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Clinical outcomes of sectioning versus non-sectioning techniques in third molar extraction

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ABSTRACT:-To compare the outcomes of third molar removal via a minimally invasive tooth sectioning technique with non-sectioning technique. Fifty patients within the age of 15-18 years were randomly divided into the sectioning and non-sectioning groups. The randomization was done at the first extraction, and second extraction was done 60 days later by the other technique. The operation time, postoperative complications were observed and compared between the two groups. Operation in non-sectioning group (mean 13.64 ± 1.26 minutes) significantly took longer than sectioning group (mean 10.95 ± 1.26 minutes)($P<0.05$). The patients comfort score exactly after surgery was significantly higher in sectioning group (7.8 ± 1.5) comparing to nonsectioning group (6.3 ± 1.91). Patients in sectioning group felt less pain comparing to the nonsectioning group during all 7days, the difference was statistically significant ($P<0.05$). The amount of facial swelling in non-sectioning group was significantly higher than sectioning group at 2nd and 7th days after surgery. Significant difference was observed in clinical appearance of soft tissue in sectioning group comparing to the non-sectioning group only at the 7th day after surgery. There was no nerve injury. Non-sectioning group showed a higher rate of postoperative complications.

The results obtained In the present study enable us to conclude that, in cases of equal intra operative difficulty, sectioning of third molar produces higher quality of intraoperative and postoperative condition. Authors advocate using this technique to minimize soft tissue reflection and bone removal. However, better knowledge of anatomy and more experience is essential.

Keywords: Minimally invasive sectioning techniques, Non-sectioning techniques, Lower third molar.

Introduction

Surgical removal of third molars with an impaction rate of 34.71% as per the research which had been done by J Adv Pharm Technol Res et al, in 2023, which corresponds to a significant part of the oral and maxillofacial surgical procedures [1,2,3]. New surgical techniques, as well as training and experience, have led to the evolution of impacted third molar surgery and allowed this operation to be carried out in a less traumatic manner [4,5,6]. However, discomfort and complications are inherent in the surgical procedures. Many investigators presented a report on the risks of various postoperative complications after third molar surgery in different developmental stages [7,8,9]. A surgical discomfort or complication may lead to the loss of working days, several postoperative sessions, as well as a possible lawsuit[10,11]. Thus, surgical procedures should be planned and performed according to scientific evidence[12,13]. To reduce surgical morbidity caused by manipulation, some authors have been developed sectioning technique to facilitate the removal of the impacted tooth[14,15]. The purpose of this technique is to facilitate the removal of the tooth by decreasing its zones of retention by fragmentation and also the preservation of sound bone and adjacent anatomical structures[16,17,18]. The risk of surgical common consequence and complications would seem to be less when sectioning technique is used[19,20]. The bone removal in minimally invasive sectioning technique is limited only to the small occlusal exposure and hard tissue removal is performed within the tooth crown without involvement of the surrounding bone[21,22,23].

Since there was no comprehensive prospective study during our research period in the literature that provides comparative results related to the use of this novel technique, we decided to design a prospective cross over study to compare the outcomes of third molar removal via a minimally invasive tooth sectioning technique with non-sectioning technique, and included the most recent studies in order to update and keep our research in such a way that could publish the most advanced and recent data and information.

Materials and Methods

Patients and methods

This randomized, controlled, blinded crossover trial was conducted on 50 patients between 2018 to 2020 and their outcomes were observed. Fifty patients within the age of 15-18 years were randomly divided into the sectioning and non-sectioning groups. The randomization was done at the first extraction, and second extraction was done 60 days later by the other technique. All the surgical procedures were completed by a single

calibrated professional surgeon and outcomes were observed by another surgeon (observer).

The main inclusion criterion was the need for bilateral third molar removal for orthodontic purposes of maximum one third root formation and bone coverage on orthopantomography. In this way, homogenous subjects were entered in our study and effects of confounding factors such as root formation, age, number of roots, root shape, the depth of impaction, amount of bone coverage, and tooth angulation were omitted. There were other inclusion criteria: no systemic contraindications to the surgical procedure, no pharmacologic therapy. This study is taken from a research project with local ethical committee approval. All the patients and their parents signed the informed consent prior to enrollment. If the patient did not come for the second side surgery or did not follow the rules of the study was excluded. Also our research team has prepared and registered a comprehensive collection of the latest scientific data from reliable sources, including PubMed, Hindawi, ResearchGate, ScienceDirect to provide more scientific strength to the discourse presented in this article, and to ensure reliable research on the topic.

