Post mastectomy electron beam chest wall irradiation in women with breast cancer

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Early Breast Cancer Trialists' Collaborative Group Overview

Lancet, 2005, 366:2087

23 500 women included in trials comparing radiotherapy vs none following surgery

Information sought for each individual patient

Regular 5-year update of outcome

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EBCTCG. Post-mastectomy RT

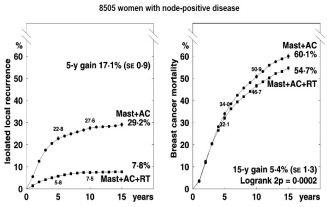
The updated meta-analysis showed that post mastectomy radiotherapy regimens produced moderate but definite reductions not only in 15-year breast cancer mortality but also in 15-year overall mortality.

Mastectomy + Axillary clearance

25 trials

9933 women

8505 women with node-positive disease



Early Breast Cancer Trialists' Collaborative Group (EBCTCG): Effects of radiotherapy and of differences in the extent of surgery for early breast cancer on local recurrence and 15-year survival: an overview of the randomized trials. Lancet 2005; 366: 2087-2106

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Background

It is shown that the electron-beam radiotherapy of the chest wall decreases the cardiac and lung toxicity and it delivers homogeneous irradiation to the chest wall.

It was also already shown that using this technique, the loco-regional control, disease free survival and overall survival rates were similar compared to standard photon beam irradiation.

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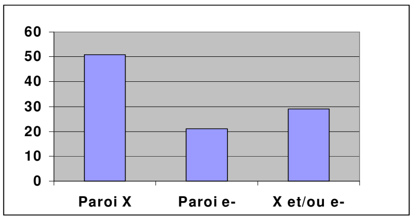
Irradiation of chest wall: current situation in France



Fournier-Bidoz N et al, SFRO 2007

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Background

Electron-beam radiotherapy of the chest wall with or without lymph node irradiation has been used at the Institut Curie for twenty-five years.


Postmastectomy electron-beam chest wall irradiation in women with breast cancer: early and late complications

Francois Campana[1], Youlia M. Kirova[1], Stephane Zervoudis[1,2], Hazem Assi[1], Nathalie Fournier-Bidoz[1], Remi Dendale[1], George Iatrakis[2], Marc Bollet[1], George Kyrgias[2], Panagiotis Peitsidis[2], Alain Fourquet[1]

(1)Department of Radiation Oncology, Institut Curie, Paris, France

Gyneco ro 2007

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Purpose

The purpose of this presentation is to show the last improvements of our technique, it's use in difficult clinical cases and discuss the future directions.

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Indications

Lymph node positive tumors at initial presentation (for patients treated with neoadjuvant chemotherapy,

Tumors larger than 40 mm,

Clinically multiple tumors and

Vascular invasion in young patients

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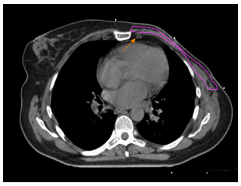
Treatment volumes and doses

The clinical target volume (CTV) of the chest wall included the breast bed and the mastectomy scar PTV = CTV with 1–2 cm margins.

IMC and supra clavicular areas are included in N+ cases or internal lesions.

The prescribed dose was is 50 Gy in 25 fractions to the chest wall and regional lymph nodes



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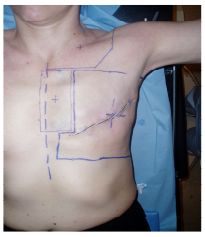
Treatment volumes and doses: « old » technique

A mixed photon and electron beam in the IMC area was our technique of choice to avoid useless irradiation of the heart, with a ratio of about 20 Gy / 30 Gy between the photon dose and the electron dose.

The supra clavicular area was irradiated with photons.



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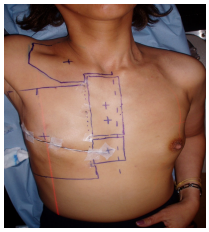
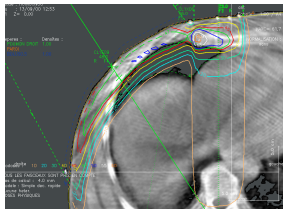
Treatment volumes and doses: « old » technique: technical problems





5 fields, "hot" or "cold" points in the junction of the fields

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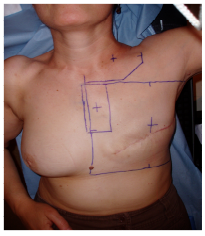
"New technique", published in 2007, IJROBP



·The chest wall and IMC volumes are now included into one unique field at a gantry angle of 20 to 30 degrees from the vertical.

