INDICAZIONI E TECNICHE DELLA RADIOTERAPIA INTERVENTISTICA NEL TRATTAMENTO DELLE NEOPLASIE MAMMARIE

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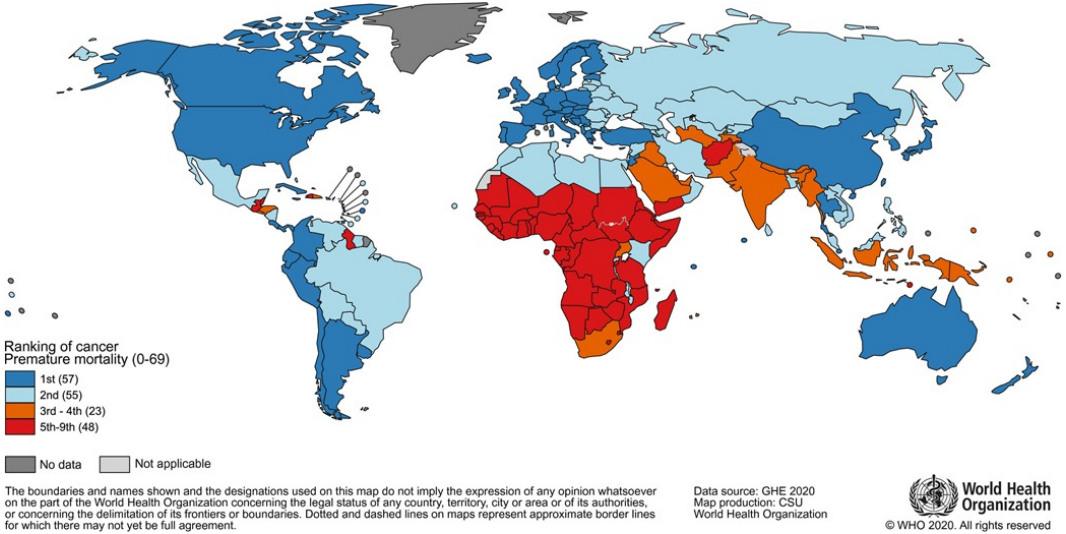
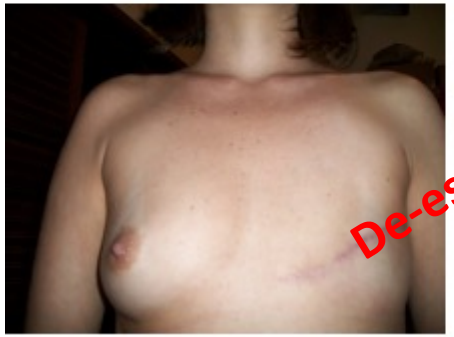
breast cancer world



Background

Over the last 20 years, the therapeutic strategy for breast cancer has increasingly turned towards organ preservation, favoring less mutilating surgical approaches that are constantly integrated with RT and antiblastic medical therapy.

We have moved from radical mastectomy (aggressive and destructive surgery) to quadrantectomy integrated with post-operative RT (QuaRT, a more conservative and aesthetically friendly treatment) which is currently considered the standard in the early stages of the disease.



De-escalation in breast cancer

BCS + RT vs Mastectomy

	BCS + RT	Mastectomy
LR	5% - 13%	2% - 14%
Survival	59% - 79%	59% - 82%

Milano I, NSABP, EORTC, IGR, NCI, DBCG

Follow up: from 6 to 20 yrs

Hypofractionated EBRT

Hypofractionated breast radiotherapy for 1 week versus 3 weeks (FAST-Forward): 5-year efficacy and late normal tissue effects results from a multicentre, non-inferiority, randomised, phase 3 trial

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START Pilot 1986 - 1998	START A 1998-2002	START B 1999-2001
• 42.9Gy in 13Fr	• 41.6Gy in 13Fr	• 40Gy in 15Fr
• 39Gy in 13Fr	• 39Gy in 13Fr	• 50Gy in 25Fr
• 50Gy in 25Fr	• 50Gy in 25Fr	

Overall there was no significant difference in loco-regional relapse at 10 years: approximately 5-8% (for pT1-3 N0-N1)

Moderate of marked breast induration, telangiectasia, breast oedema were significantly less in 39Gy or 40Gy compared to 50Gy

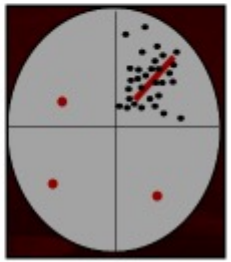
PBI rational

1) 70-80% of local recurrences occur in the area of the breast where the primary neoplasm was located

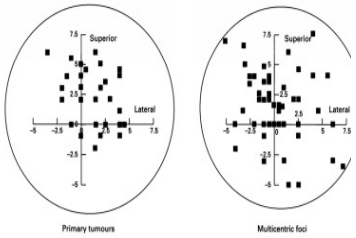
2) only 3.3% of them develop a recurrence in an other quadrant than that initially affected by the tumor

3) the ipsilateral reappearance of the neoplasm, outside the affected quadrant, is to be considered a second tumor rather than a local recurrence

85% of local recurrences occur at or near the original tumor



Veronesi U et al. Ann Oncol 2001;12:997-1003.



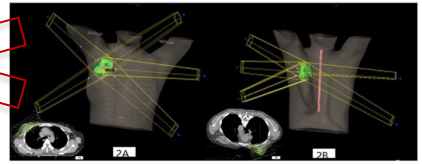
Vaidya et al 1996, Br.J.C

→ 63% of unknown tumor foci outside principal node
→ 80% of unknown foci outside index quadrant

Autors	N° recurrence	% in index quadrant
Clark RM, 1982	680	96%
Schnidt SJ, 1984	231	83%
Boyages J, 1990	783	81%
Kurtz JM, 1990	1593	86%
Fisher B, 1992	1843	100%
Veronesi U, 1993	570	90%

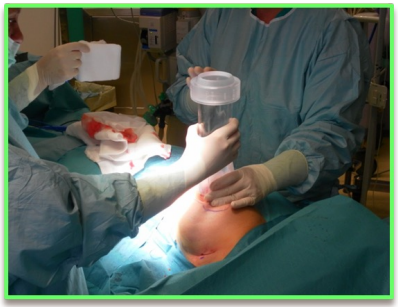
→ About 90% of local failures inside index quadrant

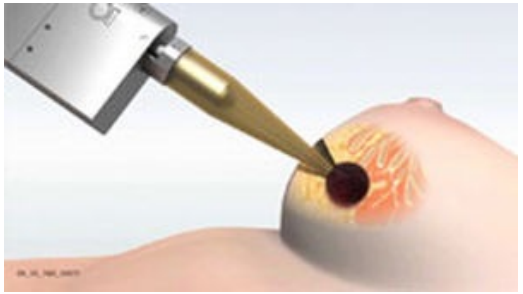
EBRT



PBI
Partial breast irradiation (Boost-exclusive)

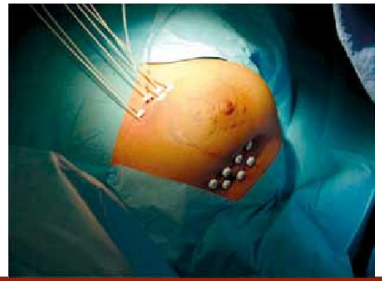
Intra Operative RadioTherapy (IORT) (E) KeV (Intrabeam)