Surgical procedures

Osteotomy method (sectioning and non-sectioning) and patient's side were randomly determined before operation. All operations were performed by the same surgeon under Local anesthesia. In minimally invasive sectioning group a small type of envelope flap was made along the external oblique ridge and extended forward to the distobuccal gingival margin of the second molar and around the buccal aspect without involvement of mesial papilla. Soft tissue reflection was carried out over the crest only to allow instrument insertion; no reflection of the periosteum was performed on the lateral and lingual aspects of the third molar region (Short envelope flap Figure 1).

Figure 1. Short envelope flap for minimal reflection of soft tissue. Note limited osteotomy of Occlusal aspect which is smaller than dimensions of the crown.

The small tooth crown exposure was performed by a round bur without involvement of bone in the lateral aspect in sectioning group (Figure 1). At the first step, tooth crown is sectioned to the depth of dental papilla in buccolingual direction almost complete way

with care to remain a small part of tooth (1-2 mm) in the lingual area. This small remnant not only protects lingual area but also does not interfere with splitting and segments movement. Using round bur creates internalcavity and space within the crown to provide

better access and visibility for segmentation and manipulation of segmented parts for removal (Figure 2).

Figure 2. Complete sectioning of bucculingual aspect and creating internal cavity within tooth crown for mobilization and removal of segments.

At second step, straight elevator insert into the created cavity in the crown for splitting. Another sectioning was planned if the distal part is not removed easily from small occlusal opening (Figure 3).

Figure 3. Removal of distal segment after splitting and mobilization inwardly.

At third step, mesial segment is mobilized inwardly into the big cavity which was created by cavity creation and distal segment removal by engagement of delicate instrument (Figure 4).

Figure 4. Mobilization of mesial segment inwardly to the created cavity in the tooth socket after removal of distal part.

If removal of mesial segment is not possible through grasping, another sectioning in mesial segment is planned in the inward mobilizedposition (Figure 5).

Figure 5. the mesial segment is sectioned to facilitate removal from small bony exposure.

The purposes of minimally invasive sectioning technique are small amount of exposure in soft and bony tissues and removal of tooth bulk instead of bone (Figure 6).

Figure 6. Small amount of soft tissue exposure and bone removal in minimally invasive sectioning technique.

Tooth crown usually segmented to 2-4 parts. According to these rules this technique is applicable for third molar removal in all stages of tooth formation by following the same steps for roots area. In non-sectioning group, the incision is continuedthrough the mesial aspect of the 1st molar for better access and exposure. More flap reflection particularly over the lateral border and standard bone removal from the buccolateral and distal aspects to reach the tooth cervical line was performed and finally the tooth was removed in one piece.

After copious irrigation and removal of any debris, surgery was completed by suturing with 3-0 silk which removed 7days later. All subjects were completed by the same postoperative protocol. The operating time which was the time needed to complete the procedure, including osteotomy, sectioning (in sectioning group) and dental germ removal, was recorded during the surgical procedures to compare the two techniques. Subjective method for evaluation of the patient was intra operative patient comfort and pain. Intra operative patient comfort was assessed after surgery by using a visual analog scale (VAS), where on a 10cm long horizontal ruler, 0 indicated the minimum and 10 the maximum comfort. For pain assessment, the patients were asked to record a daily VAS score (0 to 10) for the first 7days, at the same timeevery day.

Objective methods

For objective measurement, patients came to three schedules follow- up visits at 2, 7 and 30 days post-operation and were assessed by an observer. To evaluate swelling we used a tape which was placed from the corner of the mouth to the lobe of the ear on the side of surgery before and at 2, 7 and 30 days after surgery (12). Maximum incisal opening was measured and compared with the preoperative measurement; clinical appearance of the soft tissue where assessed 7 and 30 days after surgery, scores 0 to 3, according to the color and presence of edema and bleeding (0, normally pink & not edematous; 1, pink-Red & slightly edematous; 2, red& edematous; 3, red & edematous& bleeding inlight touch (13)). Besides, presence of secondary infection, dry socket, persistent edema, nerve injury and postoperative bleeding were assessed 7 and 30 days after surgery (yes/no).

Statistical analysis

Data were analyzed using PASW Statistics 20 (Predictive Analytics Software) for windows (SPSS: An IBM Company, Chicago, IL, USA). Numerical data were presented as mean and standard deviation values, where Student's and paired t-tests were used for parametric numerical data, but Mann–Whitney U test and Wilcoxon signed-rank test were used for nonparametric numerical data. Qualitative data were presented as frequencies and percentages; Chi-square ($\chi 2$) test was used between the two groups. The significance level was set at $p \leq 0.05$.

