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وقل رب زدني علما

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Radiodensitometric Evaluation of Low Intensity Laser Therapy on Healing Of Mandibular Fracture in Tooth Bearing Area

A Thesis is Submitted for Partial Fulfillment of Requirements of Master Degree in Oral And Maxillofacial Surgery

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Dedication

To my family, my father, my mother and to my Supervisors who helped me to succeed and supported me during my study.

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LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

PEMF : Pulsed Electromagnetic Field.

LILI : Low Intensity Laser Irradiation.

MMF : Maxillo-Mandibular Fixation.

BMP : Bone Morphogenic Protein.

Ga-Al-As : Gallium Aluminum Arsenide.

LILT : Low Intensity Laser Therapy.

LLLT : Low-Level Laser Therapy.

ATP : Adenosine Triphosphate

CT : Computerized Tomography.

CADIA : Computer Assisted Densitometric Image Analysis.

IM : Intramuscular.

Introduction

Introduction

The mandible is the second most commonly fractured part of the maxillofacial skeleton because of its position and prominence.[1,2]

The direction of vector of the force and the mechanism of injury both affect the location and pattern of the fractures. Also the patient's age, the presence of teeth and the physical properties of the causative agent have a direct effect on the characteristics of the resultant injury.[3]

The goals of mandibular fracture treatment is to restore function by ensuring union of the fractured segments and reestablishing preinjury strength; to restore any contour defect that might arise as a result of the injury; and to prevent infection at the fracture site. Restoration of the mandibular function, in particular, as part of stomatognathic system must include the ability to masticate properly, to speak normally and to allow for articular movements as ample as before the trauma. In order to achieve these goals, restoration of normal occlusion of the patient becomes paramount for the treating surgeon.[4]

Principles of orthopedic surgery applied to mandibular fractures include reduction, fixation, immobilization and supportive therapies. It is well known that union of fractured segments will only occur in absence of excessive mobility. Stability of the fracture segments is the key for proper hard and soft tissue healing in the injured area. Therefore, the fracture site must be stabilized by mechanical means in order to help guiding of the physiologic process towards normal bony healing. Reduction of the fracture can be achieved either with an open or closed technique. A closed reduction

takes place when the fracture site is not going to be surgically exposed but reduction is deemed accurate by palpation of the bony fragments and by restoration of the functioning segments, for example, restoration of the dental occlusion by wiring the teeth together, using splints, or employing external pins.[4,5]

It is generally accepted that the vast majority of fractures of the mandible may be treated satisfactorily by closed reduction. Nevertheless, with the advent of the plate and screw fixation devices, open treatment become more common. According to Bernstein, "it is safe to say that the vast majority of fractures of the mandible may be treated satisfactory by the closed reduction technique".[6] May and colleagues go further: many fractures are properly over treated by open reduction.[7]

It is important to realize that the majority of fractures can be successfully managed by conservative means (closed reduction). " This concept becomes critical when one considers the economic significance of inflated hospital, operating room material, the need of general anesthesia, and personnel costs. A patient with a mandibular fracture managed by closed technique can be successfully treated as an outpatient with either local anesthesia or conscious sedation.[8,9,10]

According to Peterson, most uncomplicated fractures in children are united in 2 to 3 weeks, in adults 3to 4 weeks and in older patients in 6 to 8 weeks.[11

The main disadvantage of closed technique is the need for long period of immobilization under intermaxillary fixation with subsequent delay of rehabilitation. This draws the attention of many researchers toward

accelerating the healing of fractures by stimulation of osteogenesis. With the subsequent reduction of the immobilization period, prevention of joint stiffness and permission of early rehabilitation. Doubtless, great benefits would accrue to orthopedic patients if the processes of bone healing could be brought under the command of the surgeon, permitting the formation of bone on demand in order to aid in the repair of fractures, nonunion and other skeletal defects.[12]

Various devices and methods have been used to enhance bone healing including; Low intensity pulsed ultrasound[13,14], pulsed electromagnetic therapy (PEMF),[15,16] and low intensity laser irradiation (LILI).[17]

A lot of studies and researches have been done for over 20 years to know the effect and mechanism of low intensity laser therapy on bone healing. Therefore the aim of this study is to investigate the effectiveness of using low intensity laser therapy in enhancing bone healing in mandibular fractures treated by closed reduction to decrease the immobilization period of maxillomandibular fixation (MMF).

Review of literature