

# RADIOTERAPIA PARCIAL ACELERADA DE MAMA

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**Oncologia Radioterapia**

# Introducción

- ❖ RT postoperatoria en cáncer de mama:  
Reduce la probabilidad de recurrencia  
locorregional y las tasas de muerte por cáncer  
de mama
- ❖ Aumenta Supervivencia global

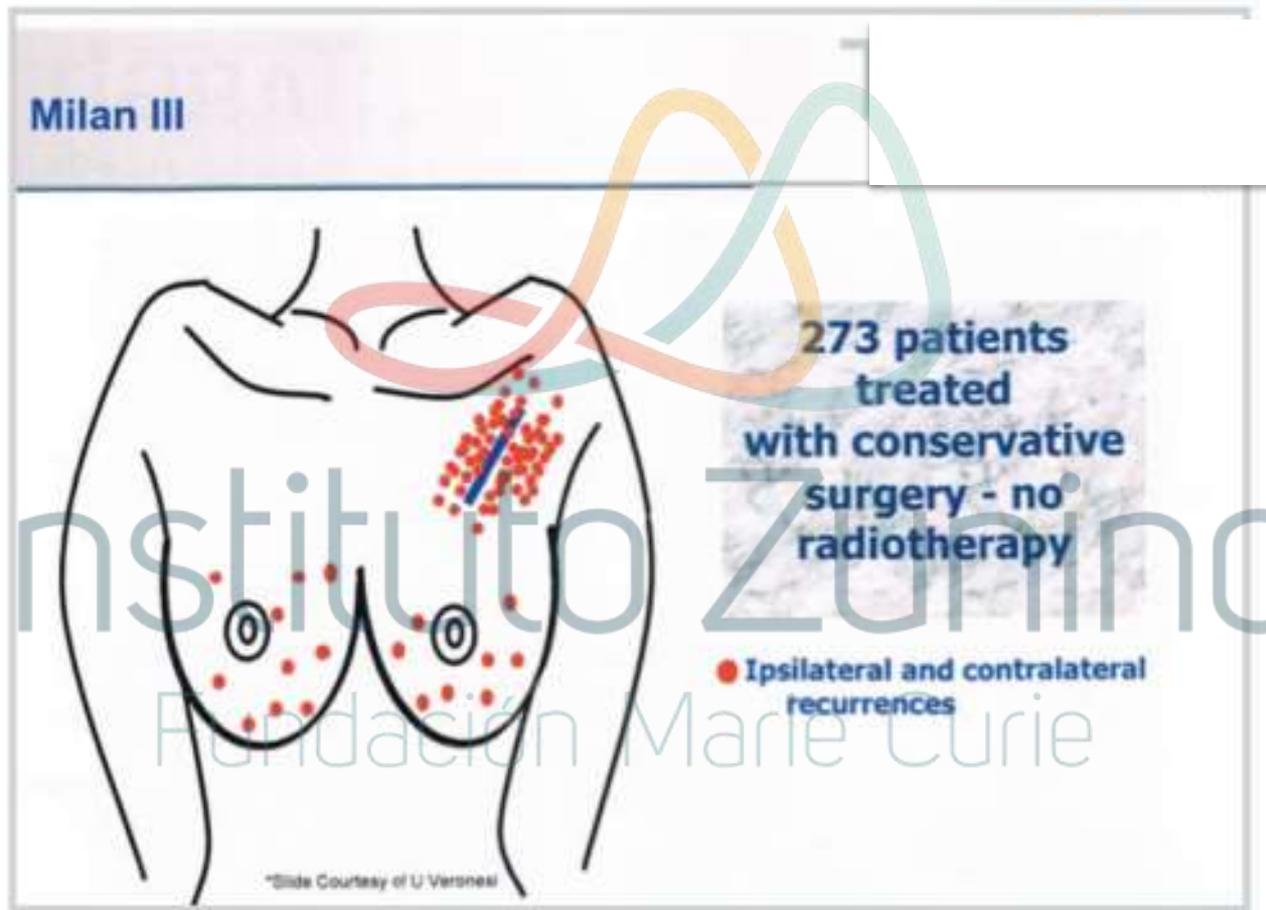
EBCTCG. Lancet 2005.

# A pesar de lo anterior ... hacia fines de los 90's

- ❖ En USA 1 de cada 5 mujeres no recibió RT (estando indicada).
- ❖ Explicaciones:
  - ❖ Larga duración => 25-33 días hábiles (Fx estándar)
  - ❖ Implica uso de recursos
  - ❖ Alteración de vida cotidiana / reubicación de la paciente lejos del hogar
  - ❖ Zonas con menor densidad de centros de RT o mayor distancia entre el hogar y estos  
=> menores tasas de BCT

Voti L. Breast Cancer Res Treat 2006  
Nattinger AB, Natl Cancer Inst 2001  
Lazovich DA, JAMA 1991

# Si sumamos lo siguiente ...





**APBI**

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# ¿Que es APBI?

- ❖ Tipo de radioterapia que se administra solo en la parte de la mama donde se encontraba el tumor
- ❖ Permite administrar una dosis más alta, en menos tiempo
- ❖ Disminuir dosis a tejidos sanos



Cansase C, et al. ASTRO, 2017

# APBI vs RTE

Breast Cancer Research and Treatment  
<https://doi.org/10.1007/s10549-019-05209-9>

REVIEW



## Toxicity and clinical outcomes of partial breast irradiation compared to whole breast irradiation for early-stage breast cancer: a systematic review and meta-analysis

Yasmin Korzets<sup>1,2,3</sup> · Anthony Fyles<sup>1</sup> · Daniel Shepshelovich<sup>3,4</sup> · Eitan Amir<sup>4</sup> · Hadar Goldvaser<sup>2,3,4</sup> 

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Review

## Effectiveness of different accelerated partial breast irradiation techniques for the treatment of breast cancer patients: Systematic review using indirect comparisons of randomized clinical trials



Gustavo Nader Marta<sup>a,b,\*</sup>, Jessica Barrett<sup>c</sup>,  
Gustavo José Martiniano Porfirio<sup>d</sup>, Ana Luiza Cabrera Martimbianco<sup>d</sup>,  
José Luiz Barbosa Bevilacqua<sup>e</sup>, Philip Poortmans<sup>f</sup>, Rachel Riera<sup>d,g</sup>

# APBI vs RTE

- Resultados similares en términos de:
  - Supervivencia global
  - Supervivencia cáncer específica
  - Supervivencia regional
  - Cáncer de mama contralateral

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Pero.....

