

ALGORITHM FOR CHOOSING THE TREATMENT STRATEGY FOR IMPACTED THIRD MOLARS

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Abstract: Impacted third molars remain one of the most common pathologies of the maxillofacial region and represent a significant clinical problem in modern oral surgery. According to epidemiological studies, the prevalence of this condition among the adult population reaches 20–30%, while the choice of the optimal treatment strategy remains a subject of ongoing debate in contemporary dentistry. The issue of prophylactic removal of asymptomatic impacted teeth still lacks a unified approach, which determines the relevance of developing standardized clinical decision-making algorithms. This article presents a comprehensive approach to selecting the treatment strategy for impacted third molars based on the assessment of clinical, anatomical-topographic, and radiological criteria. Modern classifications of tooth impaction, risk factors for complications, indications and contraindications for surgical intervention, as well as the principles of dynamic patient follow-up are discussed. The proposed algorithm allows a differentiated approach to determining indications for surgical extraction or conservative management, minimizing the risk of postoperative complications and unjustified surgical interventions.

Keywords: Impacted third molars, wisdom teeth, oral surgery, treatment algorithm, extraction, coronectomy.

Introduction

Impaction of teeth is a pathological condition characterized by delayed eruption of a fully formed tooth beyond the physiological period of its appearance in the oral cavity. Among all groups of teeth, third molars are most frequently affected by impaction due to the anatomical-functional and evolutionary characteristics of the human maxillofacial system. In modern dental practice, impacted third molars are regarded not only as a local dental problem, but also as a potential source of inflammatory, cystic, neurological, and orthodontic complications.

The high prevalence of this pathology is explained by the phylogenetic reduction in jaw size while maintaining almost unchanged tooth dimensions. As a result of insufficient space in the distal regions of the dental arch, conditions are created for atypical eruption or complete retention of third molars within the jawbone. According to various authors, the prevalence of third molar impaction ranges from 18% to 32% depending on age, sex, ethnicity, and the structural characteristics of the dentofacial system.

Particular clinical significance belongs to impacted mandibular third molars, which occur considerably more frequently than maxillary third molars and are associated with a higher risk of complications. This is related to the anatomical features of the mandible, increased bone density, limited retromolar space, and the proximity of the inferior alveolar nerve. At the same time, impacted teeth may remain asymptomatic for long periods, significantly complicating the determination of optimal patient management.

In contemporary dentistry, the necessity of removing asymptomatic impacted third

molars remains controversial. On the one hand, prophylactic extraction may prevent the development of potential complications, including pericoronitis, caries of the distal surface of the second molar, cystic changes, and resorption of adjacent tooth roots. On the other hand, surgical intervention itself is associated with the risk of intraoperative and postoperative complications, among which injury to the inferior alveolar nerve, alveolitis, bleeding, and infectious-inflammatory processes occupy a special place.

In this regard, the development of a systematic algorithm for selecting treatment tactics becomes particularly relevant, allowing the clinical decision-making process to be standardized while taking into account the combination of factors determining disease prognosis and the risk of complications.

Etiological Factors of Third Molar Impaction

The development of third molar impaction is caused by a combination of local and systemic factors. Among the most significant local causes is deficiency of retromolar space resulting from the discrepancy between the dimensions of the dental arch and erupting teeth. Insufficient distance between the distal surface of the second molar and the anterior border of the mandibular ramus prevents physiological eruption of the third molar and contributes to its atypical position.

The position of the tooth germ also plays a substantial role. Mesial, distal, horizontal, or inverted inclination of the longitudinal axis of the third molar creates mechanical obstacles to normal eruption. In some cases, impaction may result from odontogenic cysts, benign neoplasms, supernumerary teeth, or pronounced osteosclerosis of the alveolar process.

Particular attention should be paid to changes in the soft tissues of the retromolar region. Fibrous hyperplasia of the mucosa, scar changes after inflammatory processes, and chronic traumatic irritation of the gingiva may also interfere with normal tooth eruption.

