Assessment of the Infraorbital Nerve Function After Rigid Fixation of Zygomaticomaxillary Complex Fractures

Thesis

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DEDICATION

To the
Soul of my Father

To the one who gave me love, care and support ....

Who was by my side in each step in my life .... To my dear mother

To my husband and lovely kids

To my dear sisters

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First to "**Allah**" Goes all my deepest gratitude and thanks for achieving any work in my life

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Ghada Abd El-Moneim

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LIST OF ABBREVIATION

3D	Three dimentional
CBC	Complete blood count
CM	Centimeter
CT	Computer tomography
EP	Evoked potential
GA	General anaesthesia
gm	Gram
IM	Intramascular
INR	International normalized ratio
ION	Infraorbital nerve
mA	Milliampire
mg	milligram
mm	Millimeter
msec	Millisecond
NO	Number
ORIF	Open reduction internal fixation
Pt	Patient
PT	Prothrombin time
PTT	Partial prothrombin time
SD	Standard deviation
Sec	Second
SEP	Somatosensory evoked potentials
TSEP	Trigeminal somatosensory evoked potential
W	Wave
ZF	Zygomaticofrontal
ZM	Zygomaticomaxillary
ZMC	Zygomaticomaxillary complex
ZT	Zygomaticotemporal
μv	Microvoltes

INTRODUCTION

The zygoma is considered the most critical bony structure in the lateral mid face, because of its anatomical shape and its critical position, that makes it highly susceptible to fracture[1-3] with sequela of acute sensory disturbance of sensory distribution of the infraorbital nerve (I.O.N) in the majority of patients of this type of fractures.[1,2,4-13]

The reported incidence of posttraumatic sensory disturbance of (I.O.N) in ZMC fractures varies from 24- 94% due to the close proximity of the nerve to the ZMC with higher incidence in displaced than non displaced fractures.[2,4,7,9,12-20]

Various methods have been used to evaluate the I.O.N function including patient questionnaire and highly sophisticated technology examination modalities. The purpose of these sensory assessment is to acquire information to render a clinical diagnosis, distinguish different degree of nerve injury, monitor sensory recovery, determine whether nerve micro-surgery is indicated or not, monitor sensory nerve recovery following micro-surgery and to help medico legal evaluation.[21-25]

Hence, the purpose of this study was to evaluate the efficacy of trigeminal somatosensory evoked potential (T.S.E.P) as an objective neurosensory test pre and post operatively after rigid fixation of the ZMC fractures.

REVIEW OF LITERATURE

ANATOMY OF THE ZYGOMA:

The zygoma is considered the most critical bony structure in the lateral midface. It represents the principal buttress between cranium and maxilla. It is a quadruped central body bone in shape from which four bony processes project articulating with the adjacent frontal, maxillary, temporal and the greater wing of the sphenoid bone through sutural function which are correspondingly named. That is why the zygomatico maxillary complex ZMC fractures has been also called "Tetrapod fractures" and "tripod fractures" are a misnomer **(Fig. 1, 2)**.[1-4,26]

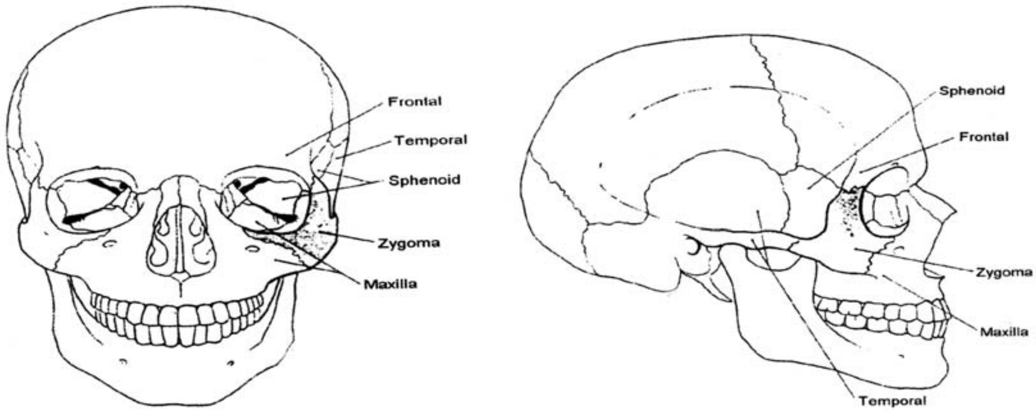

Fig. (1): Drawing showing frontal and lateral views of the zygoma and its articulations.[26]

