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Surgical Approach in The Removal of Impacted Mandibular Molars in Correlation with Their Position.

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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; Pell-Gregory's class I and Sisk's class II was most present amongst the examinees; regarding the oral surgical approach in cases with total impaction, Axhausen's flap design was dominantly a method of choice, whereas in cases with partial tooth impaction a continuous envelope flap with vestibular extension was mostly used; coronectomy was mostly performed in the oral surgical procedures. Different positions and relations of the impacted mandibular molars require different techniques of their removal. Therefore, it is critical to carefully evaluate the clinical signs and the radiography, before making the detailed treatment plan.

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

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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 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 lesions, pulpitis or periapical pathology in the mandibular third molars are also considered as an indication for their extraction.[1,2] In cases, where the impacted mandibular third molars are positioned deep inside the jaw bone and don't cause any clinical symptoms, they should only be submitted to a regular periodic check-up. It is very important to differentiate pain that derives from third molar pathology with pain from pathological changes in the TMJ or mastication muscles, due to their close anatomical location.

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 their correlation with the adjacent anatomical structures.

The Pell and Gregory classification of the impacted mandibular third molar is based on the amount of tooth covered by the anterior border of the ramus and its association with the mandibular second molar. This classification puts the impacted mandibular third molar in three classes:

- Class I- the space between the ramus of the mandible and the distal plane of the mandibular second molar is sufficient
- Class II- the space between the ramus of the mandible and the mandibular second molar is smaller than the mesiodistal width of the mandibular second molar.
- Class III- The mandibular third molar or a larger part of it is located inside the ramus of the mandible.

Initially, the oral surgeon must determine the degree of the angle between the axes of the mandibular third and second molar. 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.

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 NG[3], suggest that the postoperative complications (mostly in the form of alveolitis) are more common in female patients and patients with age above 24. Song 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.[4] The doctor must inform the patient about the possibility of appearance of these symptoms. These analyses by Song are in accordance with Berges.[5] 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.[6]

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.

RESULTS

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 were dominantly in a vertical position; Pell-Gregory's class I and Sisk's class II was most present amongst the examinees; regarding the oral surgical approach in cases with total impaction, Axhausen's flap design was dominantly a method of choice, whereas in cases with partial tooth impaction a continuous envelope flap with vestibular extension was mostly used; coronectomy was mostly performed in the oral surgical procedures.

Table 1: Distribution of patients with impacted mandibular molars according to the classification of Pell-Gregory

class	Dens impacta I group		Dens semiimpacta II group	
	count	%	count	%
I class	19	47,5	20	50,0
II class	18	45,0	19	47,5
III class	3	7,5	1	2,5

Graph 1: Distribution of patients with impacted mandibular molars according to the classification of Pell-Gregory

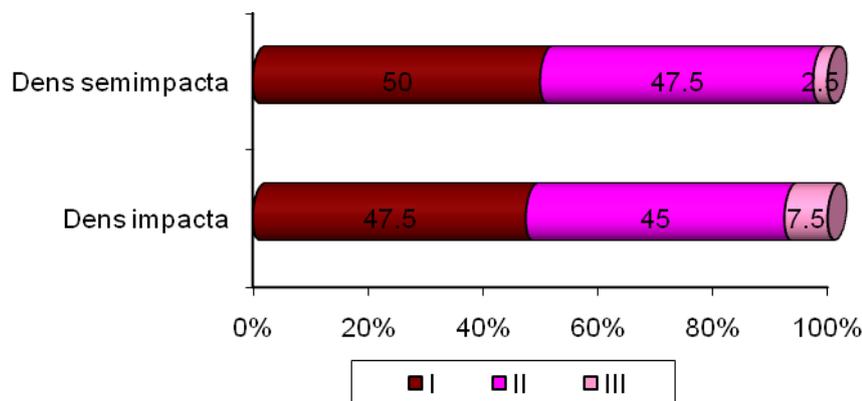


Table and graph 2 show the distribution of patients according to the classification of Pell-Gregory and the level of impaction in the two groups. The difference between the modalities in the third class inside the groups is statistically significant for $p < 0.05$.

