The Effect of Bone Marrow Aspirate Concentrate on Bone Regenerate During Rapid Mandibular Distraction Osteogensis

Thesis

Submitted for partial fulfillment of the requirements for Doctorate degree in Oral and Maxillofacial Surgery

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2019

Disclosure

“This thesis was a part of an experimental project conducted on distraction osteogenesis to assess the effect of Bone Marrow Aspirate Concentrate on bone quality during distraction osteogenesis and assessment the effect of three dimensional planning on distraction osteogenesis cosmetic outcome. This project included thesis of dear colleagues Mohamed Seif entitled (The Effect of Bone Marrow Aspirate Concentrate on Bone Regenerate During Mandibular Distraction Osteogenesis: (Experimental study)) and Hossam El Deen Hany entitled (Computer-Guided Mandibular Distraction Osteogenesis: A Clinical Study).”

Dedication

“For the one who believes in me
My Mother”

“For my dear wife Chehad, without your help this work won’t see light”

“Special Dedication for my brother and sister and the soul of my father and grandmother seta”

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Acknowledgment

I would like to express my special thanks and gratitude to

Pancreatic Transplant Unit, Ain Shams University Staff, especially Mr. Alaa Edris (technical supervisor of the laboratory of the unit) for their valuable support in hosting the animals and providing the technical laboratory support for the current research.

Assistant lecturer/ Basma Abd El Rahman Teaching assistant in Pathology department, Faculty of Dentistry, Ain Shams University, for her sincere help during histological assessment of the results of this research.

Assistant lecturer/ Aliaa Hazem Teaching assistant in Dental Material department, Faculty of Dentistry, Ain Shams University, for her sincere help during mechanical assessment of the results of this research.

Last, but not the least the distraction osteogenesis project team Mohamed Seif and Hossam El Deen Hany.

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DO: Distraction Osteogenesis.

BMAC: Bone Marrow Aspirate Concentrate.

HFM: Hemifacial Microsomia

MSCs: Mesenchymal Stem Cells.

PBS: Phosphate Buffer Saline.

CBCT: Cone Beam Computed Tomography.

H&E: Haematoxylin and Eosin

MT: Masson Trichrome

Introduction

Bone reconstruction procedures in the craniofacial region are considered a complicated condition, which usually require skeletal correction to overcome psychological, breathing and eating problems by reconstructing both soft and hard tissues. Grafting from distant sites to regenerate and reconstruct missing bony segments carries the risk of donor site morbidity, the risk of rejection, infection or low bone quality. Distraction osteogenesis (DO) is a surgical process used in reconstruction of skeletal deformities and lengthening of the long bones. Distraction technology was used mainly in orthopedics and is currently used in the oral and maxillofacial region to correct deformities of the facial skeleton without grafting risk (1).

Distraction osteogenesis refers to a surgical technique designed to address defects and deficiencies in the skeleton. Distraction osteogenesis originally was first mentioned by Hippocrates; Ilizarov introduced the DO 40 years ago and the orthopedic community has employed distraction techniques to lengthen and reconstruct arms and legs (2).

Distraction surgery was first reported to treat defects of the oral and facial region in 1992 by McCarthy. Since then, the surgical and technological advances made in the field of DO provided oral and maxillofacial surgeons with a safe and predictable method to treat selected deformities of the oral and facial skeleton (3).

Maksimov in 1908 was the first scientist to introduce the term stem cells. Becker et al. in 1963 were the first to prove the existence of self-reproducible cells in the bone marrow of rats. Stem cell therapy was used in many fields of