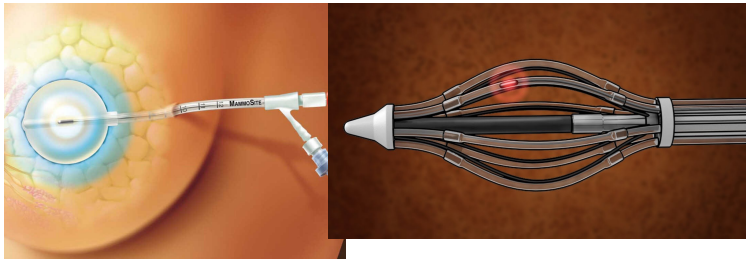




Brachitherapy

recurrence





IORT : vantaggi

- l'esposizione chirurgica permette una accurata definizione del bersaglio
- l'esposizione chirurgica permette una adeguata protezione dei tessuti sani adiacenti (retrazione tess. mobili, schermatura tess. fissi)
- buon rapporto efficacia terapeutica / tossicità

IORT TEAM

RADIOTERAPISTA

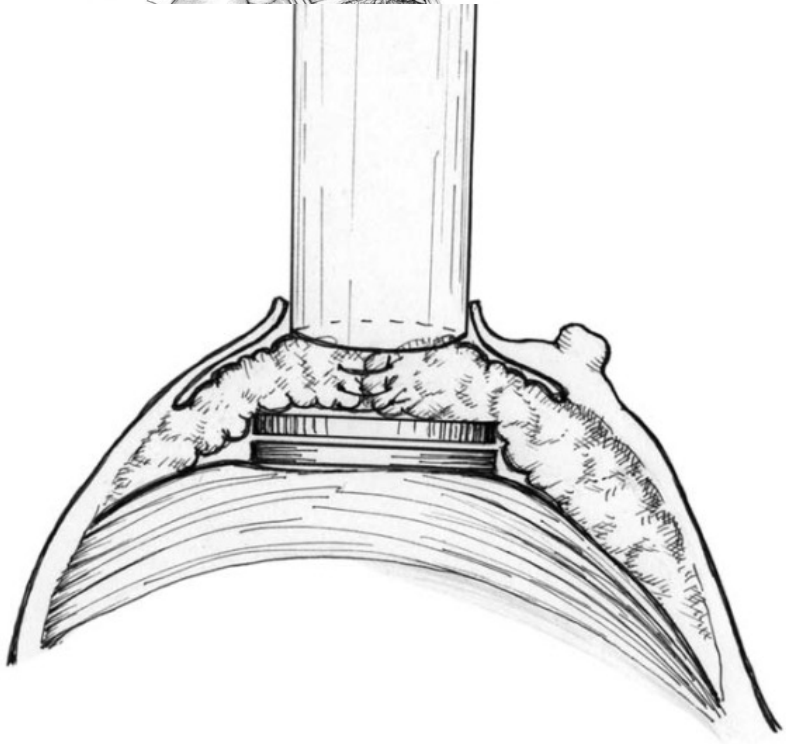
CHIRURGO

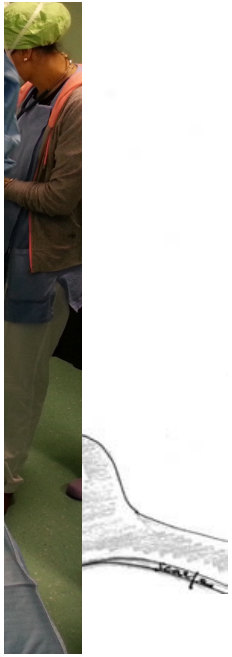
ANESTESISTA

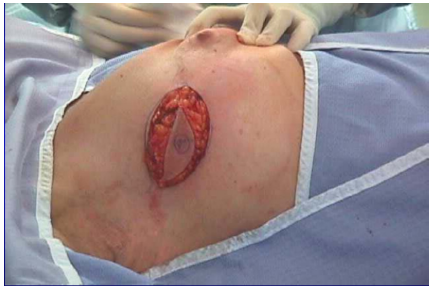
IL FISICO SANITARIO

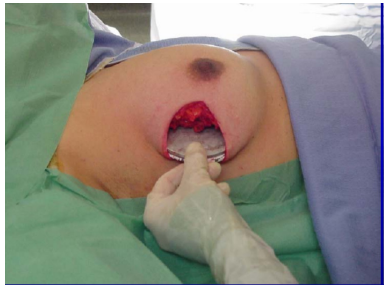
IL TECNICO DI RADIOLOGIA MEDICA (TSRM)

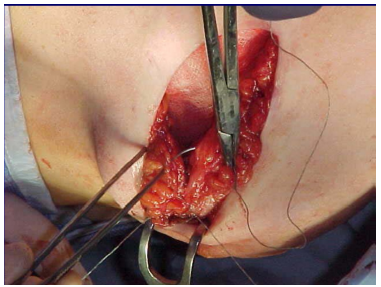
L'INFERMIERE

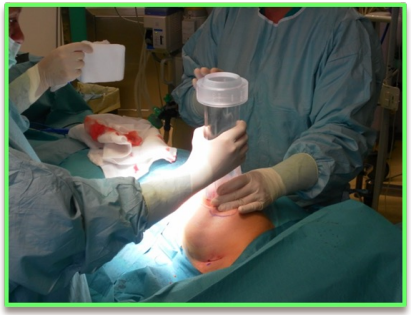


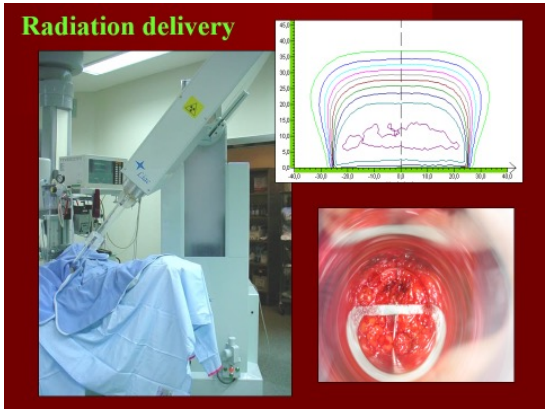








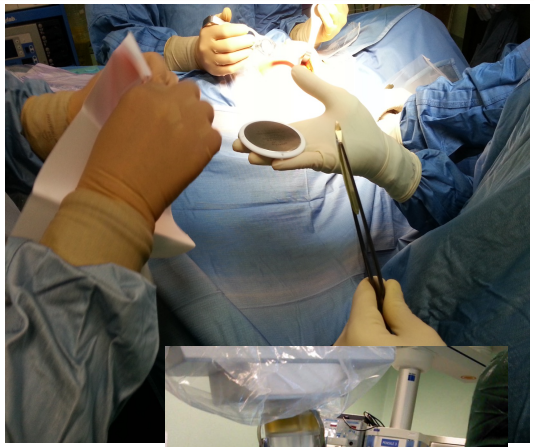
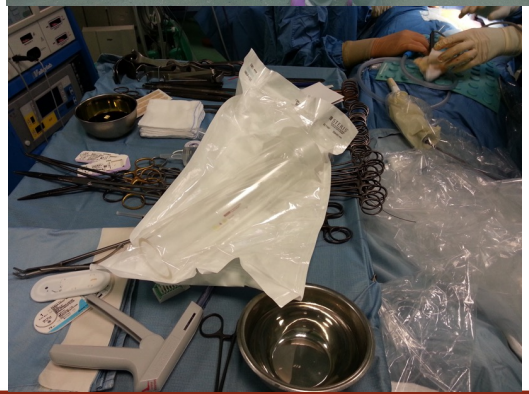