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¿Qué pasa en términos de  
recurrencia local?

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## Toxicity and clinical outcomes of partial breast irradiation compared to whole breast irradiation for early-stage breast cancer: a systematic review and meta-analysis

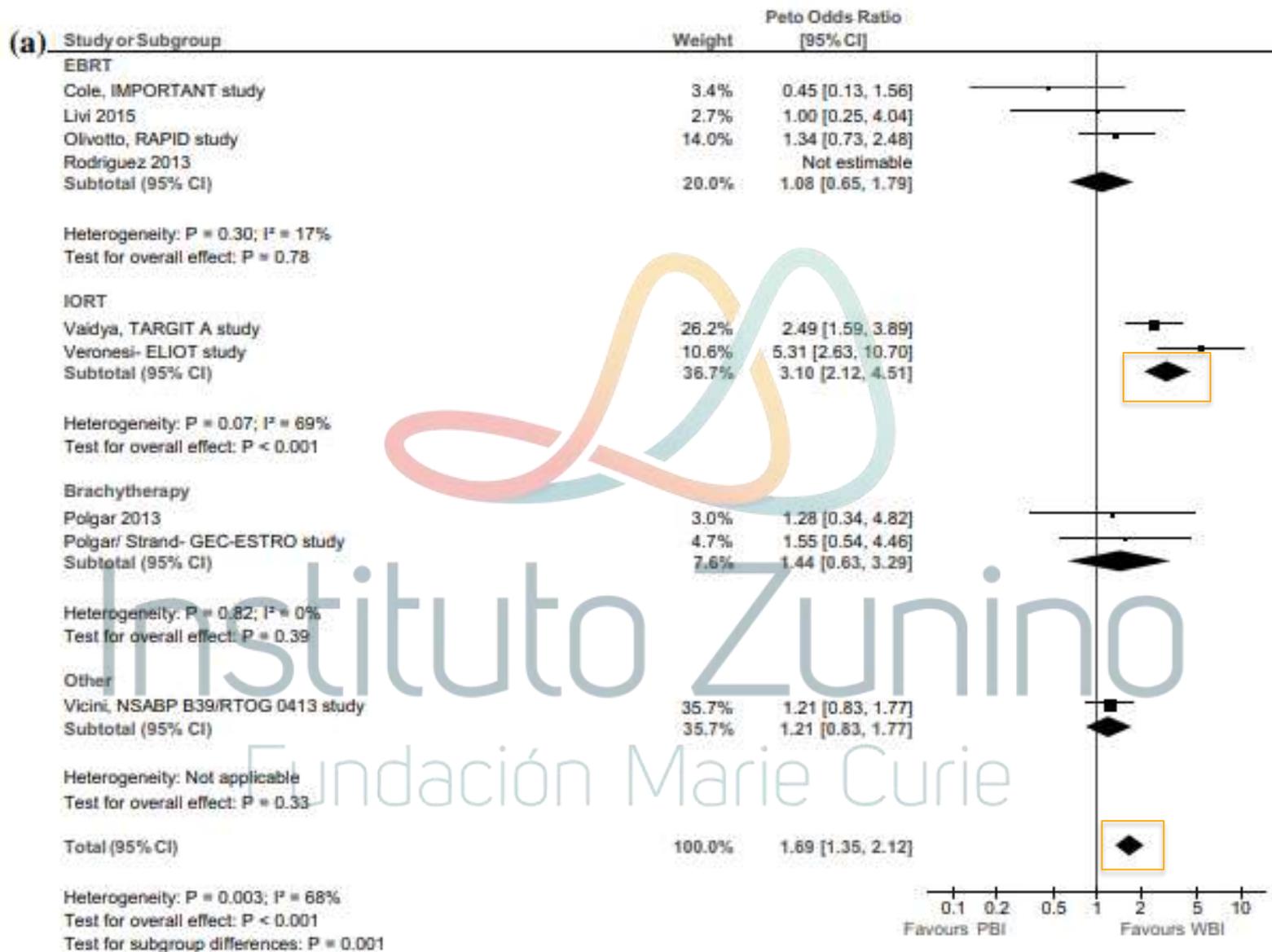
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- 14,514 pacientes
- 11 estudios

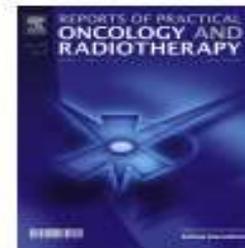




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## Review

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- 4343 pacientes
- 10 estudios



Fig. 1 – Indirect comparisons related to local control at 5 years. Note: EBRT: external beam radiation therapy; BT: brachytherapy; IB: intraoperative low energy photons (IntraBeam); IOE: intraoperative electrons.



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La respuesta

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# Selección de los pacientes



# ¿En que pacientes se puede hacer APBI?

**TABLE 2** Patients selection for APBI based on ABS, ASTRO, and ESTRO recommendations

Features	ABS <sup>16</sup>	ASBrS <sup>17</sup>	GEC-ESTRO <sup>2</sup>	ASTRO <sup>1</sup>
Age (years)	≥50	≥45	≥50	≥50
Subtype	All invasive carcinomas and DCIS	IDC and DCIS	IDC	IDC or favorable DCIS subtypes <sup>d</sup>
Size	≤3 cm	≤2 cm	≤ 3 cm	≤2 cm
Margin	Negative	Negative		
≥ 2 mm	≥2 mm	≥2 mm		
LVS1	Absent	-	Absent	Absent
ER	Positive or negative	-	Positive	Positive
Focality/centricity	-	-	Unicentric/unifocal	-
Nodal status	Negative	Negative	Negative	Negative
Neoadjuvant chemotherapy	No consensus	-	No	-

ABS, American Brachytherapy Society; ASBrS, American Society of Breast Surgeons; ASTRO, American Society for Radiation Oncology; cLVS1, Lymphovascular space invasion; DCIS, Carcinoma Ductal carcinoma in situ; ER, Estrogen receptor; GEC-ESTRO Groupe Européen de Curiethérapie, European Society for Radiotherapy and Oncology; IDC, Invasive Ductal Carcinoma; ILC, Invasive lobular carcinoma; LVS1, Lymphovascular space invasion

<sup>a</sup>Screen, detected, low to intermediate nuclear grade, size ≤2.5 cm and margin negative at ≥3 mm.

