Mandibular angle fracture following closed extraction of lower third molar: A case report and systematic review

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Objectives Mandibular third molar extraction is among the most commonly performed dental procedures. Fracture of the angle of mandible after third molar extraction is a rare complication of this procedure. Herein, we report fracture of the right angle of mandible immediately after extraction of mandibular right third molar in a 38-year-old healthy female patient, which was surgically managed. A review of the relevant literature is also presented. Thirty four cases of mandibular fracture following third molar extraction are reported in the literature. Most of these cases were removed surgically.

Conclusion Systematic review of papers showed that angulation of impacted third molar is one of the most related factors in following fractures of mandibular angle.

Keywords Third molar, Mandible, Mandibular fractures

Introduction

Mandibular third molar extraction is among the most commonly performed dental procedures1, 2. Major perioperative complications of this procedure include fracture of the adjacent tooth, trauma to the inferior alveolar nerve or lingual nerve, displacement of tooth into the sublingual or submandibular space and rarely mandibular fracture3. Pain, swelling, trismus, infection and delayed jaw fracture are among the most common postoperative complications4-5. Mandibular fracture occurs in case of applying excessive force or inadequate bone strength. Reduction in bone strength often occurs due to physiological factors such as osteoporosis and ridge atrophy or pathological factors such as presence of cysts and tumors in bone. Applying excessive force for tooth extraction or during the surgical procedure may result in mandibular fracture during or after surgery6-7. Immediate mandibular fracture following third molar extraction has been rarely reported8-9. Herein, we report a mandibular fracture case following third molar removal as it has been operated soon after the occurrence of the fracture.

Review of the literature

The PICO (population, intervention, comparison, and outcome) question was stated as follows: In patients with impacted third molar does different impaction types effect on the following mandibular fracture? An electronic search was carried out in PubMed; Embase and Cochrane databases according to Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) 2015 statement10 and after screening (Figure 1), nine relevant articles were chosen out of 144. The searched keywords were “surgical extraction”, “extraction”, “lower third molar” and “mandibular fracture”.

The inclusion criteria were case reports on closed extraction or surgical extraction of mandibular third molars and fracture of mandible following tooth extraction.

The data extracted from the articles are categorized in Table 1 under titles of author(s), publication year, tooth number, method of extraction, type of fracture, and treatment/management.

Literature Review

Thirty four mandibular fracture cases following third molar extraction are reported in nine papers. All the cases were removed surgically. Most of them were in mesioangular position and fully impacted. All fractures happened either immediately or within 6 months. Most of the cases were treated by open reduction and internal fixation technique.

Materials and methods

Case

A 38 year-old female patient was referred to the Oral and Maxillofacial Surgery Department of Shahid Beheshti University of Medical Sciences, Tehran, Iran by her general dentist due to fracture of the angle of mandible noticed after extraction of her mandibular right third molar. On extra-oral clinical examination, a step was palpated in the right inferior border of the mandible. The patient complained of hypoesthesia in the path of the inferior alveolar nerve at the right side. Intraoral clinical examination revealed that the patient’s occlusion was off and she had right posterior open bite. Empty socket of right mandibular third molar was evident.
Table 1 - Categorized papers reported the mandibular fracture following third molar extraction

<table>
<thead>
<tr>
<th>References</th>
<th>Number of patients</th>
<th>Patients age</th>
<th>Patients gender</th>
<th>Type of impaction</th>
<th>Type of fracture</th>
<th>Time of fracture</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krimmel et al. (2000)</td>
<td>6</td>
<td>45</td>
<td>5 M and 1 F</td>
<td>Fully impacted</td>
<td>Without displacement</td>
<td>Within two weeks</td>
<td>ORIF in 6 cases, CR in 8 cases and no treatment in 3 cases</td>
</tr>
<tr>
<td>Wagner et al. (2005)</td>
<td>17</td>
<td>49</td>
<td>One female patient and the others were male</td>
<td>All types of pell and Gregory classification</td>
<td>Displacement</td>
<td>ORIF in 6 cases</td>
<td>CR or Within a month</td>
</tr>
<tr>
<td>Woldenberg et al. (2007)</td>
<td>1</td>
<td>37</td>
<td>Female</td>
<td>Vertical fully impacted</td>
<td>Without displacement</td>
<td>At the time of surgery</td>
<td>CR</td>
</tr>
<tr>
<td>Kao et al. (2010)</td>
<td>1</td>
<td>54</td>
<td>Male</td>
<td>Fully impacted</td>
<td>Without displacement</td>
<td>After 6 weeks</td>
<td>Open reduction without fixation</td>
</tr>
<tr>
<td>Cankaya et al. (2011)</td>
<td>2</td>
<td>33 and 35 year old</td>
<td>Male and female</td>
<td>Mesioangular fully impacted and one of them partially impacted</td>
<td>Without displacement</td>
<td>At the time of surgery</td>
<td>CR and the other no treatment</td>
</tr>
<tr>
<td>O’zakir-Tomruk and Arslan (2012)</td>
<td>2</td>
<td>32 and 34 year old</td>
<td>Both female</td>
<td>Partially erupted</td>
<td>With displacement</td>
<td>During surgery</td>
<td>ORIF</td>
</tr>
<tr>
<td>Cutilli et al. (2013)</td>
<td>3</td>
<td>32</td>
<td>Male</td>
<td>Two mesioangular and one vertical case</td>
<td>Without displacement</td>
<td>After surgery and within three weeks</td>
<td>ORIF</td>
</tr>
<tr>
<td>Xu et al. (2014)</td>
<td>1</td>
<td>20</td>
<td>Female</td>
<td>Fully impacted</td>
<td>Without displacement</td>
<td>At the time of surgery</td>
<td>ORIF</td>
</tr>
<tr>
<td>Correa et al. (2014)</td>
<td>1</td>
<td>52</td>
<td>Male</td>
<td>Distoangular and fully impacted</td>
<td>With displacement</td>
<td>After 15 days</td>
<td>ORIF</td>
</tr>
</tbody>
</table>