Table 2: Distribution of patients according to the local dental status

Local dental status	Dens impacta I group		Dens semiimpacta II group	
	count	%	count	%
Acute pericoronitis	9	22.5	5	12.5
Chronic pericoronitis	12	30.0	18	45.0
Ulcerous pericoronitis	2	5.0	7	17.5
Asymptomatic	17	42.5	10	25.0

Graph 2: Distribution of patients according to the local dental status

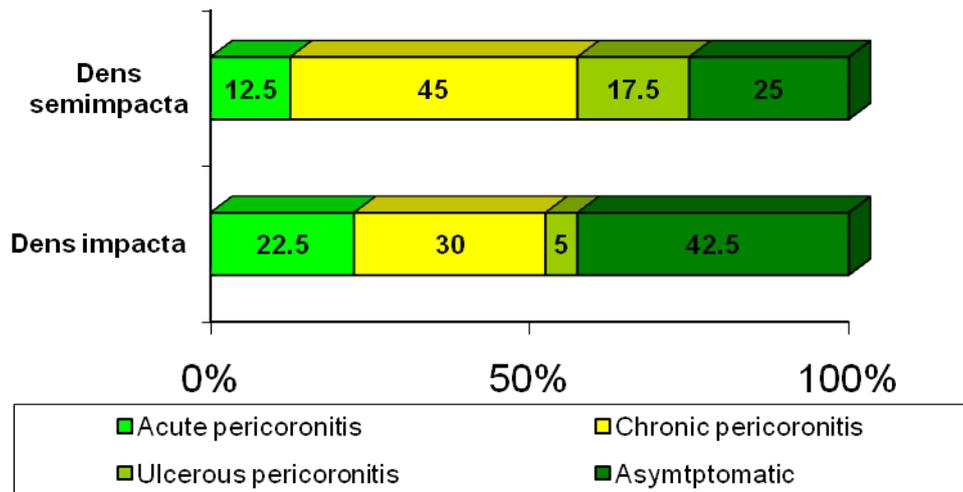


Table and graph 3 show the distribution of the patient according to the local dental status and the level of impaction in the two groups. In the first group, the clinical examination revealed asymptomatic condition in 42.5%, followed by the chronic pericoronitis in 30.0% and acute pericoronitis in 22.5% of the cases. The difference between these modalities and the ulcerous pericoronitis is statistically significant for $p < 0.05$

Table 3: Distribution of patients according to the root complex in both groups of impaction

Classification of the root complex	Dens impacta I group		Dens semiimpacta II group	
	count	%	count	%
One root	18	45.0	15	37.5
Two divergent roots	12	30.0	14	35.0
Two convergent roots	9	22.5	8	20.0
More than two roots	1	2.5	3	7.5

Graph 3: Distribution of patients according to the root complex in both groups of impaction.

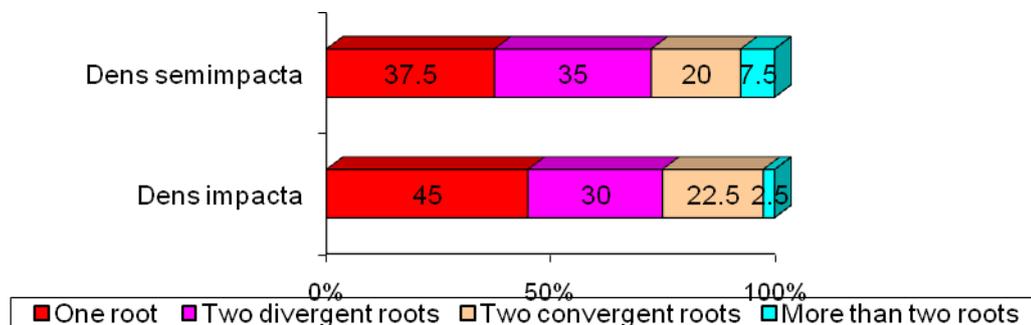


Table 4: Distribution of different types of incisions performed in both groups.

Surgical approach	Dens impacta I group		Dens semiimpacta II group	
	count	%	count	%
Incision by Axhausen	37	92.5	2	5.0
Ridge incision	0	0	13	32.5
Ridge incision with relaxing incision on the mesial site	3	7.5	24	60.0
Sulcus incision	0	0	1	2.5

Graph 4: Distribution of different types of incisions performed in both groups.

