

Background

- Radiation has been established as an integral modality in adjuvant therapy of radically resected adenocarcinoma of the stomach and gastroesophageal junction
- With limited published data, an arbitrary PTV margin of 1 cm has been used at Princess Margaret Hospital
- This carries the potential of under coverage or excess toxicity

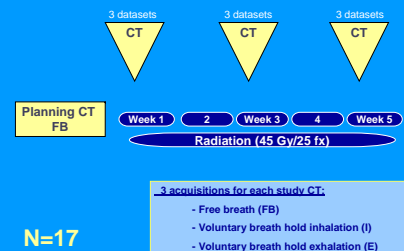
Objectives

- Quantify interfraction motion of abdominal organs during adjuvant 3D conformal RT for gastric adenocarcinoma
- Assess stability in different breathing states
- Quantify displacement due to respiratory motion

Materials and study design

- 17 patients undergoing adjuvant radiation for gastric cancer have been accrued (of 20 planned)
- Patients undergo the planning CT scan and each treatment in freebreath state, immobilized supine in bodyfix
- A standard light meal is taken an hour prior to scan/treatment
- Patients undergo additional CT scans in week 1, 3 and 5 in 3 acquisitions: free breath, voluntary breath hold inhalation and voluntary breath hold exhalation

Figure 1. The design of the study



Methods

IMAGE FUSION

CT scans are imported into the Pinnacle planning system version 6.2, and fused to the planning CT scan using an algorithm for bone registration

Figure 2. Fusion of planning (grayscale) and exhalation (inverse grayscale) scans illustrating the displacement of the left kidney

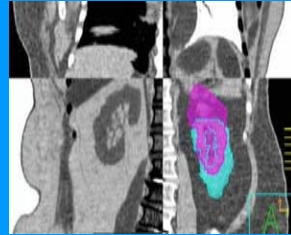


Figure 3. Location of the analyzed regions of interest (ROIs).



- Each ROI is contoured on planning CT scan and all study scans
- For each ROI represented by a volume, the center of mass is placed
- The position of each point of interest is documented in the right left (RL), craniocaudal (CC) and anterior posterior (AP) directions

Results

Figure 4. Interfraction displacement of organs on free breath scans in the cranial-caudal direction (mm)

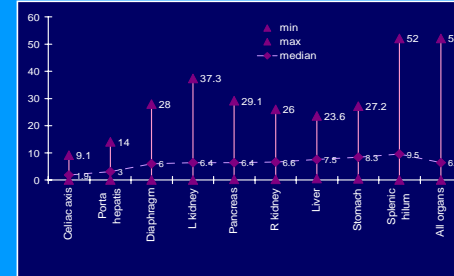


Figure 5. Interfraction displacement of all organs (mm)

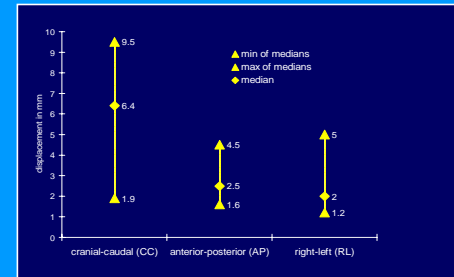
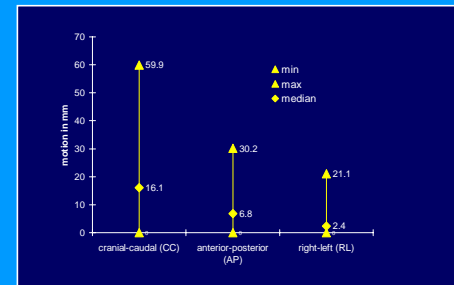
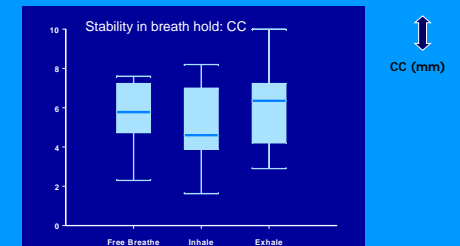
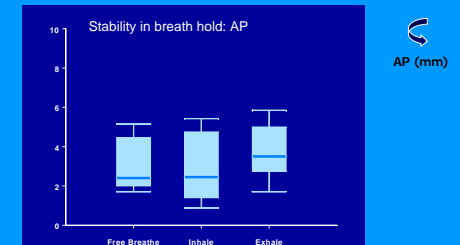
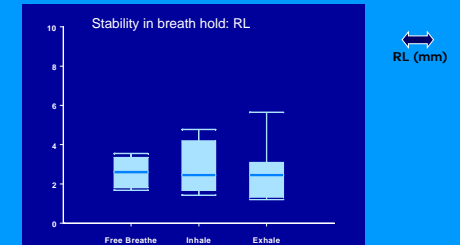


Figure 6. Respiratory motion (difference in position on inspiration vs. expiration scans) in mm



Results

Figure 7. Interfraction displacement in RL, AP and CC directions of all organs (boxes – 50th centile; whiskers – 95th centile)



Conclusions

- Displacement of abdominal organs can be substantial in individual patients
- In the absence of ABC, no clear advantage of voluntary breath hold over free breathing was seen
- PTV margin of 1 cm is reasonable for most patients
- Individualized and/or adaptive planning may be beneficial