

Intraoperative Radiotherapy in Early Breast Cancer

A single institution experience

Mariana Steiner
Carmel Medical Center
Haifa, Israel



Partial Breast Irradiation

The concept

Based on :

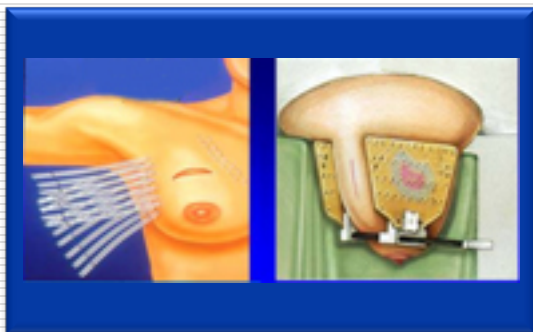
1. The general tendency to minimize local breast cancer therapy in order to reduce morbidity
2. The fact that most ipsilateral breast tumor recurrences after local excision and whole breast irradiation occur around the tumor bed
3. The long follow up after breast conserving therapy which shows that in the vast majority of patients survival is not compromised by local failure

Accelerated Partial Breast Irradiation

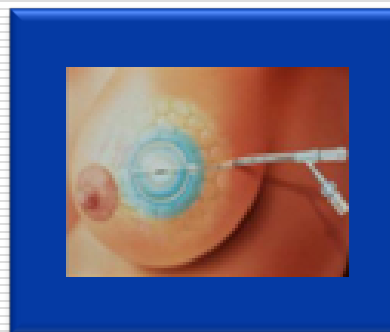
Techniques

POST
OPERATIVE

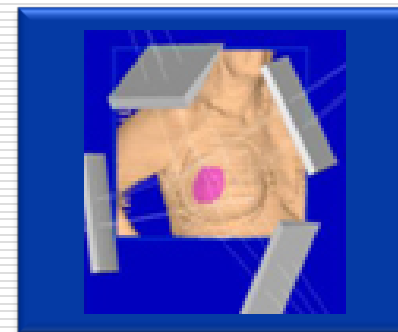
Catheter Based
Brachytherapy



BallonCatheter
"MammoSite"



