

Article

Histological and Molecular Biological Changes in Canine Skin Following Acute Radiation Therapy-Induced Skin Injury

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Simple Summary: This study focused on understanding how radiation therapy, a common treatment for cancer, affects the skin of dogs. While radiation is effective at destroying cancer cells, it can also cause damage to healthy skin, leading to various side effects like redness, peeling, changes in skin color, and sores. Over nine weeks, we monitored these skin changes in dogs, observing that radiation led to increased inflammation and stress in the skin cells, as well as significant disruptions in how skin cells grow and heal. We also noticed changes in specific proteins and genes related to skin inflammation, healing, and cell death. These findings help us better understand how radiation therapy impacts the skin and provide valuable information for managing these side effects in dogs.



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Abstract: Radiation therapy is a crucial cancer treatment, but it can damage healthy tissues, leading to side effects like skin injuries and molecular alterations. This study aimed to elucidate histological and molecular changes in canine skin post-radiation therapy (post-RT) over nine weeks, focusing on inflammation, stem cell activity, angiogenesis, keratinocyte regeneration, and apoptosis. Four male beagles received a cumulative radiation dose of 48 Gy, followed by clinical observations, histological examinations, and an RT-qPCR analysis of skin biopsies. Histological changes correlated with clinical recovery from inflammation. A post-RT analysis revealed a notable decrease in the mRNA levels of Oct4, Sox2, and Nanog from weeks 1 to 9. VEGF 188 levels initially saw a slight increase at week 1, but they had significantly declined by week 9. Both mRNA and protein levels of COX-2 and Keratin 10 significantly decreased over the 9 weeks following RT, although COX-2 expression surged in the first 2 weeks, and Keratin 10 levels increased at weeks 4 to 5 compared to normal skin. Apoptosis peaked at 2 weeks and diminished, nearing normal by 9 weeks. These findings offer insights into the mechanisms of radiation-induced skin injury and provide guidance for managing side effects in canine radiation therapy.

Keywords: canine; clinical change; quantitative real-time PCR; radiation therapy-induced injury

1. Introduction

Radiation therapy stands as a prominent treatment modality for various types of cancer and is often utilized in conjunction with chemotherapy and surgery in the fields of