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CONVENTIONAL MOLARS EXTRACTION TECHNIQUE VERSUS A SYSTEMATIC SECTIONING APPROACH: A PILOT STUDY

Dental Science

Ayat Sammouda College of Dental Medicine, University of Sharjah, United Arab Emirates.
Eman AlRahin College of Dental Medicine, University of Sharjah, United Arab Emirates.
Fatma Al Ali* College of Dental Medicine, University of Sharjah, United Arab Emirates. *Corresponding Author
Ghadeer AlArayedh College of Dental Medicine, University of Sharjah, United Arab Emirates.
Khaldoon Mardini College of Dental Medicine, University of Sharjah, United Arab Emirates.

ABSTRACT

Traditional methods of tooth extraction using forceps and elevators often result in some degree of soft and hard tissue damage; hence, an increased emphasis has raised on the importance of atraumatic teeth extraction. Aim: - This prospective clinical study aims to compare soft and hard tissue damage in extracting maxillary and mandibular 1st and 2nd molars using the conventional technique and an atraumatic technique by a systematic sectioning approach. Materials and Methods: - A single blinded randomized controlled clinical trial of 20 participants that require extraction of 1st or 2nd molars. The postoperative aspects evaluated were: - clinical chair time, soft tissue laceration, hard tissue trauma as buccal plate fracture and adjacent tooth integrity, wound healing, and post-operative complications such as pain, trismus and swelling. Results: The systematic sectioning approach had the same clinical outcomes and pain perception when compared to the conventional method of extracting 1st and 2nd maxillary or mandibular molars ($p \geq 0.05$).

KEYWORDS

Atraumatic Extraction, Sectioning Multirooted Teeth, Soft And Hard Tissue Preservation.

INTRODUCTION

Traditional methods of tooth extraction using forceps and elevators often result in some degree of soft and hard tissues damage, which range from slight soft tissue laceration to complete loss of the buccal bony plate, and interdental bone crest.[1] Other complications involve post-operative pain, trismus, facial swelling, and dry socket. Furthermore, due to the inappropriate use of elevators, the adjacent tooth can get luxated or even, in some cases, extracted instead of the planned tooth.[1] Recently, patients tend to choose implants as a replacement of their lost tooth, rather than other tooth replacement options.[2] If the extraction site is to receive an implant, a tooth must be removed as atraumatically as possible to avoid fracturing walls of the alveolus, especially if the patient is planned for an immediate implant.[2] Over the last decade, there has been an increased interest in atraumatic tooth extraction in order to minimize post-operative complications associated with conventional extraction, and to maintain bone for implant insertion. As a result, new innovations in dentistry, such as the powered periotome, piezosurgery, and physics forceps were introduced. Another technique, that is usually used in surgical or difficult extractions, has also been proposed as an alternative atraumatic way in exodontia; the sectioning approach technique which involves the splitting of multirooted teeth to single roots, or single roots to several pieces. The objective of this technique is to minimize the force needed for extraction, and thus minimize trauma during extraction.

MATERIALS AND METHOD

This study was conducted on patients with non-restorable 1st or 2nd molar teeth diagnosed by a specialist in the oral comprehensive care clinic in University Dental Hospital of Sharjah (UDHS) and referred to the oral surgery clinic. Subjects that were included in this study met the following criteria:

- Healthy patients (ASA1 and ASA2 according to American society of anesthesiologists), within the age group of 20-60 years, irrespective of gender.
- Non-smokers.
- The condition of the tooth crown should have at least an intact buccal and lingual walls, as teeth with no available walls go for sectioning directly, and do not have the option of conventional extraction.

EXCLUSION CRITERIA INCLUDED:

- Patients with uncontrolled diabetes or hypertension.
- Proximity of tooth to any of the vital structures (maxillary antrum and inferior alveolar nerve).
- Teeth with grade 2 and 3 mobility, since it can be extracted easily by conventional means.
- Teeth with roots that are either dilacerated, bulbous, hypercementosed, as these conditions are greatly indicated for immediate surgical extraction.
- Teeth with periapical lesion exceeding 3 mm.