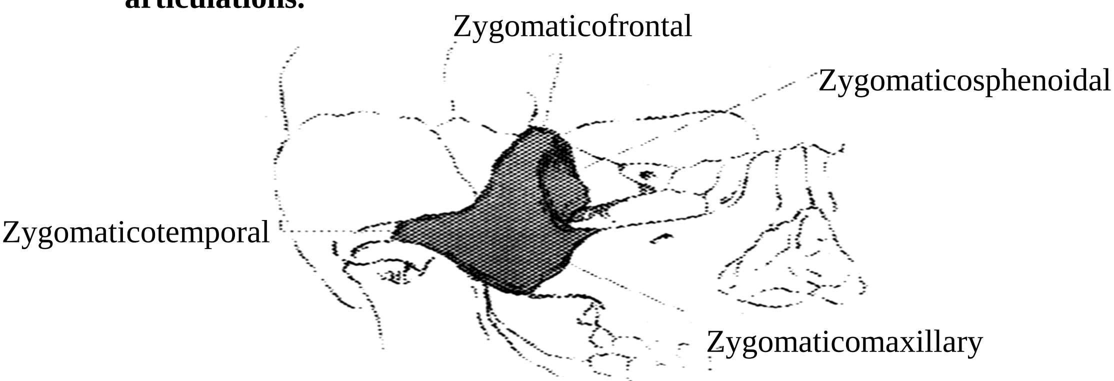

Fig. (2): Drawing showing the quadripod nature of the zygoma. Note the four sutures, in particular the location of the zygomaticosphenoid suture at the lateral orbital wall.[35]

The zygomatic bone itself usually does not fracture but separation of the suture lines or fracture of the adjacent bones occurs. The zygomaticofrontal (ZF), zygomaticotemporal (ZT) and zygomaticosphenoidal suture lines are considered the weakest sites of four articulation lines and usually they are involved in the (ZMC) fractures. Especially the ZT suture line which represents the articulation of temporal process of zygomatic bone with zygomatic process of temporal bone forming a thin delicate zygomatic arch which commonly fractures when subjected to minimal force. The zygomaticomaxillary (ZM) suture line is stronger and resist fracture; when the cheek receive a blow the force is transmitted from the solid maxillary process of zygoma to the weaker zygomatic process of the maxilla and lateral wall of maxillary sinus that cause their fractures.[2,3,26-28]

The zygomatic bone has an outer convex and inner concave surface. It's the place of origin to the major portion of the masseter muscle in its lower border and inner surface of zygomatic arch and also gives attachment for temporal and zygomatico minor and major muscles.[2,3] It plays a significant role in the formation of the bone framework of facial skeleton, temporal fossa, maxillary sinus, cheek contour and the orbit.[1-3,27,28]

INCIDENCE AND CAUSES OF ZMC FRACTURES:

ZMC fractures are one of the most common facial injuries secondary to the nose. The high incidence of this type of fractures is because of its prominent position in the facial skeleton. [2,14,29-31]

The main cause of ZMC fractures is road-traffic accidents including: motor vehicle accidents, motor cycle accidents and bike accidents because of high speed driving, insufficient stress on use of seat belts or protective head guard, and ignoring traffic rules and regulations in 29.8 - 80% of all ZMC fracture patients.[32-34]

The remaining fractures (20.0%) were caused by falls (6.51 - 6.6%), physical assaults (4.3 - 5.0%), then sport related injuries and interpersonal violence (2.8 - 3.8%) commonly among males between 10-30 years, work accidents (1.8 - 2.2%) and Gunshots (1.08 - 1.4%).[30-38]

The highest incidence of ZMC fractures was found in the 3rd decade of life 31-54% followed by the 4th decade representing 27%, 15% of the patients were below 15 years old, while only 1-4% were between the 7th and 8th decade.[30-34,36]

The sex distribution ratio is observed higher for males 83-89% than females 11-17% (9:1) and this can be explained as males are more involved in violence and are considered the dominant patient population.[30,32-38]

The wide variation in the reported incidence and causes of ZMC fractures occur as a result of the variation in the related factors as environmental, geographical, cultural status, age and sex from patient to patient and from one country to another one.[31,32,39-41]

CLASSIFICATION OF ZMC FRACTURES:

Many classification schemes for ZMC fractures are suggested according to type of fracture, displacement of the fractured bone and the severity of the fracture.[6,42,43] These variability of classification schemes aim to identify, categorize and describe the anatomical points of the affected bones or position, and criteria of fracture are likely to be stable after selection of proper treatment.[2,4,6,2642]

Classification of ZMC fractures based on the anatomical points and fracture pattern into 3 types: