
EXTRATION OF MANDIBULAR THIRD MOLARS, A CORRELATION BETWEEN THE SURGICAL TECHNIQUE AND WINTER'S

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Abstract: Total and partial impaction of the teeth is considered to be a developmental anomaly, that can affect any tooth in both deciduous and permanent dentition, but according to a large number of dental authors it is mostly associated with the mandibular third molars. Its multifactorial etiology, diagnostics, oral surgical approach and techniques can increase the difficulties of this problem which is encountered in the everyday oral surgical practice.

The selection of the appropriate oral surgical technique mostly depends on the various positions in which the total or partial impacted mandibular third molar may appear and his correlation with the adjacent anatomical structures, thus leading to different diagnostic and therapeutic problems.

This study includes 80 patients, divided in two groups of 40 patients, where one group is diagnosed with a total impaction and the other group with a partial impaction of the mandibular third molars.

After a statistical analysis of the obtained data was performed with the help of appropriate world renowned classifications concerning the position of the impacted mandibular third molars, we came to the following results: according to Winter's classification, the impacted molars where dominantly in a vertical position; Axhausen's flap design was dominantly a method of choice; buccodistal osteotomy is the most frequently used technique; the impacted molars presented a convergent anatomical configuration of the roots in most of the cases.

Keywords: impacted lower third molar, position, flap design, surgical approach, surgical technique.

ЕКСТРАКЦИЈА НА ТРЕТИ МАДИБУЛАРНИ МОЛАРИ, КОРЕЛАЦИЈА ПОМЕЃУ ХИРУРШКАТА ТЕХНИКА И КЛАСИФИКАЦИЈА ПО WINTER

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Резиме: Импакцијата и полуимпакцијата на забите спаѓа во развојни аномалии и е присутна како во млечната, така и во перманентната дентиција, а со неа може да биде зафатен било кој заб, но сепак најголем процент според голем број автори од деналната литература завземаат мандибуларните трети молари. Нивната мултикаузална етиологија, дијагностицирање, орално хируршки пристап и орално хируршка техника во зависност од морфологијата на коренскиот комплекс и степенот на импакција се специфичен проблем со кој секојдневно се среќаваме во орално хируршката проблематика.

Изборот на адекватна орално хируршка техника во голема мерка е условена од различните положби во кои се јавува импактираниот и полуимпактираниот мандибуларен трет молар.

Во оваа студија беа опфатени 80 пациенти и тоа поделени во две групи од по 40 пациенти, едната група со дијагноза на импактирани а другата со дијагноза на полуимпактирани мандибуларни трети молари.

По статистичката обработка најголем број од испитаниците според класификацијата по Winter молари се во вертикална положба, начесто користен хируршки пристап е резот по Axhausen, најчесто користена техника е буккодистална остеотомија а најчесто импактираните молари биле со два корена со конвергентна поставеност.

Клучни зборови: Импактиран долен трет молар, местоположба, флап дизајн, хируршки пристап, хируршка техника.

1. INTRODUCTION

An impacted, retained or included tooth is considered to be a tooth that has failed to completely or partially erupt in its correct position in the dental arch and its eruption potential has been lost. These are teeth that manifest variations in their size, number and developmental stage, which variations are likely influenced by biological, dynamical and mechanical factors from genetic and phylogenetic origin.

The impacted tooth can be imbedded with its full size inside the jaw bone or only partially (a condition known as semi-impaction of the tooth). If the impacted or semi-impacted tooth is located near its anatomical determined position, then it is described as orthotopic retention. Also it can be found outside of its normal position in the jaw bone, a condition referred to as ectopic position of the tooth. Impacted and semi-impacted teeth can appear both in deciduous and permanent dentitions and despite the regular teeth, supernumerary teeth can also appear in these positions.

According to most of the dental studies, the mandibular third molars are prevalently present as impacted or semi-impacted teeth. Also, other groups of teeth may appear in an impacted position, such as: the maxillary third molars, the maxillary canines, the mandibular canines and rarely other groups of teeth.

