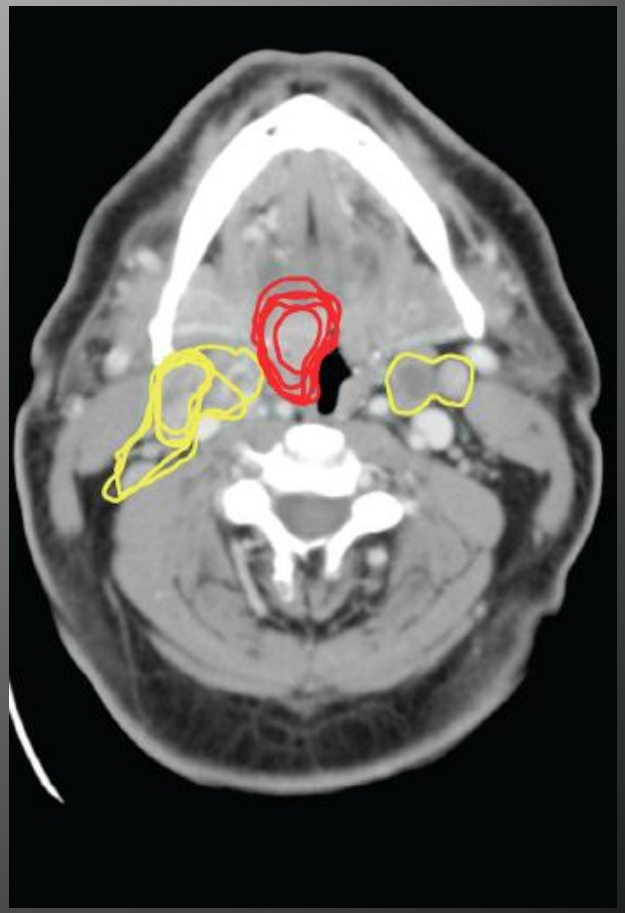
Prospective Evaluation of an Online Atlas-Based Educational Intervention on Head and Neck Organ-At-Risk (OAR) and Lymph Node Level (LNL) Contouring: A Pilot Feasibility Study Using Web-Based Feedback and Analytic Software

Clifton D. Fuller, MD, PhD[1, 5], Jayashree Kalpathy-Cramer, PhD[2, 5], Jehee Choi, MD[3], Emma Ramahi, MD[1,3], Virginia Clyburn, MD[3], Abhilasha Patel, MD[3], Elizabeth Maani, MD[3], Anna Harris, MD[3], Daniel Baseman, MD[1,4], William E. Jones, III, MD[3] , K. Kian Ang, MD, PhD[1] , David I. Rosenthal,MD[1]

[1-] University of Texas MD Anderson Cancer Center, Houston, TX, USA.
[2-] Massachusetts General Hospital, Boston, MA, USA.
[3-] University of Texas Health Science Center at San Antonio, San Antonio, TX, USA.
[4-] 21st Century Oncology, Asheville, NC, USA.
[3-] Dept. of Radiation Medicine, Knight Cancer Institute, Oregon Health & Science University, Portland, OR, USA.

Purpose

- Head & neck contouring of lymph node levels (LNLs) and organs-at-risk (OARs) is time consuming and operator dependent
- We wanted to determine if an online atlas paired with real-time feedback designed to would reduce interobserver variation of head and neck (H&N) OAR and LNL regions-of-interest (ROIs) in resident trainees.



