ORIGINAL ARTICLE

# EFFECTS OF SURGERY DURATION ON POST-EXTRACTION SEQUELAE FOLLOWING IMPACTED THIRD MOLAR SURGERY BY USING TWO DIFFERENT BONE CUTTING METHODS; A DOUBLE BLIND RANDOMIZED TRIAL

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## ABSTRACT

*The objective of this research was to analyze the impact of duration of surgery on post-operative pain and swelling after surgical removal of mandibular third molars.*

*This study was planned as double blind randomized clinical trial that comprised of 60 patients experiencing unilateral mandibular third molar extraction who were recruited into two groups before surgery on the basis of bone cutting method. The study duration was three months, executed at Department of Oral and Maxillofacial Surgery, Dow International Dental College, Dow University of Health Sciences, Karachi. Post-operative complications (pain and swelling) were assessed pre operatively and then on 3rd and 7th day post operatively using visual analogue scale and objective scale for swelling measurement using five anatomical points on face. Surgery duration was divided into two groups, 10-20 minutes group and 20 minutes onwards.*

*Mann Whitney test was used to assess the impact of duration on pain and swelling in both groups. In 10-20 minutes group, mean difference for pain on day one, day 3 and day 7 was calculated with p-value of 0.15, 0.641 and 0.081 respectively while in group having surgery duration of 20 minutes and more, the computed p-value were 0.002, 0.0168 and 0.02 respectively. Mean difference for swelling was calculated in both bone cutting groups with p-value of 0.0916 in 10- 20 minute group and 0.004 in 20 minute onward group.*

*Increasing time duration was associated with more pain and swelling irrespective of the method used for bone cutting. Conventional slow speed hand piece used for bone cutting was associated with less post-operative complications.*

**Key Words:** *Duration of surgery, bone cutting, mandibular third molar surgery, pain & swelling.*

## INTRODUCTION

Mandibular third molars are the commonest teeth to be impacted and their extractiom are one of the most prevailing procedure in dento-alveolar surgery after simple extraction.[1-6,13,15,16,17,20,22] Surgical trauma initiates the complex biological process that results in postoperative pain and swelling. The post-operative sequelae is the physiological response to surgical interventions. Contar CM et al states that these complications range from 4% to 30%.[5] In another study C. Freudlsperger et al states that these inflammatory complications ranges from 1% to 30%.[7]

The difficulty in extracting third molar is assessed by the use of different pre-surgery radiographs[16] mainly OPG, and on the basis of these radiographs the difficulty level of the surgery is evaluated. Different classifications have been established to determine the difficulty level and type of impaction. Pederson difficulty index is one of the measure to determine the surgical difficulty pre-operatively by using the angulation of the tooth, depth and tooth relationship with ramus.[8] According to this index the surgical procedure ranges from easy procedure to difficult procedure depending upon different

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factors that might affect the post-surgical management. Duration of surgery depends upon the difficulty level and also on bone density. Bello et al. states that pain and swelling increases with increasing time.[1]

Beside the surgery timing and difficulty of extraction there are many other factors also on which the post-surgical sequelae depend like age, gender, smoking, use of oral-contraceptives, bone density, experience of the surgeon, poor oral hygiene, type of impaction, use of different antibiotics and presence of any pre-existing pathology.[1,3,4,18,22]

Bone cutting is the most crucial step in surgical extraction of the impacted third molars and different bone cutting instruments are used like conventional slow speed hand-piece[21], physiodispenser and piezo-electric (ultrasonic bone cutting instrument) method.[9] Physiodispenser is mainly used in implant surgery[10,11] but its use for osteotomy during third molar surgery is not so unacquainted. Constant irrigation or externally used saline is used to lower down the temperature, as heat is the principle factor for producing post-surgical sequelae and have disreputable effects on bone healing and regeneration.

All the above mentioned patient related, operator related or tooth related factors helped us to established a hypothesis for this research, that is duration of surgery have some association with post-operative morbidity and there is difference in post-surgical pain and swelling in third molar extraction patients by using physio dispenser and slow speed handpiece for bone cutting.

The primary aim of this study is to investigate the association of duration of surgery with pain and swelling and the secondary aim is to evaluate and compare two different bone cutting methods following impacted third molar surgery.

## METHODOLOGY

Patients were selected through random sampling technique until required sample was achieved. The sample was recruited from one center; DIDC Oral Maxillofacial Surgery Department, DUHS, Karachi. As this study was a human based trial, so written consent was taken from all the participants of the study.

Using PASS v11, a repeated measures design with 1 between factor and 1 within factor has 2 groups with 4 subjects each for a total of 8 subjects. Each subject is measured 3 times. This design achieves 100% power to test factor B if a Geisser-Greenhouse Corrected F Test is used with a 1% significance level and the actual effect standard deviation is 2.27 (an effect size of 2.78), achieves 100% power to test factor W if a Geisser-Greenhouse Corrected F Test is used with a 1% significance level and the actual effect standard deviation is 4.76 (an effect size of 11.67), and achieves 100% power to test the BW interaction if a Geisser-Greenhouse Corrected F Test is used with a 5% significance level and the actual effect standard deviation is 4.76 (an effect size of 11.67).[1,2] So, total 60 participants were selected that compromised of 30 participants in each group.