Special Article

# Accelerated Partial Breast Irradiation: Executive summary for the update of an ASTRO Evidence-Based Consensus Statement



Candace Correa MD<sup>a</sup>, Eleanor E. Harris MD<sup>b</sup>, Maria Cristina Leonardi MD<sup>c</sup>, Benjamin D. Smith MD<sup>d</sup>, Alphonse G. Taghian MD, PhD<sup>e</sup>, Alastair M. Thompson MD<sup>f</sup>, Julia White MD<sup>g</sup>, Jay R. Harris MD<sup>h,\*</sup>

# PACIENTES IDÓNEAS (debe cumplir todos los criterios)

Factores de la paciente	<ul style="list-style-type: none"><li>- Sin mutación BRCA 1-2</li><li>- Edad <math>\geq</math> 50 años</li></ul>
Factores patológicos	<ul style="list-style-type: none"><li>- Histología ductal invasor, mucinoso, tubular o colóideo</li><li>- Tis o T1</li><li>- Cualquier grado</li><li>- Sin componente intraductal extenso</li><li>- Unicéntrico</li><li>- Clínicamente unifocal (se permite multifocal patológico, pero dentro de una zona de hasta 2 cm, incluyendo tejido sano)</li><li>- Bordes a <math>\geq</math> 2 mm</li><li>- ILV (-)</li><li>- ER (+)</li></ul>
En caso de CDIS	<ul style="list-style-type: none"><li>- Sólo detectado por imágenes de screening</li><li>- Grado 1/2</li><li>- Tamaño hasta 2,5 cm</li><li>- Bordes a <math>\geq</math> 3 mm</li></ul>
Factores nodales	<ul style="list-style-type: none"><li>- pN0 (i-, i+), por biopsia de SN o Dax</li></ul>
Factores de tratamiento	<ul style="list-style-type: none"><li>- Excluye QT neoadyuvante</li></ul>

# PACIENTES DE PRECAUCIÓN

(basta 1 criterio)

Factores de la paciente	<ul style="list-style-type: none"><li>- Edad 40-49 años y cumplir todos los otros factores de idóneo</li><li>- Edad <math>\geq 50</math> años y cumplir al menos uno de los factores patológicos de precaución y ninguno de los de grupo de pacientes no idóneas.</li></ul>
Factores patológicos	<ul style="list-style-type: none"><li>- Histología lobulillar invasor</li><li>- T2 con tamaño tumoral hasta 3 cm</li><li>- Componente intraductal extenso <math>\leq 3</math> cm</li><li>- Clínicamente unifocal y multifocal patológico dentro de una zona de 2.1 - 3 cm, incluyendo tejido sano.</li><li>- Bordes (-), a <math>&lt; 2</math> mm</li><li>- ILV (+) focal/limitada</li><li>- ER (-)</li></ul>
En caso de CDIS	<ul style="list-style-type: none"><li>- Tamaño hasta 3 cm, sin cumplir todos los criterios de grupo idóneo.</li></ul>

# PACIENTES INADECUADAS (basta 1 criterio)

Factores de la paciente	<ul style="list-style-type: none"><li>- Mutación BRCA 1-2 (+)</li><li>- Edad &lt; 40 años</li></ul>
Factores patológicos	<ul style="list-style-type: none"><li>- T2 con tamaño tumoral &gt; 3 cm o T3-T4</li><li>- Componente intraductal extenso &gt; 3 cm</li><li>- Multicéntrico</li><li>- Clínicamente multifocal o multifocal patológico dentro de una zona de &gt; 3 cm, incluyendo tejido sano.</li><li>- Bordes (+)</li><li>- ILV (+) extensa</li></ul>
En caso de CDIS	<ul style="list-style-type: none"><li>- Tamaño &gt; 3 cm</li></ul>
Factores nodales	<ul style="list-style-type: none"><li>- pN1-2-3</li><li>- Sin cirugía nodal</li></ul>
Factores de tratamiento	<ul style="list-style-type: none"><li>- QT neoadyuvante realizada</li></ul>



Y, la calidad de vida?

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# Quality-of-life results for accelerated partial breast irradiation with interstitial brachytherapy versus whole-breast irradiation in early breast cancer after breast-conserving surgery (GEC-ESTRO): 5-year results of

European Journal of Cancer 76 (2017) 17–26



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.ejcancer.com](http://www.ejcancer.com)



Original Research

## Accelerated partial breast irradiation using intensity modulated radiotherapy versus whole breast irradiation: Health-related quality of life final analysis from the Florence phase 3 trial



Icro Meattini <sup>a,\*</sup>, Calogero Saieva <sup>b</sup>, Guido Miccinesi <sup>c</sup>, Isacco Desideri <sup>a</sup>, Giulio Francolini <sup>a</sup>, Vieri Scotti <sup>a</sup>, Livia Marrazzo <sup>d</sup>, Stefania Pallotta <sup>d</sup>, Fiammetta Meacci <sup>a</sup>, Cristina Muntoni <sup>a</sup>, Benedetta Bendinelli <sup>b</sup>, Luis Jose Sanchez <sup>c</sup>, Marco Bernini <sup>e</sup>, Lorenzo Orzalesi <sup>e</sup>, Jacopo Nori <sup>f</sup>, Simonetta Bianchi <sup>g</sup>, Lorenzo Livi <sup>a</sup>

treatment of breast cancer with advantages in quality of life and work resumption



Luca Sorrentino <sup>a</sup>, Susanna Fissi <sup>b</sup>, Ilaria Meaglia <sup>c</sup>, Daniela Bossi <sup>b</sup>, Ottavia Caserini <sup>b</sup>, Uccelli <sup>a</sup>, Marta Truffi <sup>a</sup>, Sara Albasini <sup>a</sup>, Paola Tabarelli <sup>d</sup>, Marco Liotta <sup>d</sup>, Valdi <sup>c</sup>, Fabio Corsi <sup>a, b, \*</sup>

- APBI



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# ¿Como se puede realizar la APBI?

❖ IORT

❖ Radioterapia externa: Conformal e IMRT

❖ Braquiterapia

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**IORT**

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Electrones

RT Intraoperatoria

Fotones  
50 kV



Técnica

electrones

Número de pacientes

1305

Dosis y fraccionamiento RT  
externa

50 Gy / 25 Fx + boost

Dosis y fraccionamiento APBI

21 Gy / 1 Fx

Seguimiento

5 años

Recurrencia local

Todas las pacientes:

IORT 4,4% v/s 0,4%

Pacientes "idóneas":

IORT 1,7%

Toxicidad

IORT mejor

Necrosis grasa radiológica

IORT peor: 14,6% v/s 6,8%

	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 pvalue	..	..	..
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 pvalue	..	..	..
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	7/43	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 2.0 cm, or four or more positive nodes, grade 3, or triple negative.