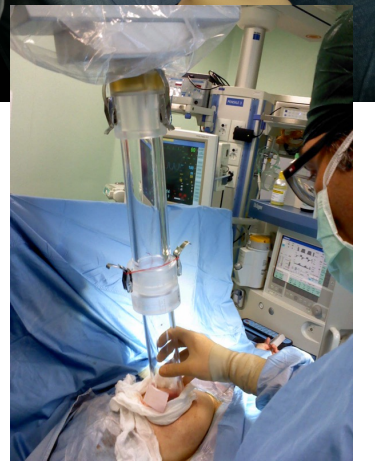

Radiation delivery

AIRO2023

Radioterapia Oncologica:
l'evoluzione al servizio dei pazienti

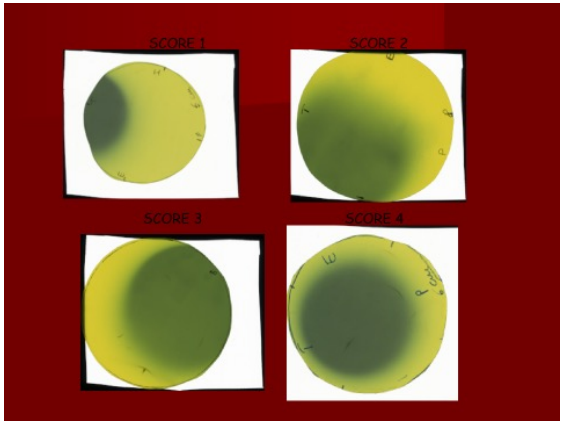


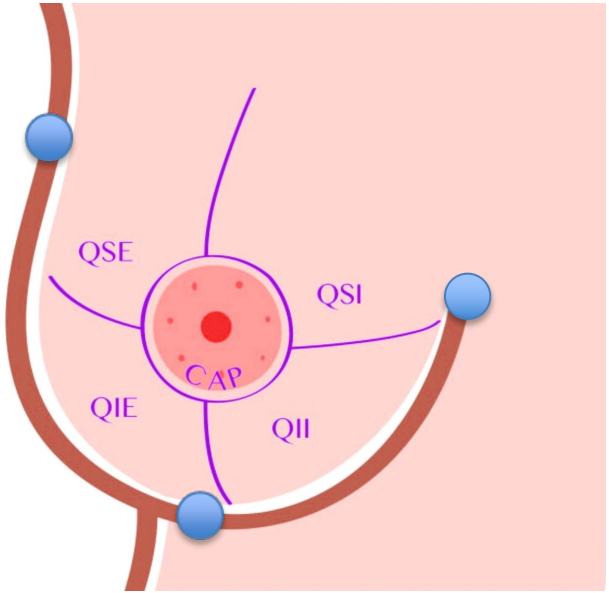



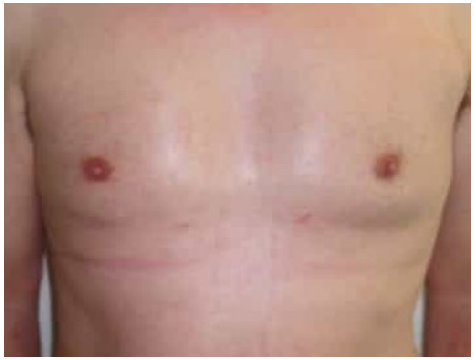
ACCESSORI

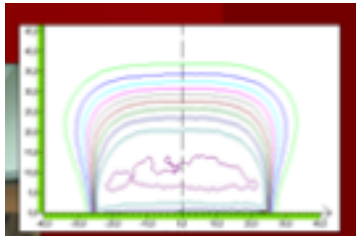
- Applicatori e preapplicatori
- Dispositivi di radioprotezione

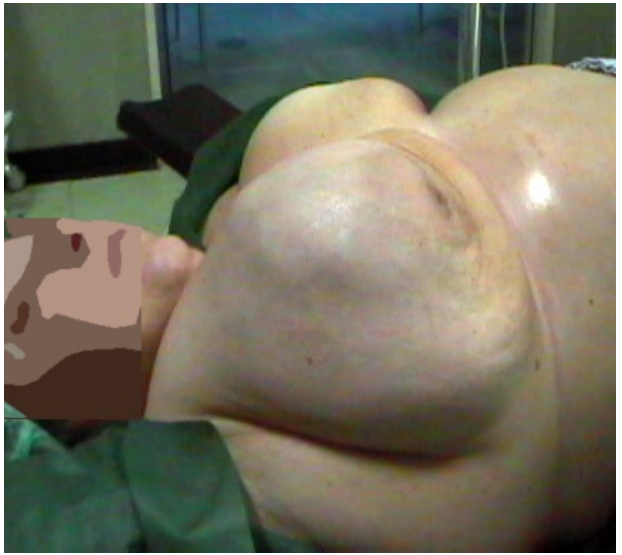


LIMITI ANATOMO-DOSIMETRICI









INTRABEAM

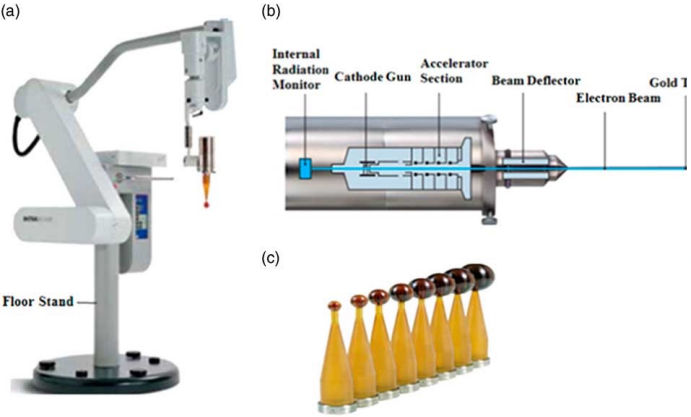
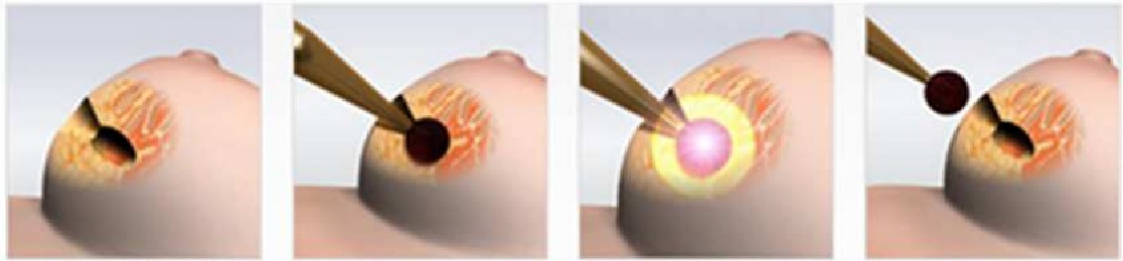


Figure 2.2: Delivery of radiation with INTRABEAM



Step 1: INTRABEAM IORT is delivered during the lumpectomy procedure, immediately following tumor removal.

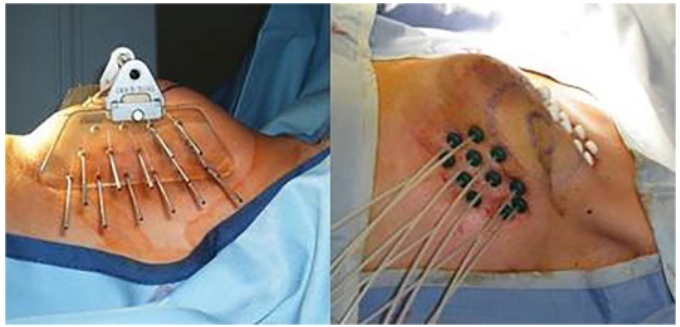
Step 2: After the surgeon has removed the tumor, the radiation oncologist positions the INTRABEAM applicator in the area of the breast where the tumor was located.