Results and Discussion

A total of 50 cases were entered (38 females and 12 males), aged 15 to 18 years; mean age of 16±1.4 years. Operation in nonsectioning group (mean 13.64 ± 1.26 minutes) took longer than sectioning group (mean 10.95 ± 1.26 minutes) and the difference was statistically significant ($P<0.05$). The patients comfort score after surgery was significantly higher in sectioning group (7.8 ± 1.5) comparing to non-sectioning group (6.3 ± 1.91). On the other hand, 30 days after second extraction, the patients were asked to give a subjective opinion about the surgical methods; thus, more than 80% were reported the feeling of pressure and 30% were experienced pain during germ removal in non-sectioning group. Most of the patients experienced less discomfort during the removal of sectioned parts. The pain experienced in the week after the procedures, has been summarized as a mean profile for each type of treatment (**Table 1**).

Table 1. Subjective pain (VAS)

Pain	Sectioning group (Mean± SD)	Non sectioning group (Mean± SD)	P.Value
Day1	3.57±1.50	6.66±1.71	0.01
Day2	2.33±1.35	5.8±1.51	0.00
Day3	2.02±1.13	5.04±1.37	0.00
Day4	1.50±1.00	3.84±1.23	0.00
Day5	0.96±0.88	2.6±1.1	0.00
Day6	0.5±0.53	1.54±0.83	0.00
Day7	0.12±0.32	0.58±0.6	0.00

Patients in sectioning group felt less pain comparing to the nonsectioning group during all 7days. The amount of facial swelling in nonsectioning group was significantly higher than sectioning group at 2nd and 7th days after surgery, but there was no significant difference on the 30th day (**Table 2**).

Table 2. Measurement of facial swelling by recording distance from the corner of mouth to the ear lobe (mm)

Day	Sectioning group (Mean± SD)	Non sectioning group (Mean± SD)	P.value
0	121.25 ± 21	121.05 ± 19	0
2	129.66 ± 13	145.5 ± 15.8	0.00
7	122.48 ± 13.19	132.44 ± 13.1	0.00
30	121.64 ± 13.5	121.88 ± 13.31	0.09

Maximum incisal opening also showed the same results at 2nd and 7th days after surgery and no difference after one month (**Table 3**).

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	Sectioing group	Non sectioning groupN	
Maximum incisal opening	Mean± SD mm	Mean± SD	P.Value
0	46.12± 3.08	46.12± 3.08	0.8
2	39.3±3.1	28.20±4.2	0.0
7	44.76± 3.54	38.06± 4.63	0.0
30	45.80± 3.18	45.76± 3.25	0.74

Significant difference was observed in clinical appearance of soft tissue in sectioning group comparing to the non-sectioning group only at the 7th day after surgery (**Table 4**).

Table 4. Clinical appearance of soft tissue (VAS 0-3) 7 & 30 days after surgery

	Sectioning group	Non sectioning group	
Clinical appearance	Mean± SD	Mean± SD	P.Value
After 7days	0.76 ± 0.71	1.4 ± 0.9	0.00
After 30days	0	0.1 ± 0.3	0.25

Table 5 shows postoperative complication in both groups. There was no nerve injury in our study. Non-sectioning group showed a higher rate of postoperative complication

Table 5. Postoperative complications

	Sectioning group	Non sectioning group
Complications Exudate	0(0)	2(4%)
Postoperative infection	0	2(4%)
Persistent edema at day 7	4(8%)	30(60%)
Nerve injury	0(0)	0(0)
Postoperative bleeding	0(0)	1(2%)
Dry socket	0	3 (6%)

The extent of swelling and the severity of pain are the chief indicators of patient discomfort during the postoperative period. Surgical trauma and consecutive inflammation are the most important cause of swelling, pain and trismus which depend directly to the extent of bone removal and soft tissue injury during surgery[24,25,26]. Considering the reason for extensive laterobuccal and distal bone removal in mandibular, third molar surgery is creating an outward path way; so any technique, which facilitates tooth removal and maximizes bone preservation without significant increasing in the complexity and time of operation, is recommended. Tooth sectioning is one of the wellknown techniques to reduce surgical trauma[27,28,29]. In our opinion, sectioning technique has a steep learning curve and nonexperienced surgeons, have to spend much more time. Purposes of minimally invasive sectioning technique are minimum soft tissue reflection, limited bone removal to a small occlusal exposure of the crown and hard tissue removal within the tooth crown without involvement of the surrounding bone. The necessary space and access for

