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RECENT TRENDS IN THE MANAGEMENT OF MANDIBULAR FRACTURES

Dental Science

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ABSTRACT

Mandible fractures account for a significant portion of maxillofacial injuries. Evaluation and management of these fractures remain challenging despite improved imaging technology and fixation techniques. Appropriate surgical management can prevent complications such as malocclusion, pain. Depending on the type and location of the fractures, various open and closed surgical reduction techniques can be utilized.

KEYWORDS

Mandibular Fracture, Facial Trauma, Open Reduction, Maxillomandibular Fixation

INTRODUCTION

In day to day practice, mandibular fractures are regularly encountered by oral and maxillofacial surgeons and account for a significant portion of maxillofacial injuries. Various studies have demonstrated higher incidence of mandibular fracture in males as compared with the females. A review of 13,142 patients stated that men have a fourfold higher incidence of mandibular fractures with nearly 50% arising from assault. In contrast, females sustain mandibular fractures from motor vehicle accidents and falls (approx. 25%) more often.[1-3]

With improved safety technology the injury pattern and epidemiology of facial fractures has changed in the last few years.[4]The combination of seat belt and airbags have most likely reduced the incidence of sustaining facial fracture during motor vehicle accident by over 50%.[5,6]

INITIALASSESSMENT

Patients must be evaluated in accordance with the Advanced Trauma life support protocol, treating the life-threatening injuries as a priority. Assessment of the mechanism of injury is beneficial as the type of injury is often related to fracture patterns. An angle fracture has high incidence due to physical assault (lateral blow), whereas motor vehicle accidents often tend to cause symphyseal, parasymphyseal, body and condylar fractures.[1,7,8] Assessment of cervical spine injuries should be undertaken vigilantly before proceeding with any operative management. Various studies report an incidence of 2-10% of cervical spine injuries.[9]

IMAGING

Patient workup requires radiographic assessment as an integral necessity with facial trauma. Most patients with mandible fractures undergo initial computed tomographic (CT) imaging in a poly-trauma setting, to evaluate cervical spine injuries in conjunction with other concomitant injuries. Panoramic tomography is considered to be the gold standard for assessment of dental trauma (cost-effective), certain fracture patterns may be missed, particularly in posterior mandible. Therefore, with helical CT imaging (100% sensitivity) is noted as compared to panoramic tomography (86% sensitivity), comprising the advent of three-dimensional reconstruction, CT scan is a recent diagnostic choice for radiographic diagnosis of mandibular fractures.[10]

MANAGEMENT

The ultimate goal of treatment is to re-establish the patient's dental relationship as it was preinjury. Fractures which are favorable (undisplaced) with no occlusal changes may not require surgical management, whereas the unfavorable mandibular fractures require stabilization with open reduction and internal fixation, restoring pretraumatic maxillomandibular orientation. Numerous treatment modalities exists today for fixing the fracture site depending on the treating surgeon's preference. The patient's demographics, comorbidities, dentition and fracture characterization are the factors influencing the choice of fixation by the surgeon.

FRACTURE FIXATION PRINCIPLES

Fracture fixation can be classified into two basic categories: load-bearing and load-sharing. Load-bearing osteosynthesis signify a structure which is capable of bearing 100% of the functional load generated by the mandible such that the bone at the facture site bears no stresses generated, constructively shielding the healing bone from the masticatory forces. Major examples of load-bearing fixations includes: compression plates, locking plates, reconstruction plates. Clinical considerations for them comprises of defect fractures, comminuted fractures and fracture in severely atrophic mandible. On the note of comparing load-sharing fixations denotes distribution of masticatory forces between the hardware and the fractured site.[11,12] Examples of load-sharing fixation includes a single miniplate fixations in some senarios include a single miniplate along the external oblique ridge for angle fractures, a single miniplate along with arch bar for body fracture, two point fixation using miniplates in conjunction with the arch bar for superior border plating for symphyseal fractures and lag screw fixation.

Maxillomandibular fixation can be achieved with the use of Erich arch bar, hybrid arch bars, intermaxillary fixation screws, circummandibular and peralveolar wiring and orthodontic brackets with hooks.[1]

BODY FRACTURE

Undisplaced and minimally displaced fractures can be managed with a period of maxillomandibular fixation, often when the fracture is isolated and reducible with a normal occlusion and sufficient number of teeth present. However, it requires a long term immobility period with difficulty in oral hygiene maintainance. Therefore, to avoid this hinderance of dental wiring and patient discomfort open reduction and internal fixation is preferred, for optimal anatomic reduction. A vestibular sulcus incision for an intraoral approach or Risdon approach can be utilized if necessary.[13] As noted by Ellis[14] the use of one miniplate is best suited avoiding the postoperative complication (wound dehiscence, need for plate removal).