*During the simulation, the radiation oncologist determines the clinical volume of the chest wall to be irradiated and also delineates the IMC target volume

Kirova et al, IJROBP, 2007

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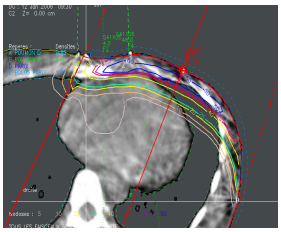
Dosimetry



* The electrons energy is chosen so that the 47.5 Gy isodose is at the costal wall depth when a 5 mm bolus is in place

·To better spare the skin where the additional dose is delivered at the IMC, the boost field is delivered with photons (6MV).

·It is treated by fractions of 0.5 Gy (prescribed at Dmax), once or twice a week, depending on the complement dose to be delivered.

Kirova et al, IJROBP, 2007

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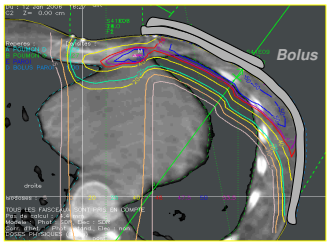
New technique, solutions in case of problems



·When the reference isodose (47.5 Gy) enters into the ipsilateral lung, a second layer of bolus of 0.5 cm is placed. The bolus is prepared by the dosimetrist.

·When two layers of bolus are needed to protect the lung, a beam's eye view showing the projection of the bolus layers limits helps for bolus confection.

Kirova et al, IJROBP, 2007

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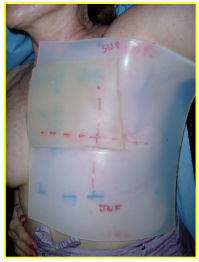

The transversal and sagittal lasers positions are marked at the patient's skin and on each of the bolus layers to ensure a reproducible positioning at every fraction.

Kirova et al, IJROBP, 2007

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If you need more information

Int. J. Radiation Oncology Biol. Phys., Vol. 69, No. 4, pp. 1139–1144, 2007

0360-3016/07/$–see front matter

doi:10.1016/j.ijrobp.2007.05.007

CLINICAL INVESTIGATION Breast

POSTMASTECTOMY ELECTRON BEAM CHEST WALL IRRADIATION IN WOMEN WITH BREAST CANCER: A CLINICAL STEP TOWARD CONFORMAL ELECTRON THERAPY

YOULIA M. KIROVA, M.D., FRANCOIS CAMPANA, M.D., NATHALIE FOURNIER-BIDOZ, PH.D., ANNE STILHART, REMI DENDALE, M.D., MARC A. BOLLET, M.D., AND ALAIN FOURQUET, M.D.

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Conclusions

This new technique is an improvement in the standard post mastectomy electron beam technique of chest wall irradiation.

It provides better target homogeneity and conformality compared with the "old" technique

….but there are still difficult cases…

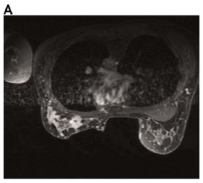
some examples…

Clinical case,

Caussa et al, 2009, Radiother Oncol

Forty-three years old woman diagnosed with T3N1M0 left breast lesion has been seen in a multidisciplinary meeting at the Institut Curie. The biopsy showed invasive ductal carcinoma, Elston Ellis grade II, low mitotic activity, positive Oestrogen Receptor status (OR+), negative HER-2 status. The fine needle aspiration biopsy confirmed the axillary lymph node involvement. The initial magnetic resonance imaging (MRI) showed a complete absence of the pectoralis major muscle and a less developed pectoralis minor

Initial MRI

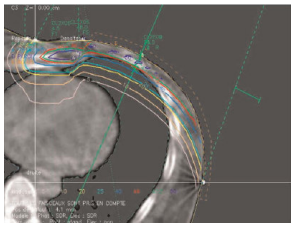


Poland syndrome, breast cancer: The importance of the radiotherapy technique after mastectomy

CT scan in treatment position

Clinical case, conclusions

Caussa et al, 2009, Radiother Oncol



Electron-beam radiotherapy of the chest wall with lymph node irradiation using the presented technique seems well adapted and safe for this rare population of patients.

But also for all patients with thin chest wall

Dosimetry

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Immediate breast reconstruction when postmastectomy radiotherapy is indicated should be done with caution

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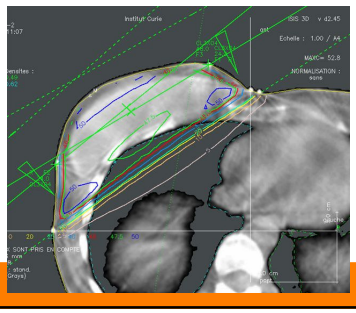
The impact of immediate breast reconstruction on the technical delivery of post mastectomy RT: the problem for the radiation oncologist?