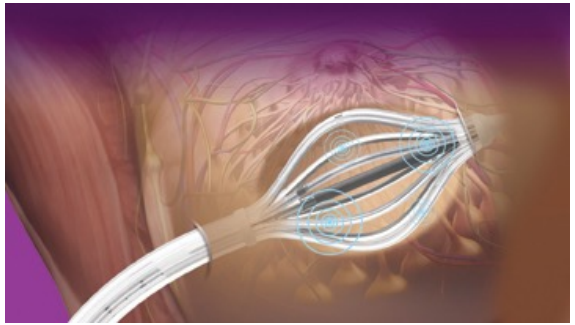
Step 3: Low energy radiation is delivered locally to the targeted tissue in the tumor bed, minimizing healthy tissue exposure to radiation.

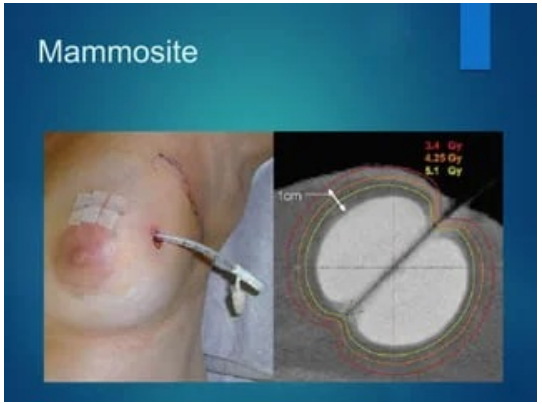
Step 4: After 20-30 minutes of radiotherapy, the applicator is removed and the surgeon then closes the incision.

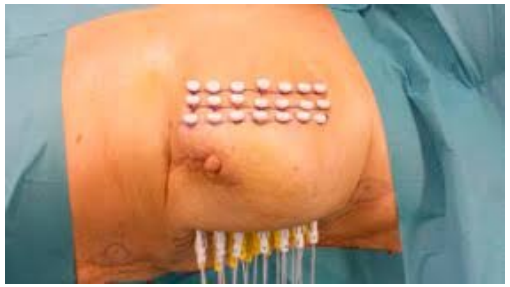
Source: Oncology Systems Limited (2016)

BRACHITERAPIA









Intraoperative radiotherapy versus external radiotherapy for early breast cancer (ELIOT): a randomised controlled equivalence trial

Umberto Veronesi, Roberto Orecchia, Patrick Maisonneuve, Giuseppe Viale, Nicole Rotmensz, Claudia Sangalli, Alberto Luini, Paolo Veronesi, Viviana Galimberti, Stefano Zurrida, Maria Cristina Leonardi, Roberta Lazzari, Federica Cattani, Oreste Gentilini, Mattia Intra, Pietro Caldarella, Bettina Ballardini

Summary

Background Intraoperative radiotherapy with electrons allows the substitution of conventional postoperative whole breast irradiation with one session of radiotherapy with the same equivalent dose during surgery. However, its ability to control for recurrence of local disease required confirmation in a randomised controlled trial.

Methods This study was done at the European Institute of Oncology (Milan, Italy). Women aged 48–75 years with early breast cancer, a maximum tumour diameter of up to 2·5 cm, and suitable for breast-conserving surgery were randomly assigned in a 1:1 ratio (using a random permuted block design, stratified for clinical tumour size [<1·0 cm *vs* 1·0–1·4 cm *vs* ≥1·5 cm]) to receive either whole-breast external radiotherapy or intraoperative radiotherapy with electrons. Study coordinators, clinicians, and patients were aware of the assignment. Patients in the intraoperative radiotherapy group received one dose of 21 Gy to the tumour bed during surgery. Those in the external radiotherapy group received 50 Gy in 25 fractions of 2 Gy, followed by a boost of 10 Gy in five fractions. This was an equivalence trial; the prespecified equivalence margin was local recurrence of 7·5% in the intraoperative radiotherapy group. The primary endpoint was occurrence of ipsilateral breast tumour recurrences (IBTR); overall survival was a secondary outcome. The main analysis was by intention to treat. This trial is registered with ClinicalTrials.gov, number NCT01849133.

Findings 1305 patients were randomised (654 to external radiotherapy and 651 to intraoperative radiotherapy) between Nov 20, 2000, and Dec 27, 2007. After a medium follow-up of 5·8 years (IQR 4·1–7·7), 35 patients in the intraoperative radiotherapy group and four patients in the external radiotherapy group had had an IBTR (p<0·0001). The 5-year event rate for IBRT was 4·4% (95% CI 2·7–6·1) in the intraoperative radiotherapy group and 0·4% (0·0–1·0) in the external radiotherapy group (hazard ratio 9·3 [95% CI 3·3–26·3]). During the same period, 34 women allocated to intraoperative radiotherapy and 31 to external radiotherapy died (p=0·59). 5-year overall survival was 96·8% (95% CI 95·3–98·3) in the intraoperative radiotherapy group and 96·9% (95·5–98·3) in the external radiotherapy group. In patients with data available (n=464 for intraoperative radiotherapy; n=412 for external radiotherapy) we noted significantly fewer skin side-effects in women in the intraoperative radiotherapy group than in those in the external radiotherapy group (p=0·0002).

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Scientific Directorate (Prof U Veronesi MD), **Division of Radiation Oncology** (Prof R Orecchia MD, M C Leonardi MD, R Lazzari MD, F Cattani MD), **Division of Epidemiology and Biostatistics** (P Maisonneuve DiplEng, N Rotmensz MSc), **Division of Pathology** (Prof G Viale MD), **and Division of Breast Surgery** (C Sangalli MSc, A Luini MD, Prof P Veronesi MD, V Galimberti MD, Prof S Zurrida MD, O Gentilini MD, M Intra MD, P Caldarella MD, B Ballardini MD), **European Institute of Oncology, Milan, Italy; and University of Milan, Milan, Italy** (Prof R Orecchia, Prof G Viale, Prof P Veronesi, Prof S Zurrida)

	External radiotherapy	Intraoperative radiotherapy with electrons
Age*		
48–49 years	43 (7%)	44 (7%)
50–59 years	267 (41%)	286 (44%)
60–69 years	269 (41%)	259 (40%)
≥70 years	75 (11%)	62 (10%)
Histology†		
Ductal	514 (79%)	524 (81%)
Lobular	57 (9%)	53 (8%)
Ductal and lobular	21 (3%)	17 (3%)
Other	55 (9%)	53 (8%)
Pathological size‡		
≤1 cm	194 (30%)	199 (31%)
1–1·5 cm	235 (36%)	243 (38%)
1·5–2 cm	115 (18%)	120 (19%)
>2 cm	103 (16%)	83 (13%)
Number of positive nodes†		
None	471 (73%)	478 (74%)
1–3	138 (21%)	138 (21%)
≥4	38 (6%)	31 (5%)
Tumour grade§		
G1	160 (25%)	196 (31%)
G2	328 (52%)	305 (48%)
G3	145 (23%)	129 (20%)
Oestrogen receptor¶		
Negative	56 (9%)	63 (10%)
Positive	589 (91%)	583 (90%)
Progesterone receptor‖		
Negative	132 (20%)	158 (24%)
Positive	512 (80%)	487 (76%)
Proliferative index (Ki-67)**		
<14%	242 (38%)	263 (41%)
14–20%	138 (21%)	138 (21%)
>20%	265 (41%)	244 (38%)
Molecular subtype¶		
Luminal A	237 (37%)	256 (40%)
Luminal B	352 (55%)	327 (51%)
HER2 positive (non-luminal)	24 (4%)	20 (3%)
Triple negative	32 (5%)	43 (7%)
Adjuvant treatment*		
Control	26 (4%)	25 (4%)
Endocrine therapy alone	485 (74%)	489 (75%)
Chemotherapy alone	47 (7%)	53 (8%)
Endocrine and chemotherapy	96 (15%)	84 (13%)

