

2469 Automatic Contouring Of Vital Swallowing Structures Using An Atlas-based Segmentation Method: A Time Saving And Toxicity Assessment

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Purpose/Objective(s): Long term dysphagia after radiation therapy has been associated with high doses to the pharyngeal constrictor muscles and larynx and efforts to decrease the dose to these structures have been studied. In addition radiation induced dysphagia has been shown to cause increased thickness of these muscles. Properly contouring these structures on CT is difficult and time consuming. The purpose of this study is to evaluate the utility of atlas based segmentation (ABS) in time saving in the pretreatment patient and in the assessment of toxicity in the post-treatment patient.

Materials/Methods: Commercially available software was used for atlas creation and automatic ABS (MIMvista Corp, Cleveland, OH.) The custom atlas contained a library of 10 patients (8 NPX and 2 Paragangliomas) from fused CT/MRI T2 weighted scans. The structures included were: the superior constrictor (SC), middle constrictor (MC), inferior constrictor (IC), larynx and the proximal 1cm of the esophagus. On MRI, a 5 mm brush size was found to have the best fit for the SC muscles and therefore was used for the CT scan contour. 11 new patients were then randomly selected for comparison of ABS vs. manual contouring. For each patient, the best fit atlas subject was automatically selected and contours were deformed on to the CT scan. Each contour was then edited by the author (EL). The same patient was manually contoured by the same author (EL). The time for correction of the automatic contour and the manual contour for each patient was recorded. The one sided and two sided student t test was used for statistical assessment. For the assessment of toxicity, 2 patients with known grade 3 pharyngeal toxicity pre and post radiation treatment scans were analyzed. ABS contours were created and corrected, and the total volumes of the structures were measured.

Results: 11 pretreatment scans were studied (6 OPX and 5 NPX). ABS resulted in a time reduction in 10 out of 11 patients. The one patient without time savings had a T4 hard palate mass, which resulted in poor automatic contouring of the SC muscles. Excluding the aforementioned patient, the total time was 394 sec for ABS vs. 511 sec for the manual. The timesaving ratio was 21%, 25% and 23% for the OPX, NPX and the total group respectively (one sided t test p=.05, two sided t test p=.10). In the two patients with known dysphagia, ABS contours demonstrated an increase in the total volume of SC, MC and IC muscles.

Conclusions: In the pretreatment patient, ABS afforded a time saving in contouring of these important functional swallowing muscles. In the post-treatment patient, ABS was an accurate and quantitatively useful tool in contouring constrictor muscles for assessment of treatment toxicity.

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