segmentation, visibility and manipulation of segmented parts are created in the tooth crown by systematic removal of tooth bulk. In such manner tooth removal is possible from the path of a hole smaller than crown dimensions. Engelke et al reported the first result of almost similar technique by aid of endoscopic vision under the name of inward fragmentation in non-comparative study[30]. Their first result is similar to our study for verifying advantages of minimal invasion to surrounding third molar tissues. We believe use of endoscope is not necessary for routine daily procedures, but increases the experience of surgeon, plays the main role in the success rate and time-saving. On the other hand, almost complete way of sectioning in buccolingual dimension is necessary to mobilize split distal segment inwardly. Finally, sectioning of crown is sufficient for crown removal and there is no need to crown reduction which is very time-consuming. Our samples were homogeneous in terms of the subject's age and degree of dental impaction. These kinds of sampling and cross over study eliminated other confounding factors which make a difference in surgical outcome. However, Malkawi and Jeries found more frequent immediate and late complications, which are associated with longer duration of surgery[31,32], some other researchers reported that the postoperative outcome is independent from the operating time[33,34,35]. The mean time duration of operation was longer in non-sectioning group than in the sectioning group and all operations outcomes were more convincing in the latter one. We believe in the presence of some important factors including theamount of soft tissue reflection and injury, bone removal and surgeon experience, the outcomes will not be changed by a small difference in theduration of the surgery.

In the present study, when pain was assessed it was found that there was a significant difference in the severity of pain between the two groups, from day 1 to day 7. Intensity of pain was greater in non-sectioning group in all 7days after surgery. The pain experienced by the patients in sectioning group was much less than the non-sectioning group with a faster decrease in severity. In the area of patient comfort, cases in sectioning group felt better intra operative condition. Feeling of pressure and subsequently pain at the time of levering of elevator for whole germ removal, were the main patient's surgical complaint in nonsectioning group. Some studies state that the feeling of pressure which is accompanied with pain will result in pressure on the inferior alveolar nerve[36,37].

When swelling was evaluated by a tape, found that there was a statistically significant difference in the severity of swelling between the two groups, on 2nd and 7th days postoperatively. It was seen that mean swelling experienced by the patients in the minimally invasive sectioning group was much less than the control group. We believe reflection of soft tissue flapover the external oblique ridge with looser periosteal and soft

tissue attachment, creates enough space in lateral of mandibular body foraccumulation of inflammatory transudate in non-sectioning group. Maximum incisal opening and clinical soft tissue appearance showed better condition in sectioning group. Using sectioning technique the amount of bone removal is significantly decreased. That's why every parameter dependent to surgical trauma and subsequent inflammation including pain, swelling, trismus and wound healing had better condition in sectioning group. All these outcomes are in correlation with studies, which use less traumatic approach to third molar surgery [38,39,40]. There was no nerve injury in two groups in spite of that the surgery was performed in close proximity to the inferior alveolar nerve. Authors believe the presence of dental papilla as a pressure absorber does not permit any direct touch between hard tooth germ and nerve.

The results obtained in the present study enable us to conclude that, in cases of equal intra operative difficulty, sectioning of third molar by minimally invasive technique produces higher quality of intraoperative and postoperative condition. Authors advocate using this technique to minimize soft tissue reflection and bone removal. However, special equipment is not necessary for this technique, better knowledge of anatomy and more experience is essential.

Conclusion

Based on the findings of this study, the minimally invasive sectioning technique for third molar removal, when applied in cases of comparable intraoperative difficulty, yields superior intraoperative and postoperative outcomes compared to the non-sectioning technique. This approach is characterized by reduced operative time, enhanced patient comfort, and decreased postoperative pain, swelling, and trismus. The authors advocate for the adoption of the minimally invasive sectioning technique to minimize soft tissue reflection and bone removal, thereby mitigating surgical trauma and subsequent complications. While this technique does not necessitate specialized equipment, it demands a thorough understanding of anatomy and considerable surgical expertise to ensure optimal results.

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Ethical Approval: This study was approved by the local Ethics Committee of Ahvaz Jundishapur University of Medical Sciences with the code AJUMS.REC.1398.705 and registered at IRCT20181117041685N1. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration.

Conflict of Interest: The authors declare no conflict of interest.

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