Research Article

Prevalence and Risk Factors for Complications of Mandibular Third Molar Surgery

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Abstract:

Background: Surgical extraction of third molar is one of the most common surgeries performed by maxillofacial surgeons. This study was aimed to assess the incidence of complications after surgical removal of mandibular third molar and their risk factors.

Materials and methods: This study was performed prospectively. Patients referred to the School of Dentistry for the surgical removal of mandibular third molar were included. Surgical time, number and form of roots, as well as demographic data was recorded. 24 hours later occurrence of complications including bleeding, swelling, pain, trismus, paresthesia and fracture were assessed. The frequency of reported complications, as well as the influence of risk factors was analyzed.

Results: A total of 101 patients with a mean age of 22.95±1.93 years were included. All patients showed mouth opening limitation, pain and swelling. Two cases had paresthesia (1.98%) and 31 cases (30.7%) complained of excessive bleeding. The average postoperative pain based on visual analogue scale was 4.01±0.76. Pain was lower in men. Trismus and bleeding was less in teeth with conical root compared to teeth with separate roots. In addition, it was shown that the teeth with more roots had higher occurrence of pain, swelling, trismus and bleeding. All of the complications increased with increasing surgical time.

Conclusion: Considering the high prevalence of complications following wisdom tooth surgery, in order to control them, it is necessary to be aware of the risk factors and inform patients.

Keywords: tooth impaction; wisdom tooth; surgery complications; trismus

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Consent: We confirm that the patient has given the informed consent for the casereport to be published.

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Introduction

Third molars are the last developed teeth in the growing human dentition and generally called wisdom teeth. Wisdom teeth impaction might occur due to lack of space. Complications associated with wisdom teeth mostly happen at age 18 to 25 years [1].

Third molar surgery is one of the most common operations performed by oral surgeons [2] and in most cases it is done without any complications during or after surgery [3]. Proper treatment planning and post-operative cares are the most important principles to reduce complications [3]. However, this conventional surgery may be associated with some complications [4, 5]. The risk of such complications should be discussed with the patient prior to the surgery and proper treatment should be done at the right time by the surgeon. Rate of complications following surgical removal of third molar have been reported between 2.6% to 30.9% [6-8]. These complications may occur during or after surgery, and the difference between the reported rates might be due to the diversity in the definition of the complications.

Wisdom tooth surgery is often associated with pain, swelling and trismus. However, the major complications include dry socket, infection, bleeding, and paresthesia. In addition, other rare complications such as fracture, bleeding and jaw dislocation can also occur [3, 9, 10].

Factors influencing wisdom tooth extraction complications include gender, age, systemic disease, oral contraceptives, poor oral hygiene, smoking as well as type of impaction, relation to the inferior alveolar nerve, surgery duration, surgical technique and the use of antibiotics [11-18]. In addition, the incidence of complications is associated with the surgical experience [19].

Surgery complications would influence patient satisfaction. Clinicians knowledge on the incidence of complications and influencing factors could help to reduce morbidity and better decision making [20]. Most studies that examined molar surgery complications have been performed retrospectively and mostly assessed major complications such as paresthesia, infection, dry socket and mandibular fracture [1, 8, 13, 17, 21-27]. However, short-term complications such as pain, bleeding, swelling and mouth opening limitation that are relatively common and could cause patient discomfort have been less studied. The present study aimed to investigate the prevalence of complications after surgery mandibular third molar and their risk factors.

Materials and methods

This study was performed prospectively on patients referred to the Department of Oral and Maxillofacial Surgery, School of Dentistry, Ahvaz University of Medical Sciences, in 2012 to 2014. Study protocol was approved by the university ethics committee and informed consent was obtained from all patients.

Patients who needed surgical extraction of impacted mandibular third molar were enrolled based on the inclusion and exclusion criteria (Table 1). All teeth were bony impacted and mesio-angular class II B, radiographically [28]. Surgeries were performed by second-year surgery resident with the same protocol. Envelope flap with no releasing incision was used. Bone was harvested and teeth were cut down to facilitate tooth removal. All patients were advised to take painkillers after surgery.

Prior to the the operation, apart from inclusion and exclusion criteria, demographic data, the maximum mouth opening (MMO), oral commissure to the tragus distance (TO), and zygomatic protuberance to mandibular angle distance (ZM) were recorded for each patient. In addition, surgery duration, the number and form of each tooth roots were also recorded.

After 24 hours, the patients were recalled and pain, bleeding and paresthesia were evaluated subjectively. Also MMO, TO, ZM and mandibular fractures were assessed.
Table 1 Inclusion and exclusion criteria

**Inclusion criteria**

- Bony impaction of mandibular third molar
- Mesio-angular class II B impaction [28]
- Informed consent
- Older than 16 years
- No serious systemic disease (ASA class I and II)
- No medication (including OCP)

**Exclusion criteria**

- The risk of infective endocarditis, coagulation problems, local or systemic infection, known hypersensitivity to acetaminophen or NSAIDs, history of asthma, addiction to drugs or alcohol
- Smoking
- Signs of infection, such as swelling, fever, pus, and reduce the amount of open mouth
- Not returning for follow up

**Pain assessment**

Pain after surgery was measured by Visual Analogue Scale (VAS). VAS is a psychometric instrument. The patients were asked to rate their pain intensity based on detailed description of VAS provided in writing to each patient (Table 2)

Table 2 Visual analogue scale guide

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Very low and mild pain</td>
</tr>
<tr>
<td>2-3</td>
<td>There is pain, but you feel comfortable.</td>
</tr>
<tr>
<td>4-5</td>
<td>Pain gets your attention and may affect your daily performance. (use of acetaminophen or ibuprofen)</td>
</tr>
<tr>
<td>6-7</td>
<td>Annoying pain; however you have the ability to focus on other issues.</td>
</tr>
<tr>
<td>8-9</td>
<td>Severe pain that can prohibit your work. You feel discomfort even when you rest.</td>
</tr>
<tr>
<td>10</td>
<td>Worst pain you can imagine.</td>
</tr>
</tbody>
</table>
**Swelling assessment**

A silk thread was used to measure distance between oral commissure to the tragus (TO) oral commissure to the tragus distance (TO), and between zygomatic protuberance to mandibular angle (ZM) on the surgery side while teeth were in occlusion and these distances were transferred to a ruler. Measurements were performed before and one day after surgery. Swelling index was calculated using the following equation:

Vertical index: postoperative ZM - preoperative ZM / preoperative ZM

**Trismus assessment**

The maximum mouth opening (MMO) was assessed by measurement of the distance between the upper and lower Incisors before and one day after the operation. The difference between these two measurements was considered as trismus.

**Statistical analysis**

The frequency of complications was calculated. As all variables had normal distribution, statistical analysis included independent samples t-test, one way ANOVA and Chi-Square. In order to analyze surgery duration correlation with complications Pearson Correlation test was used. Level of significance was 0.05.

**Results**

**Patients**

A total of 101 patients with a mean age of 22.95± 2.93 years (19 to 28 years) were evaluated in this study. Of these, 58 (57.4%) were men and 43 (42.6%) were female. Based on inclusion criteria, all patients were nonsmokers and none of them were taking medications. 57 (56.4%) of the teeth had two roots, 28 (27.7%) had three roots and 16 (15.8%) had four roots. Also, 79 teeth (78.2%) had separate tooth roots and 22 (21.8%) had conical joined roots. Surgery duration was between 25 to 90 minutes (average 44.11± 16.54 minutes).

**Postoperative complications**

After surgery, all patients had pain, swelling, and decreased MMO. One-third of the patients reported excessive bleeding on the first day. Numbness of the lower lip as a result of damage to the inferior alveolar nerve was reported in two female patients. Fortunately, no mandibular fracture occurred during or one day after surgery. No relation was found between the complications and patient age.

**Pain**

Average pain 24 hours following surgery was 4.01±0.76 (range 2-5) based on VAS system. The pain reported among men (3.84) is significantly lower than in women (4.24) (P = 0.007). Difference in postoperative pain between separate and joined conical roots was not significant (P = 0.256). The ANOVA showed that there is an association between the number of roots and postoperative pain (P <0.001). Scheffe post hoc test showed that teeth with more roots had more pain but this difference was not significant between the teeth with 3 and 4 roots (Figure 1a). On the other hand a good correlation (r = 0.615) between the duration of surgery and postoperative pain was shown (P <0.001) (Figure 2a).
Swelling

Average horizontal and vertical swelling index in the first 24 hours after surgery was 0.25±0.14 and 0.28±0.16, respectively. The difference between swelling index average between men and women (for ZM (P = 0.715) and for TO (P = 0.100)) and between teeth with separate and joined conical roots was not statistically significant (for ZM (P = 0.432) and for TO (P = 0.913)).

ANOVA showed a significant difference between the average swelling index of teeth with various root numbers (P <0.001). Scheffe post hoc test showed that teeth with more roots had higher swelling, but this difference was not significant between the teeth with 3 and 4 roots (Fig. 1b, c).

Similar to pain, swelling was also correlated with the duration of surgery (P <0.001). The surgery duration had good correlation with swelling index in the vertical dimension (r = 0.585) and horizontal dimension (r = 0.519) (Figure 2b, c).

![Graphs showing relationship between number of roots and swelling](image)

Figure 1 Relationship between number of roots. a) pain, b) vertical swelling, c) horizontal swelling, and d) trismus 24 hours following surgical removal of mandibular third molar.
Figure 2 Relationship between duration of surgery, a) pain, b) vertical swelling, c) horizontal swelling, and d) trismus 24 hours following surgical removal of mandibular third molar.

**Trismus**

The average preoperative MMO was 49.19±2.23 mm (range 43 to 50 mm) and it was 38.24±3.38 mm (range 32 to 45 mm) 24 hours after surgery. In all cases there was a decrease in MMO.

Difference between preoperative and postoperative MMO was considered as the trismus. Amount of trismus varied between 2 to 14 mm (mean 7.95±3.04 mm). Average trismus in men was 7.91 mm and in women was 7.98 (P = 0.902). Trismus in teeth with separate roots was 8.24 mm and in teeth with joined conical roots was 6.91 mm. This difference was statistically significant (P = 0.037). Also a significant correlation between the number of roots and trismus was shown (P <0.001). Scheffe post hoc test showed that teeth with more roots had more trismus (Figure 1d). Duration of surgery and amount of trismus had good correlation (r = 0.787) (P <0.001) (Figure 2d).

**Bleeding**

31 patients (30.7%) reported prolonged bleeding during the first 24 hours following surgery. Average surgery duration in patients who had prolonged bleeding after surgery was 60±13.29 minutes and in other patients it
was 37.17±12.56 minutes. This difference was statistically significant (P <0.001). Chi-Square test showed no significant difference in bleeding occurrence between men and women (P = 0.668). Bleeding was related to the root form (P = 0.046). In 13.64% teeth with conical root prolonged bleeding after surgery was reported while in the teeth with separated roots, bleeding occurred in 35.90% of cases. It was also shown that by increasing the number of impacted tooth roots, the occurrence of bleeding was increased significantly (P <0.001). 7.14% of the two root teeth, 46.43% of the three root teeth and 87.5% of the four root teeth had prolonged bleeding.

**Discussion**

Surgical removal of impacted third molars is a common ambulatory surgery performed in dental clinics. This surgery is done more in mandible compared to maxilla [29]. Pain and swelling after dental treatment is one of the complications that often bring unpleasant experience for patients. After tooth extraction, trauma causes inflammation at periodontium and damage to the cell wall [30-32]. Rupture of cell membranes release phospholipids which turn into prostaglandin and thromboxane and other metabolites by COX-1 and COX-2 enzymes and causes pain and swelling [32, 33]. On the other hand, trismus is caused by inflammation of masticatory muscles or pain after tooth extraction [34]. Bleeding in the first day after the operation might be due to the biochemical reasons (lack of coagulatory factors) or mechanical causes (loose stitches or factors cause frailty clot) [9].

Since trismus, pain and swelling usually occur during the first day after surgery [11], the current study, assessed the incidence of complications after mandibular third molar surgery within 24 hours after surgery and the influence if risk factors were analyzed. The results showed that on the first day after the operation the pain is moderate. In all cases somewhat limited mouth opening and swelling occurred. Almost a third of cases reported prolonged bleeding. Similarly, in previous studies the most common complications in the first days after the surgery have been pain, swelling and trismus [18, 35, 36].

Pain is completely subjective and each individual reports pain based on his/her own criterion (self-report). Various tools could be used to determine the degree of pain; VAS was used in this study. As these tools represent the individual's perception of pain, they are more useful to compare various scenarios is the same person. Therefore, in many studies, researchers are more likely to describe the qualitative scores to compare the groups and interventions rather than emphasizing on the score [37]. In the current study, analgesic was prescribed for all patients and their reported postoperative pain was mild to moderate. However, in another study, immediate pain after third molar surgery using VAS was mild in 53% of the cases and severe in 47% and 15.2% of the patients experience severe pain within a week after surgery [14].

In this study, postoperative pain was less in men compared to the women. Although trismus was less in in males than females, this difference was not statistically significant. Misgarzadah et al. [38] as well as studies of Akadiri & Berge [5, 35] also found no difference between men and women. In contrast, Grossi [39] reported that gender is a predictor factor for postoperative discomfort. Similar to the current study, two previous investigations reported that the risk of pain is more in women than men [14, 18]. Capuzzi, on the other hand, showed that men had more pain on the first and third days after surgery [15]. It is stated that low pain threshold in women and the use of a greater number of anesthetic cartridges can increase the risk of trismus and post-operative pain [34].

In the present study, same as Mesgarzadeh et al. [38], trismus and bleeding were significantly lower in patients who had conical root teeth. In another study it was demonstrated that teeth with two separate roots compared to the teeth with conical roots and teeth adjacent to inferior alveolar nerve channel had a higher risk for longer operation [14]. In the cited article, curved root was the only predictive factor of preoperative pain
The current study showed that by increasing in the number of impacted tooth roots, trismus, pain, swelling and bleeding after surgery elevates significantly.

One of the striking findings in this study was the association between duration of surgery and postoperative complications. However, some previous studies observed no significant relationship between trismus after surgery and duration of surgery [36, 38, 39]. This controversy may be because the duration of operation can be influenced by the surgeon skill and in the cited experiments, surgeries were performed by students, residents and experts with different level of skills. On the other hand, similar to this study, relationship between duration of the operation and severity of trismus was demonstrated in other studies [12, 40]. Pedersen [12] showed a significant correlation between the duration of the surgery and postoperative pain, trismus and swelling. In addition, with increasing duration of surgery, the number of analgesic pills consumed in the first 24 hours after surgery increased [12]. Similarly, Van Gool [41] and Capuzzi [15] showed that surgery duration is a risk factor for pain, swelling, and trismus after surgery. Long manipulation of soft tissue and wound could be the reason for this relation [41]. In the study of Baqain [42] duration of surgery was an independent predictor variable for pain and the complications increased with long surgery [42].

In this study, two patients (1.98%) complained of lower lip paresthesia. In previous studies, the risk of paresthesia after mandibular third molar surgery was reported between 0.6% to 7% [1, 8, 13, 14, 18, 21, 24, 25, 41]. Osborne showed that total sensory impairment in patients over 24 years is 6.5 times more than patients under 24 years of age [8]. Literature review by Alling showed spontaneous recovery of 96% of patients with damage to the inferior alveolar nerve and 87% of those with damage to lingual nerve [43]. In most patients this improvement can be achieved in 6 to 8 weeks. However, recovery can be delayed for 9 months and 2 years. Damage to the inferior alveolar nerve is primarily due to the proximity of root with nerve which could be detected by X-ray prior to the surgery [44].

Previous studies suggested that other risk factors may also influence third molars surgery complications. For instance, body composition, weight and preoperative anxiety may be more important determinants than radiographic features [5, 35]. Further studies should be performed to investigate other risk factors.

Conclusion

Considering the limitations of this study, results showed that 24 hours after mandibular third molar surgery, if appropriate analgesics were taken, the postoperative would not be severe. Relatively low incidence of the short term complication rates in the days after surgery, but limited mouth opening occurs in all patients. Approximately one third of patients reported bleeding and 1/98% had lower lip paresthesia. Pain was less in men than women. The trismus and bleeding was less in the teeth with conical roots. In addition, it was shown that by increasing the number of the roots, rate of pain, swelling, trismus and bleeding elevates. These complications also increased with increasing surgery duration. So it seems that with increasing surgeon experience and reduce operation duration, complications can be reduced.

References


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