EFFECT OF GAMMA RADIATION ON THE DENTAL PULP OF ALBINO RATS

Light and Electron Microscopic Study

Thesis Submitted to Faculty of Dentistry - Ain Shams University in Partial Fulfillment of the Requirements for Doctorate Degree in Oral Biology

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Dedication

To the souls of my parents and my dear brother, to my dear husband and my lovely kids (Noreen and Yaseen)

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List of Abbreviations

Rad	Radiation absorbed dose
Gy	Gray
cGy	Centi-Gray
γ-rays	Gamma rays
µm	micrometer
EDTA	Ethylene diamine tetra-acetic Acid
Fig.	Figure
Gp	Group
wks	Weeks
H&E	Haematoxylin and Eosin
mm	millimeter

TMJ Tempero-Mandibular Joint

TEM Transmission Electron Microscope

LM Light microscopy

Od Odontoblasts

F Fibroblasts

RBCs Red blood cells

bv Blood vessel

CFZ Cell free zone

CRZ Cell rich zone

M Mitochondria

rER Rough endoplasmic reticulum

V Vacuolation

C	Cytoplasmic clumping
e.c	Endothelial cells
nu	Nucleus
L	Lymphocyte
n	Neutrophil

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INTRODUCTION

Radiation therapy for malignant tumors of the head and neck is widely accepted as an efficient mode of treatment, when used alone or in combination with surgery and/or chemotherapy. Unfortunately, radiation injury is not limited to tumor cells but it also affects to varying degrees all cells in the beam field **(Timothy Sweeney et al., 1977)**. In the oral and paraoral region this iatrogenic injury may take the form of xerostomia secondary to salivary gland injury, osteoradionecrosis secondary to bone injury and growth disturbances associated with injury of the cartilage at condylar growth center **(Constantino et al., 1995)**, mucositis due to damage to oral mucosa and disturbances in the formation of developing teeth **(Scully and Epstein, 1996).**

From many perspectives, dental health is directly related to the health of a unique tissue; that is, dental pulp. Dentin and pulp are anatomically and functionally integrated, they are often referred to as the pulpodentin complex. The pulp also interacts with other tissues such as the periodontium and even the central nervous system. In addition to its clinical implications, dental pulp is worthy of study from a scientific

perspective. Basic science research on dental pulp has recognized several unique features of this tissue. Its location within relatively hard, unyielding walls, its particular vascular supply and dynamic cellular content have led to an increasing interest in its responses to various types of injuries and bacterial infection **(Pashley 1996)**.

There was a contradictory and scarce finding in the literature regarding the effect of ionizing radiation on dental pulp tissue. However, any disturbance in the pulp tissue leading to infection may pre-dispose to osteoradionecrosis, which is the most serious complication of head and neck radiotherapy **(De Moor 2000)**.

REVIEW OF LITERATURE

The ionizing radiation is emitted by radio-active elements and by equipment such as X-ray and radiation therapy machines. Radiation includes either high energy electromagnetic waves as x-rays and gamma rays), or particles a alpha particles, beta particles and neutrons **(Nussbaum and Wolfgang 1994)**.

Measurements of radiation according to Canadian Center for occupational health & safety are classified into: Radiation absorbed dose (Rad): is the amount of radiation energy absorbed per unit mass.

Gray (Gy): equals 100 rads.

Centigray (cGy): equals 1/10 Gy.

Gamma rays (denoted as γ) were discovered by Paul Villard, a French chemist and physicist, in 1900, while studying some radioactive materials. Gamma rays are form of electromagnetic radiation which has the highest frequency and the shortest wavelength within the electromagnetic spectrum. These rays consist of high energy photons with energies above about 100 kV.