Original Article

Surgical extraction of mesio-angularly impacted mandibular third molars: an alternative instrument for the osteotomy procedure

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ABSTRACT

Background: *Osteotomy of the bone surrounding mesio-angularly impacted tooth is part of the surgical procedure required for their extraction and has evolved in contemporary practice from the use of mallet/chisel to dental drill.*

Objective: *To describe the extractions of mesio-angularly impacted mandibular third molars using Crane pick dental elevator for the osteotomy procedure.*

Materials and Methods: *This was a prospective clinical study of patients done at the Oral and Maxillofacial Surgery Clinic of our institution, over three years period. With gentle, controlled, downward force, bone was removed with Crane pick elevator to expose the mesio-angularly impacted tooth cervical line, creating buccal and distal troughs that were linked and made in cancellous bone. The clinical variables evaluated were age, gender, and reason(s) for extraction, duration of treatment/osteotomy, degree of postoperative trismus and swelling, and complaints during follow-Up.*

Results: *The ages of the 74 patients studied ranged from 18-63 years with mean age of 32.6± 2.8 years. Majority (83.8%) were in the age category of 16-45 years (P=0.001). The duration of the surgery from incision to placement of the last suture ranged from 12.8 to 17.1 minutes with mean 14.3±1.4 minutes. The duration of the osteotomy including the delivery of the tooth from their sockets ranged from 3.2 to 7.4 minutes with mean 5.3±0.7 minutes. The younger the patient's age, the shorter the osteotomy procedure (P=0.001).*

Conclusion: *This study showed that certain mesio-angularly impacted mandibular third molars can be extracted using only Crane pick elevator.*

Key Words: *Crane pick elevator, impaction, mandible, mesio-angular, osteotomy, third molar*

Introduction

The bone surrounding mesio-angularly impacted mandibular third molars contributes to the impediments that result in their failure to erupt completely into the oral cavity necessitating surgical procedures for their extractions when there is need. [1, 2] As a result of this, osteotomy of the surrounding bone is part of the surgical procedure required for their extraction. [3-5] The surgical methods and instruments used for the osteotomy procedure have evolved over the decades, changing in contemporary practice from use of mallet and chisel to dental drill, because most surgeons and patients prefer bone around impacted mandibular third molar to be removed with bur mounted in a hand-piece with adequate moderate speed and high torque powered by a drill. [6-8] According to the Pell and Gregory Classification of the degree of the difficulty of an impacted mandibular third molar, the amount of bone removed varies according to angulations of the teeth, depth of the impactions and morphology of the roots. [9] However, bone is rarely removed from the lingual aspect of the mandible during this procedure due to possibility of damage to the lingual nerve. [10, 11]

Consequently, the extraction of impacted teeth can either be relatively easy, or extremely difficult irrespective of the surgeons' experience. The mesio-angularly impacted tooth is considered to be the least difficult impaction to extract. [5, 9] This type of impaction is the most common and comprises about 43% of all impacted mandibular third molars. [12, 13] This paper describes the extractions of mesio-angularly impacted mandibular third molars with Pell and Gregory Class 2 ramus relationship, Class B depth, and a favorable root morphology (conically shaped and convergent) using only a Crane pick dental elevator for the osteotomy.

Materials and Methods

This was a prospective, clinical study involving 74 patients, between the ages of 18 and 63 years who had extractions of symptomatic mesio-

angularly impacted mandibular third molars classified as Pell and Gregory [9] Class 2 ramus relationship, Class B depth, with a favorable root morphology (conically shaped and convergent) under local anesthesia using Crane pick dental elevator for the osteotomy. The study was done at the Oral and Maxillofacial Surgery Clinic of our institution over three years, from May 2013 to April 2016. Each patient gave informed consent, as the study followed the Declaration of Helsinki on Medical Protocol and Ethics 1975 (as revised in 2008), and the Regional Ethical Review Board approved the study.

The diagnosis of symptomatic mesio-angularly impacted tooth was made from clinical evaluation and radiological interpretation of lateral oblique radiograph of the mandible. Non-smokers, patients not on steroid therapy or having any systemic condition(s) that may interfere with healing of surgical wounds were included. The mesio-angularly impacted mandibular third molars associated with lesions or made contact with inferior alveolar canal, patients that require more than one extraction, pregnant and lactating females, and patients who did not meet the inclusion criteria were excluded. The anatomical relationship between the inferior alveolar nerve and the mesio-angularly impacted third molars were judged with oblique lateral radiograph as recommended by Rood and Shehab. [14]

The surgical extraction was done by the same oral surgeon and dental surgery assistant in the same dental surgery setting. Local anaesthesia was achieved using 2% lidocaine with 1: 80,000 adrenaline. A full-thickness incision was made from the gingiva down to the bone to develop a 3-sided muco-periosteal flap. The flap was elevated with Howarths periosteal elevator, and bone was removed using the buccal and distal guttering technique. With gentle, controlled, downward force the blade of the Crane pick elevator (figure 1) was used to remove bone, from the buccal, and then distal aspects of the impacted tooth under constant irrigation with 0.9% normal saline. The buccal and distal troughs created were linked, deepened until it was made in cancellous bone. This process was continued on the buccal and distal parts bone surrounding the impacted tooth until the cervical line of the tooth was exposed, and tooth elevated and delivered.