Table 3: Factors associated with IBTR among patients randomised to

• Recaída > 10% en pacientes con:

- Tu > 2 cm

- ≥ 4 ganglios (+)

- Tu G3

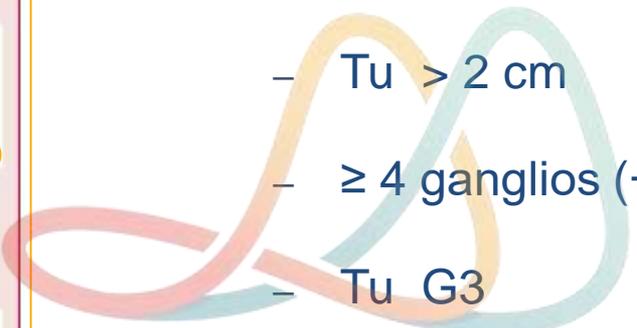
- Tu receptores hormonales negativos

- Triple (-)

5 años:

⇒ 11,3% factores de mal pronostico

⇒ 1,5% en el resto



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Toxicidad tardía	ELIOT	TARGIT-A
Técnica	electrones	
Número de pacientes	1305	
Dosis y fraccionamiento RT externa	50 Gy / 25 Fx + boost	
Dosis y fraccionamiento APBI	21 Gy / 1 Fx	
Seguimiento	5 años	
Recurrencia local	Todas las pacientes: IORT 4,4% v/s 0,4% Pacientes "idóneas": IORT 1,7%	
Toxicidad	IORT mejor	
Necrosis grasa radiológica	IORT peor: 14,6% v/s 6,8%	

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Toxicidad tardía	ELIOT	TARGET-A
Técnica	electrones	Fotones 50 kV
Número de pacientes	1305	3451 (prepatol = 2298)
Dosis y fraccionamiento RT externa	50 Gy / 25 Fx + boost	50 Gy / 25 Fx +/- boost
Dosis y fraccionamiento APBI	21 Gy / 1 Fx	20 Gy / 1 Fx (+ WBI: borde cercano, EIC, ILC, N1 = 15%)
Seguimiento	5 años	5 años (estimado)
Recurrencia local	Todas las pacientes: IORT 4,4% v/s 0,4%	Todas las pacientes: IORT 3,3% v/s 1,3% p=0,042
	Pacientes "idóneas": IORT 1,7%	Prepatológicas: IORT 2,1% v/s 1,1% NS
Toxicidad	IORT mejor	IORT mejor (piel)  Sin diferencias en complicac. herida
Necrosis grasa radiológica	IORT peor: 14,6% v/s 6,8%	---



# Braquiterapia

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## BQT intersticial multicatéter



## Terapias intracavitarias

### Intracavitary brachytherapy



**Table 1 Results of recent clinical experience with Interstitial brachytherapy with more than 5 years follow up**

Author	No of cases	Follow up interval (years)	Dose rate/pt no	Scheme	Total dose (Gy)	5-year LR (%)	Good/Excellent cosmesis
Strnad et al.[60]	274	5.25	PDR/HDR	PDR = 0.6 Gy/hr HDR = 4 Gy x8	PDR = 50 Gy HDR = 32 Gy	2.9%	90%
Antonucci et al. [59]	199	9.6	LDR/HDR	LDR 0.52 Gy/h × 96 hours HDR = 4 Gy x8 HDR = 3.4 Gyx10	LDR = 50 Gy HDR = 32 Gy HDR = 34 Gy	5%	99%
Johansson et al.[61]	50	7.2	PDR	50Gy/5	50	4%	56%
Arthur et al.[62]	99	7	LDR/HDR	LDR = 3.5 -5 days HDR = 3.4 × 10	45 Gy (LDR) 34 Gy (HDR)	4%	n/a
Polgar et al.[63]	128	6.8	HDR	5.2 × 7	36.4 Gy	4.7%	77%
King et al [64]	51	6.25	LDR/HDR	LDR = 4 days 4 Gyx8	45 Gy (LDR) 32 Gy (HDR)	3.9%	75%
Otto et al. [65]	274	5.25	PDR/HDR	PDR 5 days, 0.6 Gy/hr HDR = 4 Gyx8	49.8 Gy (PDR) 32 Gy (HDR)	2.9%	92%
Polgar et al.[58]	45	11.1	HDR	4.33 × 7 5.2 × 7	30.3 Gy 36.4 Gy	4.4%	78%

LR = local recurrence, HDR = high dose rate, LDR = low dose rate, PDR = pulsed dose rate, n/a = data not available

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# GEC-ESTRO

- 1184 pacientes
- RTE vs APBI con BT



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# 5-year results of accelerated partial breast irradiation using sole interstitial multicatheter brachytherapy versus whole-breast irradiation with boost after breast-conserving surgery for low-risk invasive and in-situ carcinoma of the female breast: a randomised, phase 3, non-inferiority trial

Vratislav Strnad, Oliver J Ott, Guido Hildebrandt, Daniela Kauer-Dorner, Hellen Knauerhase, Tibor Major, Jaroslav Lyczek, Jose Luis Guinot, Jürgen Dunst, Cristina Gutiérrez-Miguel, Pavel Slampa, Michael Allgauer, Kristina Lössl, Bülent Polat, György Kovács, Arnt-René Fishedick, Thomas G Wendt, Rainer Fietkau, Marion Hindemith, Alexandra Resch, Anna Kulik, Leo Arribas, Peter Niehoff, Fernando Guedea, Annika Schlammann, Richard Pötter, Christine Gall, Martina Malzer, Wolfgang Uter, Csaba Polgár, on behalf of the Groupe Européen de Curiothérapie of European Society for Radiotherapy and Oncology (GEC-ESTRO)



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**Sin diferencia en recidiva mamaria ipsilateral a 5 años: APBI: 1.4% v/s WBI: 0.9% p=0.42**





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# Radiotherapy and Oncology

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Original article

## GEC-ESTRO multicenter phase 3-trial: Accelerated partial breast irradiation with interstitial multicatheter brachytherapy versus external beam whole breast irradiation: Early toxicity and patient compliance

