T1 and Volumetric Q-MRI of the Major Salivary Glands: Effects of Aging (Preliminary Results in 41 Subjects Over the Human Lifespan)

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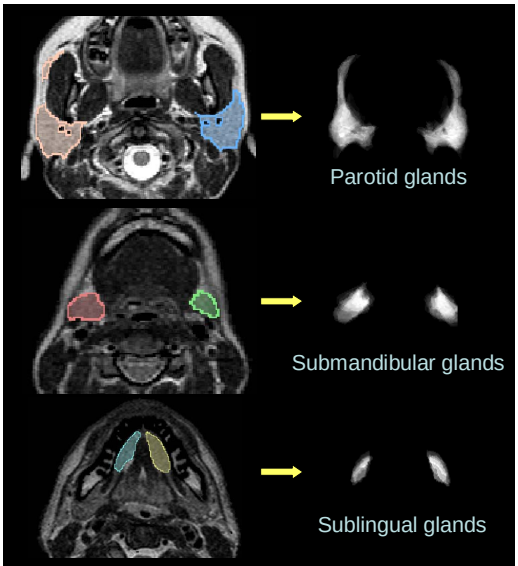

Fig. 1 Segmentation of the salivary glands

Introduction: The aging of the salivary glands have been studied quantitatively by using various imaging modalities. It has been reported that an aging decrease in the volume of parenchyma accompanied by an increase of adipose tissue and connective tissue (**Ref.** 1-3). Most of the quantitative MR studies of salivary glands have been performed with the apparent diffusion coefficient from diffusion weighted MR imaging sequences. Age-related T2 changes in the salivary glands have been also studied (**Ref.** 4).

Purpose: To study age-related dependencies in T1 relaxometry and volumetry of the salivary glands; parotid, submandibular, and sublingual glands, over the full human lifespan.

Materials and Methods: The protocol was approved by the IRB of our institution, and all subjects were consented following NIH HIPAA guidelines. Forty one subjects (6 months - 87 years old) who underwent MRI of the head for various reasons unrelated to the salivary glands were imaged at 1.5T with the mixed-TSE pulse sequence (**Ref.** 5). Image datasets with motion artifacts and low signal intensity were excluded. Parotid glands, submandibular glands, and sublingual glands were segmented manually using 3D Slicer (version 2.6, http://www.slicer.org/) (**Fig.** 1). Q-MRI algorithms were programmed by MathCAD 2001i (PTC, Needham, MA). T1 relaxation time histogram of the each salivary gland was generated and modeled with gaussian functions: peak values were recorded and plotted as a function of age. Volumes were calculated from the T1 histograms.

Results: 82 parotid glands, 52 submandibular glands, and 50 sublingual glands (age range: 6 months - 87 years old, average: 34.4 years old) were segmented and T1 histograms were successfully generated from the segmented T1 maps. Overall, the T1 distribution of the parotid glands had shorter peak T1s than the submandibular and sublingual glands (see for example **Fig.** 2). The T1 histograms of all subjects are shown in **Fig.** 3 as a function of increasing age. Glandular tissue showed very subtle age-related changes throughout life and notable subject-to-subject differences are seen. Volumetry: all salivary glands grow in volume over the full human lifespan. Preliminary observations appear to show two distinct rate of growth after 60 years of age (**Fig.** 3).

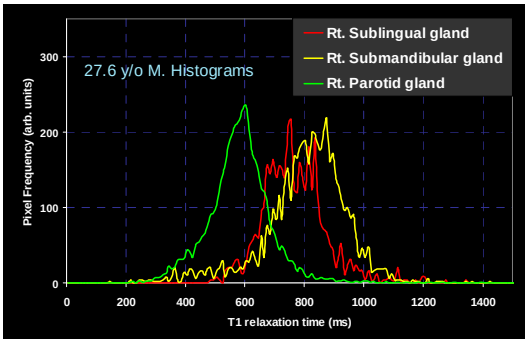

Fig. 2: T1 histograms of a selected subject. Similar histogram relations were observed for most subjects.

Conclusion: Intersubject variability in T1 relaxometry appears to exceed, and therefore obscure age-related changes. On the other hand, volumetry shows clear aging growth patterns for all three glands. Two different growth patterns are observed for the older subjects (>60 years of age).

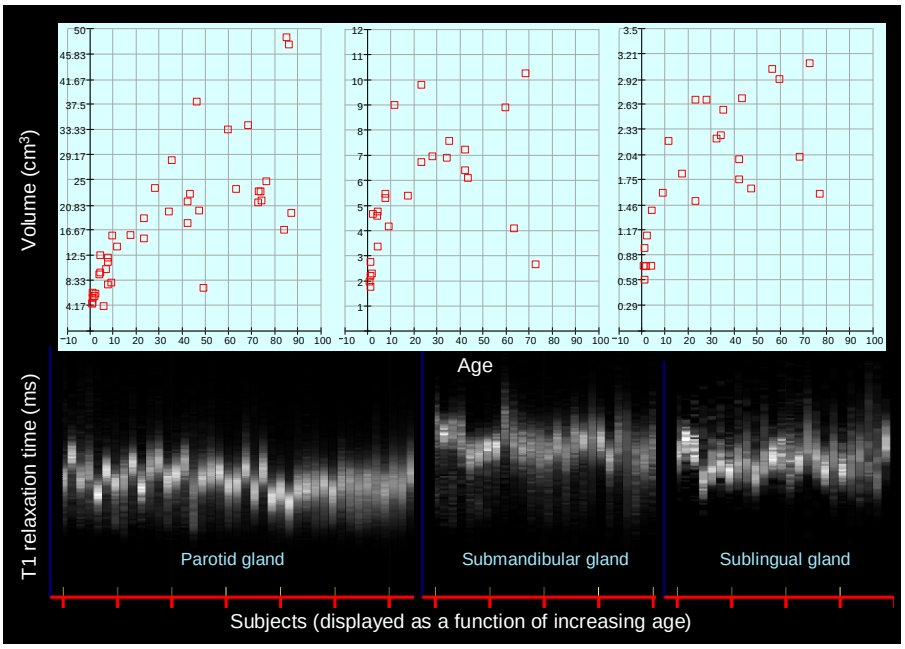

Fig. 3: Volumes and T1 histograms of all subjects for three major salivary glands.

References:

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