3D Conformal External
Beam Radiotherapy

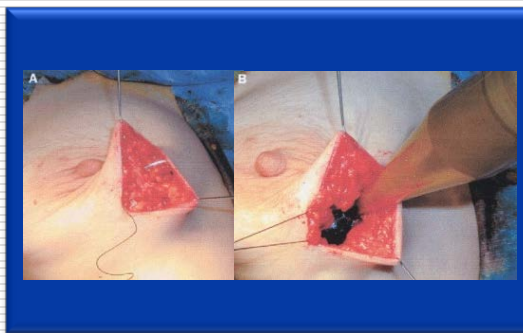


INTRA
OPERATIVE

ELIOT



TARGIT



IOHDR

Intraoperative
High Dose Rate
Brachytherapy

Intraoperative Radiotherapy in Early Breast Cancer

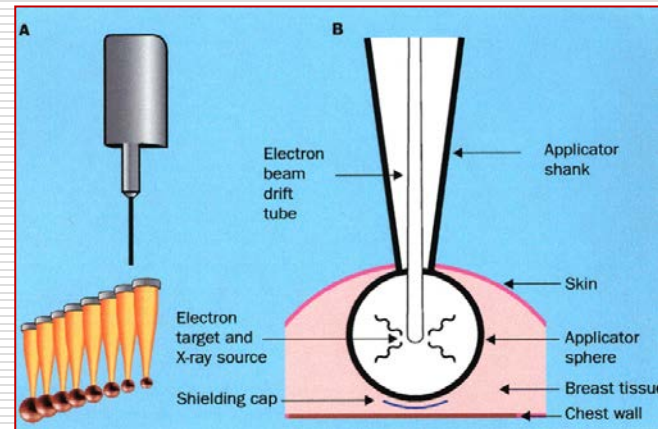
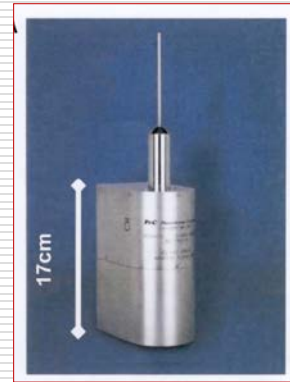
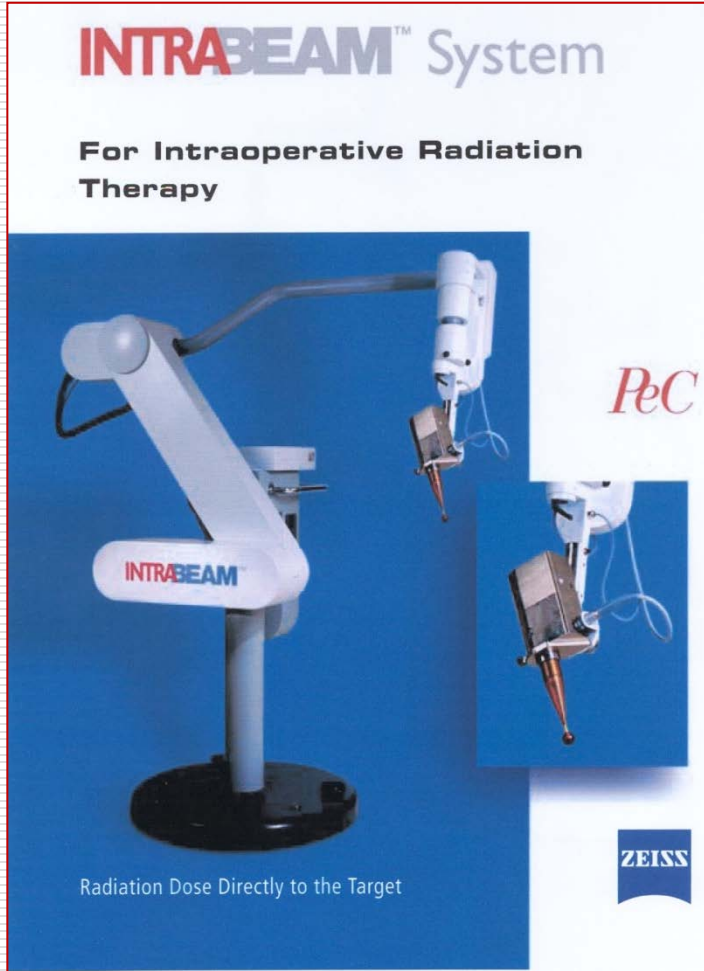
Carmel Medical Center

From September 2006 we introduced intraoperative radiotherapy as the only post lumpectomy irradiation in selected early breast cancer patients as an **alternative option** to the standard post operative external whole breast irradiation

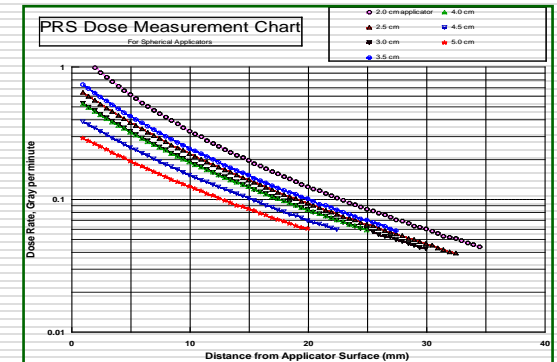
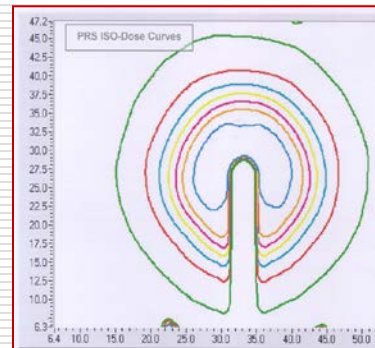
Inclusion criteria:

- Histological confirmed invasive ductal carcinoma of the breast
- Age ≥ 60 years
- Tumor size ≤ 2 cm (measured by US)
- Tumor at least at 1 cm distance from chest wall (measured by US)
- No suspected involved axillary nodes (by examination and US)
- Younger patients (≥ 50 years) or patients with bigger tumors up to 3.5 cm or with other tumor histology who are not candidate for standard local therapy
- Signed informed consent