Oliver J. Ott<sup>a,\*</sup>, Vratislav Strnad<sup>a</sup>, Guido Hildebrandt<sup>b,c</sup>, Daniela Kauer-Dorner<sup>d</sup>, Hellen Knauerhase<sup>c</sup>, Tibor Major<sup>e</sup>, Jaroslaw Łyczek<sup>f,g</sup>, José Luis Guinot<sup>h</sup>, Jürgen Dunst<sup>i</sup>, Cristina Gutierrez Miguez<sup>j</sup>, Pavel Slampa<sup>k</sup>, Michael Allgäuer<sup>m</sup>, Kristina Lössl<sup>l</sup>, Bülent Polat<sup>p</sup>, György Kovács<sup>n</sup>, Arnt-René Fishedick<sup>o</sup>, Thomas G. Wendt<sup>q</sup>, Rainer Fietkau<sup>a,d</sup>, Rolf-Dieter Kortmann<sup>b</sup>, Alexandra Resch<sup>e</sup>, Anna Kulik<sup>f</sup>, Leo Arribas<sup>h</sup>, Peter Niehoff<sup>i,r</sup>, Ferran Guedea<sup>j</sup>, Annika Schlamann<sup>b</sup>, Richard Pötter<sup>e</sup>, Christine Gall<sup>s</sup>, Martina Malzer<sup>s</sup>, Wolfgang Uter<sup>s</sup>, Csaba Polgár<sup>e</sup>, on behalf of the Groupe Européen de Curiethérapie of European Society for Radiotherapy and Oncology (GEC-ESTRO)

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- 2016

**Table 2**

Early side effects per treatment arm.

Early side effects	WBI % (n/N)	ABPI % (n/N)	p-Value
<b>Dermatitis associated with radiation</b>			
• Grade 0	7 (39/552)	79 (496/630)	<0.0001
• Grade 1	49 (273/552)	19 (120/630)	
• Grade 2	36 (200/552)	2 (13/630)	
• Grade 3	7 (40/552)	0.2 (1/630)	
<b>Hematoma</b>			
• Grade 0	98 (543/553)	80 (503/630)	<0.0001
• Grade 1	2 (9/553)	19 (120/630)	
• Grade 2	0.2 (1/553)	1 (7/630)	
<b>Breast infection</b>			
• Grade 0	98 (541/552)	95 (598/630)	0.0052
• Grade 1	2 (10/552)	4 (28/630)	
• Grade 2	0.2 (1/552)	0.5 (3/630)	
• Grade 3	-	0.2 (1/630)	
<b>Breast injury</b>			
• Grade 0	99 (549/553)	95 (598/630)	<0.0001
• Grade 1	1 (4/553)	5 (31/630)	
• Grade 2	-	0.2 (1/630)	
<b>Breast pain</b>			
• Grade 0	71 (392/553)	74 (469/630)	n.s.
• Grade 1	26 (146/553)	23 (144/630)	
• Grade 2	3 (15/553)	3 (17/630)	

n.s.: not significant.

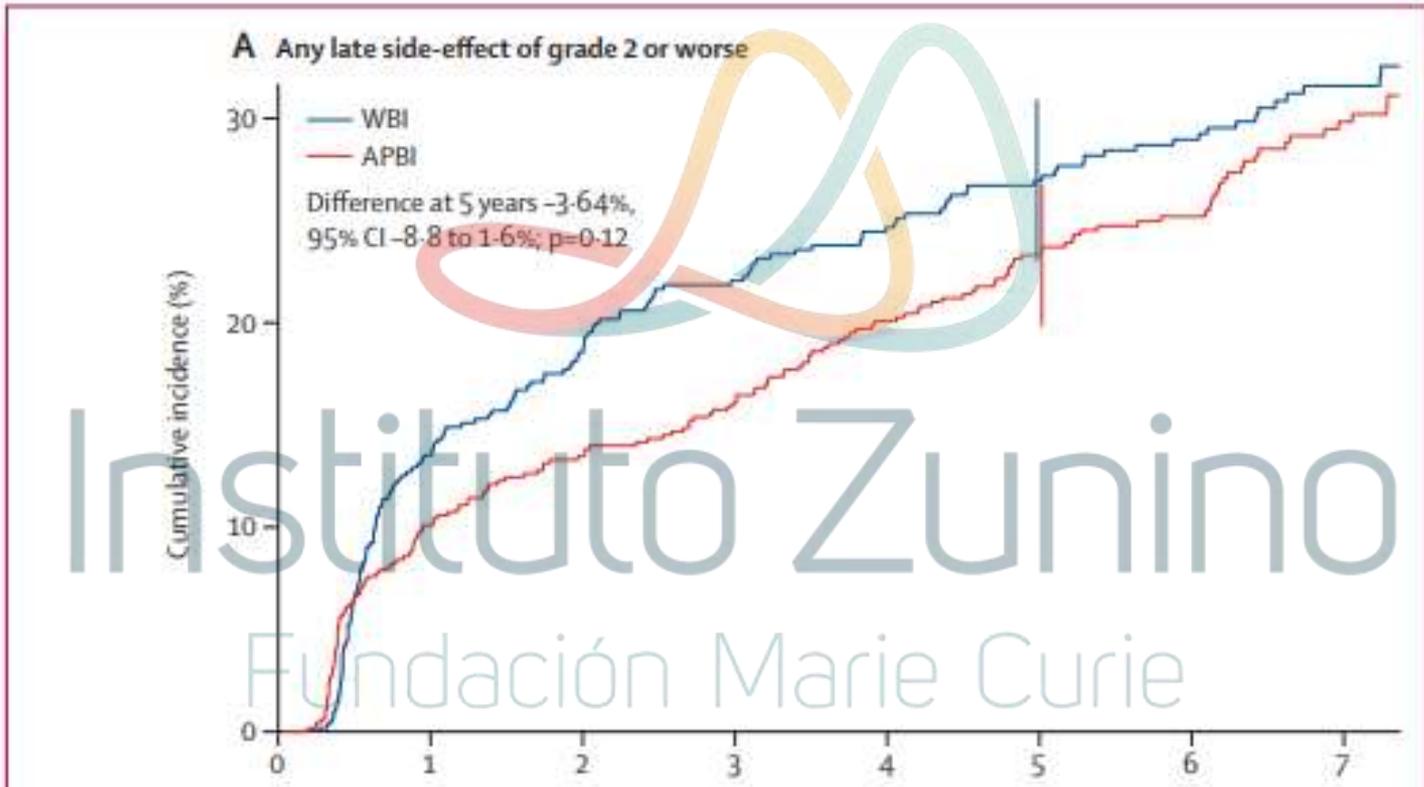
# GEC-ESTRO

Late side-effects and cosmetic results of accelerated partial breast irradiation with interstitial brachytherapy versus whole-breast irradiation after breast-conserving surgery for low-risk invasive and in-situ carcinoma of the female breast: 5-year results of a randomised, controlled, phase 3 trial