Instruments and materials used during the research are:- 0.2% chlorhexidine mouth wash, mouth mirror, sterile gauze, saliva ejector, high volume oral evacuator tip, local anesthesia syringe, long and short needles, 2% lidocaine with epinephrine 1:80,000 cartridges, periosteal freer elevator, straight elevator no.1,2&3, cryer elevator, universal maxillary and mandibular molar extraction forceps, high-speed handpiece, surgical fissure bur, fine diamond bur, curette, bone file, Vernier calipers, and a timer.

The operative procedure was performed at the University Dental Hospital of Sharjah (UDHS) by calibrated oral surgeons during the clinical hours between 9:00AM-3:00PM. Consent was obtained from the participants after establishing their full understanding of normal surgical risks including postoperative bleeding, swelling, bruising, infection, damage to the adjacent teeth, creation of an oro-antral communication, and the possible need of further surgery.

Participants were randomly divided into 2 groups, a study group that had their molars extracted using the sectioning technique, and a control group that had their teeth extracted using the conventional technique by elevators and forceps only.

The standard surgical technique began with setting the timer and giving the patient a 10ml of 0.2% oral chlorhexidine for one-minute rinse in order to reduce oral contamination prior to the procedure, followed by one and half carpules of 2% lidocaine with epinephrine 1:80,000 given as Inferior alveolar nerve block, lingual block and long buccal nerve infiltration for mandibular 1st and 2nd molar extraction. Buccal infiltration to anesthetize the posterior and middle superior alveolar nerve, and palatal infiltration to anesthetize greater palatine nerve for maxillary 1st and 2nd molars. 5-7 minutes will be the time given for the anesthesia to start.

For **Maxillary molars**—as illustrated in (Figure 1), the crown is decoronated initially slightly coronal to the gingival margin. This

facilitates access to the individual roots during sectioning. The maxillary furcations are located 4 mm from the cemento-enamel junction (CEJ) on the buccal and 4 to 6 mm from the mesial and distal. Following detection of the furcations, guide cuts are made on the flat occlusal surface to correspond to their locations. This step ensures proper alignment during sectioning. Guide cuts are deepened and lengthened until they merge and separate the roots (Figure 1). The palatal root is separated from the buccal roots with a mesiodistal cut, while the buccal roots are separated with a buccopalatal cut. After the roots are separated, they are delivered with an elevator, or a narrow-beaked forcep.[3]

Figure 1 – Sectioning approach on maxillary molar. [3]

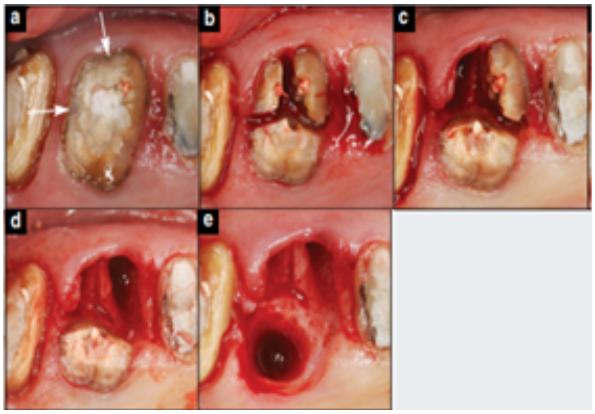
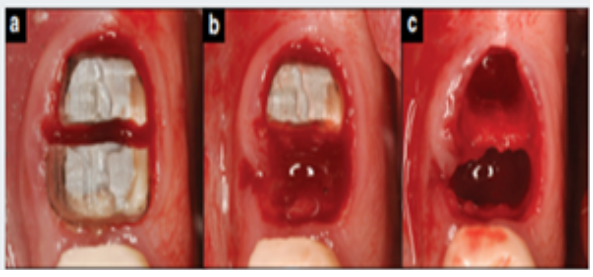


Figure 2 – Sectioning approach on mandibular molar. [3]



Mandibular molars— as presented in (Figure 2), similar to maxillary molars, mandibular molar crowns are sectioned horizontally, coronal to the CEJ, slightly coronal to the gingival margin. Furcations are located and guide cuts are created, deepened, and connected. After the tooth is sectioned, an elevator and forceps combination can be used to remove the roots.