The mandibular third molars are teeth with a remarkable high probability for variations in their development, crown and root morphology, anatomical positions, etc. They appear in the oral cavity between the age of 17 and 24. Pericoronitis is an inflammation of the soft tissues, which can normally occur while the tooth is in stage of eruption. However, when it comes to impacted teeth, the pericoronitis may take up an acute, chronic or ulcerative form which inevitably leads to extraction of the affected tooth. The presence of non-restorative caries lesions¹, pulpitis or periapical pathology in the mandibular third molars are also considered as an indication for their extraction (Knights²).

In cases, when the mandibular third molars are deeply imbedded inside the jaw bone, without causing any problems, they should be monitored. It is very important to prevent a wrong accusation of the impacted molars due to pain originating from TMJ or masticating muscles.

The surgical approach and technique for the removal of the impacted mandibular molars is planned and performed by an oral surgeon. The extraction may vary from extremely difficult to relatively simple and short. A cautious consideration of the classifications of impacted teeth that are in accordance to the standard international systems can help ease the selection of the adequate surgical approach and help predict the postoperative complications. A panoramic dental x-ray is sufficient to precisely determine the position of the impacted mandibular molars and there correlation with the adjacent anatomical structures. The mesioangular impaction, in which the mandibular third molar is tilted toward the second molar, prevails in most of the cases. When the tooth is embedded rather deep in the jaw bone and is in close relation with the contents in the canal of the mandible, the extraction procedure becomes more complicated, regardless of the degree of the angle between the third and second molar.

The morphology of the root complex of the impacted teeth has a great impact on the severity of the surgical procedure and the planning of the surgical technique. If the morphology consists of one conical root or several roots fused in one large conical structure, the surgical procedure is simplified, because there is no need for root separation

and fracture of the root tips is avoided. Factors which determine the degree of impaction of the mandibular third molars are: the length of the root (the optimal time for surgical extraction is when 2/3 of the root are formed), the type of the root morphology (conical roots are much easier to extract, with a minimal possibility of fracture). If only 1/3 of the root is developed, the extraction can be complicated because of the possibility of rotational movements during the tooth extraction. Another determining factor is the form of the roots, whether they are conical, fused or separated, more or less curved, converge or diverge one from another, leading to a formation of a wide or tight interradicular septum. Roots that are fused and with a smaller curvature are much easier to extract and provide a lower risk for fracture during the procedure. The distal curvature of the roots is also with a great significance, such as the mesioangular impacted mandibular third molars with a distal curvature can be removed without the use of excessive force and without a risk of root fracture. The width of the roots in mesiodistal direction should be compared with the width of the crown in the cervical area. A more enhanced apical curvature of the roots can complicate the oral surgical procedure and necessitate the need for their separation. The density of the adjacent bone (the density rises proportionally with the patients age, due to a decrease in the bone elasticity), is a major factor in the severity of the surgical procedure. Also the tooth follicle can have an influence on the tooth extraction, as so if it is larger the extraction procedure will be more simple.

Because of their various ethiology, positions, diagnostics and possibilities of complications, the impacted mandibular third molars are a serious problem in the oral surgical procedures.

In the dental literature we can find many types of classifications of the impacted mandibular third molars, which classifications can provide simplicity in the planning of the surgical approach.

According to the correlation between the long axis of the mandibular second molar and the position of the impacted mandibular third molar, George Winter classifies the impacted mandibular third molars in 8 different positions (vertical, mesioangular, horizontal, distoangular, buccoangular, linguoangular, inverted and atypical position).

Recent dental studies show that one of the most used flaps is the envelope flap (also known as a sulcus incision). This flap can be either short or prolonged, with or without a vestibular extension, stretching from the distal plane of the second mandibular molar, all the way to the mesial papilla of the first mandibular molar. In cases where the impacted mandibular third molars are placed quite deep inside the jaw bone, the use of the envelope flap is inadequate and is substituted with a three corner flap (also known as triangular flap or Axhausen's flap), which extends buccally, providing a slightly better visual approach to the surgical area. The envelope flap is considered to cause less pain and complications. Other types of flaps, that are used for surgical removal of the impacted mandibular third molars are the L- flap, bayonet- flap, vestibular tongue flap, grooves flap and many others.