Data are n (%). Some percentages do not total 100% because of rounding. 654 patients were assigned to external radiotherapy, and 651 to intraoperative radiotherapy with electrons. *n=654 for external radiotherapy, n=651 for intraoperative radiotherapy with electrons. †n=647 for both groups. ‡n=647 for external radiotherapy, n=645 for intraoperative radiotherapy with electrons. §n=633 for external radiotherapy, n=630 for intraoperative radiotherapy with electrons. ¶n=645 for external radiotherapy, n=646 for intraoperative radiotherapy with electrons. ‖n=644 for external radiotherapy; n=645 for intraoperative radiotherapy with electrons. **n=645 for both groups.

Table 1: **Characteristics of patients according to allocated group (intention-to-treat population)**

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Radioterapia Oncologica: l'evoluzione al servizio dei pazienti

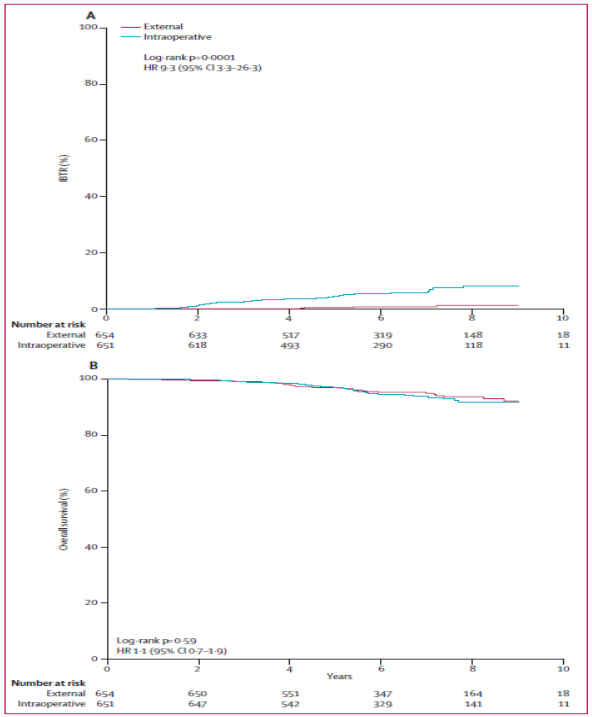


Figure 2: Cumulative incidence of (A) ipsilateral breast tumour recurrence and (B) overall survival

	Patients (n/N)	IBTR 5-year event rate (95% CI)	Log-rank p value*
Total	35/651	4·4% (2·7–6·1)	..
Age			
48–49 years	0/44	0	..
50–59 years	21/286	5·6% (2·7–8·5)	..
60–69 years	10/259	3·1% (0·8–5·4)	..
≥70 years	4/62	7·2% (0·4–14·1)	0·11
Histology			
Ductal	28/524	4·5% (2·6–6·5)	..
Lobular	3/53	4·6% (0·0–10·8)	..
Ductal and lobular	2/17	6·3% (0·0–18·1)	..
Other	2/53	2·1% (0·0–6·1)	0·69
Pathological size			
≤1 cm	5/199	1·9% (0·0–4·0)	..
1–1·5 cm	13/243	4·2% (1·5–6·9)	..
1·5–2·0 cm	7/120	4·7% (0·7–8·8)	..
>2·0 cm	10/83	10·9% (3·7–18·1)	0·006
Number of positive nodes			
None	21/478	3·5% (1·7–5·3)	..
1–3	10/138	5·3% (1·5–9·2)	..
≥4	4/31	15·0% (1·4–28·7)	0·06
Overall p value	..	..	
Tumour grade			
G1	5/196	1·1% (0·0–2·7)	..
G2	15/305	3·8% (1·5–6·1)	..
G3	15/129	11·9% (5·7–18·2)	0·0003
Oestrogen receptor			
Absent	8/63	14·9% (5·2–24·5)	..
Present	21/583	3·3% (1·8–4·9)	0·004
Overall p value	..	..	
Progesterone receptor			
Absent	12/158	7·4% (2·9–11·8)	..
Present	23/487	3·5% (1·7–5·2)	0·17
Proliferative index (Ki-67)			
<14%	8/263	1·8% (0·0–3·5)	..
14–20%	5/138	1·5% (0·0–3·6)	..
>20%	22/244	9·1% (5·1–13·1)	0·002
Molecular subtype			
Luminal A	7/256	1·4% (0·0–3·0)	..
Luminal B	20/327	4·9% (2·4–7·4)	..
HER2-positive (non-luminal)	1/20	5·9% (0·0–17·1)	..
Triple negative	7/42	18·9% (6·1–31·7)	0·001
Characteristics suggesting subsequent whole breast irradiation			
No	14/452	1·5% (0·3–2·7)	..
Yes†	21/199	11·3% (6·4–16·1)	<0·0001

IBTR=ipsilateral breast tumour recurrence. * Overall p value. †Tumour larger than 2·5 cm, or four or more positive nodes, grade 3, or triple negative.

Table 3: Factors associated with IBTR among patients randomised to receive intraoperative radiotherapy with electrons

	External radiotherapy	intraoperative radiotherapy with electrons	p value†
Any skin toxicity			
No	427	401	..
Yes, acute	32	5	..
Yes, chronic	5	6	0·0002
Erythema			
No	7	24	..
Grade 1–2	35	5	..
Grade 3	2	0	..
Grade 4	3	0	..
Grade 5	0	0	<0·0001
Dryness			
No	128	147	..
Grade 1–2	20	10	..
Grade 3–5	0	0	0·04
Hyper-pigmentation			
No	138	146	..
Grade 1–2	36	11	..
Grade 3–5	0	0	0·0004
Pruritus (scale 0–10)			
0	174	153	..
1–2	6	5	..
≥3	11	0	0·006
Overall p value	..	..	
Necrosis (radiological)			
Absent	136	129	..
Present	10	22	0·04

*Information available only for a subset of patients. †Overall p value.

