Management of Fractures Through the Angle of the Mandible

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KEYWORDS

• Mandibular fracture • Angle fracture • Miniplate

Fracture through the angle of the mandible is one of the most common maxillofacial injuries sustained in modern societies. Among issues related to the treatment of maxillofacial injuries, those concerning angle fractures are the most hotly debated, with the exception perhaps of those concerning the condylar process of the mandible. There are several reasons for this controversy about treatment of angle fractures, a controversy too often made up of arguments founded on emotion rather than on scientific information. This article discusses some of the controversies in the management of such fractures.

DEFINITION

There is no consensus in the literature about the definition of an ''angle'' fracture of the mandible. However, there are two points of agreement. The first is that the term *angle* refers to an anatomic region, although some disagree about what encompasses that region. The second point of agreement is the position where the fracture is located on the superior aspect of the mandible: The fracture line starts in the area where the anterior border of the mandibular ramus meets the body of the mandible, usually in the region where the third molar is or was. If the third molar is present, it may be located anywhere along the root of this tooth. Sometimes the fracture may be along the distal root, with the tooth remaining within the distal segment of the mandible. Other times, the fracture is located along the mesial root, with the tooth remaining within the proximal segment. Still other times, the fracture runs through the middle of the tooth with the tooth lying almost free within the fracture, especially if the roots are incompletely formed and the tooth is unerupted. Occasionally, the fracture will also split the tooth, with one root remaining in the proximal and one in the distal segment (**Fig. 1**). When the tooth is fractured, it is almost always an erupted tooth. When the third molar is missing, the fracture is usually along the distal root of the second molar, exposing the root to the fracture. However, the fracture may be further posterior to the second molar, occurring in the area where the third molar would normally be, leaving a layer of bone covering the roots of the second molar.

The greatest disagreement regarding the angle fracture is its location on the inferior or posterior mandibular border. Does the ''angle'' fracture have to extend through the gonial angle of the mandible? Most of the literature indicates that the fracture extends to the inferior border anterior to the gonial angle. However, in the author's experience, the vast majority of fractures of the angle of the mandible extend vertically from the region of the third molar inferiorly through the inferior border of the mandible (see **Fig. 1**). They can, however, extend posteriorly as they pass inferiorly. In a small percentage of cases (approximately 8%), the fracture extends toward the gonial angle of the mandible (**Fig. 2**), and occasionally even slightly above it (**Fig. 3**). In extremely rare cases, the fracture can extend anteriorly, exiting the inferior border in a location that is anterior to the region where it occurred along the superior border.

Biomechanically, any fracture that extends from the third molar region to the inferior or posterior border is similar in that the muscles that elevate the mandible tend to cause the ramus to rotate

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Fig. 1. Panoramic radiograph of a fracture through the mandibular angle and also through the third molar. The location of this fracture could be considered typical in that it extends from the third molar area inferiorly, exiting through the inferior border of the mandible.

anterosuperiorly. Thus a fracture of the mandibular ''angle'' can be variable in its course through the mandible (**Fig. 4**).

ANGLE FRACTURE CHARACTERISTICS

With any fracture there are certain characteristics that provide useful information on the ''nature'' or the ''character'' of the injury. Six descriptors are commonly used, the first being location, which in this case is the angle region of the mandible. The others are whether the fracture is:

- Complete or incomplete (**Fig. 5**)
- Linear (or simple) (see **Figs. 1–3** and **5**) or comminuted (**Fig. 6**)
- Compound or closed (ie, noncompound) (see **Figs. 1–3**)
- Displaced or nondisplaced (**Fig. 7**A)
- Mobile or nonmobile

Much of the controversy regarding management of angle fractures relates to the inclusion of different types of angle fractures in the same series without distinguishing among them.

Fig. 2. Panoramic radiograph of a fracture extending from the third molar area through the gonial angle of the mandible.

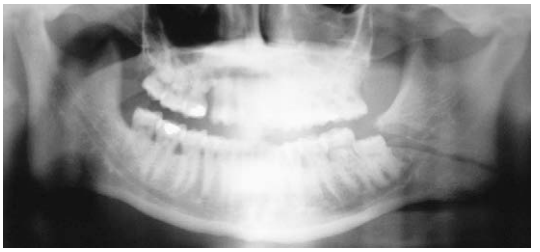

Fig. 3. Panoramic radiograph of a fracture extending from the third molar area through the posterior border of the mandibular ramus, just above the gonial angle.

ANATOMY/BIOMECHANICS

In making decisions regarding the management of angle fractures, it is important to understand the factors that account for displacement and how these can be effectively counteracted. The region of the mandibular angle is bounded by the strong elevator muscles (temporalis, masseter, medial pterygoid) that allow the generation of significant bite forces (300–400 N).[1,2] This force is significantly reduced for several weeks after a fracture of the mandible,[1,2] probably by the central nervous system inhibiting full contraction when it perceives an injury from the mechanoreceptors in the bone and soft tissues around the fracture. Fortunately, this means that fixation schemes applied to a fractured mandibular angle do not have to resist normal forces, but only have to counter the reduced forces that patients with fractures can generate.

However, even reduced contraction of the elevator muscles allows the ramus to rotate upward and forward when a fracture exists through the angle, displacing the bone fragments, especially at the superior surface (see **Fig. 7**A).

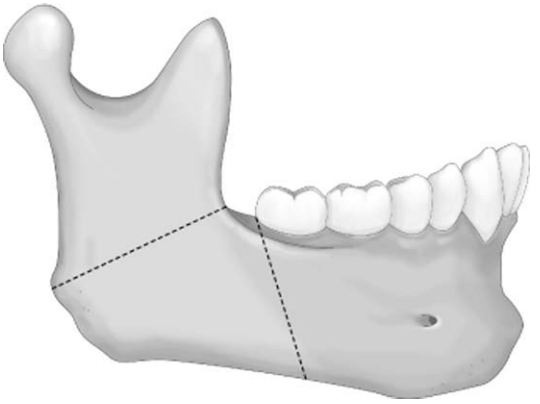

Fig. 4. Fractures of the mandibular angle tend to occur in the area between the dotted lines.