Fig. 1 Crane pick elevator

The impacted teeth were removed from their sockets with the same Crane pick elevator, and debridement of the sockets was done, hemostasis achieved and flaps sutured with 3/0 vicryl sutures. The duration of surgery, from the time the first incision was made to the placement of the last suture was recorded in minutes. The duration of the osteotomy procedure was recorded separately. The patients were given the same postoperative order, antibiotics and analgesics.

The subjects were reviewed postoperatively on the third and the seventh day in a blinded manner by the same surgeon, different from the operating surgeon. Further reviews were done after two, four, eight and 12 weeks. The variables recorded were age, gender, and reason(s) for the extraction, duration of treatment/osteotomy procedure, degree of trismus and swelling after treatment, and complaints of the subjects during follow-up. The patients were evaluated for trismus and swelling in a blinded manner by one examiner on the post-operative 3rd and 7th days. Using calibrated caliper, mouth opening and trismus were respectively determined by measuring the distance between the incisal edges of the lower and upper central incisors at the maximum mouth opening in millimeter pre-operatively and post-operatively. Also, the facial width and swelling (centimeter) were evaluated by measuring the distance from the commissure of the mouth to the attachment of the earlobe following the bulge of the cheek, and the

distance from the outer canthus of the eye to the mandibular angle of the affected side. The mean of the two measurements was assumed to be the baseline. The difference between the post-operative measurement on the 3rd and 7th days and the baseline became the facial swelling for the day. Complications were diagnosed based on patients' complaints and clinical evaluation during follow-up. The data obtained were analyzed using EPI INFO 7, 0.2.0, 2012 version software (CDC, Atlanta, GA, USA). For analysis, descriptive statistics, and test of significance were used. P value of <0.05 was considered significant.

Results

Overall, 74 patients with mesio-angular impactions were studied. Their ages ranged from 18-63 years with mean of 32.6± 2.8 years. Majority (n=62, 83.8%) were in the age category of 16-45 years (P=0.001, Table 1). There were more females than males, giving a male to female ratio of 1:1.1. However, the age (P=0.58) and gender (P=0. 81) distribution were insignificant (Table 1). The reasons for the extractions were chronic irreversible pulpitis (n=43, 58.1%), recurrent pericoronitis (n= 24, 32.4%) and acute pulpitis (n=7, 9.5%).

The duration of the entire operative procedure from incision to the placement of the last suture ranged from 12.8 to 17.1 minutes with mean 14.3±1.4 minutes. The duration of the osteotomy procedure including the delivery of the tooth from their sockets ranged from 3.2 to 7.4 minutes with mean 5.3±0.7 minutes. The younger the patient in age, the shorter the osteotomy procedure (Table 2, P=0.001). The mean (SD) of the facial width (baseline) was 10.2 (0.14) cm (range 9.9-10.6 cm). The mean (SD) of facial swelling on the 3rd post-operative day was 0.32 (0.13) cm (range 0.24-0.51 cm), and by the 7th day 0.0 cm. The mean (SD) of the mouth opening (baseline) was 4.7 (0.37) cm (range 4.3-4.9 cm). The mean (SD) of trismus on the 3rd post-operative day was 0.42 (0.10) cm (range 0.15-0.55cm) and on the 7th day 0.0cm.

The patients complied with post-operative appointments. One (1.35%) alveolar osteitis was diagnosed in a 28 year old female on the 3rd post-operative day. This was treated by debridement and curettage of the extraction socket, and the healing was uneventfully. There was no complication related to the use of the Crane pick elevator.

Table 1: Age and gender distribution of patients

Age (Years)	Gender			
	Male n(%)	Female (%)	Total	%
16-25	10(13.5)	8(10.8)	18	24.3
26-35	13(17.6)	16(21.6)	29	39.2
36-45	9(12.2)	6(8.1)	15	20.3
46-55	2(2.7)	5(6.8)	7	9.5
56-65	2(2.7)	3(4.0)	5	6.7
Total	36(48.7)	38(51.3)	74	100.0

Table 2: Comparison of age of patients with the duration of the osteotomy procedure

Age (Years)	Duration of osteotomy (minutes)				
	3-4	5-6	7-8	Total	%
	n(%)	n(%)	n(%)		
16-25	14(18.9)	4(5.4)	0(18)	24.3	
26-35	13(17.6)	15(20.3)	1(1.3)	29	39.2
36-45	3(4.1)	6(8.1)	6(8.1)	15	20.3
46-55	0(0)	2(2.7)	5(6.8)	7	9.5
56-65	0(0)	2(2.7)	3(4.0)	5	6.7
Total	30(40.6)	29(39.2)	15(20.2)	74	100.0

Discussion

This study showed that mesio-angularly impacted mandibular third molars classified as Pell and Gregory Class 2 ramus relationship, Class B depth, with favorable root morphology was extracted using only Crane pick dental elevator for the osteotomy causing minimal temporary post-operative trismus and swelling in the patients, and alveolar osteitis in one subject.