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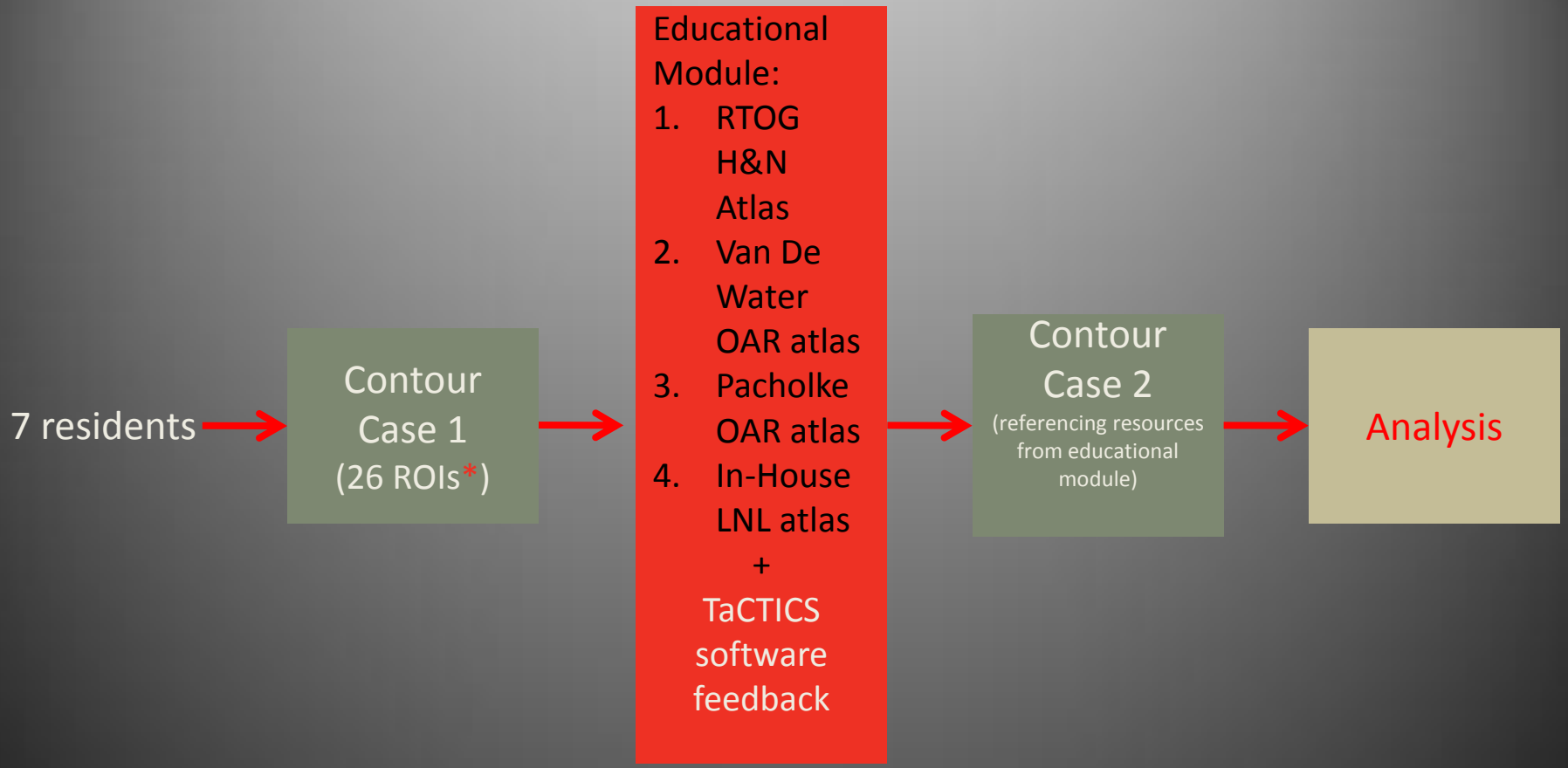
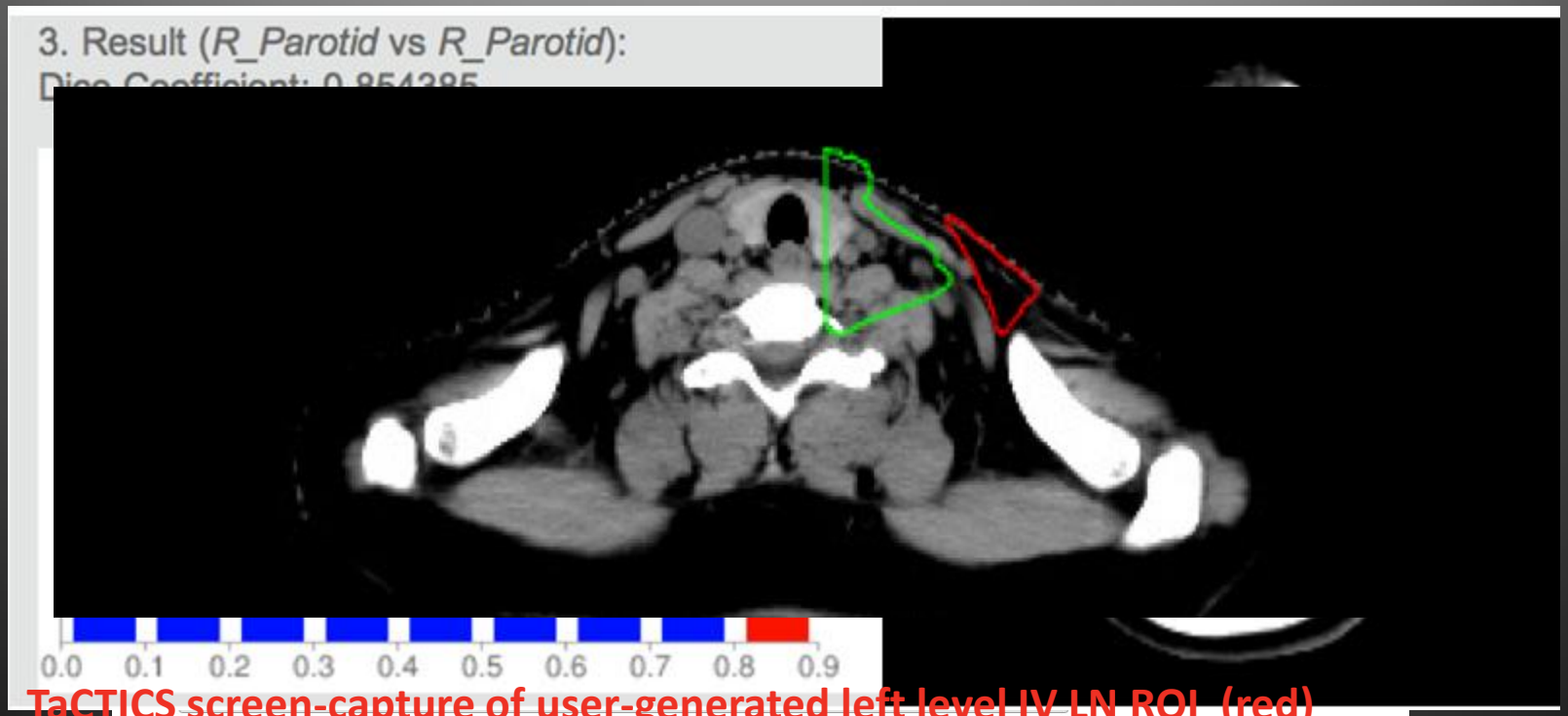
Study design