Regardless of the types of surgical approach and technique that are chosen, the bone removal should be reduced to a minimum and the use of a sterilized oral surgical kit with a continuous saline cooling system is an imperative in order to prevent postoperative complications.

By itself, the impacted mandibular third molar is a risk that may evoke complications with a various severity, thus leading to an unpredictable therapeutic prognosis. The complications that are caused by the impacted mandibular third molars can be divided in two groups:

- a) Complications with an inflammatory character:
 - Pericoronitis acuta
 - Pericoronitis chronica
 - Pericoronitis ulcerosa
- b) Complications with a non-inflammatory character:
 - Neuralgia
 - Follicular cyst
 - Fibroma
 - Odontoma and adamantinoma

Some studies, such as those of Blondeau F and Daniel NG³, suggest that the postoperative complications (mostly in the form of alveolitis) are more common in female patients and patients with age above 24. Song⁴ indicates that postoperative symptoms, such as trismus, mild pain and swelling are considered to be a normal reaction in the first five days after the surgical procedure and their severity is in accordance with the amount of inflicted trauma and duration of the tooth extraction. The doctor must inform the patient about the possibility of appearance of these symptoms. These analyses by Song are in accordance with Berges⁵. The occurrence of alveolar osteitis (known as dry socket) was thoroughly examined in Larsen's study, in which he managed to control the risk factors that can lead to this condition (smoking, use of oral contraceptives, gender, severity of the tooth extraction procedure). His study included 138 surgical procedures performed by two teams, of which one was lead by an experienced oral

surgeon, and the other by a young not so experienced surgeon. The results indicated that a larger possibility of dry socket development was present in the patients that received treatment by the young and less experienced surgeon.

2. MATERIAL AND METHODS

This study included 80 patients with clinically diagnosed total or partial impaction of the mandibular third molar, who checked in the department of oral surgery in the Dental Clinical Centre “St. Panteleimon”- Skopje. The patients were divided in two groups of 40 examinees:

- I. Group of 40 patients with a total impaction of the mandibular third molar.
- II. Group of 40 patients with a partial impaction of the mandibular third molar.

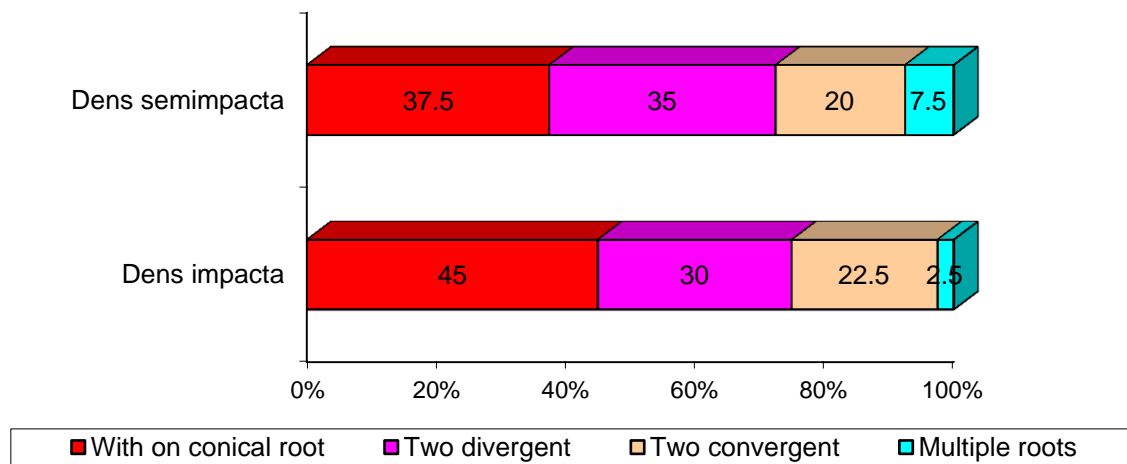
The patients were given a questionnaire, which they filled out with information that was significant to the research in hand.