*Csaba Polgár, Oliver J Ott, Guido Hildebrandt, Daniela Kauer-Dorner, Hellen Knauerhase, Tibor Major, Jaroslaw Lyczek, José Luis Guinot, Jürgen Dunst, Cristina Gutierrez Miguez, Pavel Slampa, Michael Allgäuer, Kristina Lössl, Bülent Polat, György Kovács, Arnt-René Fishedick, Rainer Fietkau, Alexandra Resch, Anna Kulik, Leo Arribas, Peter Niehoff, Ferran Guedea, Annika Schlamann, Richard Pötter, Christine Gall, Wolfgang Uter, Vratislav Strnad, on behalf of the Groupe Européen de Curiothérapie of European Society for Radiotherapy and Oncology (GEC-ESTRO)*



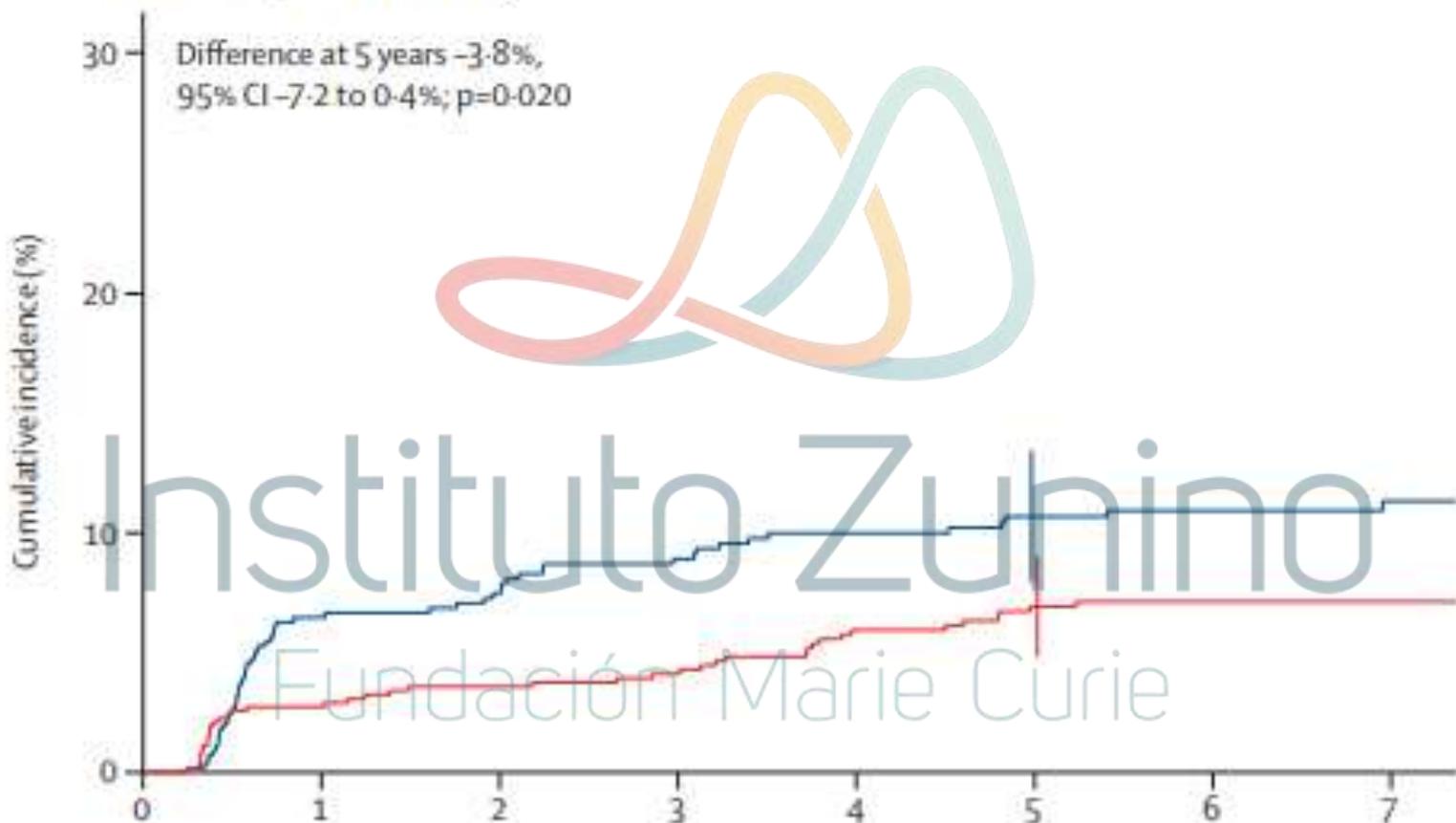
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### B Grade 2-3 late skin toxicity



	Patients' view (n=1173)*			Physicians' view (n=1173)*		
	Accelerated partial breast irradiation group	Whole-breast irradiation group	p value†	Accelerated partial breast irradiation group	Whole-breast irradiation group	p value†
<b>Baseline</b>						
Excellent to good	580/629 (92%)	499/544 (92%)	0.84	584/630 (93%)	489/543 (90%)	0.13
Fair to poor	49/629 (8%)	45/544 (8%)		46/630 (7%)	54/543 (10%)	
<b>1-year follow-up</b>						
Excellent to good	552/597 (92%)	459/503 (91%)	0.53	556/598 (93%)	452/502 (90%)	0.10
Fair to poor	45/597 (8%)	44/503 (9%)		42/598 (7%)	50/502 (10%)	
<b>3-year follow-up</b>						
Excellent to good	517/561 (92%)	421/463 (91%)	0.55	523/562 (93%)	415/463 (90%)	0.065
Fair to poor	44/561 (8%)	42/463 (9%)		39/562 (7%)	48/463 (10%)	
<b>5-year follow-up</b>						
Excellent to good	498/541 (92%)	413/454 (91%)	0.62	503/542 (93%)	408/454 (90%)	0.12
Fair to poor	43/541 (8%)	41/454 (9%)		39/542 (7%)	46/454 (10%)	

Data are n (%). \*Data available for cosmetic results at baseline. †Calculated by doubling one-tailed exact probability of Fisher's exact test.