*Residents contoured the bilateral level I-V and retropharyngeal LNLs, parotid, sublingual and submandibular glands, middle ear, vestibular apparatus, cochleas, upper and lower lips, and soft palate for each case

TaCTICS software

- Target Contour Testing/Instructional Computer Software (TaCTICS)
  - Gives near real-time semi-automated scoring (using Dice similarity index) and axial slice comparison of trainee ROIs with acceptable (“caution”) and unacceptable (“flag”) reference contours.



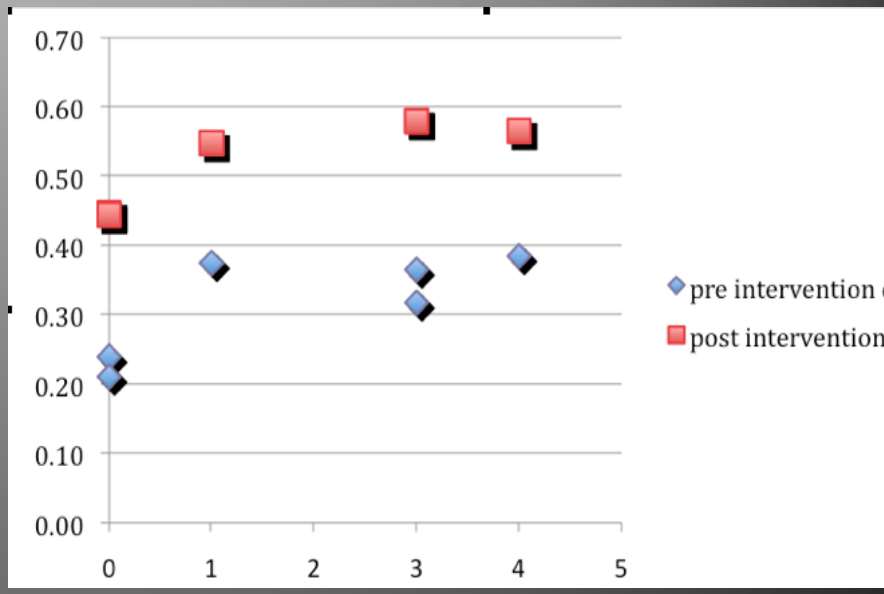
TaCTICS screen-capture of user-generated left level IV LN ROI (red) comparison with Reference Flag ROI (green), exceeding “acceptable anatomic contour range”; major deviation would result in credentialing “flag” (red).

Screenshot of graphical Dice similarity coefficient histogram output for observer feedback of a given observer (red bar; left) and axial slice ROI overlay (right; reference contours in green, observer in red).

Screenshot of the TaCTICS user interface

Results

- Interobserver differences decreased for 23/26 ROIs
- Interobserver differences decreased to statistically significant level ($p<0.05$) for bilateral LNLs I-IV, parotids, and submandibular glands.
- Educational module use standardized ROIs between users, so residents contoured more like one another.
- The effect was greatest for novice residents (incoming PGY1)
- 66% of residents reported software feedback as “helpful/extremely helpful”
- 100% deemed atlases “helpful/extremely helpful”.
- 100% reported they would like to use TaCTICS to track contouring skills over residency.



Average Dice similarity coefficient by year of residency training

Conclusions

- An atlas-based intervention combined with real-time software feedback was feasible and resulted in more uniform ROI contours.

- This suggests that online training modules might be constructed with TaCTICS to allow self-assessment of OAR/LNL/target delineation for resident trainees, and for cooperative group clinical trial credentialing.