Every single surgical procedure was performed with the application of a local anesthetic in the form of a nerve block anesthesia. After determining the position of the total or partial impacted mandibular third molar, a nerve block anesthesia was given for the inferior alveolar and lingual nerve, after which application the surgical procedure was performed with the use of one of the following flap designs: Axhausen’s flap, short or prolonged envelope flap (with or without vestibular extension) and a sulcus incision. After elevating the mucoperiosteal flap tissue, we acceded to a certain surgical technique whether it consisted of extraction of the tooth only by osteotomy, extraction with osteotomy and separation of the crown or extraction with osteotomy with separation of the crown and roots of the tooth. After removing the impacted tooth, the operative area was irrigated with saline and closed by placing a suture.

3. RESULTS

This study included a total of 80 patients, of which 36 (45%) were male and 45 (55%) were female.

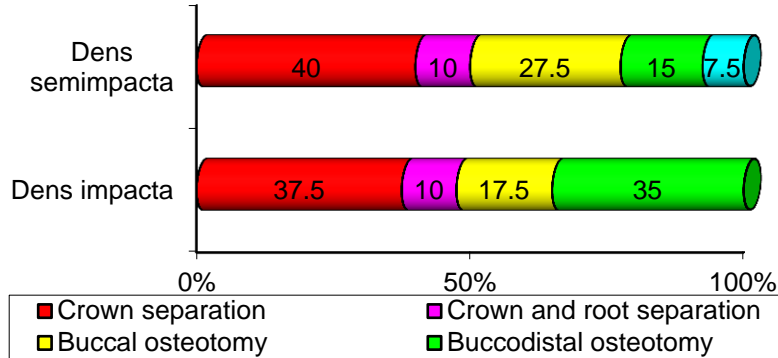
Chart 1. Distribution of the patients according to the classification of the root complex and the degree of tooth impaction.



A statistical significance is registered between the surgical approach and the degree of tooth impaction- Pearson Chi-square: 61.7436, p=0.000000.

A statistical significance is registered between the surgical approach and Winter’s classification of the position of impacted mandibular third molars- Pearson Chi-square: 32.5541, p=0.001137.

Chart 2. Distribution of the patients according to the surgical technique and degree of tooth impaction.



Crown separation as a surgical technique in correlation with the other modalities (crown and root separation, buccal osteotomy, buccodistal osteotomy and extraction with forceps) displays a percentage difference in the second groups, with a statistical significance for $p < 0.05$.

Only in the case of buccodistal osteotomy is the percentage difference between the modalities of both groups statistically significant for $p < 0.05$.

A statistically significant correlation is registered between the surgical technique and degree of impaction- Pearson Chi-square: 7.12115, $p = 0.129632$.

A statistically significant correlation between the surgical technique and Winter's classification of impacted mandibular third molars is registered in both groups (dens impacta и dens semiimpacta) (Pearson Chi-square: 42.326321, $p = 0.000029$ и Pearson Chi-square: : 30.1848, $p = 0.017079$)

4. DISCUSSION

One of the most performed procedures in the area of oral surgery is the removal of impacted mandibular molars.

Even though computer tomography and MRI can provide a more precise and accurate view of the position of the impacted tooth, panoramic x-ray is still the most used method and also provides a solid orientation of the tooth position. Numerous world renowned scientists have compared different types of radiographic techniques in order to determine the position and correlation of the impacted mandibular third molars with the adjacent anatomic structures. For instance, Antcak-Buockoms⁷ in one of their researches made a comparison between two methods of radiographs: panoramic x-ray and the Scanora system (a multimedia radiographic dental system from Scanora-Finland), in order to demonstrate which method can provide a more accurate position of the impacted mandibular molars. Their research included 285 patients and they came to the result that the Scanora system is more accurate in determining the ectopic positions and numbers of roots of the impacted tooth, whereas in all the other cases a traditional panoramic x-ray (the method we used in our study cases) was suffice in determining the tooth position.