*Chest wall coverage: heterogeneity

*Treatment of ipsilateral internal mammary chain (IMC): hot and cold spots

*Minimization of lung and avoidance of heart: difficult

Timing of RT: the delay of starting RT may reduce the probability of local control and decrease the survival

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Capsular contracture following IBR with implant and RT

				CC %		Re-operation	Med. F/U
	IBR No.	IBR + RT No.	RT Protocol	no RT	with RT	%	(mths)
Marseilles 2003,2010	69	47	50Gy/25f	0	17	11	25
New York 2004, 2010	143	68	50Gy/25f	40	68	1.2	34
Stockholm 2006	107	24	46Gy/23	15	42	15	60
London 2006	136	44	50Gy/25f	14	39	9	48
Bristol 2008	53	18	50gy/25f	11	39	22.2	33
Cambridge 2009	120	42	40Gy/15f	0	19	19.5	50

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Postmastectomy irradiation with immediate breast reconstruction is often a technical problem

- Chest wall coverage and heterogeneities
- Combination with regional nodes irradiation
- Lung and heart avoidance
- Delay in initiation of radiotherapy

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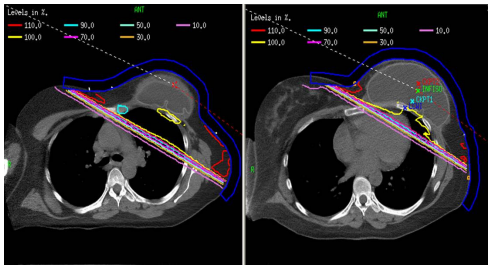
Post-Mastectomy IMRT and breast reconstruction Koutcher L et al. ASTRO 2007



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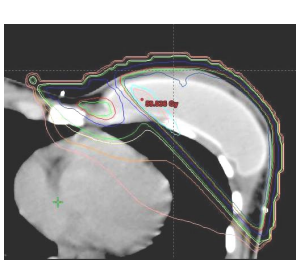
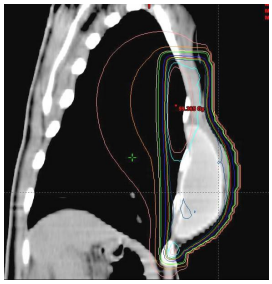
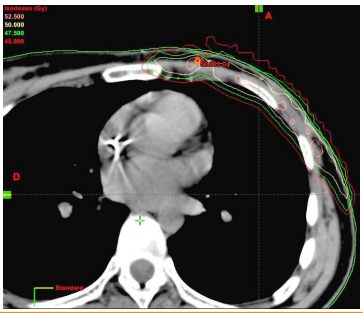
Dosimetry of chest wall and IMN irradiations





Chest wall and IMN irradiation without IBR



Radiotherapy after mastectomy and implant breast reconstruction

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Medical Dosimetry xx (2012) xxx

Medical Dosimetry

journal homepage: www.meddos.org

Implant breast reconstruction followed by radiotherapy: Can helical tomotherapy become a standard irradiation treatment?

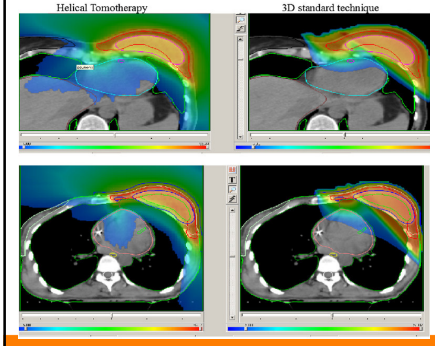
Carole Massabeau, M.D., Nathalie Fournier-Bidoz, Ph.D., Georges Wakil, M.D., Pablo Castro Pena, M.D., Romain Viard, Ph.D., Sofia Zefkili, Ph.D., Fabien Reyal, M.D., François Campana, M.D., Alain Fourquet, M.D., and Youlia M. Kirova, M.D.

Department of Radiation Oncology, Institut Curie, Paris, France

C. Massabeau et al. / Medical Dosimetry xx (2012) xxx

Helical Tomotherapy

3D standard technique



Clinical case

42 yrs old lady with pT1m pN2a M0 IDC grade III after mastectomy and immediate breast reconstruction.

Treatment: chemotherapy, followed by chest wall, IMN and supra and infra clavicular RT

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