ANALYSE DE LA LITTÉRATURE

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ACTUALITES EN RADIOTHERAPIE
39èmes journées de la SFSPM
LILLE 8.11.2017

NB: aucun conflit d'intérêt

ARTICLES ANALYSES

- CORRADINI S et al *Radioth Oncol 2017, 122: 2-10*
- QUERO L et al *Radioth Oncol 2017, 122: 11-16*
- LAURBERG T et al *Radioth Oncol 2016, 120: 98-106*
- GENTILINI O et al *Radioth Oncol 2017, 122: 37-44*
- VRIELING C et al *Jama Oncol 2017, 3: 42-48*
- SHURELL E et al *Cancer 2018, sept 28*
- RAIKOVITCH E et al *JNCI 2017, 109, (4)djw256*
- MORAN MS et al *Jama Oncol 2017, 3: 1060-68*

TRENDS OF USE AND OUTCOME OF POSTOPERATIVE RADIOTHERAPY FOLLOWING MASTECTOMY: A POPULATION-BASED STUDY

CORRADINI S et al

Radiother Oncol 2017, 122:2-10

- Analyse de 16675 patientes traitées à Munich de 1988 à 2012 par mastectomie pour un CS invasif

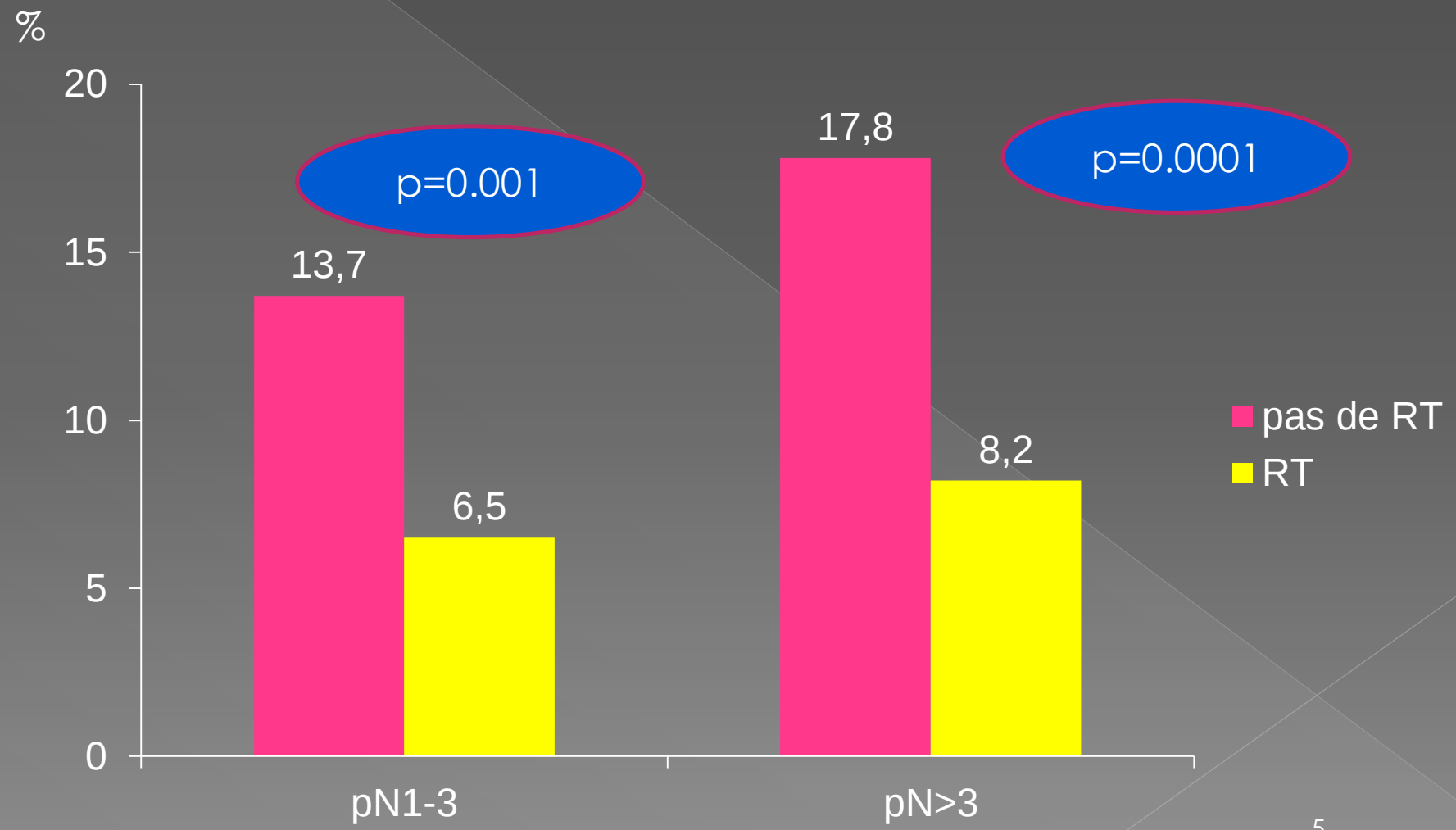
5503 (33%) ont eu une radiothérapie loco-régionale (de 18,6% en 1988 à 48, 7% en 2012)

Caractéristiques des patientes traitées avec et sans RT sur deux périodes différentes: (en %)

	1988-1997 n=6029			1998-2012 n=10646		
	M+RT	M	p	M+RT	M	p
AGE MEDIAN	57,4	61	<0.001	61	68	<0.001
pN+	75	45	<0.001	74	36	<0.001
G3/4	52	37	<0.001	43	32	<0.001
RH-	14	12	0.045	17	13	<0.001
CT	42	22	<0.001	64	24	<0.001
HT	42	38	0.003	55	47	<0.001

RESULTATS (I)

Taux de rechute à 10 ans
GLOBALEMENT: 12,4%



RESULTATS (II)

Survie spécifique à 10 ans

	RT -	RT +
pN1-3	57%	58%
pN > 3	28%	36%

10-YEAR FOLLOW-UP OF 621 PATIENTS TREATED USING HIGH-DOSE RATE BRACHYTHERAPY AS AMBULATORY BOOST TECHNIQUE IN CONSERVATIVE BREAST CANCER TREATMENT

QUERO L et al

Radiother Oncol 2017, 122:11-16

- Analyse de 621 patientes traitées par chirurgie conservatrice, radiothérapie mammaire

(20x2,2 Gy en 5 semaines) avec boost par curiethérapie interstitielle (10Gy/2fr) soit per-opératoire (27%) soit après RT externe (73%)

CARACTERISTIQUES DE LA POPULATION:

AGE MEDIAN : 56 a (30% < 50 ans)

pT : pTis: 11.6% pT1: 63.4% pT2: 25%

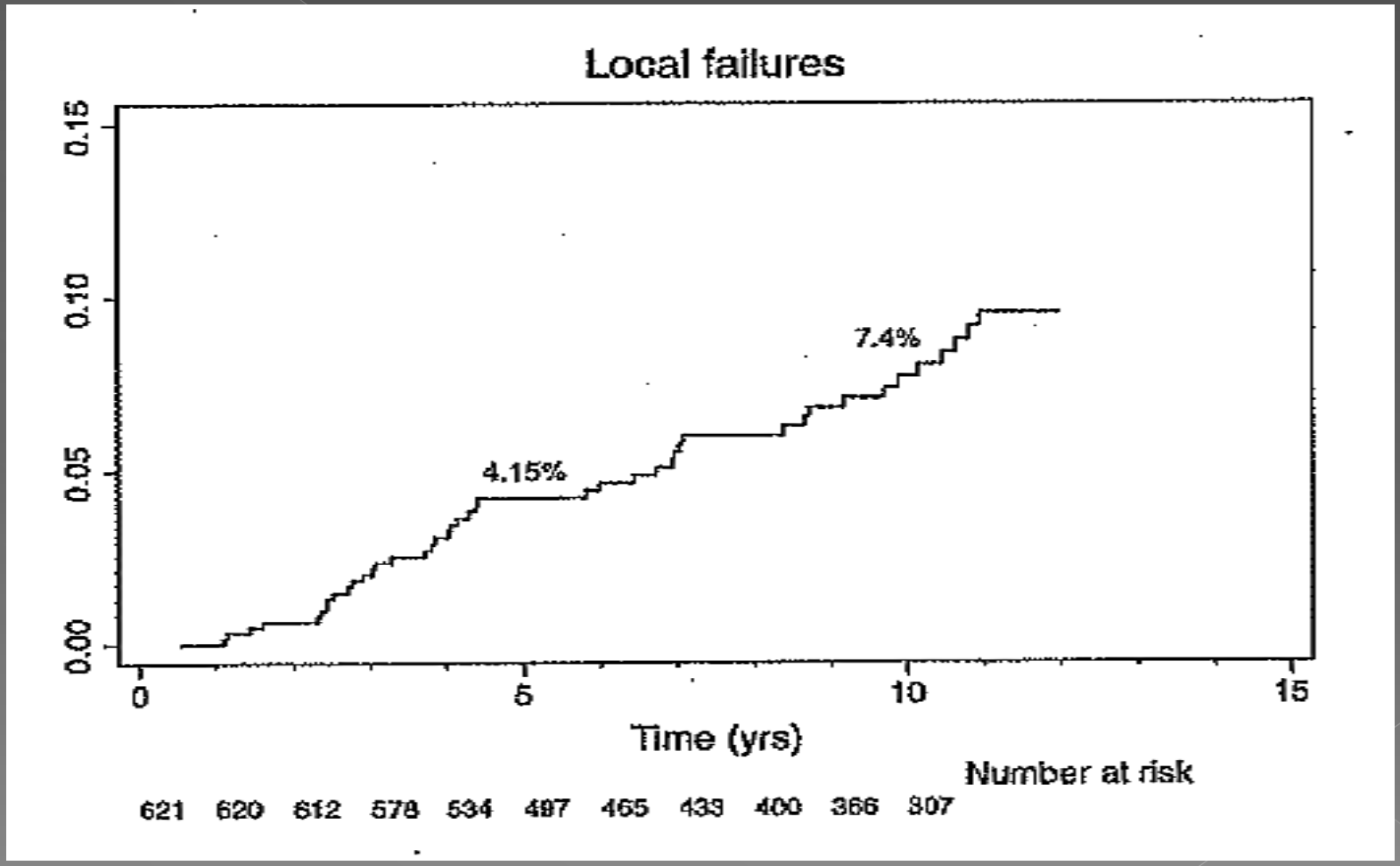
COMP. IN SITU : oui: 41% non: 51.2% NP: 7,8%

MARGES : > 1mm: 76.6%; <1mm:15.4%; +: 6.2%; NP: 1.8%

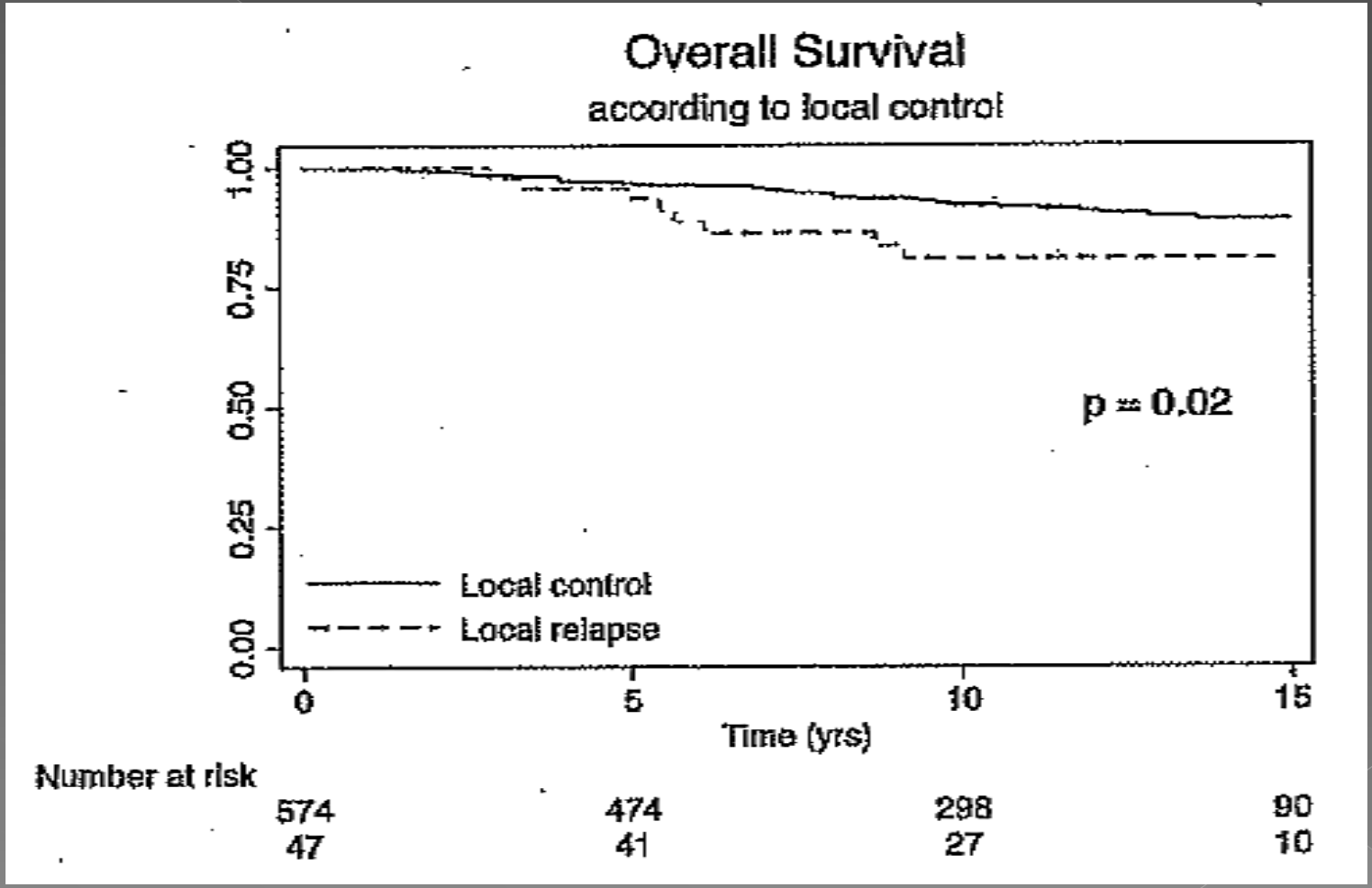
pN+ : 22.5%

CT : 43% **HT** : 39%

TAUX DE RECIDIVES LOCALES



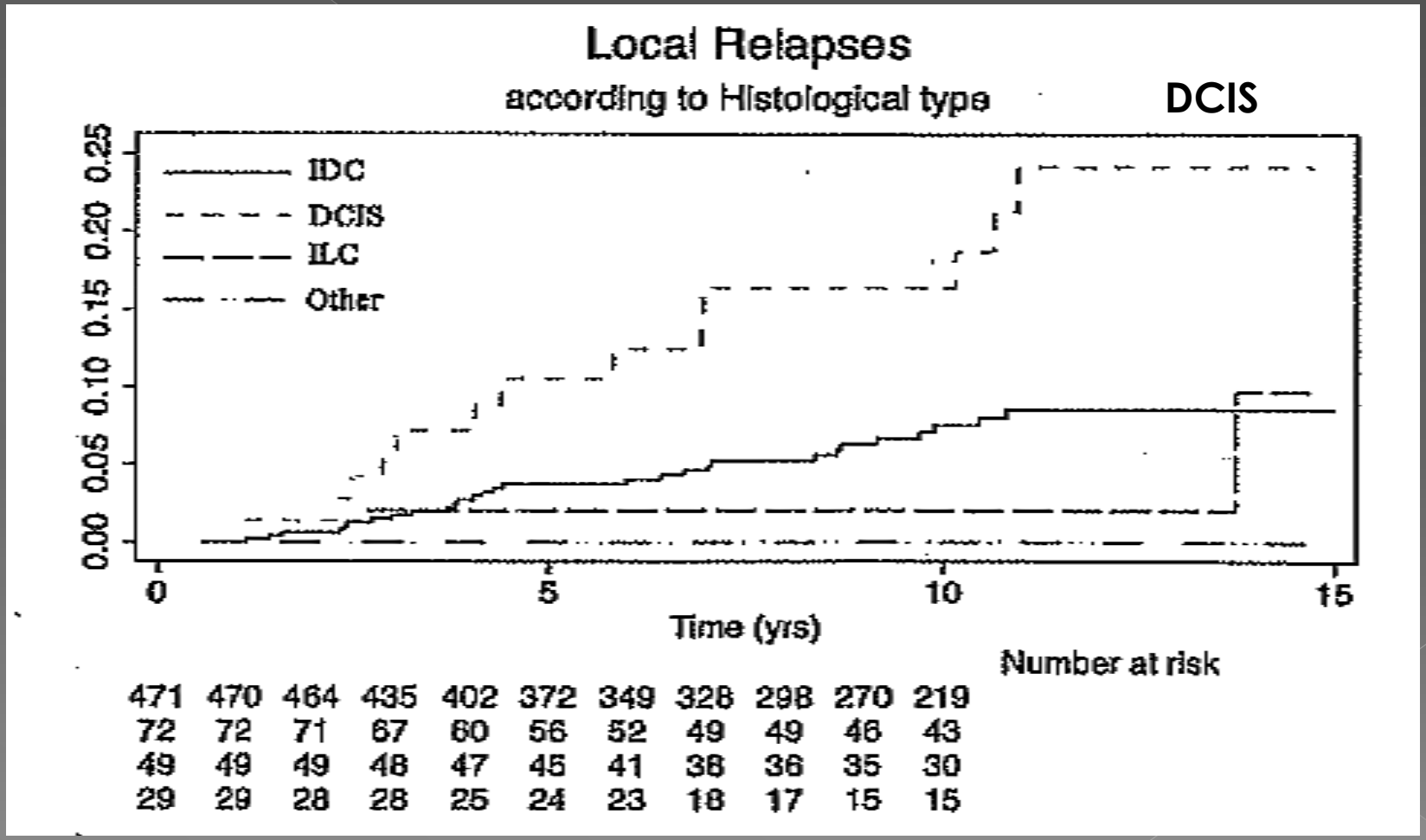
OVERALL SURVIVAL



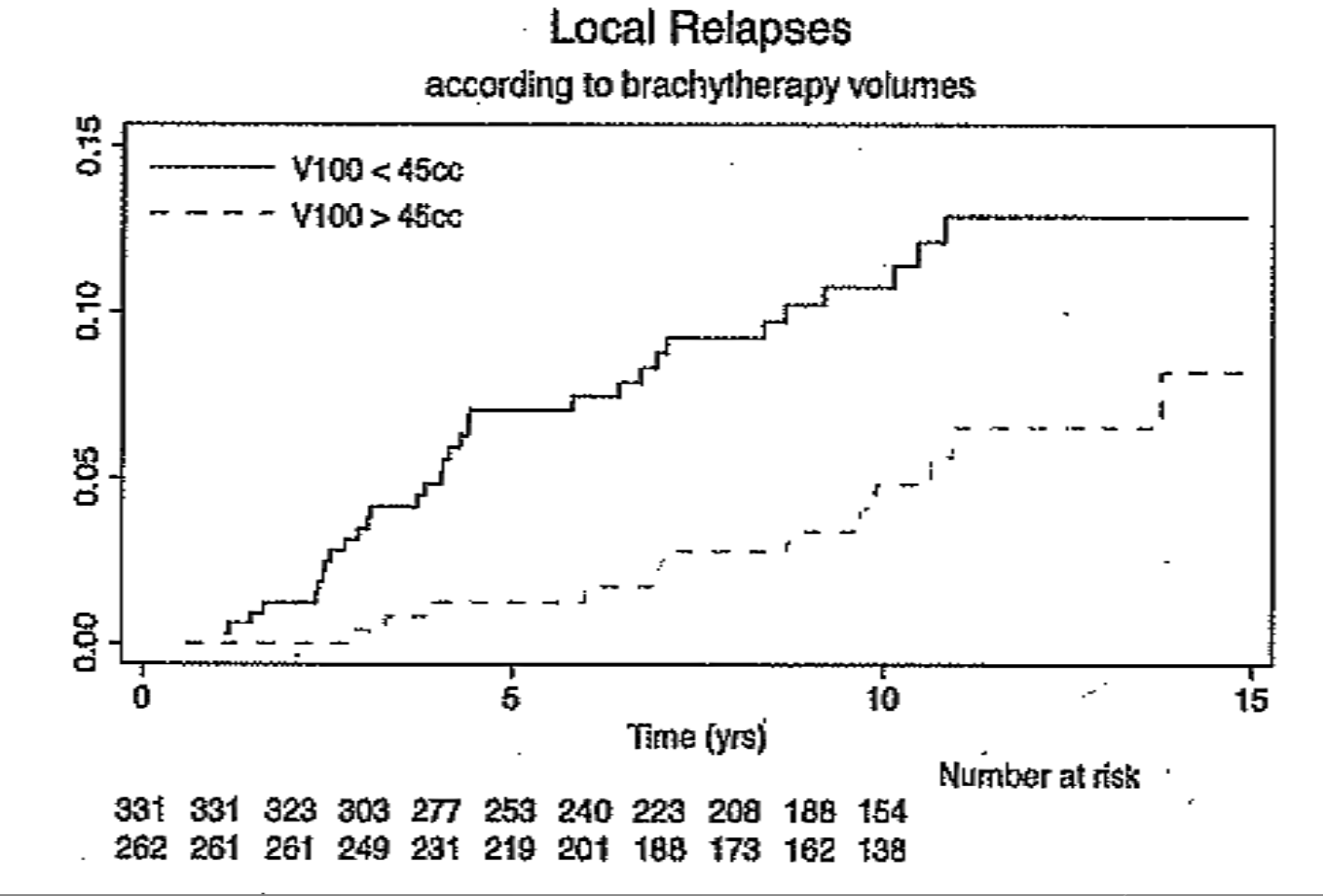
FACTEURS DE RISQUE DE RL

Factors	Local relapse probability at 10-year (%)	p
Age		
– ⩽40 yrs (n = 43)	14	0.26
– >40 yrs (n = 578)	7	
Pathological tumor size		
– ⩽15 mm (n = 398)	7	0.14
– >15 mm (n = 223)	9	
Histological type		
– IDC (n = 471)	7.2	0.004
– LIC (n = 49)	2.1	
– DCIS (n = 72)	15.3	
– Others (n = 29)	0	
Grade		
– I (n = 171)	7.7	0.12
– II (n = 283)	5.3	
– III (n = 120)	11	
– Unknown (n = 47)	9.8	
Extensive intra ductal component*		
– Yes (n = 254)	9.3	0.25
– No (n = 319)	6.8	
Surgical margins		
– >1 mm (n = 476)	4.8	0.17
– ⩽1 mm (n = 96)	7.3	
– Positives (n = 38)	11.9	
Estrogens receptors		
– Positive (n = 299)	5.5	0.12
– Negative (n = 108)	9.4	
Progesterone receptors		
– Positive (n = 215)	4.1	0.03
– Negative (n = 171)	8.8	
Nodal status		
– pN0 (n = 368)	7.8	0.3
– pN+ (n = 140)	6	

LOCAL RELAPSE ACCORDING TO HISTOLOGICAL TYPE



LOCAL RELAPSE ACCORDING TO BRACHYTHERAPY VOLUMES



LONG-TERM AGE-DEPENDENT FAILURE PATTERN AFTER BREAST-CONSERVING THERAPY OR MASTECTOMY AMONG DANISH LYMPH-NODE-NEGATIVE BREAST CANCER PATIENTS

LAURBERG T et al
Radiother Oncol 2016, 120:98-106

- Analyse de 813 patientes pT1-T2 N0 traitées de 1989 à 1998 par mastectomie (M: 515: 63%) ou traitement conservateur (BCT: 298: 37%)

Stratification en 2 groupes ≤ 45 ans; > 45 ans

Suivi médian: 17,2 ans

BCT: RT: 48 Gy/24 f. + 10/16 Gy (5-8 f.)