Prat et al⁸, Sards et al⁹ and many others consider the pericoronitis to be the most common complication of inflammatory character that the impacted mandibular molar can cause.

In 92,5% of cases that consist of removing impacted mandibular third molars, the most favorable choice of surgical approach is Axhausen's flap, whereas separation of the crown is the dominant oral surgical technique. The surgical approach is closely related with the position and depth level of the impacted mandibular molar and does not depend on the morphology of the roots.

In association with the studies by Kirtioglou T¹⁰, Seyed Ahmad Arta¹¹, Bouloux GF¹², Stephens RJ¹³, Rosa AL¹⁴, etc, Axhausen's flap (3- corner flap) was the most preferable flap design that was chosen by the surgeons in our study. According to their studies, the 3-corner flap is the best choice for deeply positioned third mandibular molars because it provides a better visual display of the surgical area and sufficient blood supply for the flap tissue. According to Cetinkaya BO et al¹⁵, Montero J et al¹⁶, Rosa AL¹⁴, Clauser C et al¹⁷, the use of split mouth design, short envelope flap have proven to be quite difficult, especially for oral surgeons with not enough experience in their field, but still remain a method of choice, regardless of the position of the impacted mandibular third molar.

Monaco G et al¹⁸ has made a study about patients with bilateral impacted mandibular third molars, in which he compared the advantages and disadvantages between the 3-corner and envelope flap, regardless of the position of the impacted teeth. Three months after the surgical procedure, he came to the result that showed no statistical significance in the use of these flaps. In other words, the decision for the type of flap design doesn't mainly depend on the position of the impacted mandibular molar, but on the fondness of the surgeon towards a particular flap design that he has grown accustomed to perform and is based on his previous surgical experiences.

In the studies by Sandhu A et al¹⁹, Koerner Karl R²⁰, removal of partial impacted mandibular third molars, the results that they came upon are similar to the results that we obtained with our second group of study (40 patients with partial impaction of the tooth), in the aspect of flap design, surgical technique with crown separation as a preferred method of choice for horizontal and mesioangular tooth position.

According to Koerner²⁰, impacted mandibular third molars with a distoangular position have proved to be quite challenging for every oral surgeon, due to the high risk of many complications. In our study, this tooth position necessitates the use of root separation during the surgical removal.

According to Chang²¹, buccodistal osteotomy is one of the most widely practiced surgical technique in the removal of the impacted mandibular third molars (also used in our dental research).

A group of Turkish scientists from the department of oral and maxillofacial surgery (InciKaraca, Sebnem Simsec et al²²), in 2007 made a research in which they came to the conclusion that the flap design, especially in cases with deeply positioned impacted mandibular molars, depends mostly on the preference of the oral surgeons, and this is a finding which we also came upon in our research.

According to Winter's classification of the impacted mandibular third molars, the results in our research proved to have a statistical significant difference with the results present in the studies of Velickovski²³, Van Der Linden²⁴, Edwards²⁵ (in which the mesioangular position was more frequently present. According to Winter's classification, the results that were obtained in our research displayed that most of the impacted mandibular third molars (27.5%) and semi- impacted mandibular third molars (32.5%) were in a vertical position.

The morphology of the root complex of the impacted teeth has a great impact on the severity of the surgical procedure and the planning of the surgical technique. If the morphology consists of one conical root or several roots fused in one large conical structure, the surgical procedure is simplified, because there is no need for root separation and fracture of the root tips is avoided. The width of the roots in mesiodistal direction should be compared with the width of the crown in the cervical area. A more enhanced apical curvature of the roots can complicate the oral surgical procedure and necessitate the need for their separation. The density of the adjacent bone (the density rises proportionally with the patients age, due to a decrease in the bone elasticity), is a major factor in the severity of the surgical procedure. Also the tooth follicle can have an influence on the tooth extraction, as so if it is larger the extraction procedure will be more simple.

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