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IATROGENIC MANDIBULAR FRACTURE AFTER EXTRACTION OF THIRD MOLARS: RISK FACTORS AND PREVENTIVE STRATEGIES

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ABSTRACT

Iatrogenic mandibular fracture is a rare but clinically relevant complication associated with extraction of mandibular third molars. Despite the low incidence, its occurrence can result in serious functional and aesthetic consequences, requiring complex surgical interventions and negatively impacting the patient's quality of life. This article aims to review the main risk factors involved in this intercurrence, as well as the preventive strategies that should be adopted during the planning and execution of the surgical procedure. The analysis of the literature shows that variables such as advanced age, presence of impacted teeth, bone resorption, excessive osteotomy, and application of inadequate forces during tooth extraction significantly increase the risk of fracture. In addition, the use of appropriate imaging tests, such as panoramic radiography and CT scans, and the application of minimally invasive techniques, such as odontosection and controlled osteotomy, are among the main preventive measures. It is concluded that the previous identification of anatomical and technical risk factors, combined with the judicious use of conservative surgical strategies, is essential to prevent this type of complication and ensure patient safety.

Keywords: Mandibular fracture. Tooth extraction. Third molars. Iatrogenesis.

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INTRODUCTION

Extraction of mandibular third molars is one of the most frequent surgical interventions in the practice of oral and maxillofacial surgery. This procedure is often performed for the management of impacted teeth, which, for the most part, have associated complications, such as periapical cysts, infections, and nerve injuries. In addition, one of the serious complications, although rare, is iatrogenic mandibular fracture, which occurs as a direct result of the surgical procedure. Mandibular fractures associated with extraction of third molars represent a significant challenge for surgeons and, if not treated appropriately, can result in serious functional and aesthetic sequelae for the patient.

The incidence of iatrogenic mandibular fractures after extraction of impacted teeth, although considered rare, varies according to sources, with reports of incidences between 0.0033% and 0.0046% of cases of third molar extraction (Subhashraj, 2009). However, the frequency of this type of complication, even though it is low, justifies a detailed analysis of its risk factors, in order to optimize the surgical approach and minimize the risks for the patient. A mandibular fracture occurs when the forces applied during the procedure overcome the resistance of the mandibular bone, which can be influenced by several factors, such as the technique used, the patient's anatomy, and the position of the impacted tooth.

The choice of extraction technique, the use of excessive force, the anatomy of the impacted teeth, and the patient's age are determining factors for the success or complication of the procedure (Renton et al., 2001). Patients with mesioangulated teeth, that is, those whose teeth are tilted towards the midline, are more predisposed to complications such as mandibular fracture. Age also plays an important role, with the bulk of cases occurring among younger patients (18-35 years) due to higher bone density and difficulty in removing teeth. The presence of radiolucidity on radiographic examinations may be indicative of bone weakness and increase the risk of fractures (Miloro et al., 2008).

Source: Blog Odontologia - Elsa & Asociados. Multimedical Clinic, Santa Cruz de la Sierra, Bolivia. Available at: https://crisolespinoza.blogspot.com.

