

Research

Influence of Tooth Sectioning on Postoperative Pain, Swelling and Trismus Following Surgical Removal of Impacted Mandibular Third Molar

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ABSTRACT

Aims and objectives: To evaluate and compare pain, swelling and trismus in patients undergoing surgical removal of impacted mandibular third molar by complete odontectomy or tooth sectioning.

Materials and methods: The study population/subjects were 84 patients that present to the Department of Oral and Maxillofacial surgery, Meenakshi Ammal Dental College and Hospital, India, Chennai for extraction of impacted mandibular third molars under local anaesthesia. The study population/subjects were divided into two groups. Patients in group I underwent surgical removal of impacted mandibular third molar without tooth sectioning. In group II patients underwent surgical removal of impacted mandibular third molar with tooth sectioning. All the patients were assessed for pain using visual analogue scale as well as swelling and trismus at postoperative intervals of 1, 3 and 7 days.

Statistical analysis used: ANOVA test using SPSS software.

Results: The results of our study have shown that sectioning of tooth had definite lessening effect on post-operative pain, swelling and trismus in group II when compared with group I. Though the reduction of pain and trismus were minimal, a notable reduction in the amount of swelling was observed with statistically significant results $P < 0.05$, while pain and trismus on 1st postoperative day showed no significant results in group II.

Conclusion: Our study concludes that sectioning of tooth is the most preferred method during surgical removal of impacted third molar, thereby minimising post-operative complications.

Keywords: With odontectomy/without odontectomy, Impacted teeth.

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INTRODUCTION

Surgical removal of impacted mandibular third molars is one of the most common procedures undertaken in oral and maxillofacial surgery. Surgery is frequently associated with postoperative complications of pain, swelling and restricted mouth opening (trismus). The onset of pain usually peaks within several hours after surgery and may last for several days or more. Facial swelling typically peaks at around one or two days before subsiding over the subsequent days [1,2]. Restricted mouth opening results from inflammation of the muscles that move the jaw and may be described initially as having a protective function by encouraging the patient to rest the surgical site and permit healing. However, it may persist for more than a few days and exceed this function causing concern and difficulty in eating for about two weeks or more [3,4].

Various techniques have been evolved in an attempt to permit the successful removal of the third molar whilst reducing the complications. The choice of surgical technique differs from

surgeons to surgeons and has been implicated in the incidence of nerve damage, and the severity of pain and swelling post-operatively [5]. Our study aims at assessing the quality of life of patients undergoing surgical removal of impacted mandibular third molar by tooth sectioning or complete odontectomy. Thereby, every effort can be made to reduce the postoperative morbidity and improve the patient experience for this commonly performed surgical procedure.

MATERIALS AND METHODS

Patient selection

This study was carried out on 84 healthy adults with mean age group of 29 years who reported to Department of Oral and Maxillofacial Surgery for removal of impacted mandibular third molars. All the patients were informed about the purpose of study and consent was obtained. The protocol of this study was reviewed and approved by the institutional review board of our institution.

Inclusion criteria

Patients under ASA I category undergoing surgical removal of mesioangular impacted mandibular third molars. (Class I and II, Position A-Pell & Gregory classification).

Exclusion criteria

1. Patients coming under ASA II, III and IV categories.
2. Patients having impacted mesioangular (class III), vertical, horizontal and Distoangular mandibular third molars.
3. Patients with systemic conditions predisposing to local infections such as diabetes mellitus, Aids or concurrent cancer chemotherapy.
4. Patients with local factors predisposing to infections such as periapical pathology, cyst, neoplastic lesions (or) history of radiotherapy on mandible.

Randomization

Patients were randomly assigned to one of the two groups.

1. Group-I-Patients undergoing surgical removal of mandibular third molar without sectioning of tooth.
2. Group-II-Patients undergoing surgical removal of mandibular third molar by tooth sectioning.

Radiological evaluation

Intra oral periapical radiographs were assessed according to Winter's and Pell & Gregory classification and the impacted tooth is categorized as mesioangular mandibular third molar and their relationship with the ramus was classified as class I and II. Only position A in relation to the depth was taken.

Type of impaction

Mesioangular

Depth

Position A-High Occlusal level

Ramus relationship

Class I-Sufficient Space

Class II-Reduced Space

Surgical procedure

The eligible patients are assigned randomly to either Group I (Non-sectioning of tooth) or Group II (sectioning of tooth). Intraoral preparation was done with povidone iodine solution. Anaesthesia was secured with 2% lignocaine hydrochloride with 1:200000 adrenaline by inducing inferior alveolar nerve block, lingual nerve block and long buccal nerve block. A Ward's incision or Ward's with distal extension was placed, the mucoperiosteal flap reflected and the bone exposed.

Group I (Non-sectioning of tooth)

Bone removal was carried out by guttering on the buccal and the distal aspect of the tooth using a straight fissure bur

number 701 (stainless steel) as required. After adequate amount of bone removal the tooth was elevated and delivered from the socket.

Group II (sectioning of tooth)

In this group a standard surgical procedure was done by adequate bone removal on the buccal and the distal aspect of the impacted tooth, in addition to which odontectomy was performed by placing the bur in the buccal groove, and the bur was moved in a bucco-lingual direction along the long axis of the tooth and the tooth was split into two halves. Then the tooth was elevated and delivered from the socket. Finally for both group I and group II the socket was irrigated with povidone iodine and saline. Sharp bony edges were smoothed with bone files and the socket was irrigated to remove bone debris. Complete haemostasis was achieved before wound closure. The wound was closed with 3-0 silk suture and the patient was given postoperative instructions. All patients were under antibiotic coverage with Amoxicillin 500 mg (oral), 8th hourly and, metronidazole 400 mg (oral) and I mol for pain 8th hourly.

Assessment

The patients were evaluated by the same independent observer postoperatively on 1st, 3rd and 7th days for parameters of pain, swelling and trismus respectively.

Subjective evaluation of pain

Pain was evaluated using a 10 cm visual analogue scale (VAS), the scoring from 0-10 with 0 being no pain, 5 being moderate pain, and 10 the worst possible pain.

Evaluation of swelling

Facial swelling was determined by the craniometric method by measuring distance from the outer canthus of eye to the angle of mandible (S1), distance from tragus of ear to the corner of mouth (S2), and distance from tragus of ear to soft tissue pogonion (S3). These measurements were obtained with a string and measured in mm on a standard graduated scale. The average of S1+S2+S3 was recorded as the amount of swelling (S) (Figures 1,2 and 3).



Figure 1: Measurement of swelling (S1) in mm from lateral canthus of eye to the angle of mandible.



Figure 2: Measurement of swelling (S2) in mm from tragus of ear to corner of mouth.



Figure 3: Measurement of swelling (S3) in mm from tragus of ear to soft tissue pogonion.

Evaluation of trismus

Maximum mouth opening was measured in mm between the incisal edges of upper and lower central incisors (**Figure 4**).

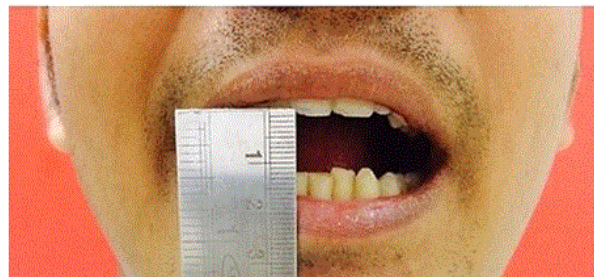


Figure 4: Measurement of trismus in mm from upper incisal edge to lower incisal edge.

STATISTICAL ANALYSIS

The clinical data was analysed statistically with ANOVA test using SPSS software. Statistical significant results were obtained for pain and trismus on 3rd and 7th postoperative days and swelling on 1st, 3rd and 7th postoperative days with $P < 0.05$ respectively (**Tables 1, 2, and 3**).

RESULTS

A total of 84 patients requiring surgical removal of impacted mandibular third molars were included in the present study, of whom 25 were men and 21 were women in group I and in group II 20 were men and 18 were women respectively. The results of pain, swelling and mouth opening scores for all two groups over the 1st, 3rd, and 7th postoperative days are presented in **Figures 3,4 and 5**. The data was analysed statistically with an ANOVA test using SPSS software (**Tables 1, 2, and 3**).

Comparison of group I (non-sectioning) and group II (with sectioning)

Pain: The severity of pain was significantly less on 3rd and 7th postoperative days in group II with mean difference of 3.92 (1.35 SD) and 1.92 (1.12 SD) which showed statistically significant results $P < 0.05$. (**Figure 5 and Table 1**).

Table 1: ANOVA test of significance for pain.

Postoperative days	Mean	Standard deviation	p value
Day 1 group I	3.01	1.35	0.87
group II	3.05	1.54	
Day 3 group I	4.35	1.45	0.04
group II	3.92	1.35	
Day 7 group I	2.17	1.33	0.05
group II	1.92	1.12	

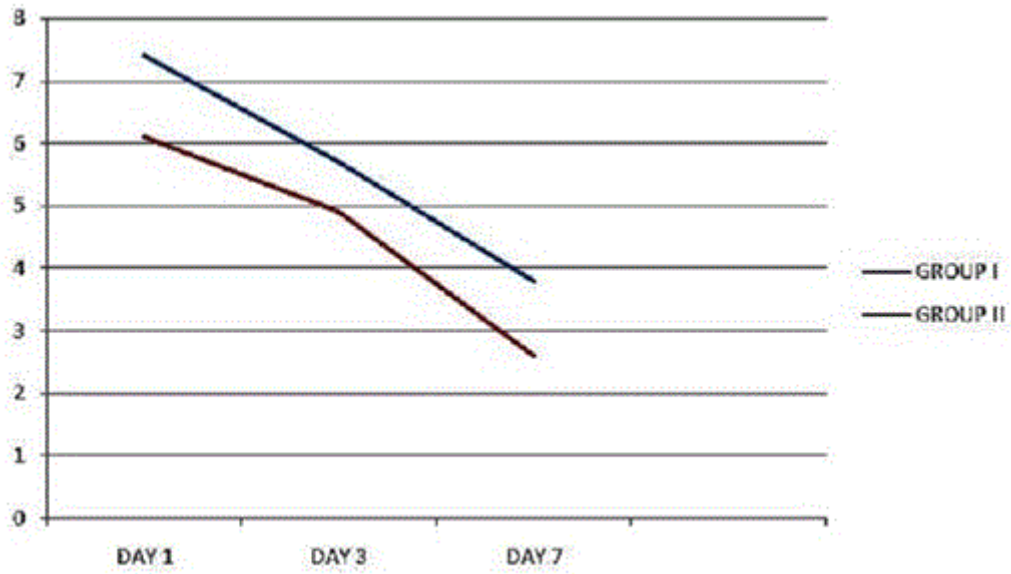


Figure 5: Average pain for each of the groups.

Swelling: The mean difference of swelling on 1st, 3rd and 7th post-operative days were 154.8 (9.87 SD), 125.4 (7.24 SD),

112.2 (4.43 SD) which was statistically significant for group II with P<0.05. (Figure 6 and Table 2).

Table 2: ANOVA test of significance for swelling.

Postoperative days	Mean	Standard deviation	p value
Day 1 group I	159.1	11.74	0.04
group II	154.8	9.87	
Day 3 group I	129	7.51	0.02
group II	125.4	7.24	
Day 7 group I	113.6	5.69	0.02
group II	112.2	4.43	

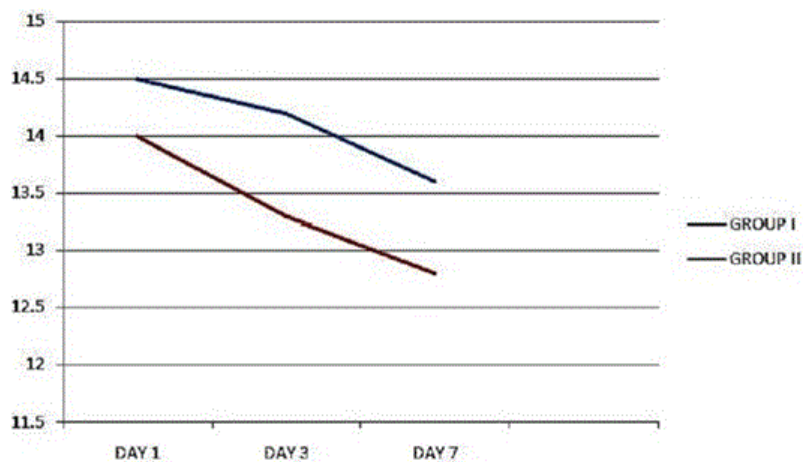


Figure 6: Average swelling in mm for each of the groups.

Mouth opening: The degree of mouth opening in group II was increased on 3rd and 7th postoperative days with mean difference of 38.04 (7.25 SD) and 42.17 (7.22 SD) when

compared with group I with statistical significance of $P < 0.05$. (Figure 7 and Table 3).

Table 3: ANOVA test of significance for mouth opening.

Postoperative days	Mean	Standard deviation	p value
Day 1 group I	35.57	7.12	0.08
group II	36.71	7.89	
Day 3 group I	37.97	6.99	0.02
group II	38.04	7.25	
Day 7 group I	41.26	6.68	0.04
group II	42.17	7.22	

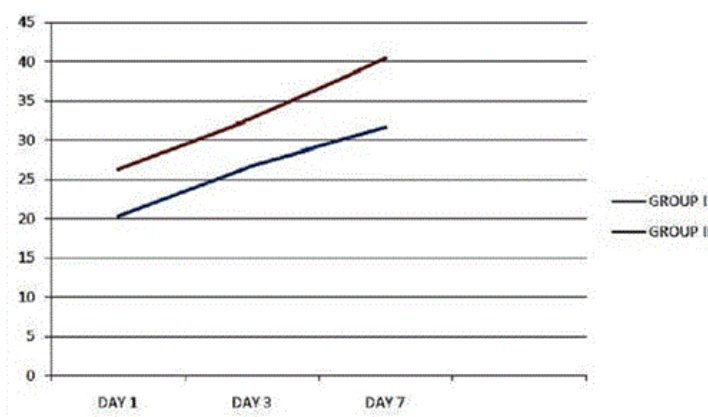


Figure 7: Average mouth opening in mm for each of the groups.

DISCUSSION

The purpose of this study was to evaluate the postoperative course in relation to pain, swelling, mouth opening after removal of impacted mandibular third molars by non-sectioning and sectioning techniques.

The surgical technique for third molar removal may differ from patient to patient depending upon the type of impaction [6]. The type of impaction is one of the anatomical factors that determines the point of purchase (point of application of an elevator) and the extraction movements necessary to deliver a tooth during surgery and which gives a prediction of the difficulty of extraction.

Glenn, et al [7] presented a tooth division technique for the removal of impacted teeth, advantages being the field of operation may be kept small. Since little or no work is done posteriorly to the tooth, the incisions are less extensive. This means less postoperative swelling. Bone removal is eliminated or considerably reduced. The operating time is shortened. Trismus is significantly reduced. Trismus is primarily due to injury to the ligaments of the temporomandibular articulation resulting from forceful elevation of the tooth. There is no damage to adjacent teeth and bone. The risk of a jaw fracture is reduced. Most fractures of the mandible result from forced elevations, usually of vertical impactions which are in contact with second molars.

Numbness of the lip following the removal of impacted mandibular third molars is prevented. Numbness usually is the result of heavy leverage which forces the roots of the tooth against the mandibular nerve. In this technique roots can be lifted away from the nerve with but slight pressure.

Pain measurement is difficult to establish, as the intensity and perception of pain by the patients is multifactorial. Pedersen [5] emphasized pain being the most potential key factor for reduced mouth opening after removal of impacted mandibular third molars. While on contrary, in our study the mouth opening reduced on immediate post-operative day and pain threshold increased on post-operative day 1 and 3. This is due to acute intense pain experienced by the patients during immediate post-operative course. Thereafter, the mouth opening gradually improved on POD 7 and returned to normal baseline level. In more than 20 patients pain gradually subsided from day 3 post operatively.

Maano et al.[6] stated that subjects in his study experienced severe pain on second post-operative day whereas in our study, it was on POD 3. Bosch et al. [9] and Gool et al. [10] found that pain developed faster than swelling, reaching a maximum after 2-3 days. While pain and swelling developed simultaneously eventually leading to trismus. The mouth opening steadily improved by the end of the 7th day. Chiapasco et al. [2] emphasized that excessive amount of bone guttering can contribute to increased postoperative pain.

In our study surgical removal of the class II mesioangular impacted lower third molar tooth required more bone removal as compared to class I. Out of 84 patients, 37 of them had class II mesioangular impacted teeth. They had pain VAS score of 6 on POD 1 and 3. Shevel et al. [11] suggested smaller incision results in reduced post-operative pain.

Srinivas et al.[12] stated that in third molar complications, the surgical oedema is expected sequelae of removal of impacted teeth. Swelling usually reaches maximum level 2-3 days post-operatively and should subside by 4 days and gets completely resolved by 7 days. But in our study the swelling had peaked on POD 3 and subsided on POD 7. Daniel et al.[13], reported in his study that the swelling had peaked on POD 2 in 46% of patients. In our study, the swelling on POD 3 was present in 82% patients. It may be due to increased tissue manipulation or buccal retraction performed during surgical removal of tooth.

Raymond et al.,[14] conducted health related quality of Lifestyle (HRQL) study to assess the patient's outcome and recovery following third molar removal. Analysis of such outcomes would probably help the clinician in future to adapt a systematic evaluation and modify the surgical technique based on type of impaction and pre-operative condition of impacted third molar. Franseco et al.[15] stated that extension of the incision as well as tissue manipulation could affect the entity of swelling and mouth opening. In our study, all patients underwent Ward's incision or Ward's with distal extension for surgical removal of impacted lower third molar but only 25 out of 84 patients had minimal restriction in mouth opening on POD 7. In general, when wards incision is carried out the distal extension placed during the surgical removal of the impacted teeth can extend lateral to the retro molar trigone or to the external oblique ridge which provides attachment to the insertion of the temporalis tendon. Incising the temporalis tendon or extensive bone ostectomy in this region can lead to trismus. Pedersen [5] and our study had direct relevance that swelling has no correlation with the length of time of the operation [16-22].

The occurrence of trismus post operatively is frequently associated with the oral surgical interventions performed in the region of the ramus and the mandibular angle. The severity of tissue manipulation and bone destruction are directly proportional to amount of trismus. Trismus is more intense on the first two days after surgery, followed by gradual improvement and resolution in one week after the surgery. Malamed [23,24] explained that the multiple needle prick does not cause trismus, but when the needle tip accidentally comes in contact with the periosteum it gets barbed. Thus barbed needle tip tears the muscle fibres of medial pterygoids on retrieval which leads to muscle spasm and thus results in trismus.

Raymond et al.[14] stated that the surgical wounding triggers the release of cascades of inflammatory mediators that cause a transient vasoconstriction of arterioles followed by vasodilation, increased blood flow, increased permeability of the post capillary venules and extravasation of fluid into the surrounding tissue. Thus trismus occurred as a result of spasm of muscle fibres following inflammatory process. Here in our

study, patients with class II mesioangular impacted teeth experienced highest reduction in mouth opening of about 6 mm on POD 7.

From our study, we state that pain, swelling and trismus are interlinked and multifactorial in nature. Severe Pain and swelling are commonly associated with pre-operative variables of impacted tooth like angulations, depth, space available and position in relation to external oblique ridge. Pain, swelling, trismus can also be associated with intraoperative variables like amount of LA administered, number of needle prick, type of incision, mucoperioosteal flap elevation, method of tooth removal [25-30].

CONCLUSION

One of the central questions faced every day by a surgeon extracting an impacted third molar is whether or not to section the tooth. The decision affects both the ease of extraction for the surgeon and the post-operative sequelae for the patient. As such it is important to understand the exact impact of sectioning or non-sectioning of impacted third molar, as such that the practitioner may make the best informed decision.

The results of our study have shown that sectioning a tooth has definite lessening effect on post-operative pain, swelling and trismus. Trismus a notable reduction in the amount of swelling was observed when compared with the non-sectioning group. Our study concludes that sectioning the tooth is the preferred technique when surgically extracting an impacted third molar.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. Rood JP, Yates C, Buchanan M. Postoperative swelling and trismus after mandibular third molar removal with the lingual split bone technique. *International Journal of Oral Surgery*. 1979;8(1): 31-35.
2. Chiapasco M, De Cicco L, Marrone G. Side effects and complications associated with third molar surgery. *Oral Surgery, Oral Medicine, Oral Pathology*. 1993;76(4):412-420.
3. Hicks EP. Third molar management: A case against routine removal in adolescent and young adult orthodontic patients. *Journal of Oral and Maxillofacial Surgery*. 1999;57(7):831-836.
4. Capuzzi P, Montebugnoli L, Vaccaro MA. Extraction of impacted third molars: a longitudinal prospective study on factors that affect postoperative recovery. *Oral Surgery, Oral Medicine, Oral Pathology*. 1994;77(4):341-343.
5. Pedersen A. Interrelation of complaints after removal of impacted mandibular third molars. *International Journal of Oral Surgery*. 1985;14(3):241-244.
6. Maano M, Desjardins PJ. Reduction of postoperative facial swelling by low-dose methylprednisolone: an experimental study. *Journal of Oral and Maxillofacial Surgery*. 1993;51(9):987-991.
7. Pell J, Glenn G, Thaddeus G. Report on a ten-year study of a tooth division technique for the removal of impacted teeth. *American Journal of Orthodontics and Oral Surgery*. 1942;28(11):660-666.
8. Sands T, Pynn BR, Nenniger S. Third molar surgery: Current concepts and controversies. Part 2. *Oral Health*. 1993;83(5):19-21.

9. Ten Bosch JJ, Van Gool AV. The interrelation of postoperative complaints after removal of the mandibular third molar. *International Journal of Oral Surgery*. 1977 Feb;6(1):22-28.
10. Van Gool AV, Ten Bosch JJ, Boering G. Clinical consequences of complaints and complications after removal of the mandibular third molar. *International Journal of Oral Surgery*. 1977;6(1):29-37.
11. Shevel E, Koepp WG, Bütow KW. Third molar teeth using different surgical techniques. *South African Dental Journal*. 2001;56:238-247.
12. Srinivas SM, Bart BF. Third molar surgery and associated complications. *Oral and Maxillofacial Surgery Clinics*. 2003;15(2): 177-186.
13. Daniel SA, Ken B, White Jr RP, Simpson KN, Bader JD. Developing a measure of patient perceptions of short-term outcomes of third molar surgery. *Journal of Oral and Maxillofacial Surgery*. 1996;54(12):1402-1408.
14. Raymond WP, Daniel SA, Shafer DM, Laskin DM, Buckley MJ, Phillips C. Recovery after third molar surgery: Clinical and health-related quality of life outcomes. *Journal of Oral and Maxillofacial Surgery*. 2003;61(5):535-544.
15. Franseco S, Ciccì M. Strategies used to inhibit postoperative swelling following removal of impacted lower third molar. *Dental Research Journal*. 2011;8(4):162.
16. Phillips C, White Jr RP, Shugars DA, Zhou X. Risk factors associated with prolonged recovery and delayed healing after third molar surgery. *Journal of Oral and Maxillofacial Surgery*. 2003;61(12):1436-1448.
17. Garcia AG, Sampedro FG, Rey JG, Torreira MG. Trismus and pain after removal of impacted lower third molars. *Journal of Oral and Maxillofacial Surgery*. 1997;55(11):1223-1226.
18. Yuasa H, Sugiura M. Clinical postoperative findings after removal of impacted mandibular third molars: Prediction of postoperative facial swelling and pain based on preoperative variables. *British Journal of Oral and Maxillofacial Surgery*. 2004;42(3):209-214.
19. Szmyd L, Shannon IL, Mohnac AM. Control of Postoperative Sequelae in Impacted Third Molar Surgery. *Journal of Oral Therapeutics and Pharmacology*. 1965;1:491-496.
20. Zhang QB, Zhang ZQ. Early extraction: A silver bullet to avoid nerve injury in lower third molar removal? *International Journal of Oral and Maxillofacial Surgery*. 2012;41(10):1280-1283.
21. Goldsmith SM, De Silva RK, Tong DC, Love RM. Influence of a pedicle flap design on acute postoperative sequelae after lower third molar removal. *International Journal of Oral and Maxillofacial Surgery*. 2012;41(3):371-375.
22. Cameron IW. An investigation into some of the factors concerned in the surgical removal of the impacted lower wisdom tooth, including a double blind trial of chymoral. *British Journal of Oral Surgery*. 1980;18(2):112-124.
23. Stanley MF. Local Complications. In: Stanley Malamed F, *Hand book of Local Anaesthesia* (5th ed) St.Louis: Mosby; 2004; pp: 292.
24. Chi BH, Edward SB, Dodson TB. Types, frequencies, and risk factors for complications after third molar extraction. *Journal of Oral and Maxillofacial Surgery*. 2003;61(12):1379-1389.
25. Krausz AA, Machtei EE, Peled M. Effects of lower third molar extraction on attachment level and alveolar bone height of the adjacent second molar. *International Journal of Oral and Maxillofacial Surgery*. 2005;34(7):756-760.
26. Lucia LM, Marcio DF. Relationships between surgical difficulty & post-operative pain in lower third molar extractions. *Journal of Oral and Maxillofacial Surgery* 2007;65:979.
27. Karaca I, Şimşek Ş, Uğar D, Bozkaya S. Review of flap design influence on the health of the periodontium after mandibular third molar surgery. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2007;104(1):18-23.
28. Bello SA, Adeyemo WL, Bamgbose BO, Obi EV, Adeyinka AA. Effect of age, impaction types and operative time on inflammatory tissue reactions following lower third molar surgery. *Head and Face Medicine*. 2011;7(1):8.
29. Osunde OD, Adebola RA, Omeje UK. Management of inflammatory complications in third molar surgery: A review of the literature. *African Health Sciences*. 2011;11(3).
30. Peterson LJ, Ellis E, Hupp JR, Tucker MR (eds). *Contemporary oral and maxillofacial surgery*. St. Louis: Mosby; 1988.