RESULTATS (I):

TAUX GLOBAL DE RL A 20ANS

- **BCT** : 20 %
- **M** : 8,7% (toutes avant 10ans)

≤ 45 ANS

- **BCT** : 28% (p< 0.001)
- **M** : 14%

> 45 ANS

- **BCT** : 10% (p< 0.001)
- **M** : 3%

RESULTATS (II):

TAUX GLOBAL DE REC.REGIONALES A 20ANS — 3.3%

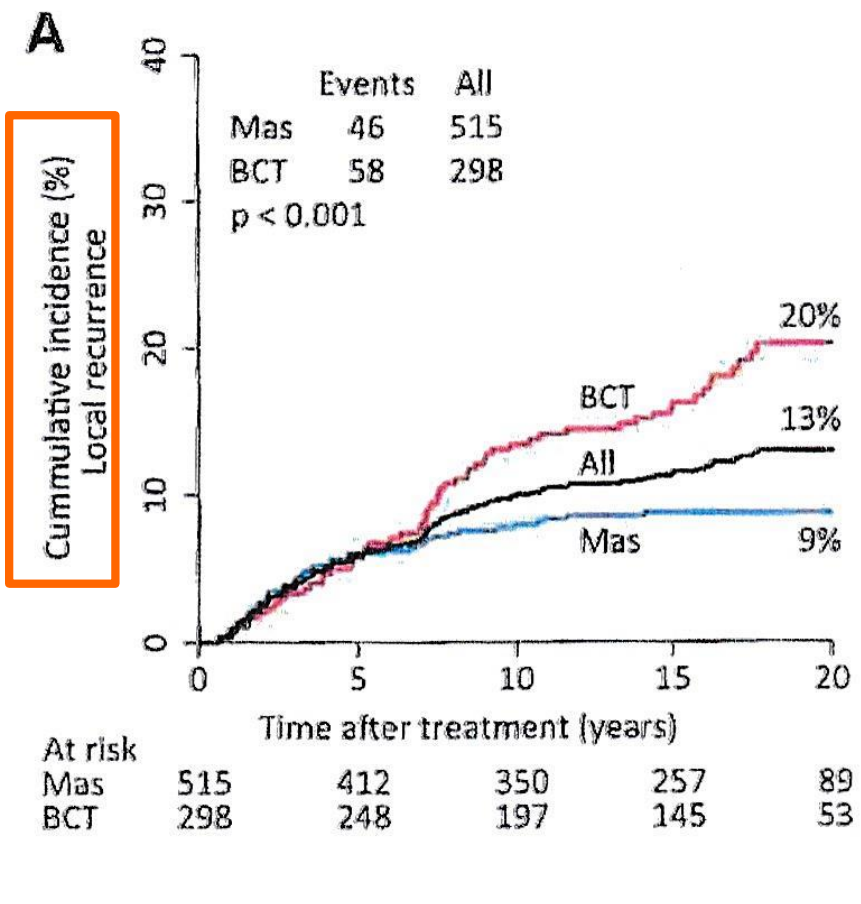
(pas de ≠ significative entre M et BCT)

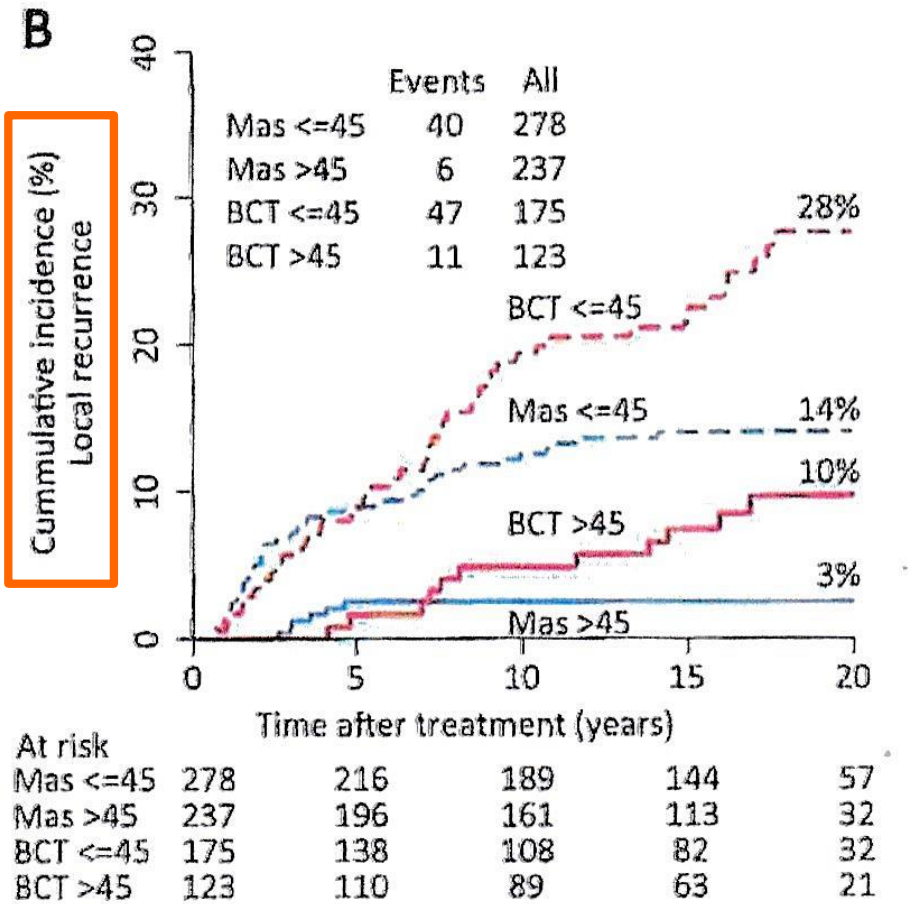
TAUX GLOBAL DE METASTASES A 20 ANS — 20%

