

Effects of Tube Drain With Primary Closure Techniques On Postoperative Trismus And Swelling After Removal Of Impacted Mandibular Third Molars

Abhishek Handa¹, Khalid Mohammed Agwani², Sharma Shrikant Surendra³,
Sandeep Singh Rana⁴, Amit Agrawal⁵, Mehul Kapadiya⁶

Abstract: Surgical removal of impacted mandibular third molars with primary wound closure may result in postoperative edema, facial swelling, pain, and restriction of mouth opening. The type of closure may be a cause of these complications. The aim of this study was to compare the effects of placement of a surgical tube drain before primary closure with the effects of primary closure alone after removal of fully impacted mandibular third molars. The study group included 25 patients aged above 16 years with bilateral fully impacted mandibular third molars. The insertion of a small surgical tube drain before primary closure (drain group) was compared to a simple primary closure procedure (no drain group) after removal of the impacted third molars in a randomized crossover design. The duration of the operation was recorded. Patients were evaluated 1, 2, 3, and 7 days postoperatively for facial swelling and trismus. The facial swelling experienced by the drain group was significantly less than that experienced by the no drain group. The degree of trismus was greater in the no drain group than in the drain group, but the difference was not statistically significant. Use of a surgical drain, especially after removal of fully impacted third molars, will reduce postoperative facial swelling. Effect of tube drain with primary closure technique on postoperative trismus and swelling after removal of fully impacted mandibular third molars

I. Introduction

The mandibular third molar continues to generate more controversy concerning eruption pattern and pathologic sequel than any other tooth in the oral cavity. Despite racial variation in eruption sequence and dates, it is universally accepted that third molars are the last teeth to erupt. This late eruption explains the fact that third molars are the most frequently impacted teeth. Several theories have been suggested to explain the aetiology of third molar impaction and these include hereditary factors, lack of sufficient eruption force for third molars, reduced growth at the posterior region of the mandible and insufficient mesial movement of the dentition of modern men due to lack of interproximal attrition. The theory of phylogenetic regression of the jaw size seems to be most widely accepted.

The removal of lower third molars is the most common minor oral operation, and the postoperative course can be complicated. There is an ongoing quest to find new and innovative methods to treat the minor complaints of this procedure. Well known to clinicians, these complaints are pain, swelling and trismus. In spite of meticulously planned and executed surgical procedures, swelling, pain and trismus is inevitable and makes it frustrating and annoying to both patient and the surgeon.

Numerous studies involving a wide range of drugs like antihistamines, steroids, enzymes, antibiotics, modified surgical techniques and even homeopathic systems of medicine have been tried but have met with limited success. This problem is further compounded by the complexity of anatomy in third molar region. There is sufficient scientific evidence that when the extraction socket is closed, the swelling is more than when compared to the socket allowed to heal by secondary intention. Sometimes if the wound is not closed there is possibility of delayed healing and infection hence attempts have been made to close the wound and leave a surgical drain. It is the purpose of this study to find out if using a small surgical tube drain and primary wound closure after mandibular third molar extraction.

II. Aim of the study

The aim of this study is to compare the effects of placements of a surgical tube drain before primary closure with the effects of primary closure alone after removal of impacted mandibular third molars.

III. Objectives of the study

The objectives of this study were to determine the absence of parameters like postoperative edema and restriction of mouth opening which are contributed to primary closure, when tube drain is placed.

IV. Materials and methods

Study design

This study is a prospective record based study of patients with symptomatic impacted mandibular third molars that were treated at the Department of Oral and Maxillofacial Surgery, Jaipur Dental College (Rajasthan University of Health Sciences) during 2006 and up to 2006-2009. Mandibular third molars were extracted with subsequent placement of tube drain, comparing it with primary closure.

The sample

This study was conducted on 25 patients, who attended Oral and Maxillofacial surgery Department of Jaipur Dental College for removal of impacted mandibular third molars from June 2006 to March 2009.

V. Inclusion and exclusion criteria

Exclusion criteria

- The following cases were not incorporated in the present study:
- Patients under 16 years of age.
- Patients with a congenital disorder and /or with systemic diseases.
- Patients who were asymptomatic and free from any pathology may be associated with impacted mandibular third molar. Patients on steroid therapy. Female patients who were pregnant or lactating.
- Patients whose mental level or lack of collaboration makes the interpretation of the results difficult or impossible.

Inclusion criteria

The following impaction cases were considered for the present study:

- Patients 16 years and above.
- Those patients presenting with clinical symptoms associated with impacted mandibular third molars.
- Patients with pathology due to impacted mandibular third molars
- Only those patients were involved whose some amount of bone was required to remove the impacted third molar.