Table 4: Skin side-effects (per-protocol analysis)*

ELIOT should be offered to selected patients at low-risk of IBTR

Taccuino IORT (2014)esclusiva al di fuori di studi clinici:indicazioni

INDICAZIONI

- Età > 50 anni e stato menopausale
- Malattia **unifocale**
- Istotipo invasivo **non** lobulare
- T ≤ 2 cm
- malattia con profilo biologico favorevole (basso indice di proliferazione, recettori ormonali positivi, HER 2 negativo ovvero gruppo fenotipico **luminal A)**
- assenza di metastasi linfonodali (**N0**)
- margini chirurgici **macroscopicamente** negativi

CONTROINDICAZIONI ASSOLUTE

- Malattia multifocale o multicentrica
- T > 2 cm o T4
- N+
- Chemioterapia neoadiuvante
- Mutazione di BRCA
- Gravidanza

CONTROINDICAZIONI RELATIVE

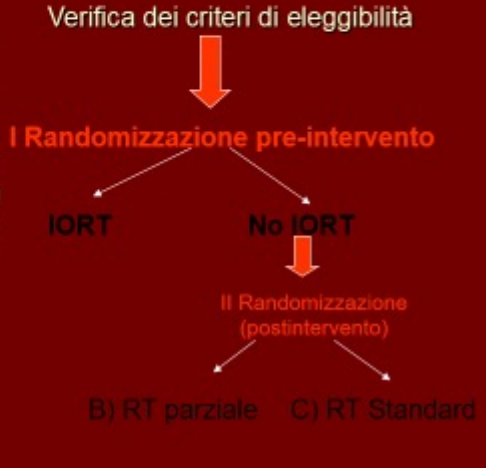
Malattie del connettivo. Alcune malattie del collageno quali lupus, sclerodermia, dermatomiosite se in fase quiescente rappresentano una controindicazione relativa, se in fase attiva assoluta per l'amplificazione delle tossicità segnalate. L'artrite reumatoide non è considerata controindicazione al trattamento

Protocollo di studio IRMA3:

carcinoma della mammella a basso rischio di recidiva locale: irradiazione parziale e accelerata con radioterapia conformazionale tridimensionale (3DCRT) vs. radioterapia standard dopo chirurgia conservativa e radioterapia intraoperatoria (IORT) verso radioterapia standard dopo chirurgia conservativa (studio di fase III).

Popolazione target dello studio

Donne di età = > 49 anni, ECOG 0-2, sottoposte a chirurgia mammaria conservativa per carcinoma della mammella invasivo, T1-2 (< 2,5 cm di diametro) N0 M0, unifocale, margini di resezione istologicamente negativi (□ 2 mm) al primo intervento o dopo successivo ampliamento.



Partial breast irradiation

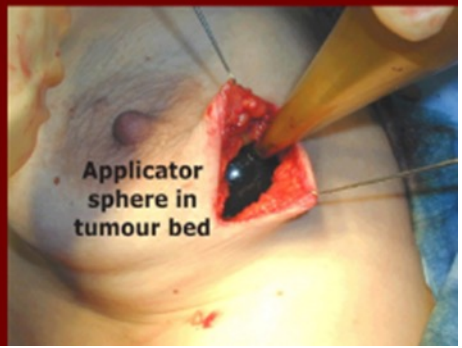
IORT sorgente RX (Intrabeam)

Caduta estremamente rapida della dose

Trattamento intraoperatorio a ferita aperta dopo verifica margini

Irradiazione della cavità chirurgica a 360°

Calcolo della dose a 0.5 cm dalla superficie



TARGIT –A: trial design

Primary endpoint: local control (non-inferiority)

Eligible patients:
Invasive ductal carcinoma
Age≥45
pT1-2 (<3.5cm)
cN0-1
Conservative s.

Standard
WBRT 50Gy/25 fr or 40.5Gy/15fr +/- boost
Pts N° =1158

Experimental arm:
IORT
Pts N° =1140

Median follow up: 8.6 years

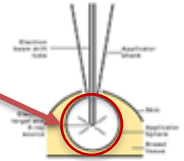
BMJ 2020;370:m2836

IORT - PBI - dose

2Gy/fraction equivalent dose of 20 Gy in single fraction:

Dose IORT	α/β	20Gy
Normal tissue (acute tox)	7	60Gy
Tumor	10	50Gy
Normal tissue (late tox)	2	120Gy

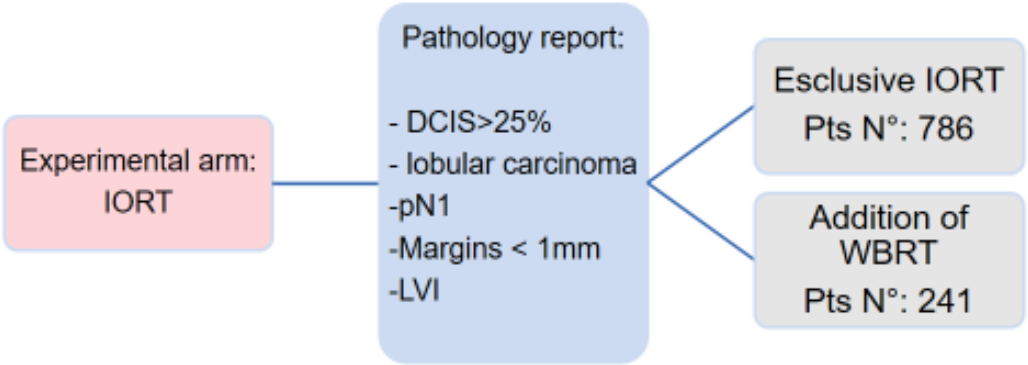
RT prescription:
-5Gy at 1cm isodose (=20Gy on applicator surface in water equivalent phantom)
-6Gy at 1 cm isodose (=20Gy on applicator surface in fat equivalent phantom)



