

Bulletin 2 » 2012

newSeno

News from senology and breast surgery at the BrustZentrum

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M·O·B·E·T·R·O·N

INTRA

■ The high-tech OR in action

Leading development

After successful implementation and set-up, one of the ultramodern linear accelerators for intraoperative electron radiation therapy (IOERT) is now operating successfully at the Department of Senology and Breast Surgery at Marien Hospital Düsseldorf, Germany. The MOBETRON features radiation therapy and technology that ensures highest precision and stability. Furthermore, the MOBETRON's penetration of the targeted tissue is superior to all currently available systems. Designed to provide highly differentiated, patient-centred and safe use it is one of the few high-performance devices of this generation internationally.



A patient is prepared for radiation therapy during breast cancer surgery

With its wide range of applications the MOBETRON out-classes some of the competitive devices that many renowned international radiation oncologists have called mere "flash-lights" in comparison. We are very grateful that the generous substantial and mental support of our friends and supporters as well as the Marien Hospital Foundation enabled us to now offer our patients the best therapy worldwide.

Do stem cells play a role?

While surgery remains the crucial element of cancer management and particular in breast malignancies, today it is the combination of radiation therapy and surgery that are the basic most important principles for the longterm success of local cancer control and cure, and indeed it might play a more important role in the outcome than chemotherapy. This assumption is backed by data from our trial that we initiated twenty years ago in cooperation with the Department of Radiation Therapy of the University Hospital Düsseldorf.

Fifteen years after the initial study the outcomes of more than 400 patients were reviewed – patients who had undergone radiation prior to surgery rather than after the surgery, which is the common procedure. Survival rates were significantly higher and cure rates are higher compared to pre-operative chemotherapy alone (see: *Longterm outcome after neoadjuvant radiochemotherapy in locally advanced non-inflammatory breast cancer and predictive factors for a pathologic complete remission; results of a multi-variate analysis*. San Antonio Breast Cancer Symposium 2012. Presenting and Correspondence Author: *Christiane Matuschek, 2012 CTRC-AACR, Abstract Number: 850076*).

Scientists assume that effective and targeted radiation therapy not only kills mature tumor cells (as in case of chemotherapy) but possibly also stem cells and precursor cells which are known to be highly resistant. The major role of these "dangerous loners", also with regard to metastases, is brilliantly described in Bördlein's article in the May issue of the *Deutsches Ärzteblatt* (*I. Bördlein, Deutsches Ärzteblatt, Jg: 109,19/11.03.2012*).

Breast cancer surgery – safer than ever

With regard to a sustainable positive long-term effect of the intraoperative radiation therapy the MOBETRON allows also for an electron boost prior to resection. In selected or more advanced cases after chemotherapy the accelerator enables, because of its advanced target volume, an electron beam for a few minutes prior to the removal of the tumor during the surgical intervention. In terms of radiation biology the effect of this approach is identical to radiation therapy weeks before surgery. The advantage however is twofold: the volume of the tumor bed containing the stem cells is radiated in a highly targeted way with normal vascularisation and oxygenation. Furthermore the radiation exposure of healthy breast tissue and adjacent organs (heart and lungs) is avoided. We consider this procedure, which is called intraoperative in-situ radiation, with the latest generation MOBETRON to be an important option in addition to standard post-resection IOERT after the removal of the tumor within clear margins. Research provides detailed information and evidence on the post-surgery development of distant metastases (Vicini, F., A. et al.: Hazard ratios for the development of Distant metastasis. *Cancer* 97:910-19, 2003) that support our confidence in this clinical approach. During our in-situ radiation, a procedure which is also applied optionally in the US, we deliver highly targeted so-called boost radiation to the tumor and thus also to the tumor stem cells, which may be mobilized and activated by the intervention.

Breast cancer – a silent epidemic: initial therapy is crucial

Breast cancer is one of the most frequent and most heterogeneous malignant diseases. Moreover tumor biology and anatomy (size and location) are highly varied. Thus successful treatment requires meticulous planning and above all an initial therapy that is tailored to each individual patient.



25 years ago we developed the oncoplastic procedures that combines safe tumor resection and reconstruction with an excellent oncological and esthetic outcome and the avoidance of any call back for re-excision or corrective sequential interventions in breast-conserving surgery.

Soft-docking of the electron accelerator prior to radiation without direct contact to the field of intervention

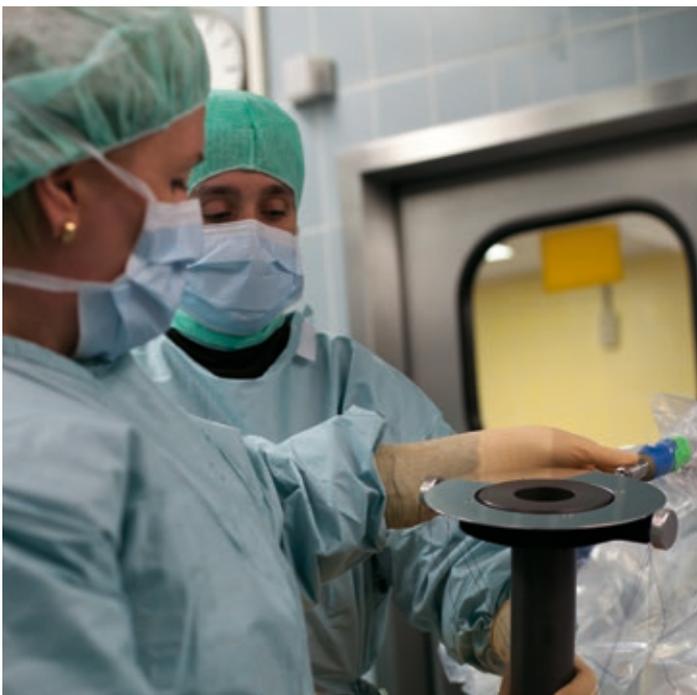
Intraoperative electron radiation therapy (IOERT) delivered by the state-of-the art MOBETRON is a further significant component in our efforts to make safe breast conserving available for our breast cancer patients.

