

Effect of irradiation on the rat parotid gland: a study involving transmission electron microscopy

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A common side effect of radiotherapy used in the treatment of oral cavity cancer is structural and physiological alteration of the salivary glands occurring due to exposure to ionizing radiation. This is evidenced by conditions such as decreased salivary flow. The current study aimed to evaluate ultrastructural alterations in the parotid glands of rats. 10 adult male Wistar rats, were separated into 2 groups. Animals in group I were not subjected to ionizing radiation, whereas those in group II received 1500 cGy fractionated doses. All animals were anesthetized through intramuscular injection of ketamine/xylazine/acepromazine. Subsequently, study animals were exposed to gamma radiation emitted from a Cesium-137 radioactive source positioned at a distance of 20 cm from the skin surface. The animals were sacrificed and the parotid glands were removed. In preparation for transmission electron microscopy, the glands were fixed in glutaraldehyde solution (2.5%), then fixed again in uranyl acetate (0.5%), dehydrated, embedded in paraffin and cut into semi-thin and ultra-thin longitudinal sections for analysis. In the ultrastructural analysis, the acinar cells of the parotid glands from group II animals showed various alterations in the cytoplasmic organelles. Similarly, the granular endoplasmic reticules in group I samples were rectangular and dense, whereas those in group II samples presented some expanded portions. The mitochondria in group I samples were of various sizes and morphology, but maintained the parallel aspect of the outer membrane and dense areas of chromatin was observed at the periphery of the nucleus. In group II samples, in addition to intramitochondrial vacuolization, complete disruption of the outer mitochondrial membrane was observed, suggesting degeneration of the organelle. In the acinar cells of irradiated animals, widely dispersed cytoplasmic vacuolization was observed. In some cases, this vacuolization displaced the nucleus from its original position. Intercellular unions, characterized by desmosomes and interdigitation, were also evaluated. In group I samples, the integrity of the desmosomes was preserved, as it was in samples from irradiated animals. Ionizing radiation promotes alterations in the glandular parenchyma, and that these alterations are directly related to the dose level of absorbed radiation. Certain phenomena that appear in the cytoplasm and nuclear material indicate that ionizing radiation leads to acinar cell death.

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