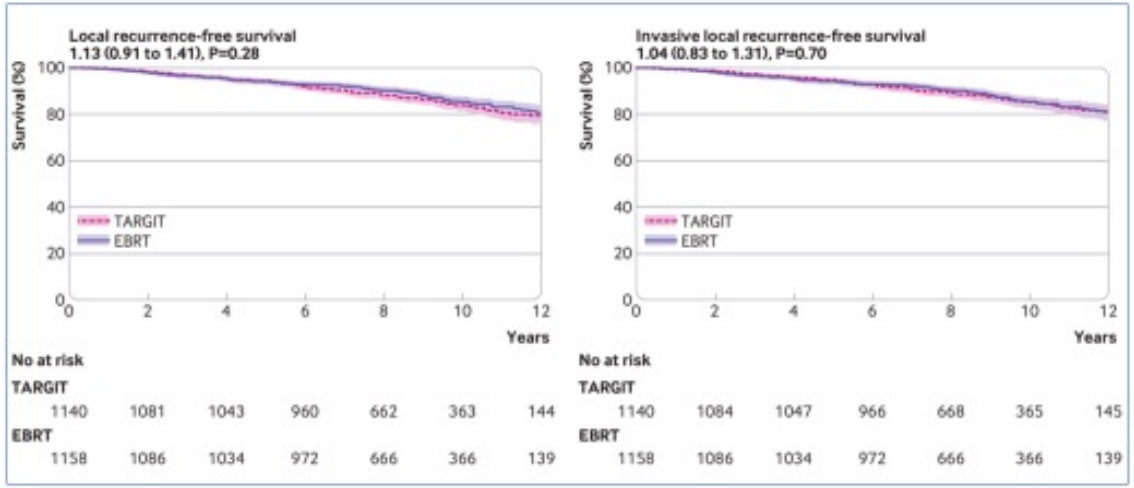
Courtesy Dr. Vinante

Targit-A: trial design

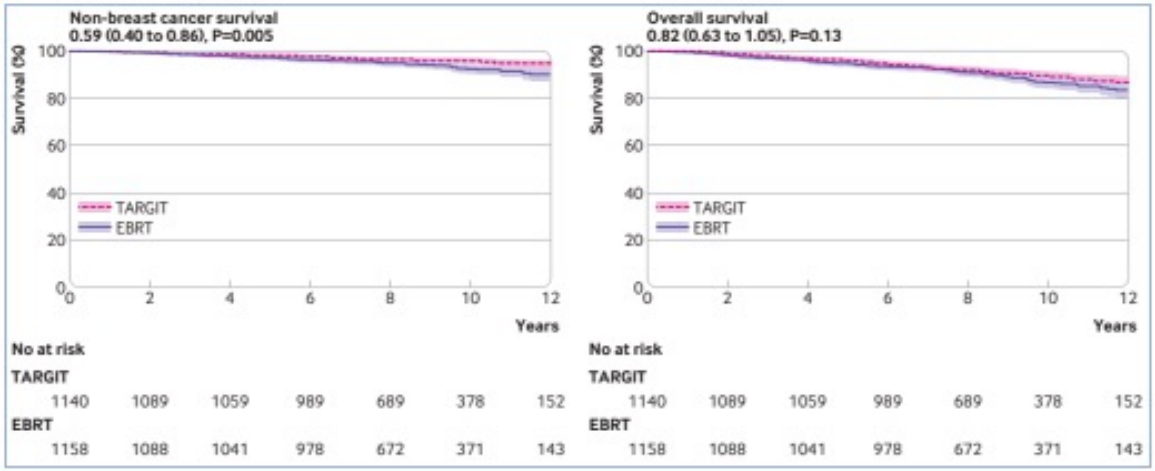
TARGIT – IORT risk adapted treatment:



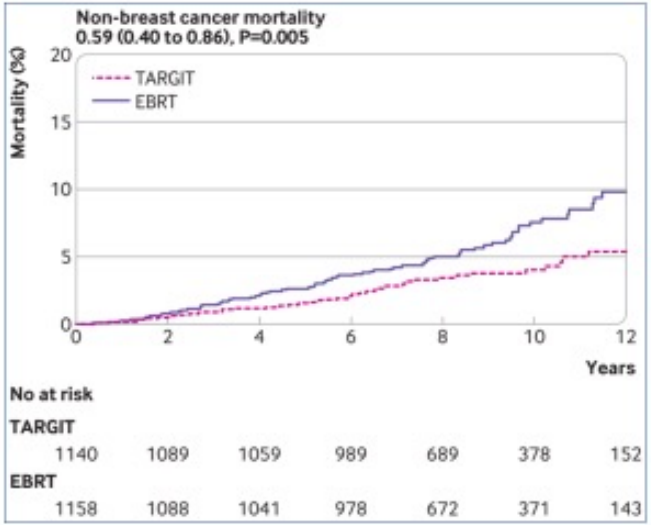
Targit-A: results



Targit-A: results



Targit-A: results



Causes of death	IORT	EBRT
Breast cancer	65	57
Cardiovascular	8	20
Other cancers	15	21
Other / not given	18	24

BMJ 2020;370:m2836

PBI Brachiterapia

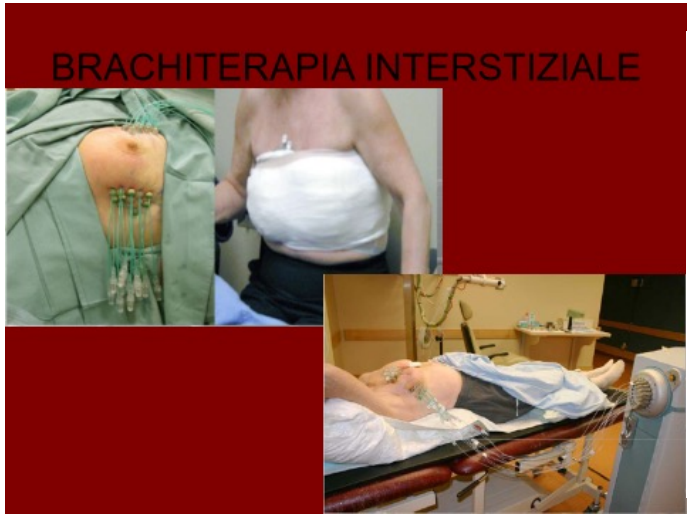
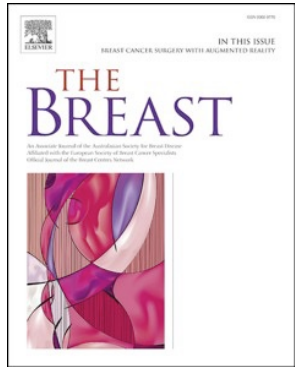


Table 1
Dose and fractionation for brachytherapy or external beam PBI.

RT approach	Total fractionated dose	Dose per fraction	N fractions
Brachytherapy [25,31,35]	30Gy	4.3Gy	7, BID
	32Gy	4Gy	8, BID
	34Gy	3.4Gy	10, BID
External beam radiation therapy [30,31,36–38]	27.5–30Gy	6Gy	5, daily or every other day
	38.5Gy	3.85Gy	10, BID
	40Gy	2.67Gy	15, daily

Abbreviations: Gy, Gray; BID, bis in day.



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Phase III randomised trial

Breast-conserving therapy with partial or whole breast irradiation: Ten-year results of the Budapest randomized trial

Csaba Polgár [a,*], János Fodor [a], Tibor Major [a], Zoltán Sulyok [b], Miklós Kásler [c]

[a] Center of Radiotherapy; [b] Center of Surgery; [c] National Institute of Oncology, Budapest, Hungary

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ABSTRACT

Background and purpose: To report the long-term results of a single-institution randomized study comparing the results of breast-conserving treatment with partial breast irradiation (PBI) or conventional whole breast irradiation (WBI).

Patients and methods: Between 1998 and 2004, 258 selected women with pT1 pN0-1mi M0, grade 1–2, non-lobular breast cancer without the presence of extensive intraductal component and resected with negative margins were randomized after BCS to receive 50 Gy WBI ($n = 130$) or PBI ($n = 128$). The latter consisted of either 7×5.2 Gy high-dose-rate (HDR) multi-catheter brachytherapy (BT; $n = 88$) or 50 Gy electron beam (EB) irradiation ($n = 40$). Primary endpoint was local recurrence (LR) as a first event. Secondary endpoints were overall survival (OS), cancer-specific survival (CSS), disease-free survival (DFS), and cosmetic results.

Results: After a median follow up of 10.2 years, the ten-year actuarial rate of LR was 5.9% and 5.1% in PBI and WBI arms, respectively ($p = 0.77$). There was no significant difference in the ten-year probability of OS (80% vs 82%), CSS (94% vs 92%), and DFS (85% vs 84%), either. The rate of excellent-good cosmetic result was 81% in the PBI, and 63% in the control group ($p < 0.01$).

Conclusions: Partial breast irradiation delivered by interstitial HDR BT or EB for a selected group of early-stage breast cancer patients produces similar ten-year results to those achieved with conventional WBI. Significantly better cosmetic outcome can be achieved with HDR BT implants compared with the outcome after WBI.

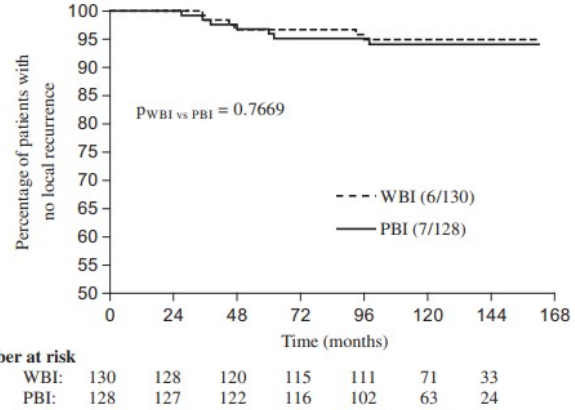

Fig. 2. Time to local recurrence by Kaplan–Meier estimates. *Abbreviations:* WBI – whole breast irradiation; PBI – partial breast irradiation.

