Localization of the Surgical Bed Following Tumorectomy Using Magnetic Resonance and Computed Tomography Scan Fusion for Planification of Breast Interstitial Brachytherapy

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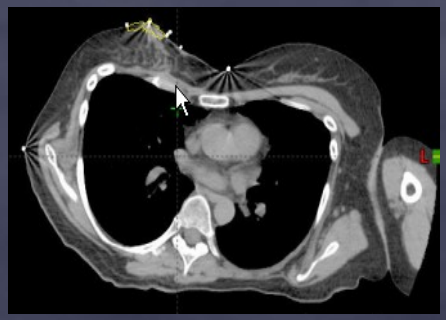
Introduction

- Several methods of surgical cavity localization
  - Intraoperative
  - Postoperative
    - CT-Scan for pre-treatment dosimetry
      - Difficult to differentiate mammary ducts from the fibrosis associated with surgical bed

- MRI: allows differentiation between mammary ducts and fibrosis
  - Problems: Diagnostic MRIs of the breast are typically performed in the prone position
    - Fusion between the planning CT-scan and MRI images is therefore not possible

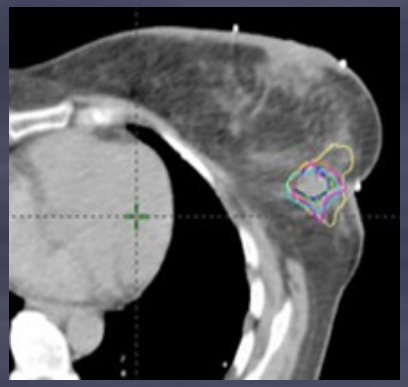


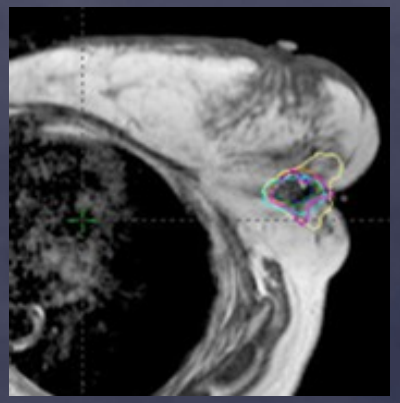
Objectives

- To perform a breast MRI in the supine position
- To fuse the acquired MRI images of the breast with the planning CT-Scan images
- To compare the volumes and locations of the surgical beds defined on each of the two modalities
- To evaluate the variation in the delineation of the surgical bed between three independent physicians

Material and Methods

- Patient placed in supine position
- Vacc-lock used as immobilisation device
- Fiducial markers placed
- Planning CT-Scan and MRI images were acquired using a breath holding technique, in the same treatment position.
- Fusion of images: *ECLIPSE* planification software
- Delineation of the surgical bed on CT-Scan and MRI images by three independent physicists





Results

- Preliminary results: 14 patients were enrolled and completed this prospective study.

Intra-Observer Variation in the Surgical Bed Volumes (cc)

Patients	Observer 1		Observer 2		Observer 3	
	CT	MRI	CT	MRI	CT	MRI
Mean	**30,31**	**19,25**	**20,19**	**13,27**	**22,96**	**15,04**
Difference	**37%**		**34%**		**34%**	

Results

Inter-observer Variation of Surgical Bed Volumes

	CT-Scan	MRI
Physician 1 vs 2	33%	31%
Physician 1 vs 3	24%	22%
Physician 2 vs 3	12%	12%

Comparison between location of surgical bed defined on CT images and MRI images

	Overlaping percentage
PHY 1	71%
PHY 2	81%
PHY 3	72%

Conclusion

- Supine breast MRI and image fusion with the planing CT are possible
  - MRI images permit adequate visualization of the surgical bed
  - The volumes defined on MRI seem smaller than on CT but location remains the same
- We propose that CT-MRI fusion may help in the delineation of the surgical cavity in view of partial breast irradiation.
- The sample size necessary for statistical evaluation has not yet been reached
  - The clinical impact of these preliminary results remains to be determined