Volumetric change of selected organs at risk during IMRT for oropharyngeal cancer.


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Paper Selection

- Volumetric change of selected organs at risk during IMRT for oropharyngeal cancer.
  - Shows one existing method of dose-toxicity analysis
  - Exemplifies the limited visual options to analyze the adverse effects of radiotherapy
  - Analyzes physiological effects of volume changes to organs at risk
Radiotherapy Dose-Toxicity Analysis User Interface

- Problem: Limited radiation therapy analysis options for oncologists and radiologists who are not experienced in programming

- Goal: Design a web-based user interface for:
  - Rendering 3D representations of organs
  - Segmenting these organs
  - Performing Dose-Volume toxicity analysis on these segments

(a) Average dose distribution
Problem Summary

■ IMRT must be applied from a variety of angles in order to deliver radiation effectively throughout the tumor(s)
■ Radiation has adverse anatomical/physiological effects on organs nearby
■ Effects are particularly extensive in oropharyngeal cancer.
  – *Due to the variety of functions around mouth and upper neck*
Background Information

Anatomy of the Salivary Glands

- Lymph nodes
- Parotid gland
- Tongue
- Sublingual gland
- Submandibular gland
Key Results and Significance

- cMM: contralateral masticatory muscle
- iMM: ipsilateral masticatory muscle
- cSCM: contralateral sternocleidomastoid
- iSCM: ipsilateral sternocleidomastoid
- cPG: contralateral parotid gland
- iPG: ipsilateral parotid gland
- cSMG: contralateral submandibular gland
- iSMG: ipsilateral submandibular gland
- TG: thyroid glands
- CM: constrictor muscle
- L: larynx
Experiment

- Patients underwent weekly CT scans during IMRT in addition to the planning CT scans
- Treatment consisted of weekly doses of IMRT for 7 weeks
- A single observer contoured each organ in CT scans
- Volumes were then computed using Phillips Radiation Oncology tools
  - Also used to overlay previous contour to help facilitate following contours
Paper Assessment

■ Pros
  - Extensive description of the workflow of the experiment
  - Provided insightful analysis on the effects of radiotherapy on head and neck organs from a volume perspective
  - Provided explanations for the different effects of IMRT on organs at risk

■ Cons
  - Most of the segmentation and contouring had to be done manually
  - Volume computation is separate from dose distribution software
  - Analysis of these effects cannot be regionally analyzed for different dose distributions
Conclusions

- Paper was successful in analyzing volume changes in response to IMRT for oropharyngeal cancer
- Demonstrated limitations of manual contouring/segmentation

Next Steps
- Build a more automated tool to contour organs in a CT scan
- Create a user interface to allow oncologists and radiologists to analyze organ volume or functional changes
- Analyze how different dose applications affect organ functions
THANK YOU