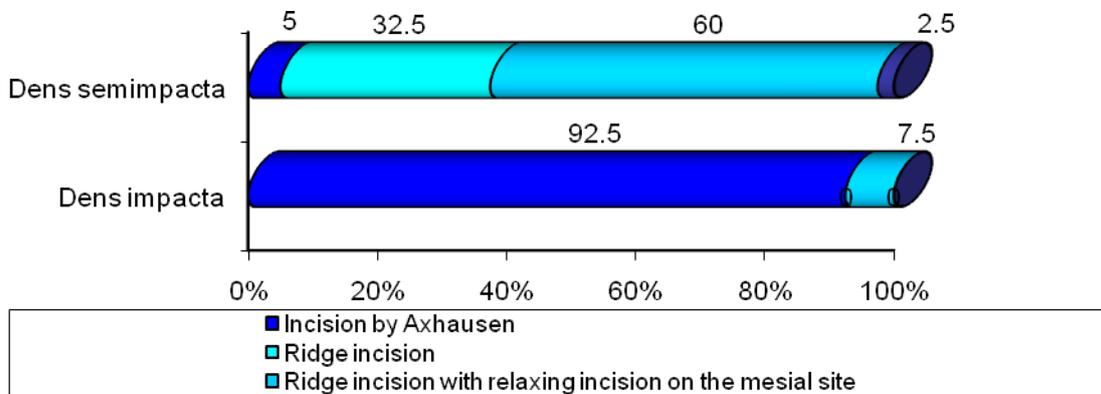


Table 5: Distribution of different surgical techniques of tooth extraction in both groups

Surgical technique	Dens impacta I group		Dens semimpacta II group	
	count	%	count	%
Crown separation	15	37.5	16	40.0
Crown and root separation	4	10.0	4	10.0
Buccal osteotomy	7	17.5	11	27.5
Buccodistal osteotomy	14	35.0	6	15.0
Extraction with forceps	0	0	3	7.5

Graph 5: Distribution of different surgical techniques of tooth extraction in both groups

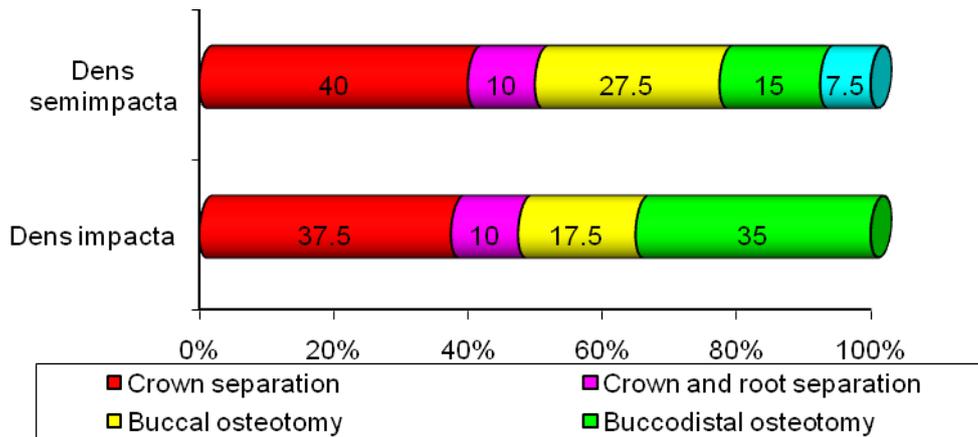


Table and graph 4 show the distribution of patients according to the classification of the root complex and the level of impaction in both groups. There is statistical difference between the surgical approach and the classification of Pell-Gregory (the position of the impacted mandibular third molar) for $p < 0.05$. There was statistically significant difference between the surgical technique and the level of impaction, as well.

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-Buockoms[7] 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 al[8], Kugelberg[9] and many others consider the pericoronitis to be the most common complication of inflammatory character that the impacted mandibular molar can cause. The positions of the tooth have no connection with the clinical form in which the pericoronitis can manifest, but the depth of the impaction is in correlation with its condition.

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.

Buccodistal osteotomy is performed in 35% of the cases with a total impaction of the third mandibular molars, whereas in 27,5% of the cases with partial tooth impaction include buccal osteotomy.

In association with the studies by Kirtioglou T[10], Seyed Ahmad Arta[11], Bouloux GF[12], Stephens RJ[13], Rosa AL[14], 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 Rosa AL[14], Cetinkaya BO et al[15], Montero J et

al[16], Clauser C et al[17], 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 al[18] 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 al[19], Koerner Karl R[20], 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 Koerner[20], 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 Chang[21], 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 al.[22]), 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 Pell-Gregory'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 Velickovski [23], Van Der Linden [24], Edwards [25] and others, where Pell-Gregory's class II is considered to be prevalent. Our research shows that the impacted mandibular third molars are dominantly categorized in Pell-Gregory's class I.

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.

CONCLUSION

Different positions and relations of the impacted mandibular molars require different techniques of their removal. Therefore, it is critical to carefully evaluate the clinical signs and the radiography, before making the detailed treatment plan.

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