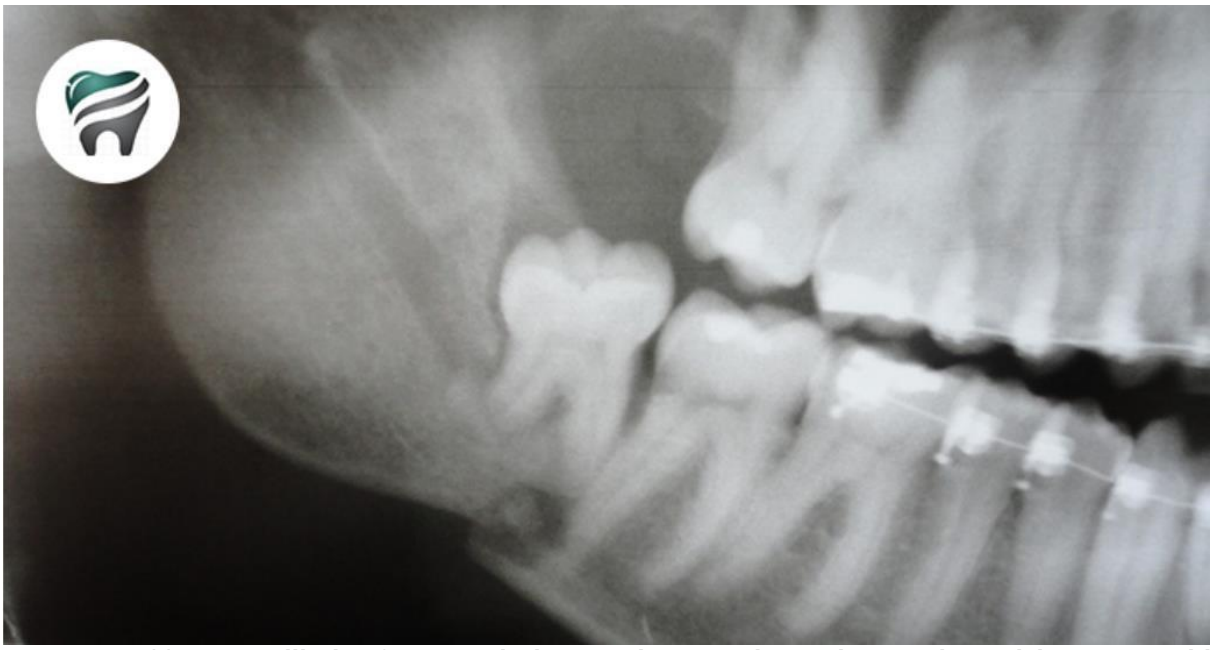
The literature highlights that most iatrogenic mandibular fractures occur during the intraoperative period, with a peak incidence among the age groups of 26 to 45 years. Factors such as the type of angulation of the impacted tooth, the difficulty in removing it, and the use of inappropriate extraction techniques, such as the application of excessive forces or the abrupt removal of the tooth, are commonly implicated in the occurrence of fractures. In addition, the risk of complications increases significantly when the procedure is performed without proper preoperative radiographic evaluation, which could identify specific anatomical features that hinder tooth extraction, such as curved roots, mesioangulated teeth, or a compromised bone line (Cankaya et al., 2011).

The identification of risk factors for iatrogenic mandibular fractures is essential for adequate surgical planning and the choice of appropriate techniques for each case. The management of complications involves early diagnosis and the choice of the best therapeutic approach, whether conservative or surgical. Fractures can be treated by open or closed methods, depending on the severity and location of the injury. In many cases, rigid internal fixation, associated with stabilization with titanium plates and screws, is necessary to ensure adequate healing and restoration of mandibular functions (Bodner et al., 2011).

In addition, a detailed analysis of the difficulty of extracting the mandibular third molar should be performed before the intervention, through clinical and radiographic examinations, in order to predict possible complications and optimize the surgical strategy. The choice of extraction technique should be thorough, and the use of appropriate tools, such as gentle pressure extractors and minimal osteotomies, can be a decisive factor in preventing mandibular fractures during the procedure (Ellis III et al., 2009).

This study aims to review the risk factors associated with iatrogenic mandibular

fracture during mandibular third molar extraction, in addition to discussing preventive strategies based on the scientific literature. The goal is to provide oral and maxillofacial surgeons with a broader understanding of the prevention and proper management of this complication, ensuring that patients receive the best possible care, minimizing risks and favoring a quick recovery without sequelae.



Source: Ortoblog. **Mandibular fracture during tooth extraction: what to do and how to avoid it**. Available at: https://www.ortoblog.com/super-video-fratura-mandibular-durante-exodontia-o-que-fazer-como-evitar/.

METHODOLOGY

This is a narrative literature review with a qualitative focus, carried out with the objective of gathering and critically analyzing the evidence available in the scientific literature about risk factors and preventive strategies related to iatrogenic mandibular fracture during extraction of mandibular third molars.

