



بسم الله الرحمن الرحيم

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**The Combined Effect of Platelet-Rich Plasma  
and Bone Marrow-Derived Mesenchymal Stem  
Cells in Regeneration of Irradiated  
Submandibular Salivary Gland  
(An Experimental Animal Study)**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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## *Dedication*

*To my parents, the symbol of love  
and giving, who have showered  
me with prayers,*

*To my father and mother in law  
who I appreciate their support,*

*To my beloved husband, Ahmad,  
who had never left my side,*

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## **List of Abbreviations**

**ADP:** Adenosine Diphosphate

**AEP:** Acquired Enamel Pellicle

**AIDS:** Acquired Immunodeficiency Syndrome

**ANOVA:** Analysis of Variance

**AP-1:** Activator protein-1

**ATM:** Ataxia Telangiectasia Mutated

**ATP:** Adenosine Triphosphate

**Bax:** Bcl-2 Associated x protein

**Bcl-2:** B-cell lymphoma 2

**Bcl-xL:** B-cell lymphoma-extra large

**bFGF:** basic Fibroblast Growth Factor

**BM-MSCs:** Bone Marrow Mesenchymal Stem Cells

**BMP-2:** Bone Morphogenetic Protein 2

**CaCl<sub>2</sub>:** Calcium Chloride

**CCR:** Coupled Chemokine Receptor

**CD:** Cluster of Differentiation

**CFU-F:** Colony Forming Unit Fibroblasts

**CXCL:** C-X-C Chemokine Ligand

**CXCR:** C-X-C Chemokine Receptor

**DMEM:** Dulbecco's Modified Eagle's Medium

**DNA:** Deoxyribonucleic Acid

**DSBs:** Double Strand Breaks

**ECGF:** Epithelial Cell Growth Factor

**ECM:** Extracellular Matrix

**ED:** Excretory Duct

**EDTA:** Ethylene Diamine Tetraacetic Acid

**EGF:** Epidermal Growth Factor

**EMT:** Epithelial Mesenchymal Transition

**ERK:** Extracellular Signal-Regulated Kinases

**FBS:** Fetal Bovine Serum

**GCTs:** Granular Convolute Tubules

**GF:** Growth Factor

**GM-CSF:** Granulocyte Macrophage-Colony Stimulating Factor

**Gy:** Gray

**H&E:** Hematoxylin and Eosin

**HGF:** Hepatocyte Growth Factor

**HIV:** Human Immunodeficiency Virus

**ID:** Intercalated Duct

**IgA:** Immunoglobulin A

**IGF-1:** Insulin-Like Growth Factor-1

**IgG:** Immunoglobulin G

**IgM:** Immunoglobulin M

**IL:** Interleukin

**IMRT:** Intensity-Modulated Radiation Therapy

**ISCT:** International Society for Cellular Therapy

**JAK:** Just Another Kinase

**JNK:** c-Jun N-terminal kinases

**KGF:** Keratinocyte Growth Factor

**MAF:** Mean Area Fraction

**MAPK:** Mitogen Activated Protein Kinase

**MCP-1:** Monocyte Chemoattractant Protein-1

**MDM2:** Mouse Double Minute 2 Homolog

**MHC:** Major Histocompatibility Complex

**MMP:** Matrix Metalloproteinase

**MRN:** Mre11, Rad50 and Nbs1

**MSCs:** Mesenchymal Stem Cells

**MT1-MMP:** Membrane Type 1 Matrix Metalloproteinase

**MVD:** Microvessel Density

**NF- $\kappa$ B:** Nuclear Factor kappa Beta

**OH:** Hydroxyl Ion

**OPN:** Osteopontin

**P53:** 53-Kilodalton Protein

**PBS:** Phosphate Buffered Saline

**PCNA:** Proliferating Cell Nuclear Antigen

**PDAF:** Platelet-Derived Angiogenesis Factor

**PDEGF:** Platelet-Derived Epidermal Growth Factor

**PDGF:** platelet-Derived Growth Factor

**PECAM:** Platelet-Endothelial Cell Adhesion Molecule

**pH:** Power of Hydrogen

**PI3K:** Phosphoinositide 3-kinases

**PRP:** Platelet Rich Plasma

**PSR:** Picrosirius Red Stain

**PUMA:** P53 Up-regulated Modulator of Apoptosis

**RBC:** Red Blood Cells

**ROS:** Reactive Oxygen Species

**S1P:** Sphingosine-1-phosphate

**SC:** Stem Cell

**SD:** Standard Deviation

**SD:** Striated Duct

**SDF-1:** Stromal-Derived Factor-1

**SG:** Salivary Gland

**SPSS:** Statistical Package for Social Science

**STAT:** Signal Transducer and Activator of Transcription Proteins

**TGF- $\alpha$ :** Transforming Growth Factor Alpha

**TGF- $\beta$ :** Transforming Growth Factor Beta

**TIMP:** Tissue Inhibitor of Metalloproteinase

**VEGF:** Vascular Endothelial Growth Factor

**Wnt:** Wingless-related integration site

**$\alpha$ -SMA:** Alpha-Smooth Muscle Actin

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