Systemic factors of impaction are encountered much less frequently; however, they are important in generalized eruption disorders. These include endocrine diseases such as hypothyroidism and hypopituitarism, nutritional deficiencies, mineral metabolism disorders, and genetically determined syndromes accompanied by abnormalities in bone tissue development.

Classification of Impacted Third Molars

Various classifications of impacted third molars are used to assess the complexity of the clinical situation and determine the surgical treatment strategy. The most widely used is the Pell and Gregory classification, based on the position of the impacted tooth relative to the mandibular ramus and occlusal plane.

According to this classification, three classes are distinguished depending on the relationship to the mandibular ramus. In Class I, the crown of the tooth is located completely anterior to the anterior border of the mandibular ramus, providing relatively favorable conditions for eruption and surgical removal. In Class II, part of the crown is covered by the mandibular ramus, increasing the technical difficulty of the intervention. Class III is characterized by the complete location of the crown within the mandibular ramus and is considered the most difficult type of impaction.

According to the depth of impaction, positions A, B, and C are distinguished. Position A is characterized by the occlusal surface of the impacted tooth being at or above the occlusal plane of the second molar. In Position B, the occlusal surface is located between the occlusal plane and the cervical line of the second molar. Position C indicates deep impaction below the cervical line of the second molar.

The Winter classification is also widely used and is based on the angulation of the longitudinal axis of the impacted tooth. Vertical impaction is considered the most favorable, whereas horizontal and inverted impactions significantly increase the risk of complications and the technical complexity of surgical extraction.

Algorithm for Clinical Decision-Making

The choice of treatment strategy for impacted third molars should be based on a comprehensive assessment of the clinical situation. The first stage includes primary diagnostics consisting of medical history collection, clinical examination, and radiological investigation.

Particular attention is paid to the presence of complaints, episodes of pericoronitis, restricted mouth opening, tenderness on palpation, and signs of inflammatory changes in the retromolar area. Clinical examination is supplemented by radiological diagnostics. Orthopantomography is the most commonly used screening method, allowing evaluation of tooth position, surrounding bone tissue condition, and the relationship between the roots and the mandibular canal.

If close contact between the tooth roots and the inferior alveolar nerve is suspected, cone-beam computed tomography is indicated, providing three-dimensional visualization of anatomical structures and allowing more accurate prediction of neurological complications.

After completion of the diagnostic stage, risk factors for complications are analyzed. High-risk features include recurrent pericoronitis, carious lesions of the impacted tooth or distal surface of the second molar, cystic transformation of the follicle, resorption of adjacent tooth roots, and signs of chronic inflammatory processes.

Moderate risk is characteristic of patients with partial impaction, isolated episodes of pericoronitis, and mesioangular tooth position. Low risk is observed in cases of complete bony impaction, absence of clinical symptoms, and no pathological radiological findings.

Based on the obtained data, the management strategy is determined. In the presence of symptoms and complications, surgical extraction of the impacted tooth is indicated. In cases of acute inflammatory process, conservative therapy aimed at reducing inflammation is initially performed, followed by planned extraction.

In asymptomatic patients, the decisive factor is the assessment of the probability of future complications. In high-risk cases, prophylactic extraction is preferred, especially in young patients. In low-risk situations and in the absence of pathological changes, dynamic observation with regular clinical and radiological follow-up is possible.

Indications and Contraindications for Surgical Treatment

Absolute indications for removal of impacted third molars include recurrent pericoronitis resistant to conservative treatment, odontogenic inflammatory diseases, cystic transformation of the follicle, resorption of second molar roots, and severe pain syndrome associated with compression of neural structures.

Relative indications include orthodontic treatment planning, preparation for orthognathic surgery, implant placement planning, and isolated inflammatory episodes in young patients.

When determining the treatment strategy, contraindications to surgical intervention must also be considered. Absolute contraindications include decompensated systemic diseases, acute myocardial infarction or stroke, severe hemostatic disorders, and malignant neoplasms in the area of the planned intervention.

