A Review of Mandibular Angle Fractures

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ABSTRACT

After studying this article, the reader will be able to: (1) review the incidence and etiology of mandibular angle fractures; (2) gain an understanding of patient evaluation and general management principles; and (3) discuss indications and available techniques for management of mandibular angle fractures. Angle fractures represent the highest percentage of mandibular fractures. Two of the most common causes of mandibular angle fractures are motor vehicle accidents and assaults or altercations. With any patient who has sustained facial trauma, a thorough history and comprehensive physical examination centering on the head and neck region as well as proper radiological assessment are essential. These elements are fundamental in establishing a diagnosis and developing an appropriate treatment plan for any mandibular fracture.

KEYWORDS: Mandibular, angle fractures, trauma

Mandibular angle fractures represent the largest percentage of mandibular fractures. Two of the most common causes of mandibular angle fractures are motor vehicle collisions and assaults or altercations. There are two main proposed reasons why the angle of the mandible is commonly associated with fractures. The first reason is the presence of a thinner cross-sectional area relative to the neighboring segments of the mandible.¹ Second is the presence of third molars, particularly those that are impacted, which weakens the region.^{2,3} Mandibular angle fractures pose a unique challenge for surgeons because they have the highest reported post-operative complication rate of any mandibular area. The key objectives of this article are to review the incidence and etiology of mandibular angle fractures; to address patient evaluation and general management principles; and to discuss indications and currently available techniques for satisfactory treatment of mandibular angle fractures.

PATIENT EVALUATION

A thorough history and physical examination are the first and most important steps in developing an appropriate diagnosis and treatment plan in any patient sustaining facial trauma. Determining the mechanism of injury is essential. This will often reveal the actual causative force and lead the clinician to evaluate for the possibility of associated life-threatening injuries, such as cervical spine (reported to be as high as 10%) and neurosurgical injuries and airway impairment. These must be ruled out or addressed prior to proceeding with any treatment of mandibular fracture. Initial management should always begin with Advanced Training Life Support protocol.⁴ Once life-threatening issues have been appropriately managed, the physician can proceed with a complete head and neck examination. Surgeons should direct their attention toward inspection of occlusal relationships; this centers on evaluating for the presence of anterior or posterior open bites and assessing for mobility and/or

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tenderness anywhere along the length of the mandible. Surgeons should also assess and document the presence of teeth, as well as mental nerve paresthesias, and the presence of trismus. Examination should also include palpation of the mandible for obvious step-off deformities and alignment deviations from the midline. Facial asymmetry and cranial motor and sensory nerve function should also be evaluated, in addition to temporomandibular joint function.

RADIOGRAPHIC EVALUATION

After completing the patient's history and physical examination, the clinician must determine the appropriate diagnostic imaging; this might consist of a panoramic radiograph (Panorex; Panoramic Corporation, Fort Wayne, NJ[®]) or a helical computed tomogram (CT scan). Conflicting data in the literature exist regarding the diagnostic sensitivity of CT scans for mandibular fractures. Some studies have suggested a lower diagnostic sensitivity for CT scanning when compared with other radiographic examinations.⁵ Particularly, the undisplaced fracture is more difficult to determine. However, these series were completed using nonhelical CT scans and do not accurately represent current helical CT technology. Wilson et al reported 100% sensitivity when using helical CT scanning for accurate diagnoses of mandibular fractures. This compared with 86% for panoramic tomography.⁶ Irrespective of the imaging modality, radiographs need to be evaluated for fracture displacement and/or comminution, the presence of fractured teeth or teeth in the line of fracture, and the relationship of the alveolar nerve to the inferior border of the mandible and fracture line. Along with a thorough history and physical examination, proper radiological assessment is paramount in establishing a diagnosis and developing an appropriate treatment plan for any mandibular fracture.

TIMING OF SURGERY AND USE OF ANTIBIOTICS

Definitive repair of a mandibular fracture is by no means a surgical emergency. Treatment may often be delayed in the multiply injured patient. A study comparing patients undergoing repair within 72 hours with patients repaired after 72 hours found no increase in complication rates.⁷ Notwithstanding, every attempt should be made to manage these patients expeditiously in an effort to minimize associated patient discomfort and fibrinous deposition within the fracture segment.⁸ After several days, scar tissue begins to form, which, if it proliferates, may make reduction of the fracture difficult.