It was a double blind randomized clinical trial, from September 2015 till November 2015. Patients of both genders who needed extraction of impacted lower third molars were included in this study. Any medical condition in which extraction is contraindicated[4,15], or the patients who have known allergy to penicillin were excluded. The study participants were randomized on the basis of method used for bone removal: Physio-dispenser and Conventional slow speed hand piece. Physio-dispenser was used for bone cutting in study group, while in the control group conventional hand piece was used. Instead of using A and B we labeled envelops with procedure names. Next, we print these names having the same font and same paper size cutting and put them in opaque paper envelops so that the text should not be visible from outside. Then these envelops were sealed and folded. This randomization sequence was masked from the operator and these envelops were opened by one of the operator just before the surgery.[12] Difficulty level for the third molar surgery was assessed with the help of radiograph[8], and single Maxillo-facial surgeon graded the impaction into two categories: easy and difficult, and he was blinded for the study and control groups. The difficulty level was assessed by Pederson Difficulty Index.[8,13]

Two surgeons (Maxillofacial surgeon: consultants) performed all the surgeries and both operators were masked regarding the difficulty levels. The patient was blinded both for the study and control group and also for the difficulty level. The basic demographic data was obtained from each study participant, past medical and dental history including smoking history were also recorded. Patients come to Dental OPD for extraction of impacted mandibular third molar had received two cartridges of LA, sterile instruments were used for all surgeries. Triangular flap was raised, irrigation volume was kept same for both groups, and 100ml of normal saline irrigation was used. 3/0 silk sutures was used and number of sutures was three at the site of extraction. Post-operative antibiotics, Amoxicillin 500mg TDS for 5 days and Iburofen 400mg QID for 3 days was prescribed, and was same in both groups. For pain visual analogue scale (VAS) was used with scale of 0 to 10, 0 for no pain, 2 for mild pain, 4 for discomforting pain, 6 for distressing pain, 8 for horrible pain and 10 for excruciating pain.[1,2,15]

For the swelling five points on face were selected; lateral canthus of the eye, corner of the mouth, bony prominence on the chin, external auditory meatus and angle of the mandible. Three lines, A: from corner of mouth to external auditory meatus, B: from lateral canthus to angle of the mandible, C: external auditory meatus to the chin were modified and were used to measure swelling.[1,4] The measurements were made one on the day of extraction (before surgery) and one on the third day of surgery (after surgery). The duration of the surgery was recorded, the time from the incision till the time taken for suturing.[12] Post-operative instructions were given to each study participant and a post-surgery appointment was scheduled for every patient on the third day of the surgery[14] and swelling measurements were obtained. Sutures were removed on the seventh day of the surgery.

During data collection the X-rays and data sheets were kept in locked cabinet until the data collection was completed.[4] Data was stratified on gender, level of difficulty and bone cutting. Duration of the surgery, pain and swelling was the study variables. For statistical analysis SPSS version 16 was used.

## RESULTS

Out of 60 patients, 25 were males and 35 were females having age 30.92±11.33 and 28.20 ± 6.75 mean (SD) respectively. For descriptive statistics mean and standard deviation was calculated for pain and swelling. For pain (Table 1) variable Mean (SD) was computed for day 1 (the day on which the surgery was performed), day 3 and day 7, then for the difference in pain was computed by subtracting pain on day 1 from day 3, pain on day 3 from day 7 and pain from day 1 from day 7. For swellings (Table 2) three lines A, B and C were added then average reading was calculated for every patient pre-operatively and post-operatively and its mean difference is calculated by subtracting pre-op values from post-op values and different variables were generated for both pain and swelling, further analysis was performed on these variables. Surgery duration was fragmentized into two duration intervals 10-20 mins and 20 mins onwards. To analyze the effect of surgery duration on post-operative sequelae Mann Whitney rank test was used for both pain and swelling (Table 3 & 4). Chi square was used with the p-value 0.03, showed that a significant association between duration of study and difficulty level was found.

TABLE 1: MEAN (SD) FOR PAIN

| Duration | Bone cutting method | Pain on day 1 | Pain on day 3 | Pain on day 7 |
|---|---|---|---|---|
| 10 - 20 mins | Physio | 3.33 (4.33) | 3.67 (2.76) | 4.11 (3.66) |
| | Slow speed | 2.53 (1.30) | 2.74 (1.79) | 1.58 (2.45) |
| 20 onwards mins | Physio | 6.83 (3.66) | 2.17 (1.80) | 0.83 (1.03) |
| | Slow speed | 4.55 (1.80) | 3.27 (1.34) | 1.45 (0.93) |