The timer was stopped immediately after extraction, then the socket was irrigated and briefly curetted if any radiolucency shown on X-ray, and the socket was palpated for any sharp bony edges. If any sharp edges were found, a bone file is used to smoothen them. A sterile gauze was placed on the socket for the patient to bite on till hemostasis is achieved, and the patient stayed to recover for 15 minutes. Following that, the patient was rechecked for hemorrhage, tissue laceration, adjacent tooth integrity and buccal plate fracture.

For bleeding assessment: After 15 minutes of extraction, the pack was removed, and the socket was examined by an oral surgeon, who was not informed if the extraction was done by sectioning or conventionally. Socket with a stable blood clot was recorded as "no bleeding", while socket with mild oozing of blood that completely turns the pack into red, but does not fill the mouth with blood, was recorded as "oozing". If the socket was found to bleed sufficiently filling the mouth with blood frequently, it was recorded as "active bleeding".[4]

For tissue laceration assessment: The surgeon assessed the presence of any vertical or horizontal cuts in the gingiva, or any excessively torn gingival tissue.

Hard Tissue Assessment: The surgeon checked for any buccal plate fracture and confirmed the adjacent tooth integrity. This was recorded as to whether the condition is 'present' or 'absent'.

All patients received oral and written postoperative instructions, a prescription of paracetamol to be taken when needed, and emergency contact numbers of the oral surgeon as well as one of the research investigators. Follow up was done after 48-hours, then after one week, by contacting the participant to record pain and swelling. Pain and swelling were evaluated using a Likert scale as illustrated in Table 1 & 2.[5] Patients were given a take-home printout that presents the Likert scale of pain and swelling, and were asked to score their pain and swelling accordingly.

Trismus and wound healing were evaluated on the 4th day after extraction by an oral surgeon in oral surgery clinic. Trismus was evaluated by measuring the distance between the mesial-incisal corners of the upper and lower right central incisors at maximum mouth opening in centimeters, preoperatively and postoperatively on the 4th day using Vernier calipers. The difference between preoperative and the postoperative measurement will indicate whether trismus is present or not.[6] Wound healing was assessed by an oral surgeon, who was not informed whether the extraction was done conventionally or using the sectioning technique, and accordingly the following was recorded:

Alveolar Osteitis: Persistent or increased post-operative pain in and around the extraction site not adequately relieved by mild analgesics. The pain was accompanied by a partially or totally disintegrated blood clot or an empty alveolus, with or without the presence of halitosis.

Normal Healing Alveolus: An alveolus with normal granulation tissue with or without pain.[1-7]

Table 1 – Likert scale of pain.

Score		
0	NO pain	The patient feels well.
1	Slight pain	If the patient is distracted, he or she does not feel the pain.
2	Mild pain	The patient feels the pain even if concentrating on some activity.
3	Severe pain	The patient is very disturbed but nevertheless can continue with normal activities.
4	Very severe pain	The patient is forced to abandon normal activities.
5	Extremely severe pain	The patient is forced to abandon every type of activity and feels the need to lie down.

Table 2 – Likert scale of swelling.

Score		
0	NO pain	The patient does not detect the slightest swelling.
1	Slight pain	The patient detects a slight swelling but it is not very noticeable.
2	Mild pain	The swelling is noticeable but does not interfere with normal mastication and swallowing.
3	Severe pain	The swelling is evident and hinders normal mastication.
4	Very severe pain	The swelling is marked. Mastication is hindered but there is no reduction in mouth opening (no trismus).
5	Extremely severe pain	The swelling is very evident and mouth opening is reduced (trismus).