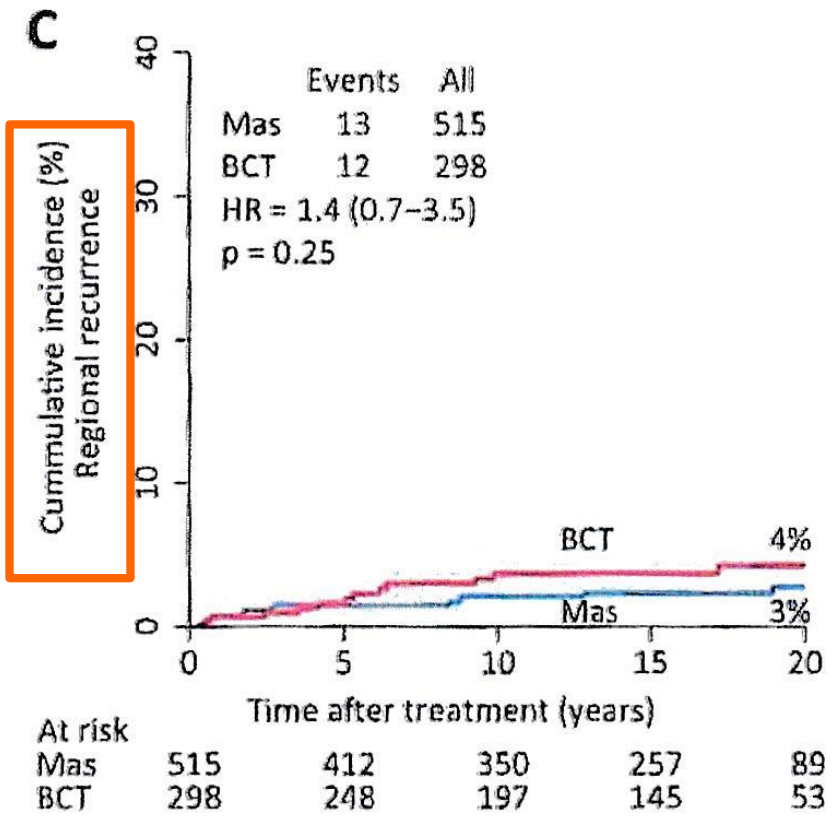
TAUX DE SURVIE A 20 ANS

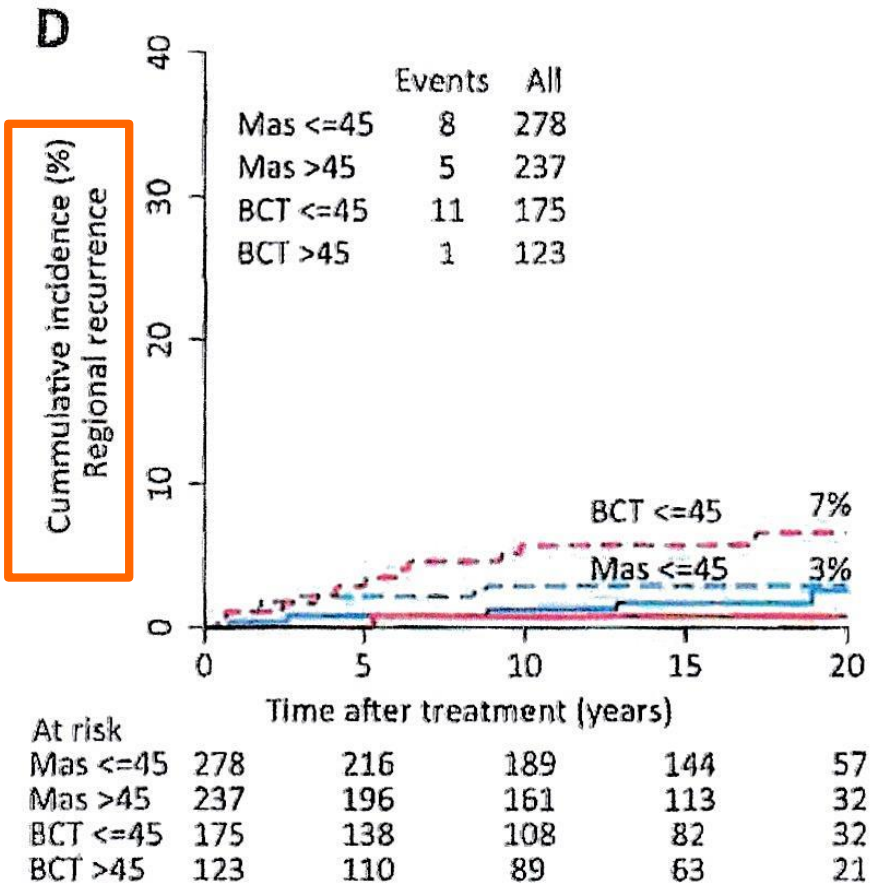
BCT — 71%

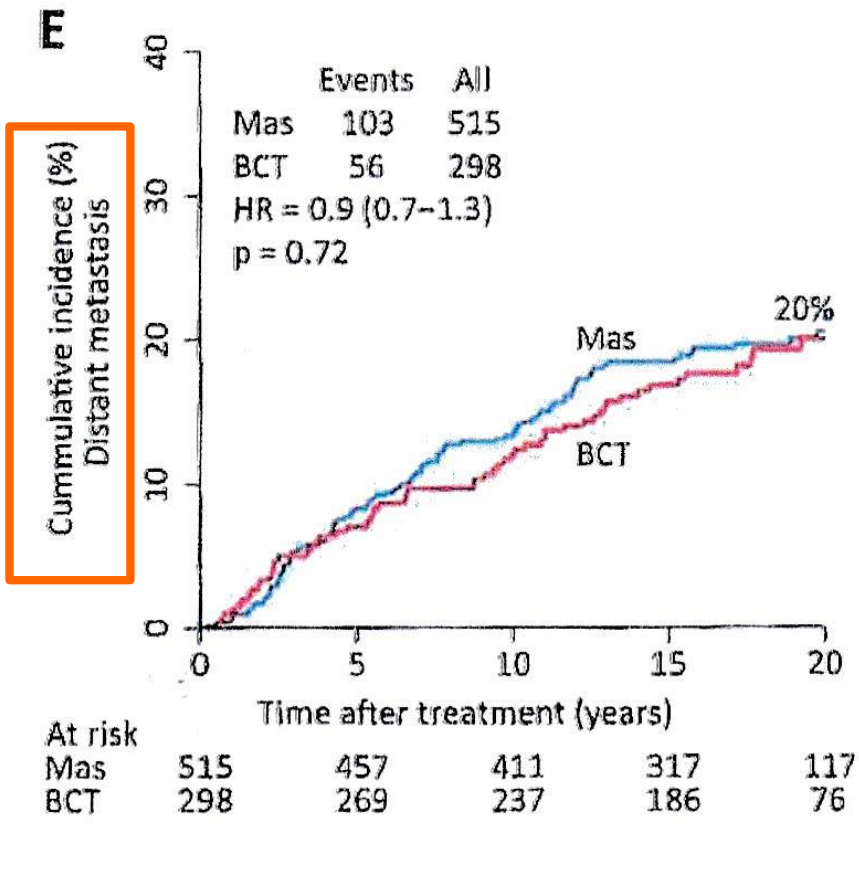
M — 68%

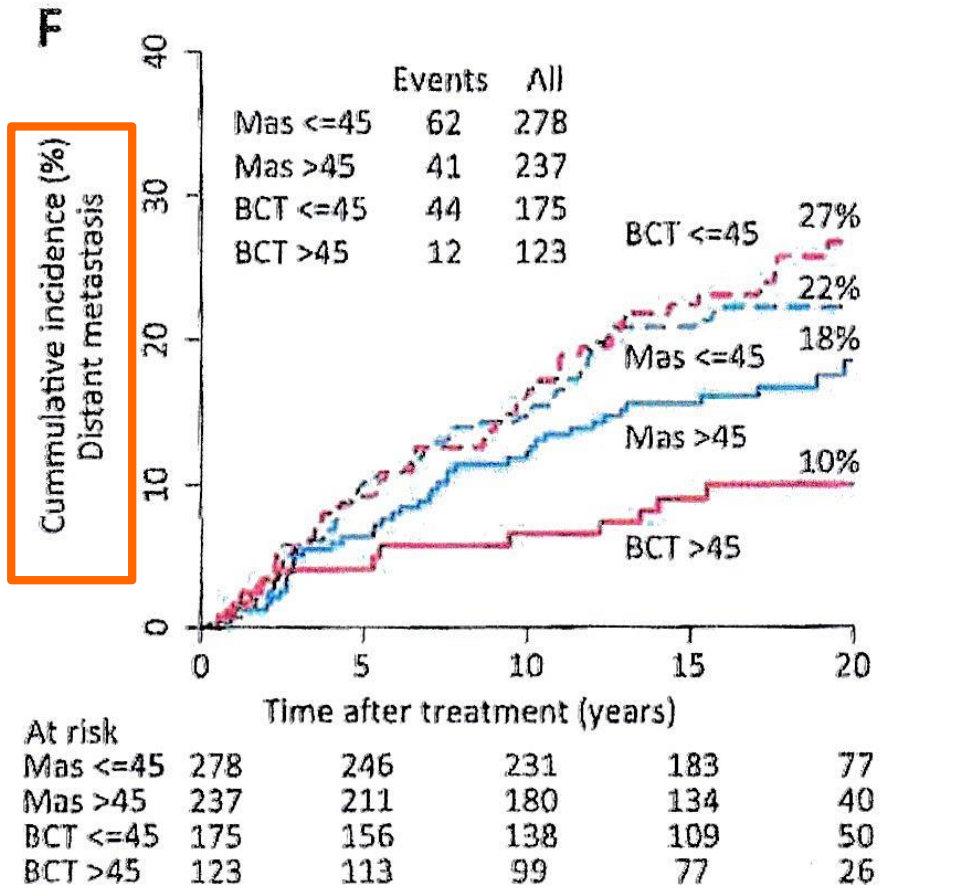

A
Cummulative incidence (%) Local recurrence
Events All
Mas 46 515
BCT 58 298
p < 0.001
20%
BCT
13%
All
Mas
9%
0 10 20 30 40
0 5 10 15 20
Time after treatment (years)
At risk
Mas 515 412 350 257 89
BCT 298 248 197 145 53

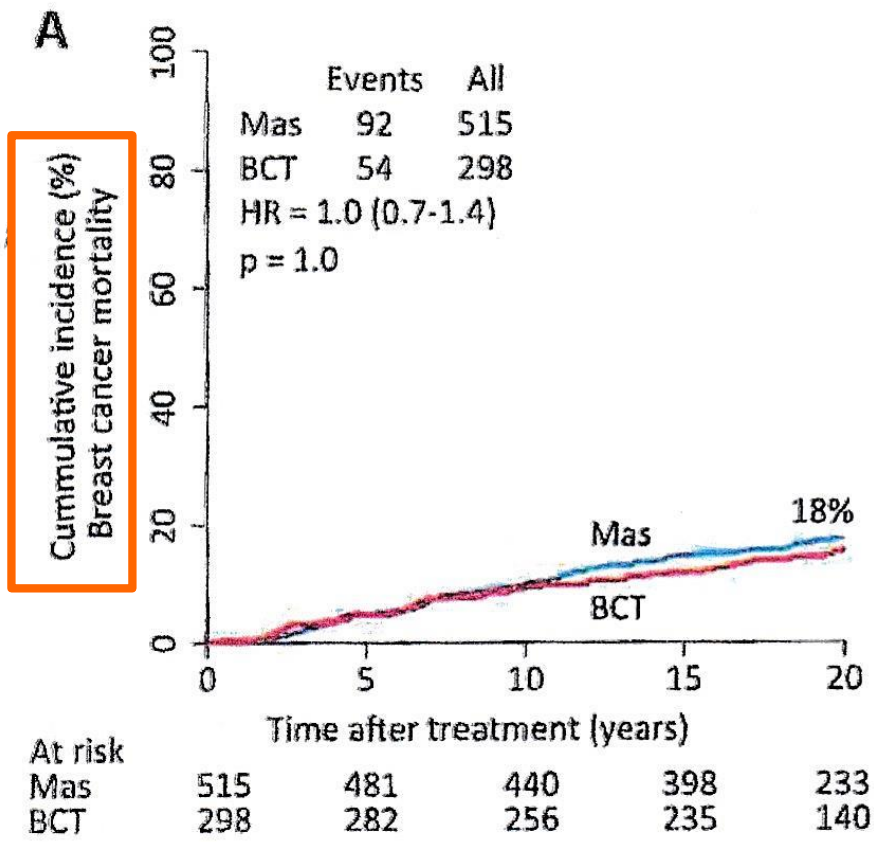

B
Cummulative incidence (%) Local recurrence
Events All
Mas <=45 40 278
Mas >45 6 237
BCT <=45 47 175
BCT >45 11 123
28%
BCT <=45
Mas <=45
14%
10%
BCT >45
3%
Mas >45
0 10 20 30 40
0 5 10 15 20
Time after treatment (years)
At risk
Mas <=45 278 216 189 144 57
Mas >45 237 196 161 113 32
BCT <=45 175 138 108 82 32
BCT >45 123 110 89 63 21

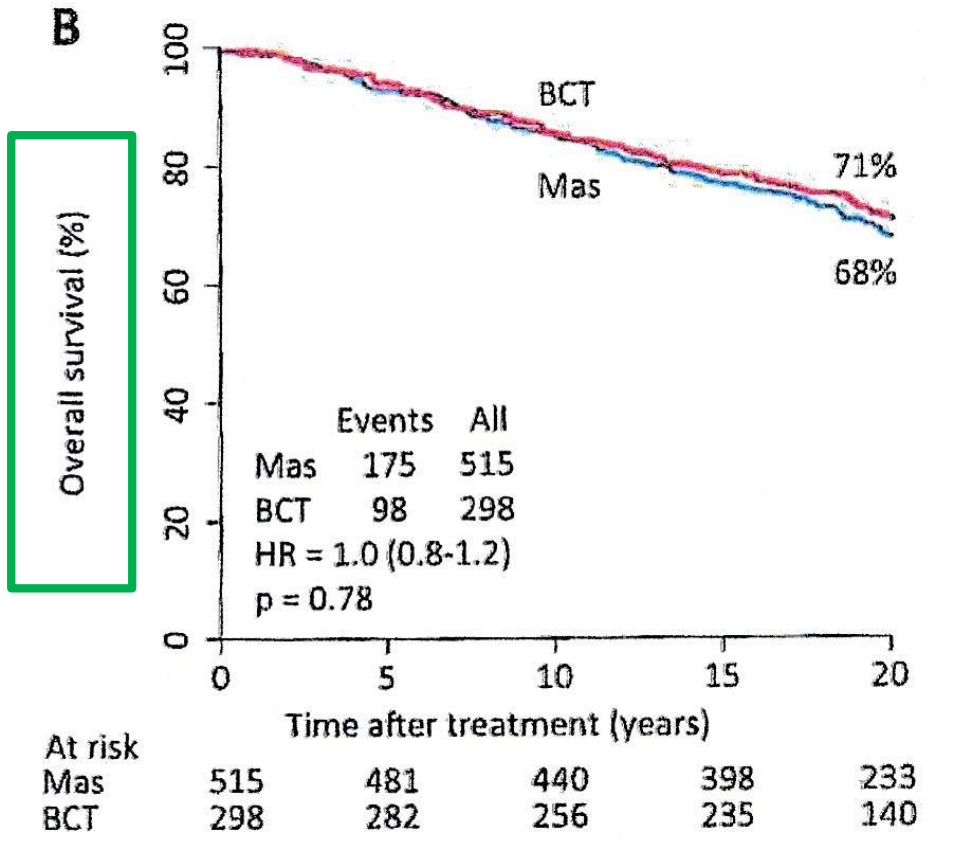

C
Cummulative incidence (%)
Regional recurrence
Events All
Mas 13 515
BCT 12 298
HR = 1.4 (0.7–3.5)
p = 0.25
BCT 4%
Mas 3%
0 10 20 30 40
0 5 10 15 20
Time after treatment (years)
At risk
Mas 515 412 350 257 89
BCT 298 248 197 145 53

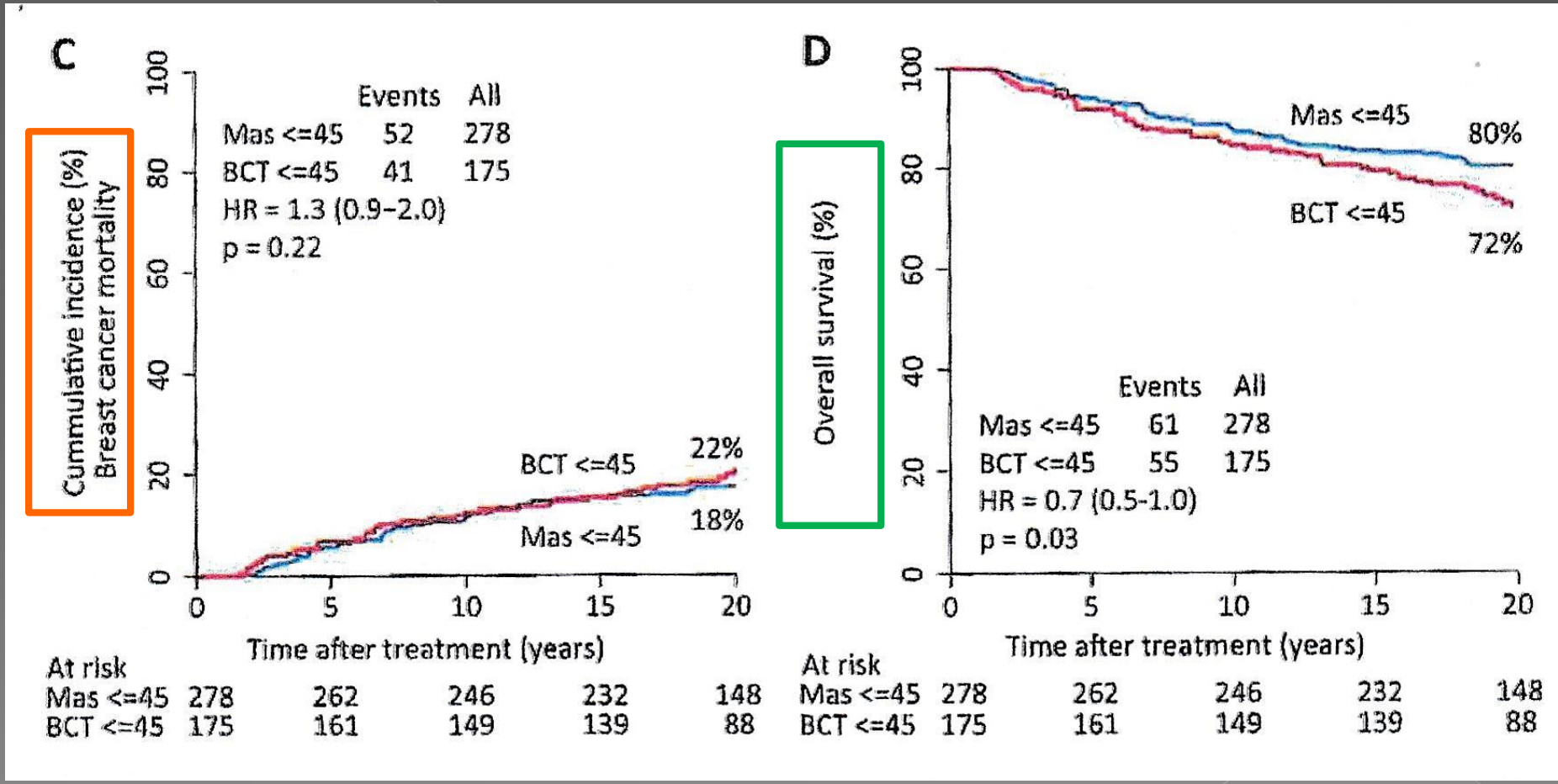

D
Cummulative incidence (%)
Regional recurrence
Events All
Mas <=45 8 278
Mas >45 5 237
BCT <=45 11 175
BCT >45 1 123
BCT <=45 7%
Mas <=45 3%
0 10 20 30 40
0 5 10 15 20
Time after treatment (years)
At risk
Mas <=45 278 216 189 144 57
Mas >45 237 196 161 113 32
BCT <=45 175 138 108 82 32
BCT >45 123 110 89 63 21