Figure 1 - Flowchart diagram of included articles.

Patient’s medical history was unremarkable and she had no systemic condition. After clinical examination, a panoramic
A radiograph was obtained (Figure 2), which revealed fracture of the right angle of the mandible and empty socket of mandibular right third molar tooth.

The patient underwent fixation surgical procedure and the broken pieces were fixed with two mini-plates, the superior one in monocortical manner to prevent the teeth roots damage and the inferior one was applied bicortically (Figure 3). The patient was discharged from the hospital two days after surgery. Elastic guides were used at both sides to limit jaw movements during the six-week follow-up period. After six weeks, the patient had normal occlusion and could open her mouth by 45 mm. The arch bar was then removed since the patient gained full recovery.

**Discussion**

Fracture of the angle of mandible following third molar extraction is extremely rare. Fracture may occur during surgery, which is referred to as immediate fracture, or may occur within four weeks after completion of surgical procedure, which is classified as late/delayed fracture. Determining the prevalence rate of mandibular fracture following mandibular third molar extraction is difficult. Mandibular fracture following third molar extraction is multifactorial and depends on patient’s age, sex, level of impaction of tooth, ratio of space occupied by the impacted tooth in the jaw, presence of bone defects, cysts and tumors, having a hard diet after surgery and technique of surgery. The mandible becomes weak by aging due to the reduction in elasticity of bone. The majority of mandibular fractures following mandibular third molar extraction have been reported in patients over 40 years of age. Moreover, ankylosis of third molars in the elderly further complicates their extraction and necessitates osteotomy in most patients. Thus, sectioning of the tooth into smaller pieces is highly recommended in the elderly in order to prevent excessive bone removal.

The role of gender in mandibular fracture is related to the bite force. The frequency of mandibular fracture is higher in males due to having a stronger bite force than females. Level of impaction of tooth is another important factor in this respect. The higher the level of impaction (the deeper the tooth), the greater the amount of removed bone and the greater the magnitude of jaw weakening.

The space occupied by the impacted tooth in the jaw is another important factor in this respect. The ratio of occupied space to the entire jaw can be assessed via buccal and lingual image reconstruction by computed tomography (CT) scan. If this ratio is >50%, the patient would be classified as having a high risk of mandibular fracture following extraction. In such cases, special care must be taken during and after surgery. Bone defects, odontogenic cysts and tumors and periodontal disease can all weaken the jawbone; all these conditions are more common in patients older than 40 years.

Mandibular fracture during surgical procedures occurs due to inappropriate use of instruments or applying excessive force, mainly by young, inexperienced dentists. Postoperative mandibular fracture often occurs due to excessive bite force. It is often reported by patients as crepitation and is not radiographically detectable in early phases.

The incidence of mandibular fracture in the right and left sides has not been commonly reported. Wagner et al. reported that 70% of the cases of mandibular fractures...
occurred in the left side; the reason was explained to be the easier application of instruments, applying a more controlled force and better accessibility in the right side of patients\textsuperscript{22,23}. The presented patient was a 38 year-old female with a fully erupted mandibular right third molar. She was systemically healthy and had no jaw pathology. To the best of authors' knowledge, there is no reported case of fracture of the angle of mandible following closed extraction of third molar in a healthy patient in the literature. The only reported case of fracture following closed extraction of third molar occurred in a 31 year-old male with osteogenesis imperfecta, who was under treatment with alendronate\textsuperscript{19}. Thus, the current report is the only one reporting immediate fracture of the angle of mandible following closed extraction of third molar in a healthy patient.

References