	15.5%
Poor cosmesis	46.1%	23%

**INTERIM COSMETIC RESULTS AND TOXICITY USING 3D CONFORMAL EXTERNAL BEAM RADIOTHERAPY TO DELIVER ACCELERATED PARTIAL BREAST IRRADIATION IN PATIENTS WITH EARLY-STAGE BREAST CANCER TREATED WITH BREAST-CONSERVING THERAPY**

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**Table 3. Treatment-related toxicities ( $N = 75$ ),  $n$  (%)**

Finding	Grade 0	Grade I	Grade II	Grade III
Erythema	62 (83)	12 (16)	1 (1)	0 (0)
Hyperpigmentation	49 (65)	20 (27)	6 (8)	0 (0)
Breast edema	52 (69)	18 (24)	5 (7)	0 (0)
Breast pain	56 (75)	15 (20)	2 (2.5)	2 (2.5)
Telangiectasia	65 (87)	6 (8)	4 (5)	0 (0)
		Focal	Diffuse	
Fibrosis	41 (55)	28 (37)	6 (8)	0 (0)
Fat necrosis	69 (92)	3 (4)	3 (4)	0 (0)
		Asymptomatic	Symptomatic	

## Long-term follow-up-findings in mammography and ultrasound after intraoperative radiotherapy (IORT) for breast cancer

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	<b>IORT</b>	<b>RT convenzionale</b>
Ematomi/sieromi	76%	37%
Dimensioni cospicue	70%	19%
Liponecrosi / oil cysts	57%	17%
Lesioni con ispessimento polipoide della parete	28%	2%

Questi rilievi rimangono stabili dopo IORT mentre diminuiscono nel tempo dopo RT convenzionale





In the treatment of patients with early breast cancer the risk of severe morbidity must be kept to a very low level, perhaps  $< 0.1\%$

Women must receive the very highest standard of treatment so that they will have the greatest chance of benefit with the minimum risk of post radiation injury