Dental elevators are used in practice to luxate teeth from the surrounding bone, expand alveolar bone, remove broken or surgically sectioned roots from their sockets and consequently make difficult extractions easier. [15, 16] The major components of the elevator are the handle, shank and the blade. [16] The shank connects the handle to the working end or blade of the elevator and is used to transmit force to the tooth, bone, or both. [16, 17] These elevators are used with caution as they can generate a large amount of force that can damage surrounding structures if not properly directed to the operating site like slipping when trying to remove bone which could injure adjacent soft tissue. [17] The Crane pick elevator is the heavy version of the pick type dental elevator and is used as a lever to elevate and extract a broken root, whole root or even teeth from their sockets. [15, 16] As this study shows, it can be used to remove bone impeding the extraction of mesio-angularly impacted mandibular third molars because of its sharp, pointed and strong blade. The advantages of using this instrument include absence of aerosol, reduce the duration of the post-operative swelling and trismus, and complication; the mandible is not supported to protect the temporo-mandibular joint during the procedure and inadvertent fracture of the mandible is not likely to occur. Because most mesio-angularly impacted teeth are extracted under local anesthesia, the fear and psychological trauma which some patients undergo, caused by the sound of the dental drill and mallet and chisel is eliminated. It can also be beneficial in low resource setting where the facilities and instruments are unavailable or inadequate for the conventionally accepted method. Furthermore, the age distribution of the patients in this study suggests that this technique can be used in the majority of the patients that present with this type of impaction. The disadvantage of the procedure is that the blade of the elevator can become blunt over time after use, slowing down the osteotomy process, and this may necessitate sharpening the blade or replacement of the elevator.

The duration of the entire surgical procedure was shorter compared with other earlier studies, [18, 19] although the present study was only restricted to patients with certain mesio-angularly impacted teeth. However, as reported in this study and documented by other researchers, the younger the patient in age, the shorter the duration of the surgical/ osteotomy procedures. [1, 20] The density of the bone surrounding the mesio-angularly impacted mandibular third molar plays a role in determining the difficulty index and indirectly the duration of the surgical extraction. [1, 5] Although radiographic assessment alone is unreliable in determining bone density, patient's age is the best option. [1, 9] In the younger age groups the bone is less dense, more likely to be pliable, expands and bends which makes it easier for the bone to be cut and removed more rapidly, and even allows the tooth socket to be expanded, shortening the osteotomy procedure and the duration of surgery. [1, 5] On the contrary, in the older age group, the bone is denser, have decreased flexibility and ability to expand. [5, 20] Consequently, the surgeon must remove all the bone tissues interfering with the surgical extraction before the tooth can be elevated and delivered. [21] This results in the osteotomy procedure taking a much longer time to be completed due to the difficulty in cutting the bone and the inability of the bony socket to expand. This prolongs the duration of the surgical procedure.

The age and gender distribution of the patients recorded was similar to an earlier report. [22] The reasons for the extractions are in consonance with previous reports [3, 23] where chronic irreversible pulpitis, acute pericoronitis and acute pulpitis were predominant, confirming the assertion that the anatomical relationship

between the mesio-angularly impacted tooth and the adjacent second molar tooth create stagnation area.

The trismus and facial swelling recorded were very minimal compared with those of earlier studies, [20, 24] and these resolved completely within 7 days. This means that the patients were able to return to their normal working duties and social life within a short period after the procedure. All authors agree that the mesio-angularly impacted tooth is the easiest to extract which probably resulted in the shorter duration of the procedures and the consequent minimal inflammatory morbidities of swelling and trismus, and even complication. [1, 3]

Alveolar osteitis after extraction of mesio-angularly impacted mandibular third molars has been reported. [4] Although the factors that may predispose to this condition were excluded in this study, the symptomatic teeth that presented and the non-adherence to some post-operative instructions may be the cause. The treatment modality used to manage the alveolar osteitis was emphasized in another study. [25]

This study was limited by the use of Pell and Gregory classification to determine the difficulty index of the mesio-angularly impacted mandibular third molars. Earlier report showed that this assessment is not completely reliable. [5] However, no one classification is ideal. Also the pre-operative and post-operative pain was not assessed. Some earlier authors stated that the degree of post-operative trismus is directly related to post-operative pain after the surgical extraction of impacted mandibular third molars. [1, 5]

This study showed that certain mesio-angularly impacted mandibular third molars can be extracted using only a Crane pick dental elevator, causing minimal temporary post-operative trismus and swelling in the patients, and alveolar osteitis in one subject. However, randomized controlled clinical trial is required to compare the treatment outcome between patients treated with this instrument and those of dental drill.

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