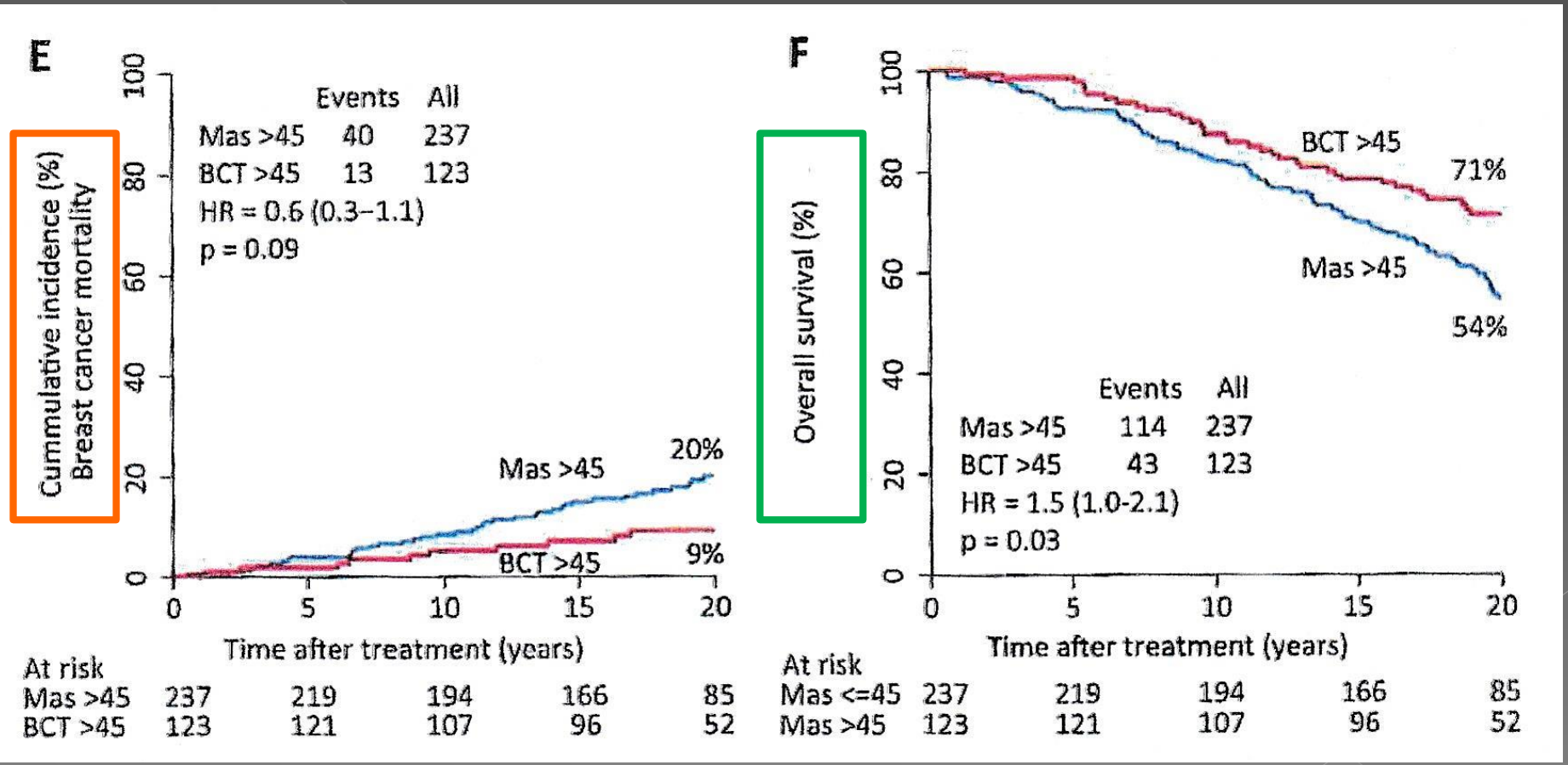

E
Cummulative incidence (%)
Distant metastasis
Events All
Mas 103 515
BCT 56 298
HR = 0.9 (0.7-1.3)
p = 0.72
Mas
BCT
20%
0
10
20
30
40
0
5
10
15
20
Time after treatment (years)
At risk
Mas 515 457 411 317 117
BCT 298 269 237 186 76


F
Cummulative incidence (%)
Distant metastasis
Events All
Mas <=45 62 278
Mas >45 41 237
BCT <=45 44 175
BCT >45 12 123
BCT <=45
27%
22%
Mas <=45
18%
Mas >45
10%
BCT >45
0
10
20
30
40
0
5
10
15
20
Time after treatment (years)
At risk
Mas <=45 278 246 231 183 77
Mas >45 237 211 180 134 40
BCT <=45 175 156 138 109 50
BCT >45 123 113 99 77 26


A
Cummulative incidence (%)
Breast cancer mortality
Events All
Mas 92 515
BCT 54 298
HR = 1.0 (0.7-1.4)
p = 1.0
Mas
BCT
18%
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas 515 481 440 398 233
BCT 298 282 256 235 140


B
Overall survival (%)
BCT
Mas
71%
68%
Events All
Mas 175 515
BCT 98 298
HR = 1.0 (0.8-1.2)
p = 0.78
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas 515 481 440 398 233
BCT 298 282 256 235 140


C
Cummulative incidence (%)
Breast cancer mortality
Events All
Mas <=45 52 278
BCT <=45 41 175
HR = 1.3 (0.9–2.0)
p = 0.22
BCT <=45
22%
Mas <=45
18%
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas <=45 278 262 246 232 148
BCT <=45 175 161 149 139 88
D
Overall survival (%)
Mas <=45
80%
BCT <=45
72%
Events All
Mas <=45 61 278
BCT <=45 55 175
HR = 0.7 (0.5-1.0)
p = 0.03
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas <=45 278 262 246 232 148
BCT <=45 175 161 149 139 88


E
Cummulative incidence (%)
Breast cancer mortality
Events All
Mas >45 40 237
BCT >45 13 123
HR = 0.6 (0.3–1.1)
p = 0.09
Mas >45
20%
BCT >45
9%
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas >45 237 219 194 166 85
BCT >45 123 121 107 96 52
F
Overall survival (%)
BCT >45
71%
Mas >45
54%
Events All
Mas >45 114 237
BCT >45 43 123
HR = 1.5 (1.0-2.1)
p = 0.03
0 20 40 60 80 100
0 5 10 15 20
Time after treatment (years)
At risk
Mas <=45 237 219 194 166 85
Mas >45 123 121 107 96 52

CAUSES DE DECES

273 DECES / 813 patientes (34%)

CAUSES	MASTECTOMIE (%)	TT CONSERVATEUR (%)
CS	18	18
CŒUR	2	3
2nd K	4	5
AUTRE	9	6
NP	0.4	0.7

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Breast radiotherapy

Ipsilateral axillary recurrence after breast conservative surgery: The protective effect of whole breast radiotherapy

Oreste Gentilini[a,*,1], Edoardo Botteri[b], Maria Cristina Leonardi[c], Nicole Rotmensz[b], Jose Vila[a], Nickolas Peradze[a], Maria Virginia Thomazini[a], Barbara Alicja Jereczek[c,d], Viviana Galimberti[a], Alberto Luini[a], Paolo Veronesi[a,b,c,d], Roberto Orecchia[e,d]

[a] Breast Surgery Division; [b] Epidemiology and Biostatistics Division; [c] Radiotherapy Division, European Institute of Oncology, Milano; [d] University of Milan, European Institute of Oncology; and [e] Scientific Directorate, European Institute of Oncology, Milano, Italy

Radiother Oncol 2017, 122: 37-44

Analyse de 4129 patientes traitées à l'IEO de Milan pour un pT1 N0 de 1997 à 2007

- **Chirurgie conservatrice et GAS avec:**

- 1190 IORT (29%)

- 2939 WBRT (61%)

NB:

IORT: 1 dose de 21 Gy (électrons)

RT: 50 Gy/25f. + 10Gy/5f. (boost séquentiel)

ou 45 Gy/20f. + 5 Gy/20f (boost concomitant)

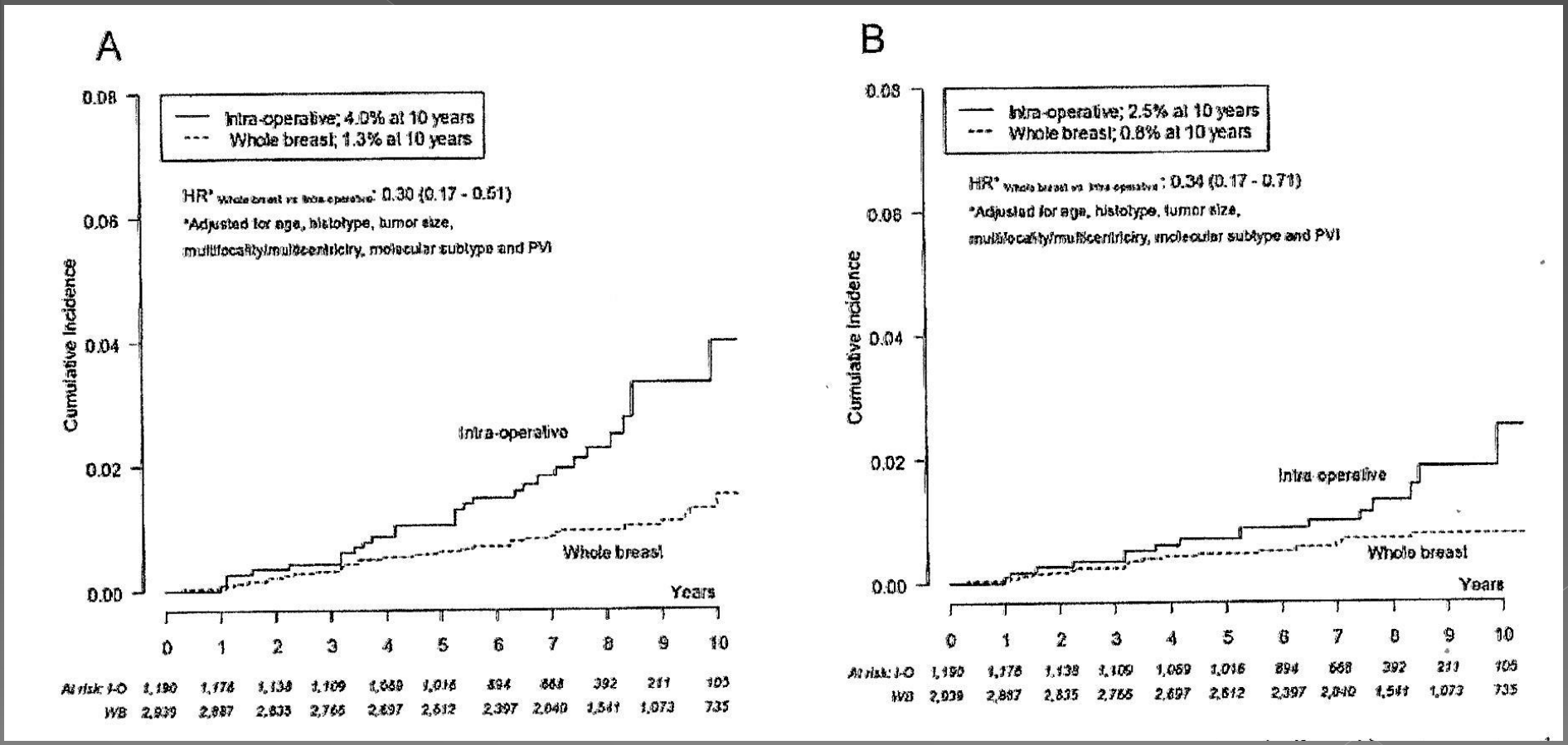
Evaluation du risque de récidive axillaire dans les deux groupes

Caractéristiques différentes (en %)

	IORT	WBRT	P
AGE MEDIAN	59	54	<0.01
MULTIFOCALITE	3	10	<0.01
CCIS « EXTENSIF »	12	20	<0.01

NB: la taille médiane est identique (1,1 cm)

Récidives axillaires (au total) et récidives axillaires sans récidives locales



Facteurs de risque de récidive axillaire: Analyse multivariée

Table 3
Multivariable analysis.