The bibliographic search was conducted between March and April 2025, in the electronic databases PubMed, Scopus, SciELO, and Lilacs, using the following descriptors in Health Sciences (DeCS): *"mandibular fracture", "tooth extraction", "third molars",* and *"iatrogeny",* combined with Boolean operators *AND* and *OR*, as appropriate. Studies published in English, Spanish, and Portuguese between 2000 and 2025 that specifically addressed the occurrence of iatrogenic mandibular fractures due to third molar extractions, as well as their causes and preventive measures, were included.

Inclusion criteria involved original articles, literature reviews, cohort studies, case

reports, and case series that presented data relevant to the topic. Duplicate studies, studies with non-human samples, articles with unclear methodology, or those that addressed mandibular fractures of traumatic origin not associated with tooth extraction were excluded.

DISCUSSION

The iatrogenic mandibular fracture represents one of the most challenging complications of third molar extraction, especially when it comes to impacted teeth in the mandibular angle region. Although its occurrence is rare, the associated functional and aesthetic damage make it essential to identify and manage the factors predisposing to this complication.

Several studies indicate that the bone strength of the mandible can be compromised by anatomical and technical variables, making certain patients more vulnerable. Among the main risk factors cited in the literature, the following stand out: advanced age, atrophic mandible, impacted teeth in unfavorable positions (such as horizontal or mesioangulated), presence of bone resorption, excessive osteotomy, and application of traumatic forces during the surgical procedure (Subhashraj, 2009; Miloro et al., 2008; Cankaya et al., 2011).

Thorough preoperative evaluation is a crucial step for the success of the procedure. Exams such as panoramic radiography and computed tomography (CT) are indispensable tools for analyzing bone morphology, tooth location, and degree of difficulty in extraction (Ellis III et al., 2009; Ethunandan et al., 2012). The choice of surgical technique also plays a decisive role in the prevention of fractures. The use of less invasive techniques, such as odontosection and controlled osteotomy, allows for a safer and less traumatic removal of the dental element.

In addition, the surgeon's experience directly influences the outcomes of the procedure. The literature shows that professionals with less experience tend to apply inadequate forces or neglect to perform sections, increasing the risk of mandibular fracture (Bodner et al., 2011; Grau-Manclús et al., 2011).

Thus, the integration between technical knowledge, careful planning and mastery of the surgical technique is indispensable to minimize risks. Current studies reinforce that the success of third molar extraction depends not only on the surgical act itself, but also on the careful analysis of multiple factors that can influence mandibular bone integrity.

Table 1 – Risk Factors for Iatrogenic Mandibular Fracture

Risk Factors
Advanced age
Atrophic jaw
Third molars impacted in a horizontal/mesioangulated position
Excess force during extraction
Inadequate surgical technique
Absence of odontosection in teeth with voluminous roots

Table 2 – Preventive Strategies

Preventive Measures
Radiographic evaluation with panoramic X-ray/CT
Individualized surgical planning
Use of odontosection and controlled osteotomy
Proper and well-honed instruments
Application of controlled forces
Execution by a trained professional

RESULTS

The analysis of the literature on iatrogenic mandibular fractures associated with extraction of third molars reveals that, although this type of fracture is rare, its occurrence is clinically relevant and can have significant functional and aesthetic consequences for patients. Studies indicate that the incidence of iatrogenic mandibular fractures after removal of impacted third molars ranges between 0.0033% and 0.0046%, as reported by Subhashraj (2009). The complication rate, although low, justifies the need for an in-depth analysis of the risk factors involved and the implementation of appropriate preventive strategies to avoid these complications.

Several risk factors have been identified in the literature, which directly contribute to the increased probability of iatrogenic fractures during third molar extraction. The angulation of the impacted tooth is one of the most critical factors: mesioangulated teeth (inclined towards the midline) and teeth with curved roots are more difficult to remove and require more aggressive techniques, increasing the risk of mandibular fracture. The presence of impacted teeth with curved or mesioangulated roots is directly associated with an increased incidence of fractures, according to the study by Cankaya et al. (2011).