RESULTS:

A total of 20 patients, divided into 2 treatment groups of 10 each, were recruited in this pilot study. The mean (standard deviation) age was 36 (11) y. Even though a comparison between the two genders was one of the study considerations, all contributing participants were males (Table 3).

Table 4, illustrates the post-operative evaluated aspects in both techniques and their comparison using a chi-square test, revealing comparable results between the two methods in most of the evaluated aspects ($p \geq 0.05$). Tissue laceration, bleeding and alveolar bone fracture were seen in both groups; however, adjacent teeth damage wasn't seen in any. The mean clinical chair side time for the conventional group (10 min) is almost double that of the sectioning

approach (5.4 min).

One of the participants in the sectioning group did not respond to the follow up periods, thus, the results were analyzed as 10 participants in the conventional, and 9 only in the sectioning group. No participants, neither in the conventional method nor in the sectioning approach, reported any significant pain after 2 days of the procedure, in addition to a marked reduction in pain scores during follow up. An exception to that was one participant, who belonged to the conventional approach group, who reported very severe pain, then severe pain in the fourth and seventh day respectively according to Likert's scale. Similarly, trismus, swelling, and alveolar osteitis were not reported in any of the two groups except for the same participant that reported the severe pain. Yet, no significant difference was found between the two methods (Table 5).

Table 3 – Descriptive statistic for the sample.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	20	20	60	36.70	11.221

Table 4– Post-operative assessment.

Variables	Conventional N=10 N (10%)	Sectional N=10 N (10%)	P value
• Tissue laceration			
- Present	4	6	0.371
- Absent	6	4	
• Alveolar bone fracture			
- Present	3	2	0.371
- Absent	7	8	
• Adjacent teeth damage			
- Present	0	0	0.00
- Absent	10	10	
• Bleeding			
- no bleeding	4	6	
- oozing	6	4	0.606
• Clinical chair side Mean (SD)	625.70 (735)	324.50 (148)	0.220

Table 5 – Evaluation of post-operative complications during the follow up.

Variables	Conventional N= 10	Sectional N= 9	P value
Pain			
• After 48hr			
- No pain = 0	4 (40%)	5 (50%)	
- Slight pain = 1	3 (30%)	2 (20%)	
- Mild pain = 2	1 (10%)	0 (0%)	0.738
- Severe pain = 3	2 (20%)	2 (20%)	
• After 4 days			
- No pain = 0	9 (90%)	7 (70%)	
- Slight pain =1	0 (0%)	2 (20%)	
- Mild pain = 2	0 (0%)	0 (0%)	0.201
- Severe pain = 3	0 (0%)	0 (0%)	
- Very severe pain = 4	1 (10%)	0 (0%)	
• After 7 days			
- No pain = 0	9 (90%)	9 (90%)	
- Slight pain = 1	0 (0%)	0 (0%)	
- Mild pain = 2	0 (0%)	0 (0%)	0.330
- Severe pain = 3	1 (10%)	0 (0%)	

DISCUSSION

This trial found that using sectioning approach to extract 1st and 2nd maxillary and mandibular molars did not reduce soft and hard tissue damage. Based on the obtained results, the null hypothesis could not be rejected. The similarity between the two interventions was constant until the end of the study. Participants treated with sectioning approach had similar post-operative outcomes when compared to those treated with the conventional approach. Nevertheless, some important highlights were observed, for example, two of the cases in the sectioning group showed clinical ankylosis of one of their roots during extraction, even though radiographic interpretation did not reveal any signs of ankylosis. Meaning that if the same tooth went for conventional approach as a primary line of extraction, the need of bur utilization would have appeared at some point of the procedure, resulting in a longer chair side time, as well as, additional discomfort for both the provider and the patient. This can be backed-up by the results outlined in a pilot study done in Germany, 2017. A total of twenty participants were divided randomly into two groups. In the control group, if the cases extracted with forceps and elevators failed, a buccal exposure with a mucoperiosteal flap, osteotomy, and subsequent flap reposition, served as the rescue technique, while the trial group were treated with the sectioning approach. Results showed that the control group had four osteotomies that exhibited severe eduction. in alveolar width compared with simple extraction sites. On the other hand, the sectioning technique performed in the test group prevented the need for open surgery in all cases.[8]