		Axillary recurrence ± ipsilateral breast recurrence HR (95% CI)	Axillary recurrence without ipsilateral breast recurrence HR (95% CI)
Age (years)	One unit increase	0.98 (0.95–1.00)	0.99 (0.96–1.02)
Histotype	Ductal *vs.* others	2.53 (1.07–5.97)	1.89 (0.65–5.48)
Tumour size (cm)	>1 vs ⩽1	1.42 (0.83–2.45)	1.85 (0.86–4.01)
Multifocality/multicentricity	Present vs Absent	2.56 (1.26–5.18)	2.70 (1.08–6.76)
Molecular subtype	Lum B (High Ki67) vs. Lum A	4.38 (1.58–12.2)	5.42 (1.03–28.5)
	Lum B (HER2+) vs. Lum A	2.49 (1.03–5.99)	5.89 (1.73–20.1)
	HER2+ vs. Lum A	1.64 (0.89–3.04)	3.35 (1.24–9.05)
	Triple Negative vs. Lum A	0.66 (0.15–2.90)	2.04 (0.39–10.8)
Peritumoural vascular invasion	Present *vs* absent	1.69 (0.89–3.19)	1.66 (0.74–3.77)
Type of radiotherapy	Whole breast vs. Intra-operative	0.30 (0.17–0.51)	0.34 (0.17–0.71)

Abbreviations: Lum, luminal; HR, hazard ratio; CI, confidence interval.

Research

JAMA Oncology | Original Investigation

Prognostic Factors For Local Control in Breast Cancer After Long-term Follow-up in the EORTC Boost vs No Boost Trial
A Randomized Clinical Trial

Conny Vrieling, MD, PhD; Erik van Werkhoven, MSc; Philippe Maingon, MD, PhD; Philip Poortmans, MD, PhD; Caroline Weltens, MD, PhD; Alain Fourquet, MD, PhD; Dominic Schinagl, MD, PhD; Bing Oei, MD; Carla C. Rodenhuis, MD, PhD; Jean-Claude Horiot, MD, PhD; Henk Struikmans, MD, PhD; Erik Van Limbergen, MD, PhD; Youlia Kirova, MD; Paula Elkhuizen, MD, PhD; Rudolf Bongartz, MD; Raymond Miralbell, MD; David A. L. Morgan, MD; Jean-Bernard Dubois, MD; Vincent Remouchamps, MD, PhD; René-Olivier Mirimanoff, MD; Guus Hart, MSc; Sandra Collette, MSc; Laurence Collette, MSc, PhD; Harry Bartelink, MD, PhD; For the European Organisation for Research and Treatment of Cancer, Radiation Oncology and Breast Cancer Groups.

JAMA ONCOL 2017, 3: 42-48

OBJECTIVE The EORTC "boost no boost" trial showed that young age and high-grade invasive carcinoma were the most important risk factors for IBTR. This study reanalyses pathological prognostic factors related to IBTR using long-term follow-up.

DESIGN, SETTING, AND PARTICIPANTS Participants included 5569 early-stage breast cancer patients, treated with breast-conserving surgery (BCS) and whole-breast irradiation (WBI), who were randomized between no boost and a 16-Gy boost in the EORTC phase III "boost no boost" trial (1989-1996). A total of 1616 patients with a microscopically complete resection (according to local pathologists), included in the central pathology review, have been analyzed in this study. Median follow-up was 18.2 years.

INTERVENTIONS No further treatment or 16-Gy boost, after BCS and 50-Gy WBI.

MAIN OUTCOMES AND MEASURES Time to ipsilateral breast tumor recurrence (IBTR) as first event.

RESULTS The 20-year cumulative incidence of IBTR in 1616 patients (160 events observed) was 15% (95% CI, 12%-17%). Young age ($P < .001$) and presence of ductal carcinoma in situ (DCIS) (HR, 2.15; 95% CI, 1.36-3.38; $P = .001$) were associated with an increased risk of IBTR in multivariable analysis. The cumulative incidence of IBTR at 20 years was 34% (95% CI, 25%-41%), 14% (95% CI, 10%-18%), and 11% (95% CI, 8%-15%), in patients 40 years or younger, 41 to 50 years and 50 years or older, respectively ($P < .001$). This incidence was 18% (95% CI, 14%-22%) and 9% (95% CI, 6%-12%) for tumors with and without DCIS ($P < .001$). High-grade tumors relapsed more frequently early during follow-up but the relative effect of age and presence of DCIS seemed stable over time. The boost reduced the 20-year IBTR incidence from 31% (95% CI, 22%-39%) to 15% (95% CI, 8%-21%) (HR, 0.37; 95% CI, 0.22-0.62; $P < .001$) in high-risk patients (≤50 years with DCIS present).

Table 1. Cumulative Incidence of Ipsilateral Breast Tumor Recurrence as First Event at 20 Years of Follow-up (Univariate Effects)

Variable	Subjects	Events	Cumulative Local Recurrence Probability, % (95% CI)	*P* Value
Treatment				<.001
No boost	801	99	17 (13-20)	
16-Gy boost	815	61	12 (9-16)	
Age, y				<.001
27-40	183	49	34 (25-41)	
41-50	442	44	14 (10-18)	
>50	991	67	11 (8-15)	
Presence of DCIS				<.001
No	664	44	9 (6-12)	
Yes	914	110	18 (14-22)	
Histological grade of invasive tumor				.08
Low	784	70	12 (10-15)	
Intermediate	398	35	14 (9-18)	
High	363	42	16 (10-22)	

Table 2. Multivariable Analysis for Ipsilateral Breast Tumor Recurrence as First Event

Variable	HR (95% CIs)	*P* Value
Treatment		
No Boost vs 16 Gy Boost	0.62 (0.41-0.92)	.02
Age		
Per year[a]		<.001
Positive nodes		
No vs yes	0.82 (0.43-1.56)	.55
Systemic therapy[b]		
No vs yes	0.76 (0.44-1.29)	.31
Diameter		
Per mm	1.03 (1.00-1.06)	.05
Grade invasive tumor		
Intermediate/low vs high	0.87 (0.52-1.46)	.60
DCIS		
No vs yes	2.15 (1.36-3.38)	.001
Estrogen		
Negative vs positive	1.11 (0.67-1.85)	.67
Progesterone		
Negative vs positive	0.79 (0.48-1.29)	.34

Abbreviations: DCIS, ductal carcinoma in situ; mm, millimeter.

[a] See eFigure 5 in Supplement 2.

[b] Systemic therapy indicates tamoxifen or chemotherapy.

Figure 3. Effect of the Radiotherapy Boost Dose on IBTR for the Different Subgroups

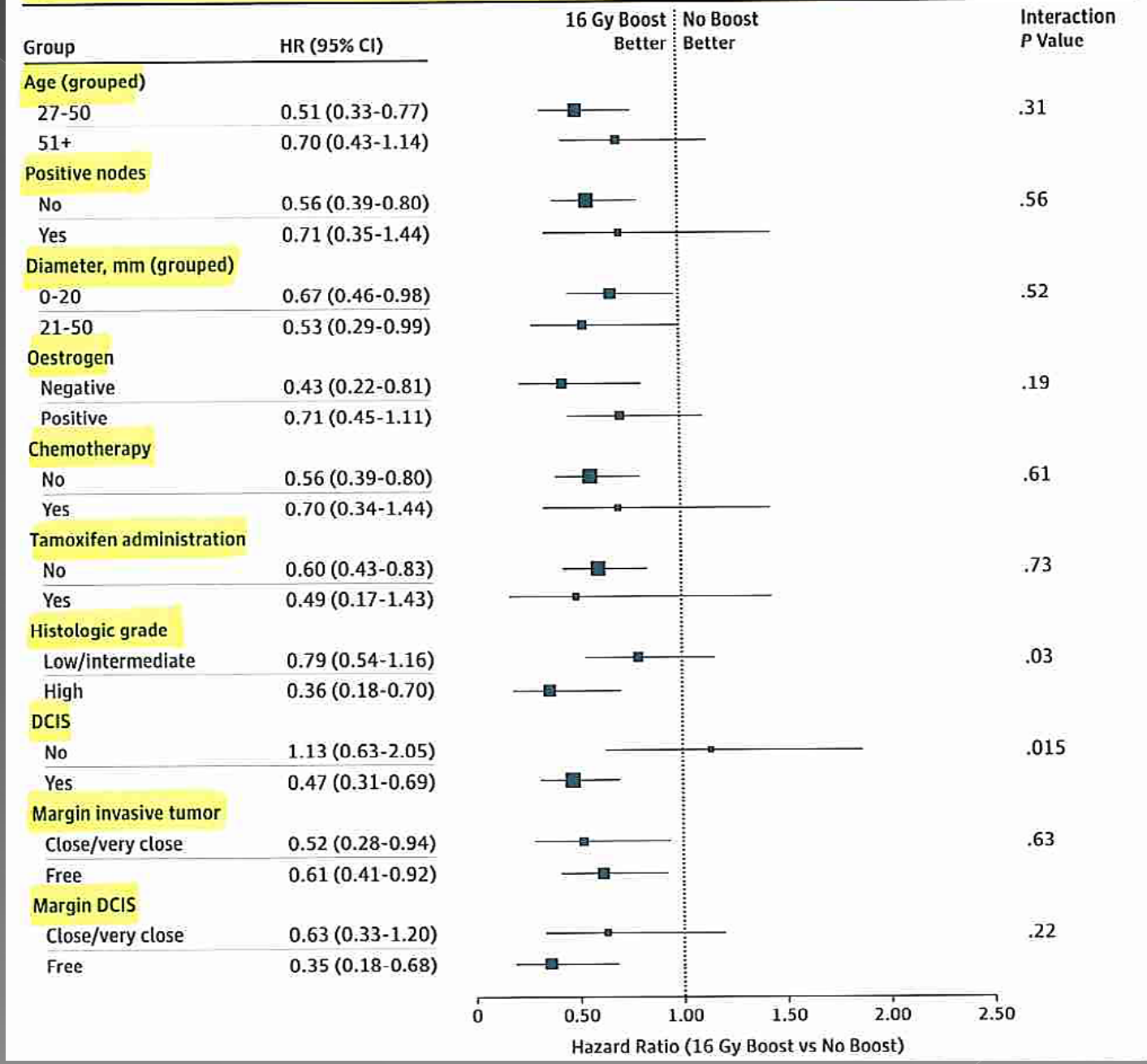
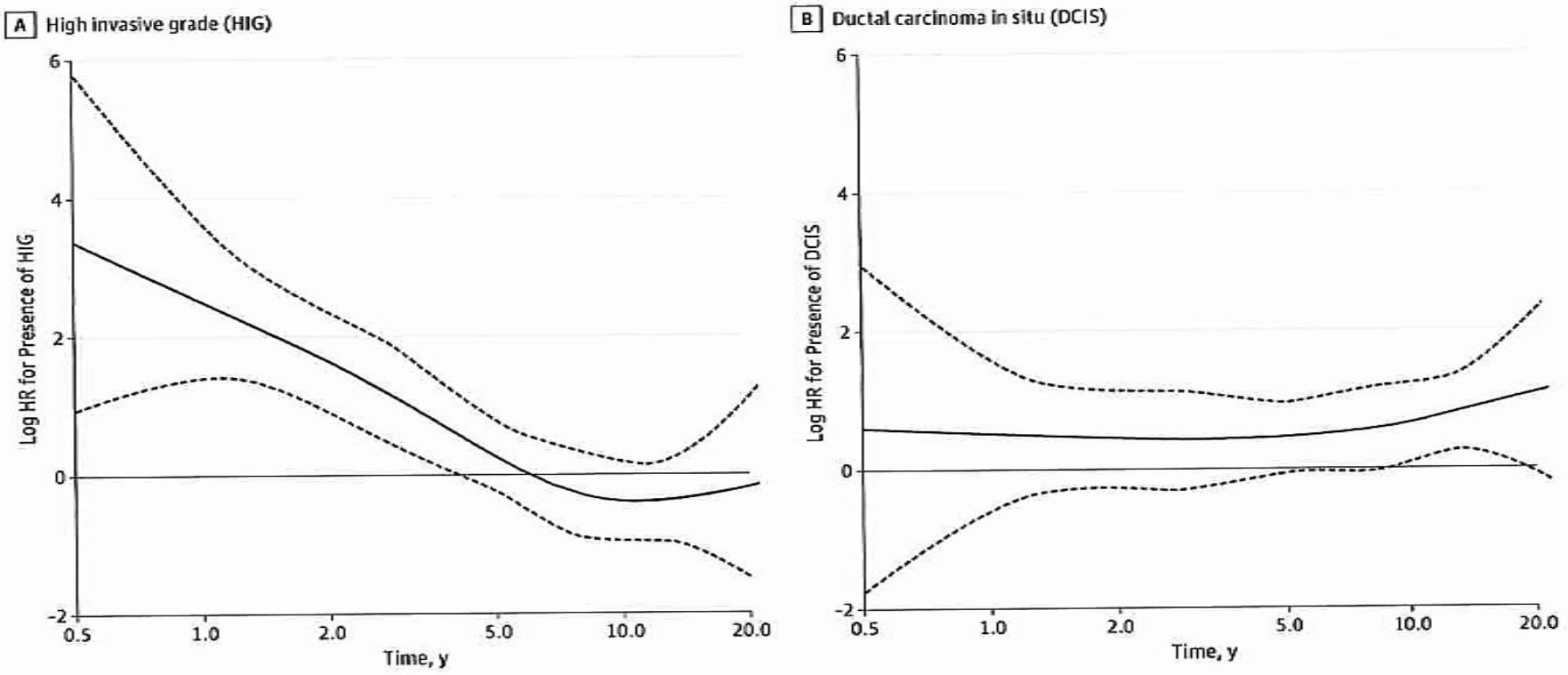