TABLE 2: MEAN (SD) FOR SWELLING

| Duration | Bone cutting | Pre-op | Post-op day 3 |
|---|---|---|---|
| 10 - 20 min | Physio | 107.81 (6.15) | 113.77 (4.97) |
| | Slow speed | 116.71 (13.64) | 122.97 (13.57) |
| 20 onwards | Physio | 102.93 (4.74) | 110.58 (5.53) |
| | Slow speed | 110.96 (7.38) | 114.81 (6.14) |

TABLE 3: MEAN DIFFERENCE FOR PAIN

| Duration | Bone cutting method | Pain: day 3- day 1 | Pain: day 7 - day 3 | Pain: day 7 - day 1 |
|---|---|---|---|---|
| 10 - 20 min | Physio | 0.333 | 0.444 | 0.777 |
| | Slow Speed | 0.21 | -1.157 | -0.947 |
| | Physio vs Slow Speed, Abs Diff (P-value) | 0.123 (0.15) | 0.713 (0.641) | 0.17 (0.081) |
| 20 onwards | Physio | -4.666 | -1.333 | -6 |
| | Slow Speed | -1.272 | -1.818 | -3.09 |
| | Physio vs Slow Speed, | 3.394 | 0.485 | 2.91 |
| | Abs Diff (P-value) | (0.002**) | (0.168) | (0.02**) |

**Sig at 1%

TABLE 4: MEAN DIFFERENCE FOR SWELLING

| Duration | Bone cutting method | Post-op - Pre-op |
|---|---|---|
| 10 - 20 min | Physio | 5.961 |
| | Slow Speed | 6.263 |
| | Physio vs Slow Speed, Abs Diff (P-value) | 0.302 (0.916) |
| 20 onwards | Physio | 7.65 |
| | Slow Speed | 3.854 |
| | Physio vs Slow Speed, Abs Diff (P-value) | 3.796 (0.004**) |

** Sig 1%

## DISCUSSION

Pain and swelling are the principle indicant of post-operative discomfort experienced by the patients following mandibular third molar surgery. In this study a significant association was ascertained between duration of surgery and aforementioned post-surgical sequelae.

The mean duration of surgery calculated for physiodispenser and slow speed handpiece was 21.33 and 21.88 mins respectively. The mean surgical time reported by Bello et al and Carvalho RW et al were 22.63 and 22 respectively that was corresponded with our study where it was of 21.58 min. Bello et al appended that increasing surgery duration has a correlation with post-op pain and swelling but it was not statistically significant in their study.[1,17] In contrast our study results were statistically significant in this regard.

Carvalho RW et al stated that different studies have mentioned surgical difficulty as a cognitive factor for duration of surgery and statistically significant association was found between these two factors.[17] We also observed the same results, as 32 surgeries were evaluated as difficult and 28 were categorized as easy. Statistically significant association was found between duration of surgery and difficulty level.[11] Root morphology was also a determinant of surgery difficulty, incomplete root formation causes the tooth to rotate around its axis which necessitates tooth sectioning that ultimately requires more time for extraction.[17]

This study has shown that despite extended operating time the VAS (pain scale) was significantly lower in physiodispenser group when compared with slow speed handpiece group. But reverse was seen for swelling measurements which indicated that prolong duration increases swelling.

M. Goyal et al stated that different bone cutting methods have been used for bone cutting including chisel, rotary burs and ultrasonic bone cutting instruments, rotary burs are associated with delayed healing and more post-surgical complications.[9] In our study we used two rotary burs for osteotomy one with internal irrigation system and other with external saline irrigation. The speed also varies in both bone cutting instruments, up to 50,000 rpm for physiodispenser and upto 30,000 rpm for slow speed hand piece.[19] The patients that undergone into surgery with physiodispenser were associated with more facial swelling when compared with slow speed hand piece, it might be due to that increase speed causes more heat generation and more post-operative complications. Overall the physiodispenser group patients experienced less pain.

Mansuri et al de Santana-Santos et al and Bello et al used the same three horizontal lines for swelling measurement as we used in this study.[1,2,13] We have used the average reading for swelling measurement pre and post operatively as used by Mansuri et al in their study. This study also stated that the swelling increases with increasing operative time and this increase in operative time is due to difficulty level of the impaction.[2] The patients were evaluated on 5$^{th}$ day in their study but in our study the patients were assessed for swelling on the 3$^{rd}$ day post-operatively.[13] All the patients were recovered completely on 7$^{th}$ day post-operatively.

Regarding limitation, the latest piezoelectric surgical technique was not used for osteotomy in this study as this method was not available. Some associations were not statistically significant which might be due to small sample size in this study. Further studies with large sample size using state-of-the-art bone cutting systems and more precise methodology is required to establish the relationship of duration of surgery and post-extraction complications. And by minimizing the effects of confounders like age, gender.

## CONCLUSION

When we compared pain and swelling in both physiodispenser and slow speed hand piece groups, less pain was observed in physiodispenser group and less swelling was experienced by the patients in conventional slow speed handpiece group. We also witnessed that the post-extraction sequelae was more severe in patients whose duration of surgery was more than 20 min group,

concluding that duration of surgery correlates with the post-surgical pain and swelling regardless of osteotomy method used.

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