In this study, the only two participants that experienced alveolar bone fracture were the ones with ankylosed teeth in the sectioning group. However, the alveolar bone fracture was minimum, and the bone fragment was firmly attached to the alveolar bone, meaning the availability of proper blood supply, which favored the treatment of fixing it in place by suturing and a good prognosis. Conflicting results were seen in a pilot study done in 2010, were results revealed that sectioning approach is less traumatic to the alveolus walls and to the soft tissue which is in favor of an immediate implant placement.[3]

Tissue lacerations were seen in both groups with comparable results, yet, a different pattern of tissue lacerations was seen. In the conventional group, a horizontal cut in the buccal or the lingual gingiva was seen, which is a result of the inappropriate placement of extraction forceps. Whereas, vertical cuts were seen in the sectioning group referring to the damage caused by the bur during the tooth sectioning. Both tissue lacerations are avoidable, and providers should give more attention to soft tissue management during surgical procedures.

The exclusion criteria followed in this study assured the elimination of factors that can affect postoperative bleeding, thus, the consistent results in both groups ensure that neither of the approaches do affect bleeding outcomes. Despite the difference in the mean value of clinical chair time, were the conventional group had almost double the time of the sectioning group, there was no significant difference. That can be explained by the large value of standard deviation in the conventional group, as some extractions were done in seconds and others took up to 20 minutes. This might be a consequence of two reasons, either because of the case selection or the provider skills. Regarding the case selection, the exclusion criteria ensured the exclusion of any teeth with a higher degree of mobility than 1, furcation involvement or with large radiolucency to standardize the cases. At the same time, it should be kept in mind that maxillary and mandibular teeth do have different anatomy, in addition to, different operative considerations during the procedure, such as the proximity to anatomical structures. The difference in the provider skills could be a contributing factor as well, one cannot deny the various skill degrees between providers, even though calibration was done prior to the study.

Noticeable reduction of pain scores was seen in both groups, while no significant pain was reported after 2 days of the procedure. An exception of one participant in the conventional group who reported increasing pain even after 3 days that did not subside with the 7th day follow up. The patient was asked to visit the surgical department, and after proper clinical and radiographic examination, it was found that a small piece of amalgam filling was fallen in the socket which explains the source of pain. Accordingly, the two techniques did not affect postoperative pain even after 7 days of the procedure, highlighting that the surgical sectioning of teeth does not cause any elevation of pain postoperatively.

This pilot study is the first to compare between the conventional technique and the sectioning technique in multirooted teeth. However, several limitations were observed, first of which is the small sample size of 20 participants with a single gender, which can contribute to selection bias. As mentioned above, even though the oral surgeons were calibrated, skills differ when it comes to operative procedures. Accordingly, it is recommended to utilize a single surgeon, and to implement a split mouth technique for a more precise comparison. Other recommendations involve objective measurements, such as measuring alveolar bone resorption by radiographic means, and measuring the socket expansion after extraction. Further studies with a larger sample size are needed to investigate the effects of both techniques.

CONCLUSION

Though results reveal that there is no significant difference in post extraction complications between the two-extraction techniques examined, the utilization of bur in multi-rooted teeth extraction should be pointed out and highlighted in future studies giving the fact that weak points of this study will be taken into consideration. This present pilot study opens new avenues for further studies in aim to achieve more reliable outcomes. We encourage more researches to be conducted in aim of achieving atraumatic and safer extractions.

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