Dysbiosis of the Oral Microbiome due to Radiation Therapy in Patients with Squamous Cell

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Intensity-Modulated Radiation Therapy (IMRT) is a novel cancer treatment. Tomotherapy, a type of IMRT, is a patient specialized radiation treatment plan that is more precisely concentrated in efforts to avoid unnecessary cytotoxic effects to the surrounding, noncancerous cells. Tomotherapy has been proven to reduce cytotoxicity, but the effects that the radiation has on the oral microbiome have gone uninvestigated. In efforts to understand the bacterial health of patients currently in treatment, human saliva samples were collected from three patients receiving Tomotherapy for head and neck cancers at three different periods during treatment. A DNA sequencer was used to read the microbiome of the patients, providing the bacterial population from each sample. Data analysis revealed a correlation across all three patients between the first and last treatments, providing evidence that bacterial health was detrimentally affected by Tomotherapy. During the first treatment, all three patients had a microbiome largely composed of Rothia mucilaginosa, a typical bacteria for healthy individuals. However, during their final treatment, a significant amount of healthy bacteria were lost and there was an abundance of Streptococcus spp. and Klebsiella spp. Both are bacteria commonly associated with unhealthy individuals. This study demonstrated that even with specialized treatments, radiation is toxic to bacteria and oral flora, and favors pathogen development in the oral microbiome.

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