■ The procedure

Indication and resection margins

IOERT as anticipated boost radiation is indicated for a wide variety of cases and can be applied in more than fifty percent of all breast cancer patients. Outcomes depend to a large degree on the initial precise surgical procedure. Multicentricity is excluded in diagnostic MR mammography and tumor location is determined sonographically prior to the targeted radiation. A pathologist is present during the surgery to perform important histological evaluations.

The four-eye principle increases targeting precision



IOERT should only be offered to patients who most likely will not require adjuvant chemotherapy, in order not to delay post-IOERT adjuvant radiation therapy due to an extended chemotherapy period. If primary chemotherapy is indicated, a neoadjuvant chemotherapy protocol is initially applied. If unexpectedly post-IOERT chemotherapy is indicated, the tumor board will decide on a case-by-case basis. Ideally, a combined radiation/chemotherapy regime is applied, followed by standard adjuvant chemotherapy.

Special case: intramammary relapse

Previously radiated patients with an intramammary relapse require a special approach. Secondary breast-conserving intraoperative radiation therapy can be performed, however only on the basis of an informed consent and after comprehensive information. In these cases no percutaneous radiation therapy will follow since this would exceed dose guidelines. All indications are discussed by the radio-oncology board.

Safe margins/radiation field

With small tumors (up to 2 cm diameter) the radiation field will be 1 to 2 cm larger than the resection field. With larger tumors (more than 2 cm diameter) the radiation field is 2 to 3 cm larger than the resection field.

Protocol: Intraoperative boost radiation of a breast carcinoma using MOBETRON

This protocol contains the key parameters such as field of radiation in the left/right breast; quadrants, type of IOERT (pre-/post-tumor resection), with/without skin island, intraoperative histological evaluation: tumor size/ resection borders, tissue thickness, distance to the thorax wall, energy (6MeV/9MeV/12MeV), tube diameter/angle, bolus, dose: (in dmax) Gy, monitor settings: MU, radiation therapist, medical physicist, surgeon with sign-off by radiation therapist and medical physicist.



Application

In our high-tech OR equipped with a special OR table for IOERT the radiation takes only a few minutes. We use Unitrac, a surgical restraint system that allows single-handed and very fast positioning of the tube in the correct angle. The skin is distanced with two holding sutures and the electron beam is set under laser guidance with the MOBETRON's soft docking feature. Actually the IOERT takes three to five minutes while the patient is being monitored with a camera system. The intervention is concluded with oncoplastic and reconstructive procedures. No permanent wound cavity will remain.

Stable anchorage of the tube with Unitrac-System

■ Summery

IOERT post-tumor resection with safe margins

- Targeted radiation by the surgeon
- Healthy breast tissue and adjoining organs are spared
- Shorter radiation times

IOERT prior to tumor resection – in-situ radiation

Advantages:

- Undisturbed vascularisation and oxygenation of the tumor and the directly surrounding tumor bed
- Possible effects on the stem cells (see neoadjuvant radiation therapy study)
- More precise positioning of the tube with regard to medial, cranial, caudal, lateral and particularly deep margins

Indication and eligibility:

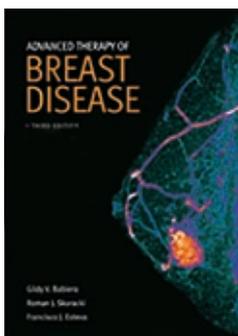
- Tumor anatomy (unifocal, delineated, smooth surface)
- Favourable relative tumor size or index tumor size post chemotherapy
- Tissue transfer intended
- Case-by-case decisions: LABC, relapse or sarcoma

The decisive aspect in favour of the Marien Hospital Düsseldorf and the VKKD of the new MOBETRON and the high-tech OR environment is a major step towards becoming a leading national and international provider of comprehensive services in oncology.

New standard text book

Advanced Therapy of Breast Diseases (ISBN: 978 - 1- 60795 - 094 - 3), editor: MD Anderson Cancer Center in Houston,

University of Texas (USA). The MD Anderson Cancer Center, a worldwide leading healthcare institution, invited me as the first European physician to contribute a chapter on developments in oncoplastic surgery (chapter 40). This is a great honour and bears witness to the fact that today our breast surgery department and the oncoplastic interventions we have developed are recognized as the international standard. This comprehensive publication covers all diseases of the female and male breast. In short: an excellent reference work for all who are interested in the current international developments in breast disease research and therapy.



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Our distinctive competencies

- Breast surgery and -service for female and male patients without restrictions
- High-resolution breast ultrasound, US-guided biopsy and wire localisation
- Sentinel lymph node biopsy and node sparing surgery
- Breast conserving surgery and oncoplastic breast surgery
- Intraoperative radiation therapy IOERT and brachytherapy
- Skin-sparing (SSM) and nipple sparing mastectomy (NSM) with immediate reconstruction
- All types of reconstruction techniques with highest degree of safety
- Reconstruction with silicone prostheses/expander or with own tissue (abdomen or back)
- Secondary and tertiary interventions with highest quality
- Relapse surgery with and without breast tissue sparing procedures
- Individual correction of malformations, breast reduction and breast augmentation, gynaecomastia in men, all techniques of aesthetic breast surgery



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