X-ray generator
Low energy (50 kV) **Variable size**
spherical applicators



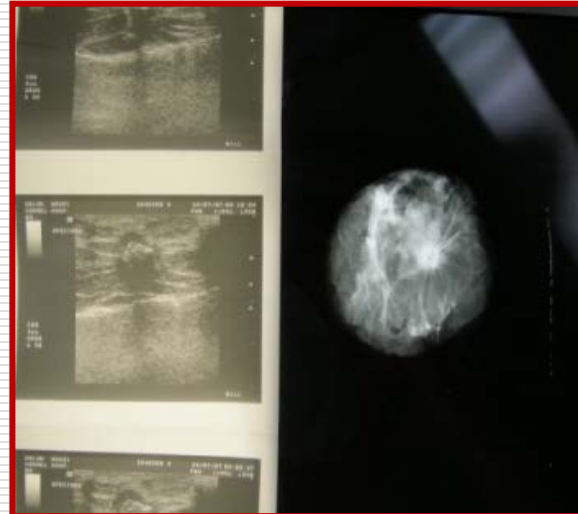
Support stand with flexible long arm
Placed in a regular operating room



IntraBeam IORT

I

- Lumpectomy
- Specimen imaging (mammography + US)
- Tissue re-excision if necessary
- Sentinel node examination



IntraBeam IORT

II

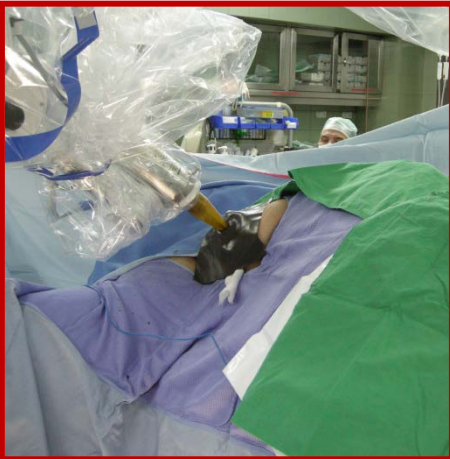
- Applicator is inserted to fit surgical cavity
- A deep surgical purse string suture is inserted in the breast to bring together the target tissue
- Skin is reverted to keep away from applicator surface
- Posterior cap shield may be used to protect ribs and left coronary artery



IntraBeam IORT

III

- Radiotherapy is delivered at the dose of 20 Gy at the cavity surface which attenuates to 6-7 Gy at 1 cm depth
- Treatment time is 30-50 min
- During the irradiation, anesthesiologist and IORT team member stay behind shielding screens



Additional Local Therapy

If adverse disease features are found at final pathological report (estimated 15%)



- invasive lobular carcinoma
- positive margins (< 1 mm)
- extensive DCIS
- significant lympho-vascular invasion
- > 3 involved axillary lymph nodes
- extensive extracapsular extension



Patients are considered for additional local therapy



- multidisciplinary discussion with the patient (oncologist, surgeon, pathologist, radiologist)
- decision is made according to clinical situation and patient's preference



Management options may include



- whole breast irradiation (with or without re-excision)
- mastectomy
- follow up

Systemic Therapy

Systemic therapy is administered as required according to clinical parameters

Follow up

- **Clinical examination every 4 months for the first three years and bi-annually thereafter**
- **Digital mammography (+/- US) of the treated breast every 6 months for the first two to three years and annually thereafter**

Local Complications/ Morbidity Definition

Mild to moderate complications:

- Wound infection requiring PO antibiotics
- Simple seroma requiring repeated fluid aspiration
- Complicated seroma (by spontaneous drainage or infection)
- Bleeding/hematoma

Significant morbidity:

- Infection requiring IV antibiotics
- Any surgical intervention
- Delayed healing (>90 days)
- RTOG Grade III-IV toxicity

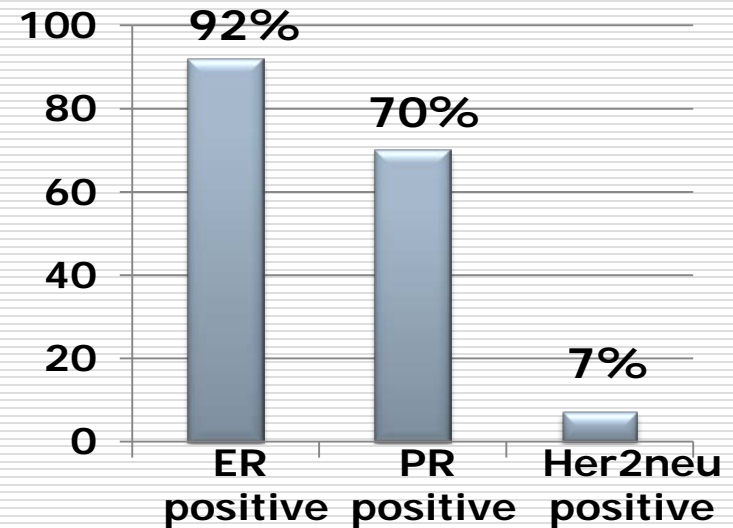
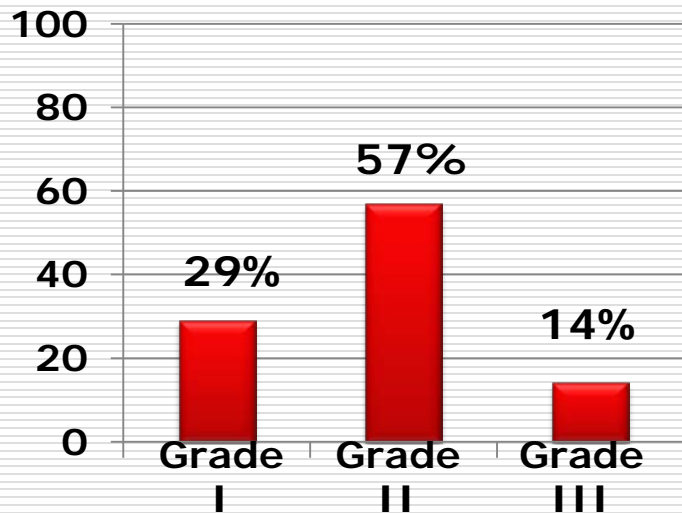
Patients Characteristics

300 patients treated (9.2006-11.2011)

Median age : 70 years (54-90)

Median clinical tumor size : 13 mm (4-30)

Histological features:



Complications

(worse complication/patient was registered)

| Mild to moderate | 45 pts | 15.3% |
|--------------------------------------|---------------|--------------|
| Wound infection | 19 pts | 6.3% |
| Complicated seroma | 16 pts | 5.7% |
| Simple seroma (repeated aspirations) | 4 pts | 1.3% |
| Bleeding/ hematoma | 6 pts | 2.0% |

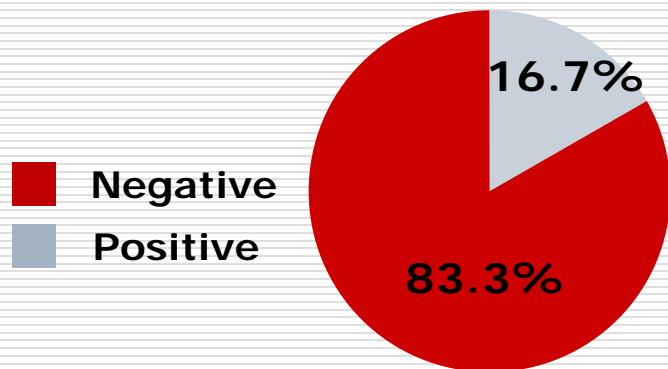
} 7%

| Major morbidity | 20 pts | 6.7% |
|-------------------------------------|---------------|-------------|
| Delayed healing | 7 pts | 2.3% |
| Surgical intervention | 5 pts | 1.6% |
| Infection treated by IV antibiotics | 4 pts | 1.4% |
| Skin necrosis (small) | 2 pts | 0.7% |
| RTOG GIII fibrosis | 2 pts | 0.7% |

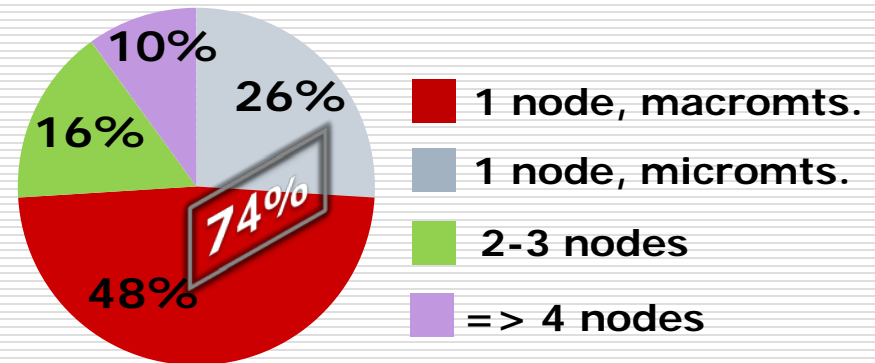
Final Pathology

- Median pathologic tumor size: 14 mm (1-40, mean 15)
- Free margins : => 1 mm 97%
 => 2mm 94%
- Axillary lymph nodes:

All patients



Positive I-nodes



Final Pathology

Adverse pathological findings

15.0%

| | |
|----------------------|------|
| L-V invasion | 5.6% |
| Extensive DCIS | 3.0% |
| Lobular carcinoma | 1.7% |
| > 3 positive nodes | 1.7% |
| Extranodal extension | 2.3% |
| Multicentric disease | 0.7% |

Additional local therapy

10.3%

| | |
|--------------------------|--------|
| Whole Breast Irradiation | 27 pts |
| Mastectomy | 3 pt |
| Local re-excision | 1 pt |

Adjuvant Systemic Therapy

| | |
|-----------------------|-------|
| ■ Hormonal therapy | 77.3% |
| ■ Chemotherapy +/- HT | 18.0% |
| ■ Anti Her2 therapy | 5.6% |
| Total | 95.3% |

Results

Median follow up: 24 months (1-62, mean 20)

154 pts with follow up > 2 years (median 37 m)

82 pts with follow up > 3 years (median 44 m)

6 pts experienced ipsilateral breast failure: 2%

4 new primaries (by location) at 6 -28 months

two invasive carcinoma, two DCIS

three treated by mastectomy and one by lumpectomy + WBRT

2 true local recurrence (invasive ca) at 31 - 51 months

both treated by lumpectomy + WBRT

3 pts developed distant disease without local failure

at 18-35 months:

1%

SHS 26.9.2006



9/2007



9/2008



2/2009



9/2011

ZEM 16.1.2007



6/2007



7/2008



12/2009



10/2010

KLM 18.11.2009

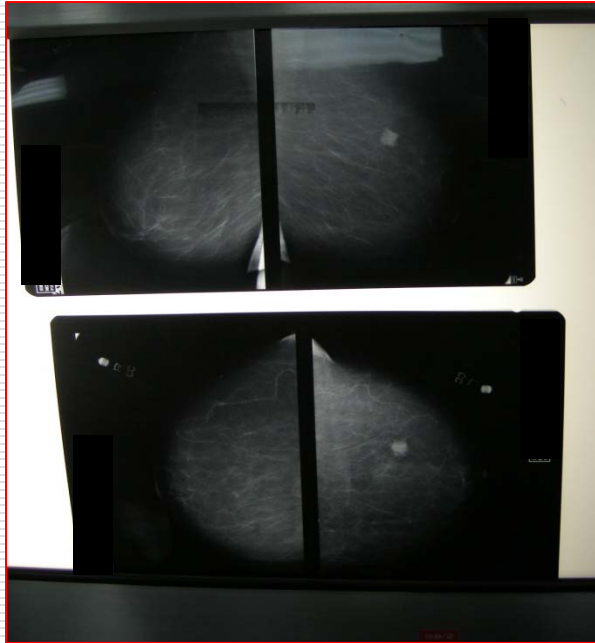


10.12.2009

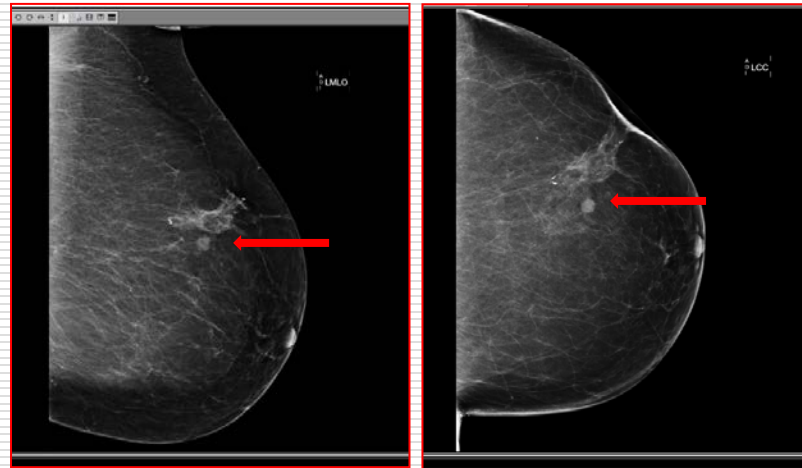


8.4.2010

STG 25.05.2007

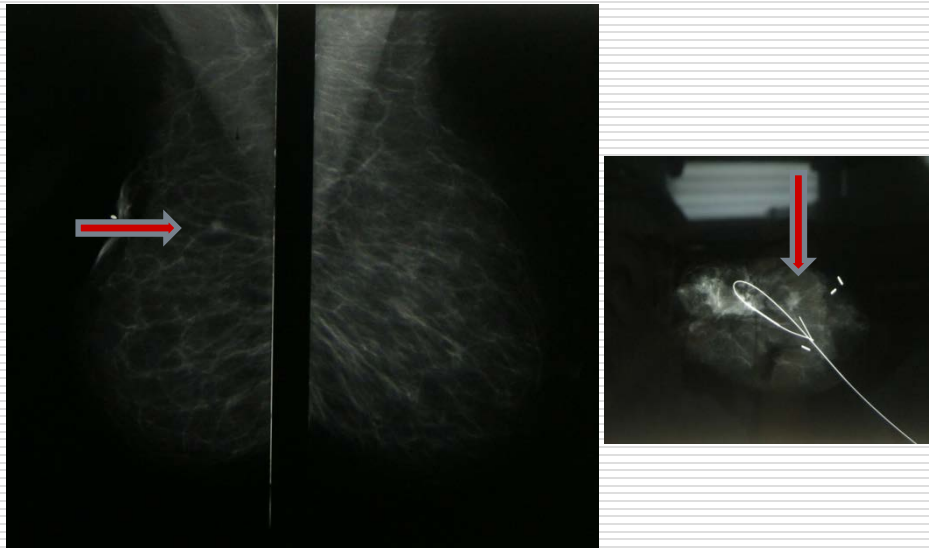


**5/2007
At diagnosis**

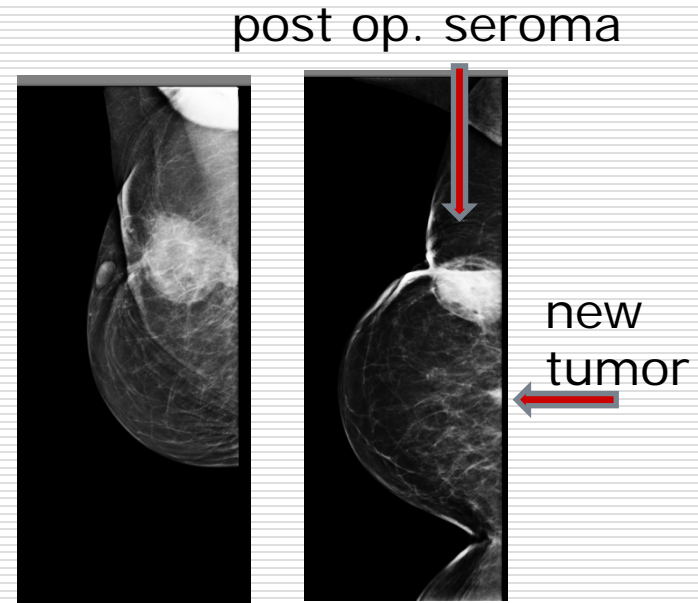


**1/2010
Local recurrence**

ART 26.08.2009



**8/2009
At diagnosis**

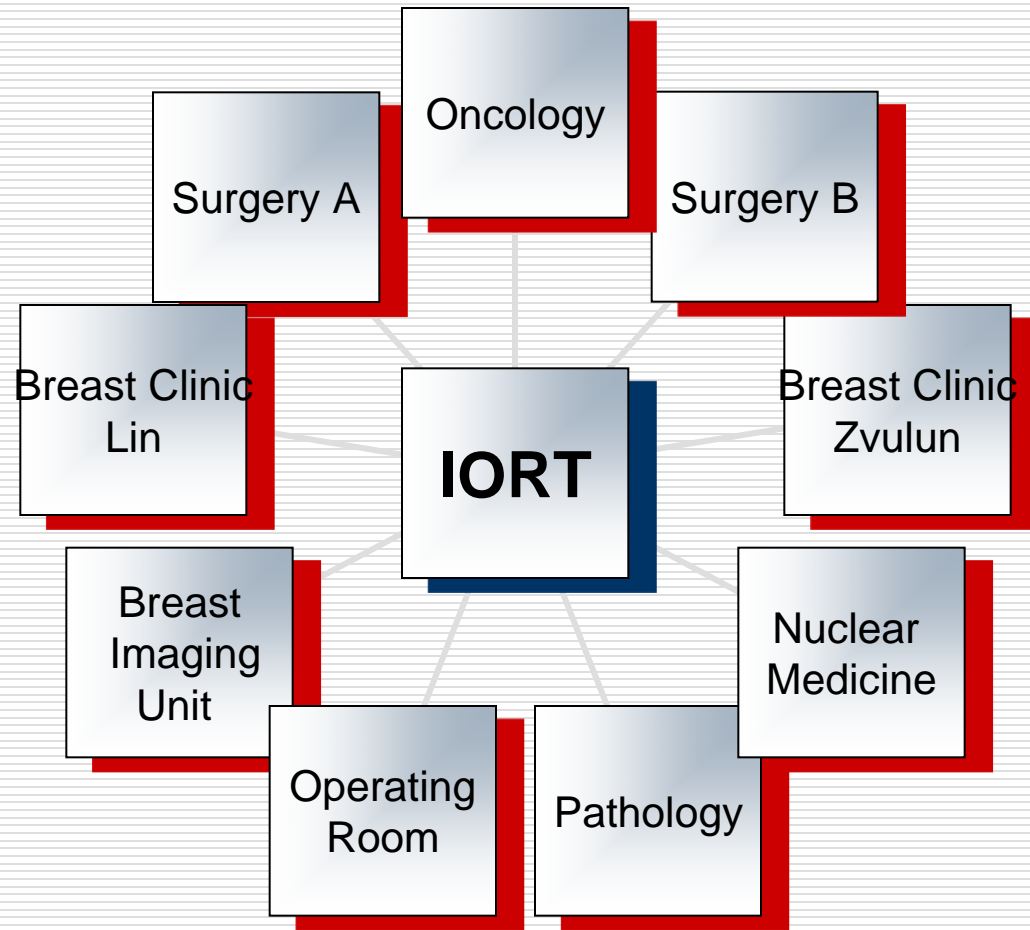


**1/2012
New primary tumor**

Conclusions

- Intraoperative radiotherapy in early breast cancer is feasible in specialized breast cancer centers
- It may offer a convenient alternative to WBRT in well selected patients
- Clinically significant local morbidity rate is low
- Preliminary results are promising
- Our data are consistent with other published figures
- Longer follow up and new data are still necessary in order to establish the implication of this approach into daily practice

Thanks



Acknowledgements to Prof Michael Baum, University College, London, UK



Thank You