Purpose/Objective(s): Xerostomia (dry mouth) is one of the most common side effects of head and neck cancer radiotherapy (RT) and could severely affect patients’ quality of life. The goal of this study is to investigate sonographic features as potential imaging biomarkers to assess parotid gland injury and xerostomia in post-radiotherapy head and neck cancer patients.

Materials/Methods: Fourteen participants, including 6 healthy volunteers and 8 post-radiotherapy head and neck patients, were enrolled in an IRB-approved cross-sectional study. Among the 8 head and neck patients, the median RT dose was 23.8 Gy (range 5.2 to 36.6 Gy) to the left parotid and 31.3 Gy (range 23.6 to 58.9 Gy) to the right parotid. The median follow-up time since completion of RT was 15.1 months (range 12.2 to 17.9 months). Each participant underwent one high-resolution (14 MHz) ultrasound study of their bilateral parotids. Longitudinal (vertical) ultrasound scans were performed of the bilateral parotids. Left and right parotid glands were contoured on the ultrasound B-mode images. Sonographic features of the parotid glands including homogeneity and echogenicity were evaluated with texture analysis method. Ultrasound finding were compared with clinical assessment of xerostomia using Dische morbidity recording scheme.

Results: Substantial differences were observed in parotid gland sonographic features between post-irradiation patients and healthy volunteers. The normal parotid glands appeared homogeneous and demonstrated increased echogenicity relative to adjacent muscles on the ultrasound images. In 7 out of 8 patients, increased heterogeneity and decreased echogenicity relative to adjacent muscles were observed in post-irradiated parotid glands: both may have resulted from fibrotic changes. These sonographic features of the parotid glands correlated to the dry mouth symptoms patients experienced.

Conclusions: This pilot study has demonstrated the feasibility of ultrasonic evaluations of parotid gland radiation effect. The sonographic features of decreased relative echogenicity and heterogeneity of echotexture may serve as a correlative imaging biomarkers to assess xerostomia.