Prophylactic antibiotics should be administered to every patient who sustains compound mandibular fractures. The use of prophylactic antibiotics has been shown

to reduce the incidence of postoperative infection to 6%, compared with 50% in patients not receiving prophylactic antibiotics.⁹ Antibiotics should be penicillin-based. Clindamycin should be used for patients with a penicillin allergy. Prophylactic antibiotics should be started at the time of clinical presentation and continued until formal reduction of the fractures is performed. Currently, there are no data supporting the use of postoperative antibiotic therapy. A recent prospective randomized trial indicated no difference in the incidence of postoperative infection when using antibiotics postoperatively.¹⁰ Oral chlorhexidine is a useful adjunct for reducing bacterial counts in the oral cavity in the presence of open fractures, and it is used routinely in the perioperative setting following mandibular trauma. However, some adverse reactions have been reported in studies with Peridex (Peridex 3M, Irvine, CA) or other chlorhexidine-containing mouth rinses. The most common side effects associated with chlorhexidine oral rinses are an increase in staining of oral surfaces and an alteration in taste perception, which most patients recover after cessation of the medication.

TREATMENT METHODS FOR MANDIBULAR ANGLE FRACTURES

Angle fractures pose a unique clinical challenge for reconstructive surgeons.^{11,12} Unfortunately, few prospective randomized studies of operative technique on angle fractures have been performed. As a result, no general consensus on the optimal treatment of mandibular angle fractures has been agreed. Current treatment protocols for angle fractures involve rigid fixation in conjunction with intraoperative maxillomandibular fixation (MMF). This produces absolute stability leading to primary bone union and permits immediate limited postoperative physiological function.¹³ Several authors have published large series on the management of mandibular angle fractures. In 1999, Ellis presented a 10-year experience of treatment methods for fractures of the mandibular angle.¹¹ His review compared the following techniques: (1) closed reduction or intraoral open reduction and nonrigid internal fixation, (2) extraoral open reduction and internal fixation using the Albeitgemeinschaft fuer osteosynthesfragen/Association for the study of internal fixation (AO/ASIF) reconstruction plate, (3) lag screws, (4) intraoral open reduction and internal fixation using two 2.0-mm minidynamic compression plates, (5) intraoral open reduction and internal fixation using 2.4-mm mandibular dynamic compression plates, (6) intraoral open reduction and internal fixation using two noncompression miniplates, (7) intraoral open reduction and internal fixation using one noncompression miniplate, and (8) intraoral open reduction and internal fixation using one malleable noncompression plate. Results showed that the use of either an extraoral open reduction and internal fixation

with the AO/ASIF reconstruction plate or intraoral open reduction and internal fixation using a single miniplate (the Champy technique) was associated with the fewest complications.¹¹ A survey by Gear et al showed that the majority of AO faculty stated that their preferred primary treatment of noncomminuted angle fractures was single miniplates placed on the superior mandibular border through an intraoral approach. In the article, the authors also stated that in certain circumstances the use of intra-operative MMF was not mandatory but the diet must be soft.¹³ In a series by Feledy et al, 22 consecutive patients with mandibular angle fractures were treated with a matrix miniplate with results comparing favorably to previously published data using one or two miniplates.¹⁴ In summary, the current literature supports management of noncomminuted isolated fractures of the mandibular angle with a single 2.0-mm miniplate secured to the superior surface of the mandible, via a transoral approach, which provides functionally stable fixation with the lowest reported complication rate. In the case of comminuted angle fractures or in the event that reduction is not possible through an intraoral approach, an extraoral technique with placement of a 2.4-mm reconstruction plate is the recommended treatment.¹⁵

CONCLUSIONS

Mandibular angle fractures continue to present challenges to reconstructive surgeons. A thorough history, with investigation into the mechanism of trauma, along with a complete physical examination and proper radiographic assessment are the keys to the development of a satisfactory treatment plan for comprehensive management of these fractures. There remains an ongoing evolution in the management of mandibular angle fractures. The use of a single miniplate on the superior border of the mandible for noncomminuted angle fractures and an extraoral approach with larger reconstruction plates for comminuted fractures are the current preferred methods of treatment. The ultimate goal when addressing any mandibular fracture is safe and successful establishment of the patient's preinjury occlusion and function.

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