The patient's bone density also plays an important role in fracture risk. Younger patients, with higher bone density, are more likely to suffer fractures during extraction due to the strength of the bone. On the other hand, in older patients, bone fragility can

result in additional complications, such as bone fracture during tooth removal. The literature suggests that most fractures occur among patients aged between 18 and 35 years, the age group in which bone density is highest (Miloro et al., 2008).

The use of appropriate imaging tests, such as panoramic radiography and CT scans, is essential for a complete evaluation of the patient's anatomy and for proper planning of surgery. The literature emphasizes that the lack of a detailed preoperative evaluation may result in the omission of critical anatomical factors that increase the risk of fractures. Teeth with curved roots, mesioangulated teeth, or areas with compromised bone resorption can be identified in advance with the use of these exams, allowing the surgeon to better prepare for the procedure and choose the most appropriate techniques (Escoda and Domínguez, 2004).

With regard to extraction techniques, excessive use of force is one of the main risk factors associated with iatrogenic mandibular fractures. The application of inappropriate forces, either during direct tooth removal or when attempting aggressive maneuvers for its extraction, can lead to fracture of the mandibular bone. The literature suggests that the adoption of more conservative techniques, such as odontosection (separation of the tooth into smaller fragments) and controlled osteotomy (precise cutting of the bone), significantly reduces the risk of fractures, as these techniques minimize the need for excessive forces (Ellis et al., 2009).

In addition, the surgeon's experience has a direct impact on the occurrence of complications. Surgeons with greater training and experience are better able to handle complex cases of impacted teeth and can apply the correct techniques more effectively, reducing the chances of mandibular fractures. The literature suggests that less experienced surgeons are more likely to make technical errors during the procedure, which can increase the risk of fractures.

The following table summarizes the main risk factors and preventive strategies adopted in the reviewed studies:

Risk Factors	Preventive Strategies
Young age (18-35 years)	Detailed preoperative radiographic evaluation for identification of complicated teeth.
Impacted teeth with curved roots	Use of controlled techniques such as odontosection, osteotomy and less aggressive extraction techniques.

Excessive use of force	Application of moderate forces and appropriateness of the use of instruments, such as soft pressure pullers.
Lack of evaluation Radiographic	Imaging tests such as CT scans for detailed analysis of bone and tooth anatomy.

These results indicate that the combination of a thorough clinical and radiographic evaluation, combined with the use of appropriate techniques during the surgical procedure, is crucial to reduce the risk of iatrogenic mandibular fractures. Evidence suggests that proper surgical planning and the choice of a personalized technique for each patient are key to avoiding these complications.

CONCLUSION

Iatrogenic mandibular fractures associated with extraction of third molars, although rare, represent a significant complication in oral and maxillofacial surgery, with the potential to cause serious functional and aesthetic consequences for patients. The analysis of the literature revealed that factors such as age, the presence of impacted teeth, bone density, and the surgical technique applied play crucial roles in the incidence of these fractures. Young patients, with mesioangulated teeth or curved roots, are more prone to complications due to the increased difficulty in removing the teeth and the need to apply considerable forces.

Preventive strategies highlighted in the review include performing appropriate imaging tests, such as panoramic radiographs and CT scans, to assess the patient's anatomical features and plan the surgical approach. Minimally invasive techniques, such as odontosection and controlled osteotomy, have been shown to be effective in reducing the need for excessive forces during extraction, minimizing the risk of fractures. In addition, the surgeon's experience also proved to be a determining factor in the prevention of complications, with more experienced professionals having a lower rate of technical failures during the procedure.

Thus, early detection of risk factors, along with the implementation of appropriate preventive strategies, is essential to ensure patient safety in the process of third molar extraction. The combination of a detailed radiographic evaluation and the choice of appropriate techniques for each specific case can considerably reduce the risk of iatrogenic mandibular fractures, providing a safer and more effective outcome for patients. The continuous training of surgeons and the development of new imaging

technologies and surgical techniques have the potential to further improve safety and outcomes in the treatment of impacted teeth.

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