Patient selection for PBI

Parameter	GEC-ESTRO	ESTRO-ACROP (2022)
Age	≥50	≥50
histology	NST (no lobular)	NST (no lobular)
T	≤ 3cm and unifocal	≤ 3cm and unifocal
N	N0	N0
Grading	Every	G1-G2
Margins	Negative	Negative > 2mm
Lymphovascular invasion	Absent (focal allowed)	Absent
DCIS	Absent or limited (<25%)	Allowed if < 2.5cm and surgical margins >3mm
Preoperatory therapy	none	none
Immunophenotype	every	Luminal A and B

ASTRO consensus statement for APBI

	Suitable (Pt meets all criteria)	Cautionary (Pt meets all criteria)	Unsuitable (Pt meets any criteria)
Age	≥ 50	40-49	< 40
Tumor Size, T stage	≤ 2 cm, Tis or T1	2.1 – 3 cm, T0 or T2	> 3 cm, T3-T4
N stage, surgery	pN0 (SNBx or ALND)		pN1-3 or no nodal surgery
Margins	Negative (≤ 2 mm)	Close (< 2 mm)	Positive
LVSI	No	Limited/focal	Extensive
ER status	Positive	Negative	
Centricity	Unicentric	Microscopic multi-centricity	Present
Histology	Invasive ductal or favorable histology	Invasive lobular	
EIC or Pure DCIS	If screen detected, low to intermediate grade, size ≤2.5 cm, resected with margins negative at >3mm	≤ 3 cm and does not meet criteria for suitable	> 3 cm
Associated LCIS	Allowed		
Neoadjuvant Tx	Not allowed		Received

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cancers
MDPI

Article

Full-Dose Intraoperative Electron Radiotherapy for Early Brea Cancer: Evidence from a Single Center's Experience

Antonio Stefanelli [1,*], Eleonora Farina [1], Edoardo Mastella [2], Sara Fabbri [2], Alessandro Turra [2], Simona Bonazza [3], Alessandro De Troia [3], Margherita K. Radica [3] and Paolo Carcoforo [3]

LR relapse 5 aa occurred in 2.5% of patients

ELSEVIER
Clinical Breast Cancer
Volume 22, Issue 2, February 2022, Pages e167-e172

Clinical Study

Long-Term Outcomes Using Electron IOERT APBI for Early Stage Breast Cancer: The Verona University Hospital Experience

Nunzia Luna Valentina Cernusco [1], Paola Del Bianco [2], Mario Romano [1], Alessandro Muraglia [1], Gabriella Rossi [1], Maria Grazia Giri [3], Stefania Guariglia [3], Davide Lombardi [4], Francesca Pellini [4], Carlo Cavedon [3], Giovanni Paolo Pollini [4], Renzo Mazzarotto [1]

LR 2.03% 5aa

age, grading, hormone profile.

IORT as reirradiation

Standard treatment for BC recurrence in previously irradiated field: mastectomy

In selected low-risk patients a second lumpectomy is a option

Systematic review of 34 studies of second conservative surgery for BC recurrence:

- 5-year local control : 76% for BCS alone vs. 89% for BCS + re-irradiation
- incidence of grade 3-4 toxicity after re-irradiation: 0 - 21%.
- No phase 3 trials → limited evidence

Walstra CJEF et al. Repeat breast-conserving therapy for ipsilateral breast cancer recurrence: A systematic review. Eur J Surg Oncol. 2019 Aug;45(8):1317-1327. doi: 10.1016/j.ejso.2019.02.008. Epub 2019 Feb 10. PMID: 30795956.

IORT as reirradiation: patient selection

Tumor characteristics:
- Unifocal
- Unicentric
- Small size (< 2cm)

} Mammography + US + MRI

Clinical characteristics:
- Timing first surgery – recurrence: ≥ 24 months
- Adequate breast size

Gentilini O et al. Repeating conservative surgery after ipsilateral breast tumor reappearance: criteria for selecting the best candidates. Ann Surg Oncol. 2012;19(12):3771-6.

IORT as reirradiation

Re-irradiation techniques:

- Brachytherapy
- EBRT (photons, electrons, protons)
- IORT (Intrabeam, electrons)

Authors	N°pts	FUP (m.)	Technique	Dmean	LC (%)	5y-OS	Tox≥G3
Kraus-tiefenbacher	17	26	50kV-X	20	100	-	-
Chin	12	14	50kV-X	20	100	-	0
Thangarajah	41	58	50kV-X	20	89.7	82	0
Blandino	30	47	electrons	18	92.3	94.2	21%

IORT reirradiation series

Montagne L. et al. Second conservative treatment for second ipsilateral breast tumor event: A systematic review of the different re-irradiation techniques. Breast. 2020;49:274-280.

AIRO Breast Cancer Group
Best Clinical Practice 2022 Update

Re-irradiazione parziale della mammella con brachiterapia

GEC-ESTRO[12] su 217 pazienti ha riportato una rate di terza recidiva, a 5 e 10 anni rispettivamente, del 5.6 e 7.2%. Nel complesso la tolleranza al trattamento è risultata accettabile. Lo studio GEC-ESTRO riporta un risultato cosmetico buono/eccellente nell'85% delle pazienti, con una tossicità cutanea e sottocutanea di grado 3 nel 10% dei casi

ASTRO consensus statement for APBI

	Suitable (Pt meets all criteria)	Cautionary (Pt meets all criteria)	Unsuitable (Pt meets any criteria)
Age	≥ 50	40-49	< 40
Tumor Size, T stage	≤ 2 cm, Tis or T1	2.1 – 3 cm, T0 or T2	> 3 cm, T3-T4
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Neoadjuvant Tx	Not allowed		Received

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CONCLUSION

All the techniques are the same?

Yes in case of adequate selection of patients

Which features allow an adequate selection of patients?

-Histology non-lobular

-Margins preferable > 2 mm

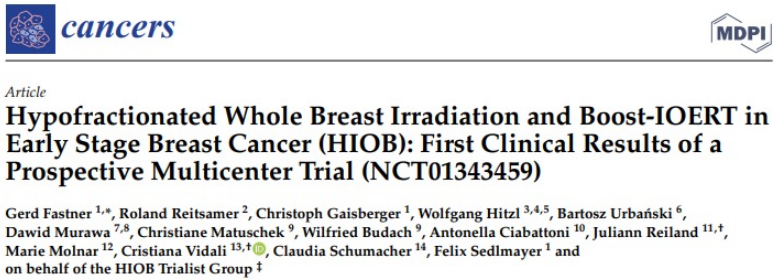
-Biology HR+/HER2-

-Tumor grade preferable G1-2

-Tumor size preferable pT1

-Nodal status preferable pN0 (ITC?)

ONE SHOOT



cancers

MDPI

Article

Hypofractionated Whole Breast Irradiation and Boost-IOERT in Early Stage Breast Cancer (HIOB): First Clinical Results of a Prospective Multicenter Trial (NCT01343459)

Gerd Fastner [1,*], Roland Reitsamer [2], Christoph Gaisberger [1], Wolfgang Hitzl [3,4,5], Bartosz Urbański [6], Dawid Murawa [7,8], Christiane Matuschek [9], Wilfried Budach [9], Antonella Ciabattoni [10], Juliann Reiland [11,†], Marie Molnar [12], Cristiana Vidali [13,†], Claudia Schumacher [14], Felix Sedlmayer [1] and on behalf of the HIOB Trialist Group [‡]