SYMPHYSIS AND PARASYMPHYSIS FRACTURE

Open reduction and internal fixation is the treatment of choice, whereas closed approach still exists as an alternative for simple undisplaced fractures. Fixation of two miniplates in the symphysis region, with an arch bar is recommended.[14,15] The surgeon should be careful in the parasymphyseal region around the mental neve to allow placement at the inferior border. Two lag screws that span the fracture line provide ridged fixation, with disadvantage as they are difficult to apply and require expertise. They may even result in shearing of fracture fragments and malocclusion if good bone to bone contact is not present.[15]

ANGLE FRACTURE

The angle is considered the most often involved site for isolated

fracture, typically resulting from assault.[21][16] The major reasons for angle fracture may include the thinner cross sectional area of this region and the presence of impacted third molars.[17,18] Angle fractures are often associated with highest complication rate.[19-21] This region consists of various powerful muscles capable of generating significant forces in multiple directions.[22] Undisplaced or minimally displaced fractures with normal occlusion may be managed via observation, soft diet with MMF. However, most angle fractures are treated via open reduction and internal fixation. A single miniplate along the oblique ridge, two lateral border plates or a matrix-type miniplate on the lateral border can be used. An intra-oral vestibular approach, suffice the need for exposure.

CONDYLE

Mandibular condylar fracture accounts for 25-35% of all the mandibular fractures.[3,9] Patients usually shows preauricular pain, malocclusion, chin deviation with mouth opening and closing. In bilateral condylar fracture typical anterior open bite is seen with posterior gag due to reduction in ramal height. History of trauma to the symphyseal region may be anccountered.[1] The management of condyle is controversial amoung oral and maxillofacial surgeons.[28][9] Condylar fracture which is intra-capsular is in aggrement to be treated closed, avoiding the risk for ankylosis. Similarly, patient with normal occlusion may avoid MMF and is suggested soft diet with follow-up. Extracapsular fractures of subcondylar region and neck may be managed with open reduction via direct approach or endoscopically. Various studies have supported the same outcome via closed approach.[9]

PEDIATRIC FRACTURES

Out of all the pediatric facial fractures, mandibular fractures have the incidence upto 40%, frequently resulting from RTA and falls. Sports related injuries and assault are common causes in teenagers, with a male to female ratio of 4:1.[9] Infants below the age of 2 years are more likely to sustain injuries of frontal region.[23]Diagnosing a fracture may put a surgeon into a dilemma, as the fractures are uncommon in pediatric patients. The elastic bony skeleton and suture lines may mimic fracture gaps on palpation.

Most frequent mandibular fractures in children involves condylar fracture (40-70%). Considering condyles the growth center of the jaw, any direct traumatic force to the symphyseal region may result in bilateral condylar intra-capsular fractures with an associated risk of growth hampering and ankylosis. a short period of MMF (7-14 days) for older patients is recommended. After the tooth buds of premolars and molars have moved up miniplates with monocortical screws can be fixed, sparing the developing tooth buds.[9]

GERIATRIC FRACTURES

The atrophic mandibular jaw is at more risk to the fracture due to decreased bone volume as a result of resorption of alveolar bone due to tooth loss.[9] These old patients are also prone to non-healing fracture site (4-20%).[9] Considering many of these patients are medically debilitated, no treatment as an option is also acceptable.[9] Closed management with gunning splint using circummandibular and peralveolar wiring is the best choice, accepting the fact that open reduction may reduce the blood supply due to periosteal striping.

COMPLICATIONS

Mandibular fracture rate ranges from 7 to 29%, depending on factors such as fracture severity, injury site and number of involved sites. The most common complications include infection, hardware failure, osteomyelitis, non-union, malunion and wound dehiscence. With the highest complication rate observed among smokers, patient's with systemic illness, substance abuse.[9]

Various authors in their studies noted, non-union as the most common complication in case of body fracture due to inadequate stabilization or reduction and multiple fractures. Malocclusion remains the most common, postoperative complication, mostly due to technical error in the placement of miniplates.

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