

Possibility of Replacement of Whole Breast Radiotherapy with Accelerated Partial Breast Irradiation for Treatment of Early Stage Breast Cancer

Olga Utehina, Sergejs Popovs, Juris Berzins

Latvian Oncology Center of Riga Eastern Hospital, 4, Hipokrata st., Riga, LV-1079, Latvia

Breast cancer in Latvia

- Breast cancer is at the 2nd place for whole population and at the 1st place for women
- 1012 new breast cancer cases were detected in Latvia in 2005
- Breast cancer epidemiology in Latvia
 - 58.6 on 100 000 inhabitants in 1995
 - 80.4 on 100 000 inhabitants in 2005
- 3rd place in terms of lethality
 - In 1995 – 27.4 on 100 000 inhabitants
 - In 2005 – 36.2 on 100 000 inhabitants
- 9884 women with breast cancer were registered in Latvian Cancer Register in 2005
 - 29.2% - I stage
 - 49.8% - II stage
- 103 breast conserving surgeries were performed at Latvian Oncology Center in 2005

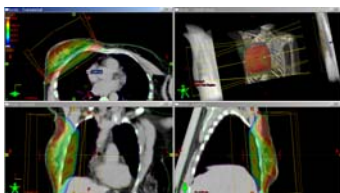
Purpose of current study was to search for a link between volume of the patient's breast and complication probability for normal breast tissue and lung during postoperative external beam whole breast irradiation

Materials and methods

- Treatment plans of 50 patients, who had received whole breast irradiation after breast salvaging surgery in REH Latvian Oncology Center during 2005, were retrospectively analyzed
- 3D treatment planning with individual dose optimization was performed for all patients
- In all cases tangential photon fields (4 – 6 MV) with wedges and MLC were used
- Treatment plan parameters under analysis:
 - dose maximum – Dmax (% from prescribed dose)
 - treated volume – TV (cm³)
 - volume receiving more than 105% of prescribed dose – V105 (cm³)
 - V105 and TV ratio – V105/TV (%)
 - lung volume receiving more than 20 Gy – V20 (cm³)
- Treated Volume (TV) is directly linked with the volume of irradiated breast and has been taken as independent variable in the current study
- Dose maximum and it's absolute and relative volumes were used as predictor of normal breast tissue complications
- Lung volume receiving more than 20 Gy was used as predictor of lung complications

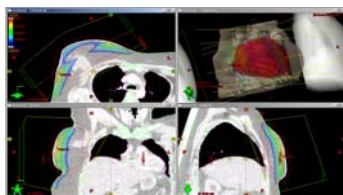
Results and discussion

Whole Breast Irradiation
Clinical Example I



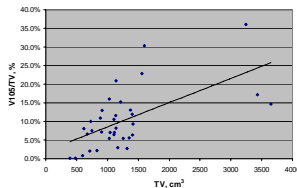
Dose visualized with colorwash: 95.0% - 103.0%

Whole Breast Irradiation
Clinical Example II



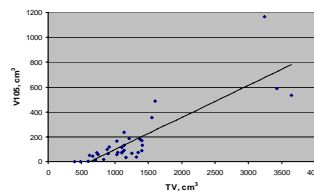
Dose visualized with colorwash: 105.0% - 115.1%

Ratio of Volume 105% and Treated Volume (V105/TV) as a function of TV



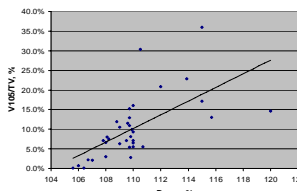
$r = 0.606; p = 0.001$

Volume 105% (V105) as a function of Treated Volume (TV)



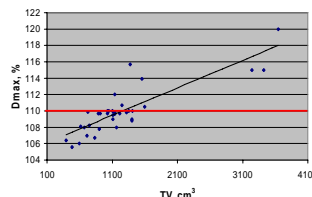
$r = 0.845; p < 0.0001$

Ratio of Volume 105% and Treated Volume (V105/TV) as a function of Dmax



$r = 0.845; p < 0.0001$

Dmax as a function of TV

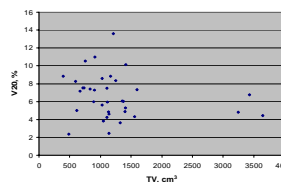


$r = 0.848; p < 0.0001$ 23% - Dmax > 110%

Correlation of variables with treated volume (TV)

Variable	Correlation	r, p-value
Dose maximum (Dmax, %)	Significant	$r = 0.848; p < 0.0001$
Volume receiving > 105% of prescribed dose (V105, cm ³)	Significant	$r = 0.845; p < 0.0001$
Ratio of V105 and TV (V105/TV, %)	Significant	$r = 0.606; p = 0.001$
V20 lung	Not significant	$r = -0.188; p = 0.279$

Lung volume receiving more than 20 Gy (V20) as a function of TV



$r = -0.188; p = 0.279$

Conclusions

- With increase of Treated Volume, Dose Maximum and volume of Dose Maximum are rising unavoidably, and complications probability is increasing
- Due to technical limitations it is not possible to develop plans with homogenous dose distributions and to avoid dose maximums above 110% for patients with large breast volume in case of whole breast irradiation with tangential fields
- For a carefully selected group of patients with large breast volume other postoperative radiotherapy delivery/treatment methods such as Intensity Modulated Radiotherapy or Accelerated Partial Breast Irradiation could be recommended
- In the case of postoperative whole breast irradiation, lung complication probability is not linked to breast volume