**Table 3: Cosmetic results according to treatment**

Terapias intracavitarias



**Table 2 Results of some of the recent clinical experience with Mammosite Brachytherapy System with more than a year follow up**

Author	No of cases	Median follow up interval (months)	IBF	Good/ Excellent cosmesis
Benitez et al.[73]	43	65	0%	81.3%
Niehoff et al [69]	11	20	0%	n/a
Patel et al.[75]	26	48.5	0%	n/a
Vicini et al.[71]	1440	30	1.6%	95%
Chen et al.[76]	70	26.1	5.7%	n/a
Belkacemi et al. [77]	25	13	0%	84%
Voth et al.[78]	55	24	3.6%	n/a
Dragun et al. [70]	90	24	2.2%	90%
Vicini et al.[79]	1440	60	2.6%	90.6%
Jeruss et al. [74]	194 <sup>\$</sup>	54.4	3.1%	92%

n/a data not available, IBF = ipsilateral breast failure, \$ these are ductal carcinoma in situ (DCIS) patients recruited in the American Society of Breast Surgeons APBI registry trial.

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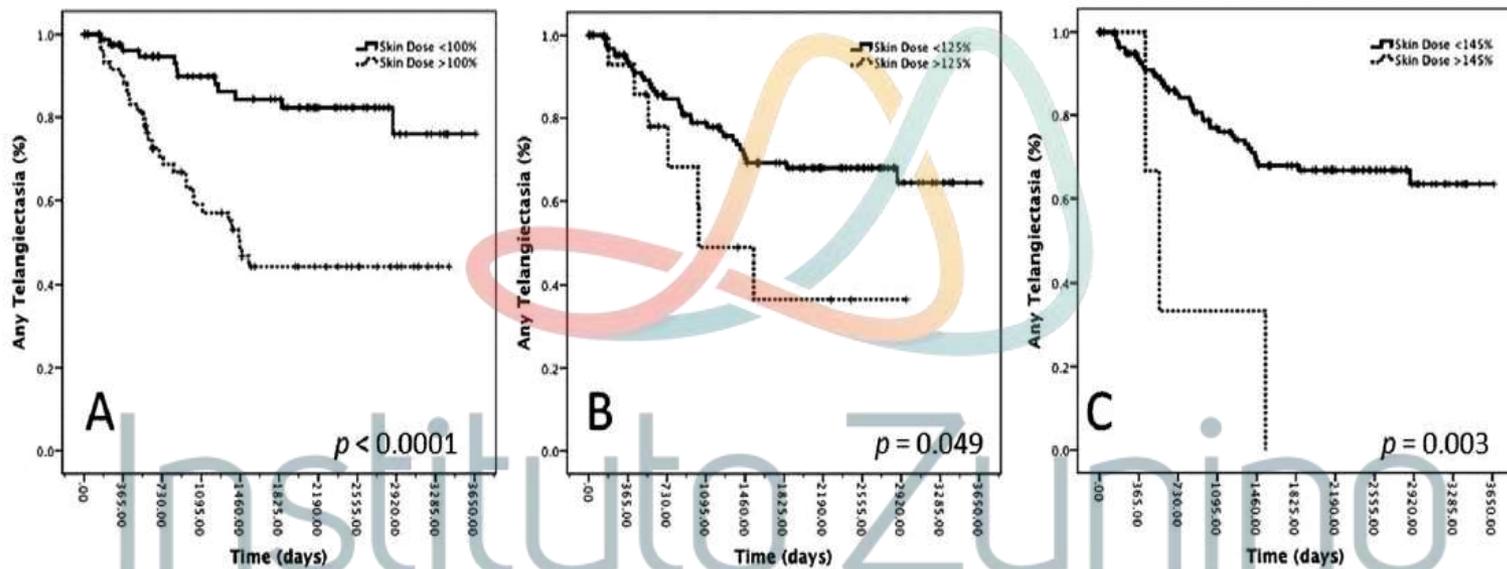
Clinical Investigation

## Extended (5-year) Outcomes of Accelerated Partial Breast Irradiation Using MammoSite Balloon Brachytherapy: Patterns of Failure, Patient Selection, and Dosimetric Correlates for Late Toxicity

John A. Vargo, MD, Vivek Verma, BS, Hayeon Kim, MS, DABR, Ronny Kalash, BS, Dwight E. Heron, MD, FACRO, FACR, Ronald Johnson, MD, and Sushil Beriwal, MD

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**Fig. 2.** Impact of skin dose on telangiectasia development. (A) Any telangiectasia as a function of the purposed cutoff of skin dose  $\leq 100\%$ . (B) Prior purposed ideal (21) cutoff of skin dose  $\leq 125\%$  from Contura phase IV trial. (C) NSABP-B39 skin dose constraint  $\leq 145\%$ .

RT externa



RT 3D

IMRT

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## RAPID

## U. Florencia

Técnica	RT 3D	IMRT
Número de pacientes	2135	520
Dosis y fraccionamiento RT externa	42.5/16 (80%) ó 50/25 - (21% boost)	50/25 + boost 10 Gy
Dosis y fraccionamiento APBI	38.5 Gy / 10 Fx BID	30 Gy / 5 Fx QOD (2 sem)
Seguimiento	3 años	5 años
Recurrencia local	----	1.5 % ambas ramas
Tox aguda	G1-2: APBI mayor G3: similar (~ 1%)	APBI menor
Tox. tardía	---	APBI menor
Resultado cosmético	APBI peor:	APBI mejor
	- Pcte: 26% v/s 18%	Buena/excelente: 95.1% v/s
	- Médico: 35% v/s 17%	89.6%

# NSABP B-39, RTOG 0413

- APBI: 10 fx de 3.4-3.85 Gy, dos veces al día con braquiterapia o RTE 3D
- RTE: 50 Gy en fracciones de 2 Gy
- 4216 pts
- Intervalo sin recurrencia: 10 años APBI 91.9% vs RTE 93.4% ( p = 0.02).

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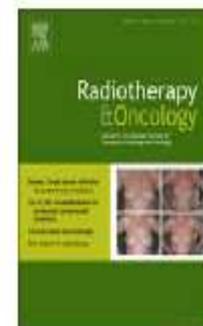


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## Radiotherapy and Oncology

journal homepage: [www.thegreenjournal.com](http://www.thegreenjournal.com)



### Review

Target volume definition for external beam partial breast radiotherapy: Clinical, pathological and technical studies informing current approaches

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<sup>a</sup>Royal Marsden NHS Foundation Trust, Sutton, UK; <sup>b</sup>Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK; <sup>c</sup>Institute of Cancer Research, Sutton, UK

**Table 1**  
Methods of target volume delineation in partial breast irradiation studies using external beam radiotherapy.