Figure 2. Log HR Over Time



Log HR over time for (A) high invasive grade ($P < .001$) and (B) presence of DCIS ($P = .41$) with confidence intervals at 2 standard errors. The time axis has been graduated according to the log scale.

Conclusions

The long-term follow-up analysis of pathological prognostic factors associated with local control in the EORTC boost no boost trial showed that young age and the presence of associated DCIS increase the risk of IBTR. In patients with both factors the radiotherapy boost dose reduced the IBTR risk with an HR of 0.37, leading to an absolute risk reduction of 16% at 20 years. The proportional hazards assumption of a constant hazard was valid for almost all variables, except for the effect of high histologic grade, which diminished over time. The fact that the relative impact of additional DCIS on local control seemed to remain constant over time, whereas the impact of high grade decreased over time, underlines the importance of long-term trial follow-up to correctly estimate absolute effects. Patients with high-grade invasive tumors need to be monitored closely especially in the first 5 years, whereas patients with invasive tumors with associated DCIS need long-term follow-up, at least 20 years.

DELAY IN RADIOTHERAPY IS ASSOCIATED WITH AN INCREASED RISK OF DISEASE RECURRENCE IN WOMEN WITH DCIS

SHURELL E et al

Cancer 2017, sept 28 doi: 10.1002

- Analyse de 1323 patientes traitées au MSKCC de New York de 1980 à 2010 pour un CCIS par CC+RT

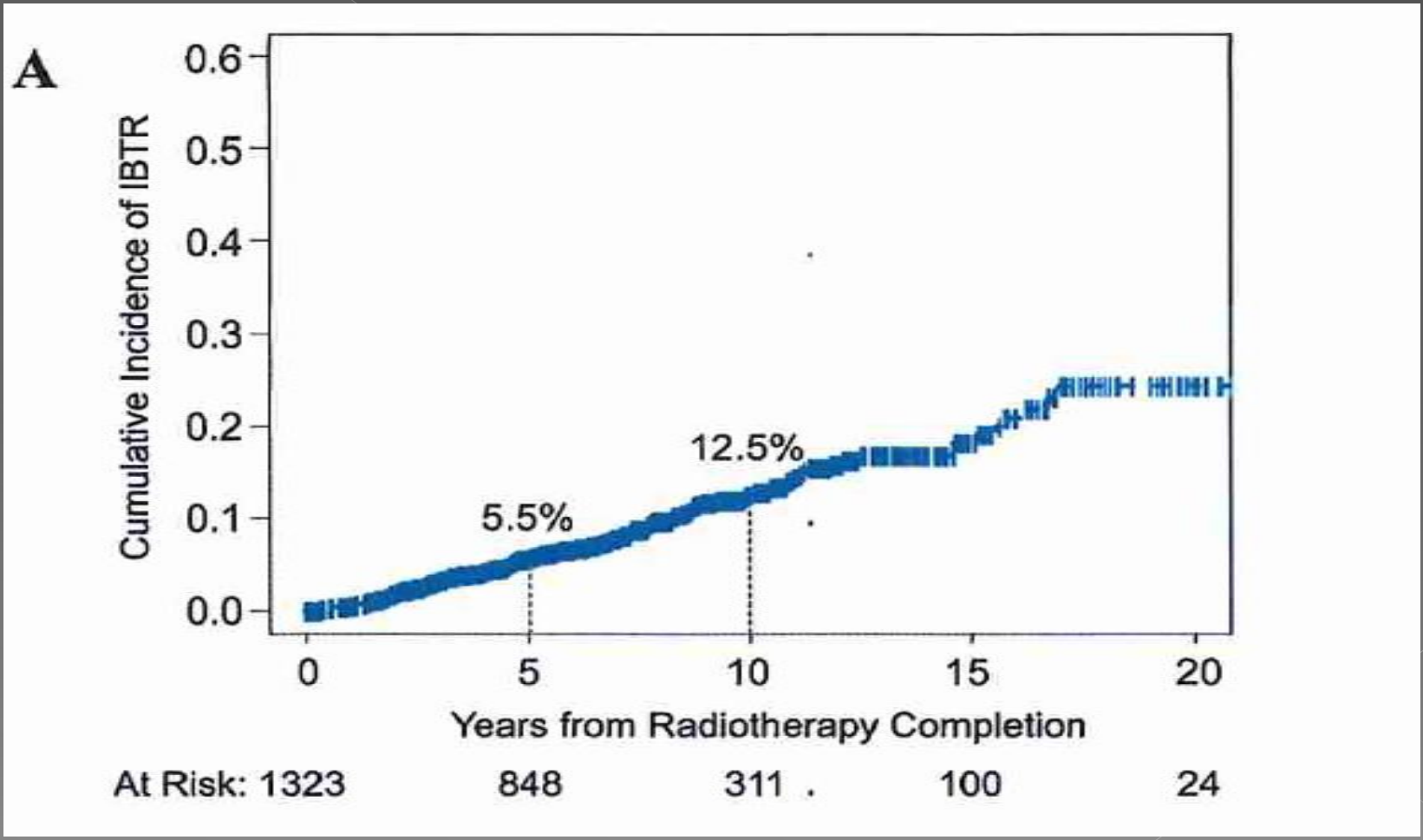
Age médian: 56 ans

Suivi médian: 6,6 ans

126 RL/1323: 9.5% (44% invasives)

Taux de RL à 5a: 5.5% et 10a: 12.5%

TAUX GLOBAL DE RL à 5 et 10 ANS



DELAIS CHIRURGIE – RT (en semaines)

- ≤ 8 : 806 (61%)
- 8-12 : 386 (29%)
- > 12 : 131 (10%)

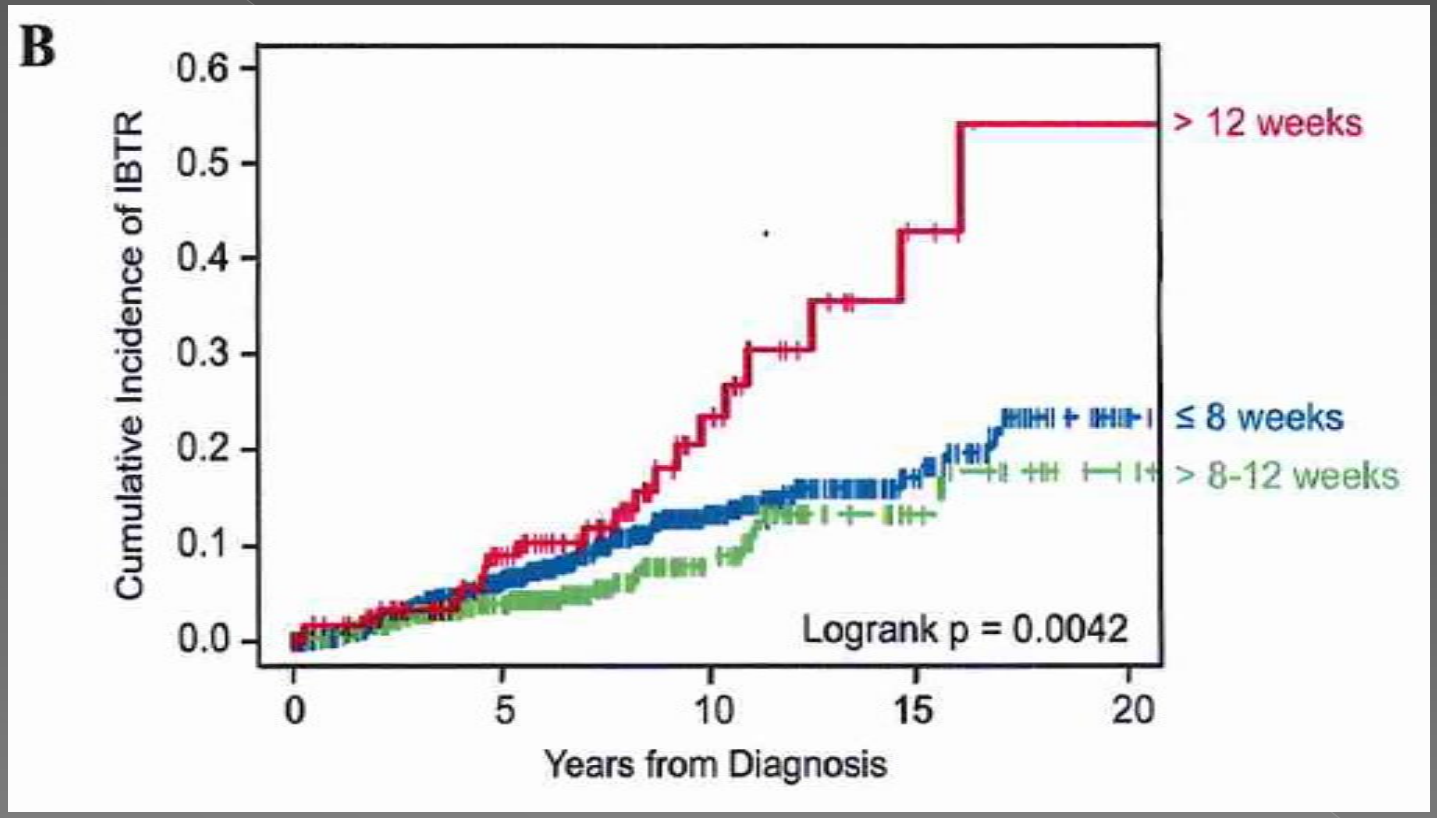
NB: aucune différence significative entre les trois groupes concernant les caractéristiques histopathologiques, l'âge, et les modalités de la chirurgie

RESULTATS

Taux de RL à 5 et 10 ans

	% RL (5A)	% RL (10A)
RT ≤ 8s	5.8	13
RT 8-12s	3.8	7.6
RT > 12s	8.8	23
POPUL. TOTALE (n=1323)	5.5	12.5

TAUX DE RL en fonction du délai CHIR-RT



CONCLUSION: au-delà de 12 semaines après la chirurgie augmente significativement le risque de RL

MULTIGENE EXPRESSION ASSAY AND BENEFIT OF RADIOTHERAPY AFTER BREAST CONSERVATION IN DCIS

RAIKOVITCH E et al

JNCI 2017, 109(4): djw256

- Analyse de 1260 patientes traitées par chirurgie conservatrice +/- RT dans l'ONTARIO de 1994 à 2003

2 cohortes:

- CC: 571 (45%)
- CC+RT: 689 (55%)

Suivi médian: 9,4 ans

LES DEUX GROUPES DE PATIENTES PRESENTENT DES CARACTERISTIQUES DIFFERENTES:

Variable	BCS only (n = 571) No. (%)	BCS + RT (n = 689) No. (%)	P*
Age at diagnosis, y			<.001
<50	110 (19.3)	164 (23.8)	
50–59	153 (26.9)	248 (36.0)	
60–69	134 (23.6)	177 (25.7)	
≥70	172 (30.2)	100 (14.5)	
Tumor size, mm			.02
≤5	77 (13.7)	62 (9.2)	
5.1–10	127 (22.6)	138 (20.4)	
>10	358 (63.7)	477 (70.5)	
Unknown	9	12	
Multifocality			.02
No	457 (80.0)	512 (74.3)	
Yes	114 (20.0)	177 (25.7)	
Tumor type			.002
Solid	358 (62.7)	496 (72.0)	
Cribriform	175 (30.7)	160 (23.2)	
Other	38 (6.7)	33 (4.8)	
Nuclear grade			<.001
Low	55 (9.6)	40 (5.8)	
Moderate	332 (58.1)	353 (51.2)	
High	184 (32.2)	296 (43.0)	
Comedo necrosis			<.001
Absent	221 (38.7)	196 (28.4)	
Present	350 (61.3)	493 (71.6)	

*Pearson's chi-square, two-sided. BCS = breast conserving surgery; RT = radiation therapy.