Relative contraindications include pregnancy, acute infectious diseases, anticoagulant

therapy, and a history of bisphosphonate-associated osteonecrosis of the jaws. In such clinical situations, surgical intervention may be temporarily postponed until stabilization of the patient's general condition or performed after appropriate medical correction and consultation with specialized physicians.

Special attention during surgical planning should be given to evaluating the risk of postoperative complications. Important factors include the patient's age, presence of chronic diseases, degree of tooth impaction, relationship to the mandibular canal, and condition of surrounding tissues. In older patients, surgical extraction of impacted third molars is generally associated with greater trauma, slower reparative processes, and a higher probability of inflammatory complications.

Methods of Surgical Treatment

The choice of surgical technique is determined by the anatomical and topographic characteristics of the impacted tooth, the degree of eruption, root morphology, and proximity to important anatomical structures. Modern oral surgery employs simple extraction, atypical surgical removal, and coronectomy.

Simple extraction is possible under relatively favorable conditions: vertical tooth position, complete or partial crown eruption, absence of significant root curvature, and sufficient access for surgical instruments. This method is characterized by minimal trauma and a relatively short postoperative period. The procedure includes detachment of the circular ligament, luxation using elevators, and subsequent removal with forceps.

In cases of deep bony impaction, horizontal or distoangular position, ankylosis, or close proximity of roots to the mandibular canal, atypical surgical extraction is performed. This method requires more complex surgical access and includes raising a mucoperiosteal flap, osteotomy, tooth sectioning, and staged removal of fragments. The use of a bur with constant irrigation reduces overheating of bone tissue and decreases the risk of postoperative necrosis.

In recent years, the technique of coronectomy has become increasingly widespread as an organ-preserving alternative to traditional extraction in patients at high risk of inferior alveolar nerve injury. The method involves removal of only the crown portion while retaining the roots within the bone tissue. The main indication for coronectomy is close proximity of the impacted tooth roots to the mandibular canal confirmed by cone-beam computed tomography.

Despite the advantages of this method in preventing neurological complications, coronectomy requires careful follow-up because postoperative root migration, inflammatory changes, or the need for repeated surgical intervention may occur.

Complications of Surgical Treatment

Removal of impacted third molars is considered one of the most complex procedures in outpatient oral surgery and is associated with a certain risk of complications. Their occurrence depends on the complexity of the operation, the surgeon's qualification, the patient's anatomical features, and compliance with postoperative recommendations.

Intraoperative complications include fracture of the crown or roots of the extracted tooth, damage to adjacent teeth, trauma to soft tissues, fracture of the alveolar process, and temporomandibular joint dislocation. During extraction of maxillary third molars, communication with the maxillary sinus may occur due to perforation of its floor.

The most common early postoperative complication is alveolitis, resulting from disruption of blood clot formation in the extraction socket. The incidence of alveolitis significantly increases after traumatic surgical procedures and in cases of noncompliance

with postoperative instructions. Clinically, this complication manifests as severe pain, unpleasant odor from the mouth, and delayed wound healing.

Other early complications include pronounced soft tissue swelling, secondary bleeding, restricted mouth opening, and suppuration of the postoperative wound. In most cases, these conditions are temporary and respond well to conservative treatment.

Late neurological complications associated with injury to the inferior alveolar or lingual nerve are of particular importance. Transient paresthesia occurs relatively frequently and usually resolves within several weeks or months. However, severe nerve damage may lead to persistent sensory disturbances significantly impairing the patient's quality of life.

Conclusion

The developed algorithm for selecting the treatment strategy for impacted third molars is based on the principles of evidence-based medicine and takes into account the multifactorial nature of the clinical situation. The key determinants of decision-making are the presence of symptoms, assessment of complication risks, anatomical and topographic features of tooth position, and the patient's somatic status.

An individualized approach makes it possible to avoid both unjustified surgical interventions in asymptomatic impacted teeth with low complication risk and delayed management in cases where postponement of surgery may aggravate the pathological process.

A promising direction for further research is the development of predictive models based on machine learning for patient risk stratification using cone-beam computed tomography data.

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