Radiographic Assessment of Healing of Mandibular fractures using Biodegradable Bone Plates by using Quantitative Computed Tomography Scan (C.T Scan)

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بسم الله الرحمن الرحيم

وقل اعملوا فسيرى الله عملكم و رسوله و المؤمنون

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DEDICATION

To the soul of my grandfather who was, is and will always be my mentor and idol.

To my parents for their continuous support, love and care and to Menna and Youssef for their encouragement and tolerance

List of Contents

Table of Figures

Abstract

Functional stable occlusion of the mandible has been the aim of many investigations leading to different internal fixation systems. Recently resorbable fixation devices have gained significant clinical appeal. The aim of this study is to evaluate radiographically the healing of mandibular fractures fixed by biodegradable bone plates using quantitative computed tomography scan.

Methods: 6 patients were selected for fixation of mandibular fractures using biodegradable bone plates (INION CPS). Assessments of the healing of the mandibular fractures to evaluate the changes of the bone mineral density (BMD) along the fracture line. This was done using quantitative computed tomography scan in intervals of immediate, 4 weeks and 8 weeks post traumatic.

Results: There was an increase in BMD along the fracture line through out the follow up period except in one patient after 8 weeks.

Conclusion: This study proved that using biodegradable bone plates in fixation of mandibular fractures is a suitable method for inducing new bone formation and healing along the fracture line.

Introduction

A fracture is a complete or incomplete break in the bone continuity. It usually results from excessive force application due to trauma. This results in a strain beyond the bone strength resulting in fracture. Fracture leads to limitation in the function and integrity of the bone regarding continuity, strength and support.

In the management of any bony fracture, the main goals are to restore the pretraumatic function of the affected bone. This could be done by maintaining the union of the fractured segments to ensure the continuity and restore any contour defects that might arise as a result of the injury and to prevent infection at the fracture site. The restored function of the mandible, in particular, as a part of the masticatory system must include proper mastication, normal speech and maximum mouth opening.

The main key for successful treatment of mandibular fractures is to establish a reproducible functional occlusion. This is maintained by various types of intermaxillary fixation .Rigid fixation has become the most common method used for fixation of fractures in the craniofacial regions. The most commonly used materials for rigid fixation systems were made up of stainless steel, vitallium and eventually titanium.

Although the widespread use of metallic fixation systems they still showed disadvantages such as atrophic changes of the underlying bone

owing to lack of functional stimuli (stress shielding), metallic artifacts in radiographs and the need for a second surgery to remove the hardware

The continuous challenge for researchers is to overcome drawbacks of the metal in order to achieve an ideal method for treatment of fracture always influenced development of new devices and fixation systems. Recently, all attempts were made to produce a biodegradable fixation system that could fulfill the requirements for fracture fixation without interfering with healing, nor causing any local or systemic disorders.

Resorbable implants and hardware have been produced from materials such as Polylactic acid, Polyglycolic acid & recently a copolymer of L-lactide / D- lactide/ Trimethylene carbonate.

One of the methods of assessment and evaluation of osteosynthesis and healing of fractures is by radiographic imaging modalities including Computed Tomography (C.T) and magnetic resonance imaging (M.R.I). This was not successful to be used with metallic fixation appliances due to streaking and artifacts they produced during C.T scanning and black shadows while using M.R.I. However, this all was overcome in using biodegradable systems due to their radiolucent nature, that enabled assessment of fracture and healing.

This study is done to evaluate the osteosynthesis of mandibular fracture reduced and fixed by using this new plating system using Quantitative C.T. scan.

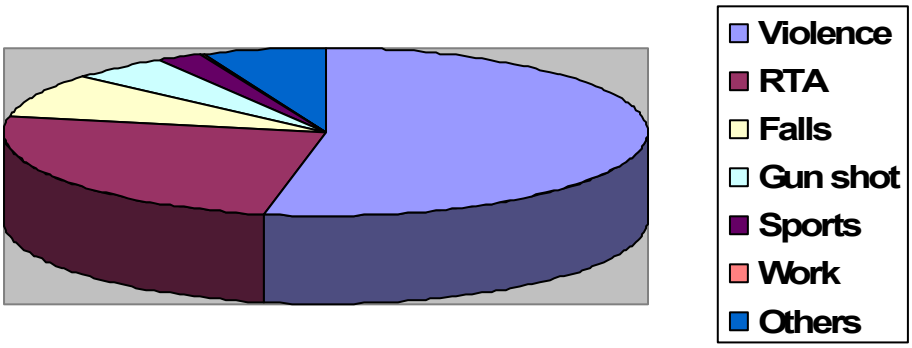
Review of Literature

The mandible as a part of the facial bones conforms to one of the common facial injuries and its treatment is one of the most frequent forms of therapy provided by oral and maxillofacial surgeons .[1]

Although the mandible is a dense and strong bone, it acquires a prominent position in the lower third of the face that makes it exposed to external trauma leading to its fracture. This makes the mandibular fractures form up to 75% of maxillofacial fractures**.** [2, 3]

The attempts for mandibular fractures treatment appeared as early as 1650 BC in an ancient Egyptian papyrus that described the examination, diagnosis and treatment. The basic principles of modern fracture repair, reduction and stabilization were first placed by **Hippocrates**. He described manual reduction of mandibular fractures using monomaxillary dental fixation and bandaging. [4]

The mandibular fractures have been caused due to a lot of variables that includes fight, fall, road traffic accidents, sports and other miscellaneous causes. In a retrospective study of 253 patients with mandibular fractures James and co-workers (1981)[5] found that interpersonal violence accounted for 53% of the causes of mandibular fractures, while motor vehicle accidents accounted for 25 %. Less frequent causes included falls (8.5%), gun shot injury (5%), sport related incidence (2.2%), work related accidents (0.3%) and other causes (6%). **(Fig.2.1)**



(Fig.2.1) ***represents a statistical pie chart diagrammatic representation of the causes of mandibular fractures***

Mandibular fractures could be classified according to anatomic region as follows: symphyseal, parasymphyseal, body, angle, ramus, condylar process, coronoid process and alveolar process . However, **Bochlogyros in 1985**[(6)] reported that mandibular body fractures were the most common (41.5%) followed by angle (23.5%) , condylar (23.1%) , symphysis (7.1%) , ramus (3%) , alveolar (1.2%) and coronoid process fracture(0.4%) .