RESULTATS:

TAUX DE RECIDIVES LOCALES

GROUPE CC

100/591 **17.5%** (19.2% à 10 ans)

(57% de RL invasives)

GROUPE CC+ RT

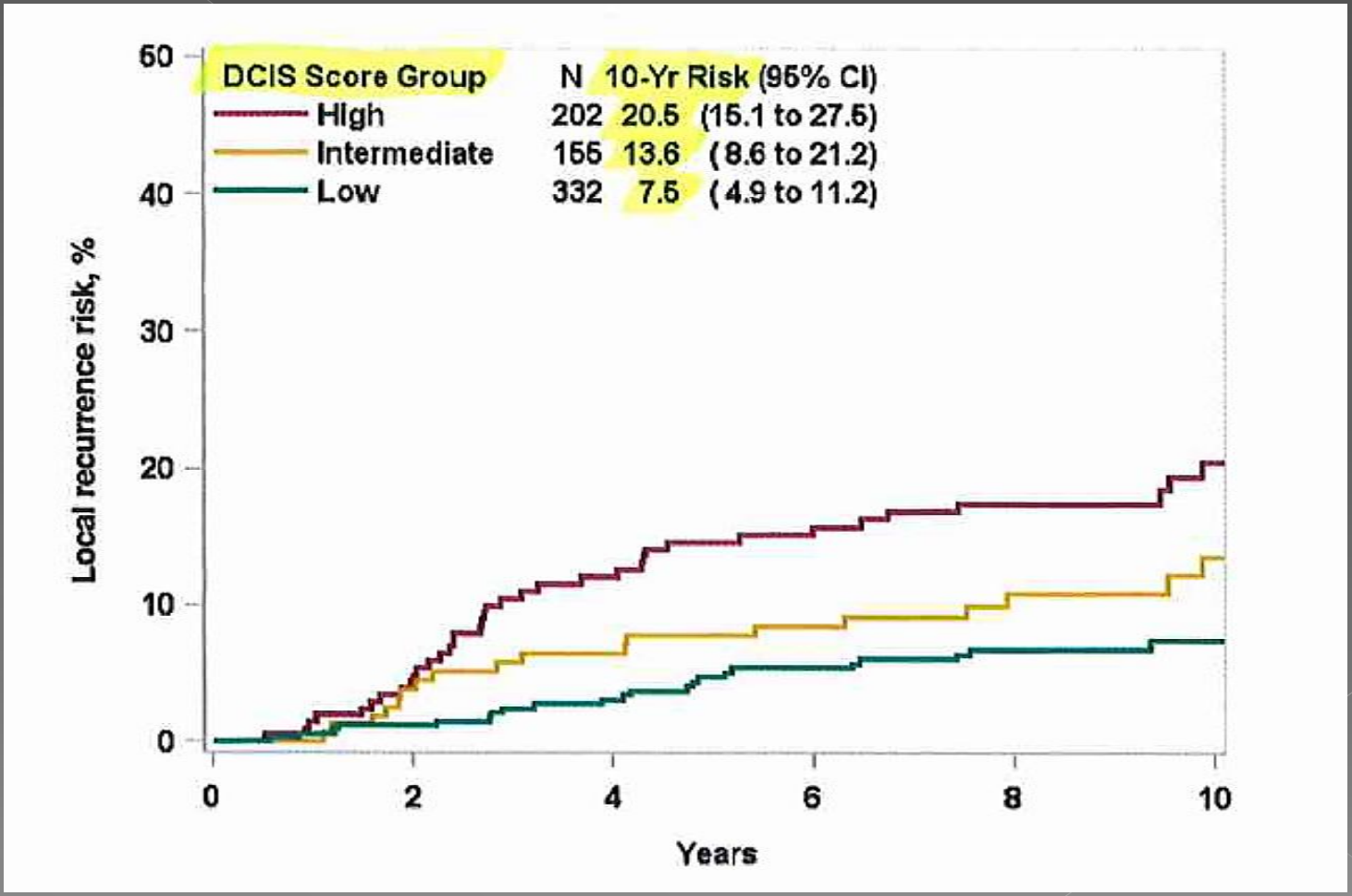
86/689 **12.4%** (12.7% à 10 ans)

UTILISATION DU DCIS-SCORE

3 CATEGORIES (GROUPE CC+RT)

LOW:	**332**	→	**48%**
INTERMEDIATE:	**155**	→	**22%**
HIGH:	**202**	→	**30%**

Risque de RL dans le groupe CC+RT en fonction du DCIS-SCORE



ASSOCIATION OF RADIOTHERAPY BOOST FOR DCIS WITH LOCAL CONTROL AFTER WBRT

MORAN MS et al

JAMA ONCOLOGY 2017, 3: 1060-1068

- Analyse de 4131 patientes traitées de 1980 à 2010 (USA-CANADA-FRANCE) par chirurgie conservatrice + RT mammaire +/- boost

Age médian: 56 ans

Suivi médian: 9 ans

Répartition:

1470 pas de boost

2661 boost (dose moyenne 14 Gy)

RESULTATS:

TAUX GLOBAL DE RL

253/4131: **6.1%** **(47% invasives)**

RL à 10 ans **6.4%**

Boost: **5.9%**

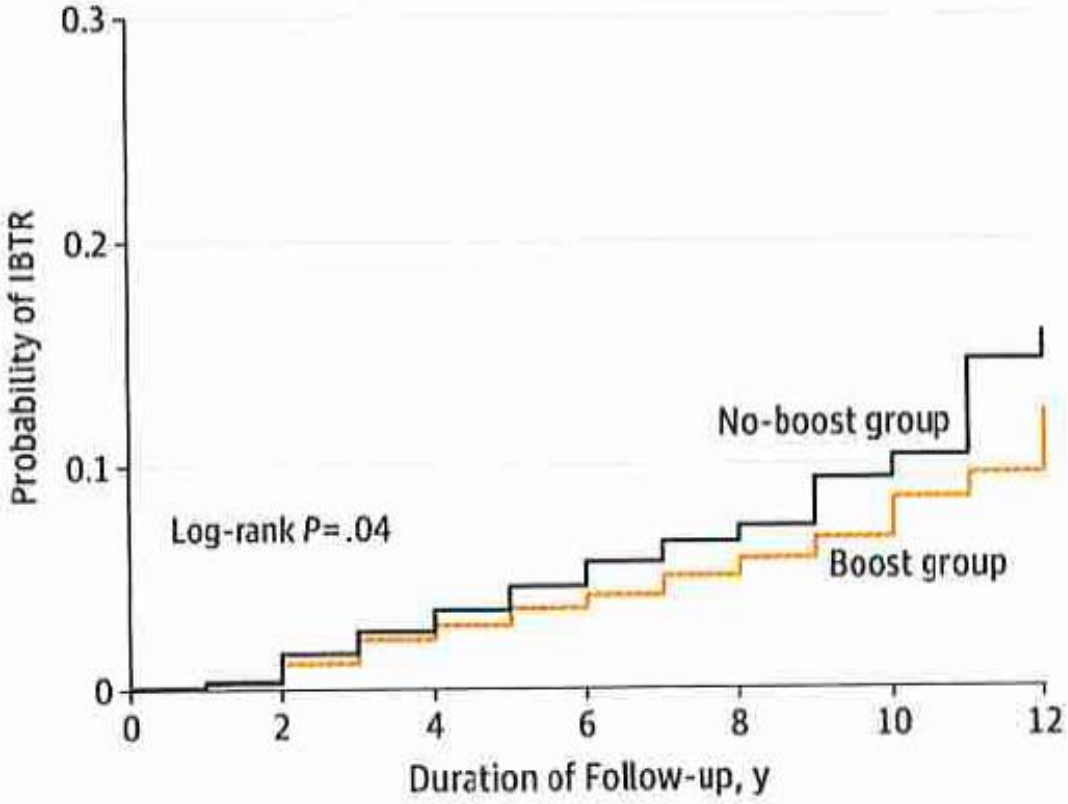
No boost: **7.5%**

RL à 15 ans **9.6%**

boost: **8.4%**

no boost: **12%**

Figure 1. Comparison of Ipsilateral Breast Tumor Recurrence (IBTR) by Treatment Group



No. at risk							
No-boost group	1210	1136	1023	821	507	277	74
Boost group	2123	2052	1878	1600	1034	535	166

Patients were stratified by those who received a radiotherapy boost (boost group) vs those who did not (no-boost group).

Table 2. Cox Proportional Hazards Regression Multivariable Analysis of Ipsilateral Breast Tumor Recurrence

Patient Characteristic	HR (95% CI)	*P* Value
Age, y		
<50	1 [Reference]	NA
≥50	0.54 (0.41-0.71)	<.01
DCIS grade		
I	1 [Reference]	NA
II or III	1.59 (1.02-2.46)	.04
Unknown	1.56 (0.93-2.59)	.09
Tumor size (continuous variable)	1.15 (1.02–1.29)	.03
Margin status		
Negative	1 [Reference]	NA
Positive[a]	1.72 (0.97-3.05)	.06
Unknown	1.65 (1.13-2.41)	.01
Comedo necrosis		
No	1 [Reference]	NA
Yes	1.12 (0.78-1.62)	.53
Unknown	0.51 (0.34-0.77)	<.01
Estrogen receptor status		
Negative	1 [Reference]	NA
Positive	0.7 (0.39-1.25)	.23
Unknown	0.85 (0.52-1.38)	.51
Tamoxifen citrate use		
No	1 [Reference]	NA
Yes	0.56 (0.36-0.87)	.01
Unknown	0.93 (0.53-1.63)	.81
RT boost		
No	1 [Reference]	NA
Yes	0.68 (0.5-0.91)	.01

Abbreviations: DCIS, ductal carcinoma in situ; HR, hazard ratio; NA, not applicable; RT, radiotherapy.

Table 3. Studies Reporting Outcomes of DCIS by Receipt of Boost vs No Boost

Source	Total No. of Patients (Patients Receiving Boost, %)	Median Follow-up, y	Effect of Boost on IBTR
Omlin et al,[21] 2006 [a]	316 (52.0)	6.0	Yes
Yerushalmi et al,[22] 2006	75 (25.0)	6.8	No
Jiveliouk et al,[23] 2009	107 (37.3)	4.0	No
Monteau et al,[24] 2009[b]	208 (71.0)	7.4	Yes
Wai et al,[25] 2011	482 (29.8)	9.3	No
Rakovitch et al,[26] 2013	1895 (29.6)	10.0	No
Meattini et al,[27] 2013	389 (48.8)	7.7	Yes
Wong et al,[28] 2012	220 (36.0)	3.8	Yes
Kim, et al[29] 2014	728 (31.9)	6.7	No
Cutuli et al,[30] 2016	819 (48.0)	7.5	No
Present study	4131 (64.4)	9.0	Yes