

Contralateral parotid volume as an objective marker for adaptive radiotherapy in head and neck cancer



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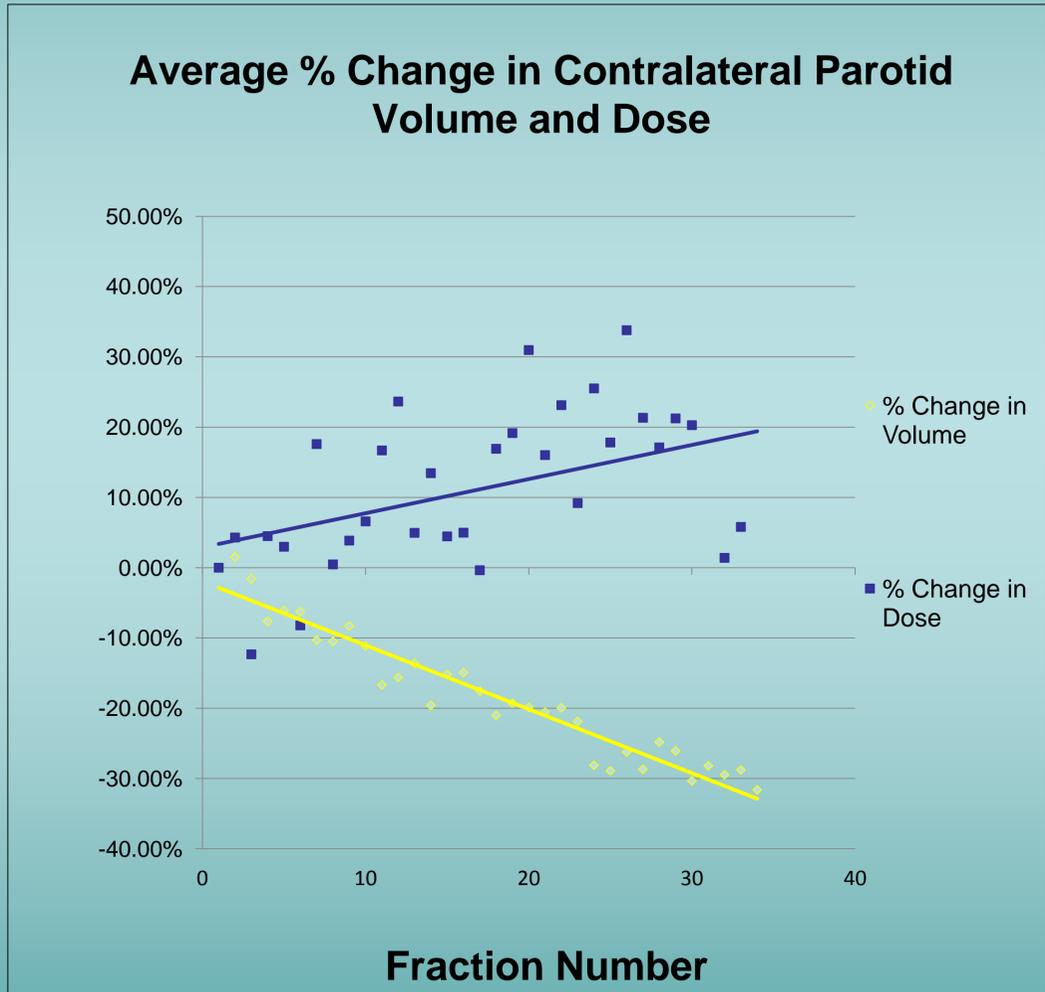
BACKGROUND

Deformable image registration simplifies the process of adaptive radiotherapy and allows for sophisticated dosimetric analyses of anatomic changes. Lacking is an objective measurement that could reliably predict for undesirable dosimetric changes during a course of radiotherapy. The specific aim was to analyze changes in contralateral parotid volume and correlate these changes to mean dose delivered to the parotid. Linear decreases in parotid volume may predict for linear increases in parotid dose.

METHODS

Treatment planning CT scans were registered to 35 daily CBCT's for four patients using a sequence of rigid and deformable registrations. Contralateral parotid contours were resampled and a deformed reconstruction of the planning CT was exported to the Eclipse treatment planning software. The original fluence map was re-computed on the reconstructions. Mean dose percent change and mean volume percent change for contralateral parotid volumes were calculated for all CBCT's and averaged across all patients. Average mean dose percent change was plotted against average mean volume change and evaluated with simple regression analysis.

Average % Change in Contralateral Parotid Volume and Dose



RESULTS

A mean of 31 CBCT's per patient were evaluated. Contralateral parotid volume percent changes for all patients were -31%, -40%, -40%, and -22% with a mean percent change of -33%. Mean dose percent changes were 25%, 35%, 19%, and 25% with a mean percent change of 26% and a mean absolute dose increase to the parotids of 6.8 Gy. Simple regression analysis identified a coefficient of determination (R^2) of 0.23 where the independent variable is volume percent change and the dependent variable is mean dose percent change.

CONCLUSION

Daily or weekly volume assessment of critical volumes is feasible utilizing deformable image registration and CBCT. Our data suggests there may be a correlation between parotid volume changes and increases in mean parotid dose though no causality is inferred. This relationship could be useful as a simple objective volumetric threshold measurement to prompt adaptive re-planning and warrants further investigation.



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