Study	Radiotherapy modality	Method(s) of TB delineation	TB-CTV margin (mm)	CTV-PTV margin (mm)
IRMA [4]	3D-conformal radiotherapy	CT plus 3–6 surgical clips	15	5
IMPORT-Low [5]	Multiple static tangential fields	CT and 6 pairs of titanium clips recommended. CT or ultrasound alone permitted only where seroma is visible	15	10
Danish Breast Cancer Group (DBCG) [6]	3D-conformal radiotherapy	CT ± TB clips (clear delineation of TB must be possible for patient to be eligible)	15	5–8
RAPID [7]	3D-conformal radiotherapy	CT ± TB clips (clear delineation of TB must be possible for patient to be eligible)	NA <sup>a</sup>	NA <sup>a</sup>
NSABP B-39/RTOG 0413 trial [8]	3D-conformal radiotherapy (also multi-catheter brachytherapy and Mammosite <sup>®</sup> balloon catheter)	CT ± TB clips (clear delineation of TB must be possible for patient to be eligible)	15	10 <sup>b</sup>

<sup>a</sup> NA, not available.

<sup>b</sup> Not required for brachytherapy.

**Table 4**  
Sources of geometrical uncertainty for external beam partial breast irradiation.

Category		Interfractional		Intrafractional	
		Systematic	Random	Systematic	Random
Variation of CTV	-in size	Changes in TB volume during the course of RT Breast swelling Delineation error	None	None	None
	-in position relative to fixed point on the patient	Weight loss Change in breast volume Non-isotropic shrinkage of seroma	Volume of inspiration	Change in treatment position	Respiratory motion
Variation in position of patient relative to treatment beams		Weight change Technical errors e.g. lasers incorrectly positioned	Daily set-up	None	Patient movement

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¿Cómo resolvemos este  
problema?

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¿Qué hacemos en la

**FALP?**

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❖ 21 Gy

❖ Total: 220

❖ Inicio: 2012



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# APBI con IMRT

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# PROTOCOLO FLORENCIA modif\*\*:

## 30 Gy / 5 Fx de 6 Gy, en días alternos

### 1) PRESCRIPCIÓN:

#### a) PTV EVAL: 30 Gy / 5 Fx de 6 Gy, días alternos

V28,5 (95% dosis)	Ideal > 99%	Aceptable ≥ 95% (excepcionalmente ≥ 90%)
V27	no usar si cumple V28,5 ≥ 95%	≥ 95% (solo en casos excepcionales)
D98%	≥ 28 Gy (93,3% dosis)	≥ 27 Gy (excepcionalmente ≥ 26 Gy)
D2%	≤ 31,5 Gy (105%)	≤ 32,1 Gy (107%)
D 1cc (IRAM)**	≤ 31,5 Gy (105%)	≤ 32,1 Gy (107%)

#### b) PTV intersect pared:

V27 (90% dosis)	≥ 95%	
D2cc	28,5 Gy (95% dosis)	
Dmax 0,035 cc	≤ 30 Gy	31,2 Gy (en CTV cercano a pared)

#### c) CTV:

V30 (100% dosis)	> 99%	> 95%
V27 debe cumplir ≥ 100%		

\*\*\* Plan no se acepta si estos 2 criterios para CTV no cumplen

### 2) OARs:

#### a) CORAZÓN \*\*

Mama derecha: V3	≤ 10% <input type="checkbox"/>	≤ 13% <input type="checkbox"/>
Mama derecha: Mean Dose	< 1 Gy	1 - 1.5 Gy (solo en tumor cuadrante interno)
Mama izquierda: V3	≤ 13% <input type="checkbox"/>	V5 ≤ 10% (Florencia)
Mama izquierda: Mean Dose	≤ 1 Gy	≤ 2 Gy (excepcionalmente 2,5 Gy)

\*\* Mean dose no está en los protocolos publicados pero se usará como reporte de dosis.

**b) PULMÓN IPSILATERAL: \*\***

V10	≤ 10% (IRAM; más restrictivo que Florencia)	≤ 15% (más restrictivo que Florencia)
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**c) PULMÓN CONTRALATERAL: \*\***

V5	≤ 5% (IRAM; más restrictivo que Florencia)	≤ 8% (IRAM; más restrictivo que Florencia)
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**d) PULMONES: \*\***

Dmean	≤ 1-1,5 Gy	≤ 2 Gy
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\*\* Long-term risks of secondary cancer for various whole and ABPI tech. Rev verde 2018.

**e) MAMA - PTV: \*\***

V15 (50% dosis)	≤ 30% (más restrictivo que Florencia)	≤ 50%
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**e) MAMA CONTRALATERAL**

Dmax 0,035 cc	≤ 1 Gy	≤ 2 Gy
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**g) PIEL: \*\***

Dmax 0,035 cc	≤ 27 Gy (90% dosis)	≤ 28,5 Gy (95% dosis)
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V24 (80%)	< 10 cc	
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**h) CANAL MEDULAR: \*\***

D1cc	< 10 Gy	
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## Datos a considerar:

**a) Paciente idónea según nuevos criterios ASTRO y lecho debe ser identificable en TAC.**

### **b) Delimitación de CTV:**

Margen 1 cm alrededor de clips / lecho

Clip 0,5 mm piel

Debe quedar a  $\geq 3$  mm de pulmón y excluir PT

### **c) Delimitación de PTV:**

Margen 1 cm alrededor de CTV

Clip 0,5 mm piel

Máximo 4 mm dentro de pulmón

### **d) Generación de PTV EVAL:**

PTV menos la pared torácica/pulmón

### **e) Generación de PTV intersect pared:**

Overlap o intersect de PTV con pared torácica/pulmón

**Total**

**12**

Toxicidad

1 paciente a nivel de  
la piel grado 1

Recaída

Inicio 2018

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# Conclusiones

- APBI es una buena opción de tratamiento en pacientes con cáncer de mama, con resultados oncológicos similares a los observados con RTE
- Existen diferentes técnicas con las cuales podemos realizar APBI
- Se debe hacer una selección adecuada de las pacientes (Criterios ASTRO)



# Masters en Radioterapia Avanzada



• CORDOBA PROVINCE, ARGENTINA



# Gracias