All the selected patients were subjected to General Medical examination to rule out any systemic disease.

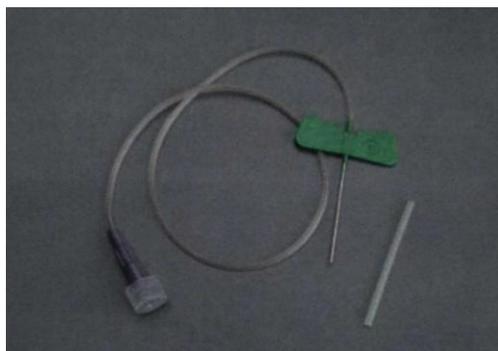
All the patients were informed about the purpose of the study.

Laboratory investigations were carried out to determine the Hb, BT, CT, TLC, DLC, HIV, HBsAG which coincided with the routine investigation protocol of the department.

The study groups were categorized in the following groups:

- > Drain group
- > No- drain group

In this study a tube drain was made from standard butterfly catheter infusion set



Standard Butterfly Catheter Infusion

Pre — operative Evaluations

All the selected cases did not have signs and symptoms of pain, swelling or trismus at the time of surgical removal of impacted third molar.

Post episodes of these symptoms were recorded in the case history.

A case history proforma which comprises the details of the clinical evaluation was designed to have a methodical recordings of the observations and investigations carried out.

Operation of the patient

All the surgical procedures were carried out at the Department of Oral and Maxillofacial Surgery, Jaipur Dental College, Jaipur under local anesthesia/midazolam sedation.

Routine painting and draping of the patient's surgical area was prepared with Betadine scrub. All patients were given the same local analgesics, that is 2% lignocaine hydrochloride with adrenaline (1:80,000) as a mandibular block, supplemented with buccal infiltration.

A standard ward's incision was used with the buccal approach with no. 15 blade. The incision began from the distobuccal cusp of the second molar obliquely downward at an angle of 45 degree towards the buccal surface at a point corresponding to the imaginary line passing through the mesiobuccal cusp of the second molar. The incision was then taken backwards and buccally of the ramus on the external oblique ridge. A mucoperiosteal flap was reflected and the underlying bone was exposed adequately. Bur technique was used for bone removal and normal saline 0.9% was used as a coolant. Bone was removed from buccal and distal aspect of the tooth by means of a surgical round bur and straight bur fixed on straight handpiece. Sufficient bone was removed so as to create a space into which the impacted tooth could be removed by elevation, Tooth sectioning was done whenever required by means of a straight bur, The tooth was then delivered and tooth follicle or granulation tissue was then removed by means of a curette. Sharp bony spicules were rounded off with the help of bone file. The socket was thoroughly checked and irrigated with betadine and saline. The epithelial margin was removed in cases where the tooth was partially erupted. In the drain group, after re-approximation and suturing of the mucoperiosteal flap with 3-0 black silk suture, the standard butterfly catheter was cut and placed in the socket partially and was secured on the buccal aspect with the same suture material.

In the no drain group, the mucoperiosteal flap was sutured with 3-0 black silk suture after reapproximation. Intraoral pressure pack were given to control postoperative oozing of blood from the operated site.

Post-operative Instruction and Care

1. Patients were advised intermittent ice pack application over the operated site, extra orally for two hours after surgery.
2. Patients were advised not to rinse their mouth frequently.
3. Patients were advised to take cold and soft diet for a period of 24 hours after the surgical procedure.

Patients were recalled on 1st, 3rd and 7th day post-operatively. Medical

Medical Therapy

Patient were put on amoxicillin 500 mg three times/day for 5 days, diclofenac sodium tablets three times/day for next 3 days and betadine mouth wash in ratio of 1:1.

Evaluations

The evaluations were done as follows:

- 1 **Swelling** : The distance between four anatomically determined points were measured



The facial swelling was measured using a tape measure. The measurement was made as follows: 1. The distances between lateral corner of the eye and angle of the mandible, 2. the distances between tragus and outer corner of the mouth, and 3. the distances between tragus and soft tissue pogonion were measured preoperatively and on the second, and seventh days after surgery.

- A. Horizontal distance between corner of the mouth to the midpoint of tragus of ear
- B. Horizontal distance between mid point of tragus of ear to the highest point on the chin
- C. Vertical distance between the outer canthus of the eye to the angle of the mandible.

Measurements were done with the help of measuring tapes.

Facial swelling was determined by the following calculations on the 2 and 7 post-operative day

$$\text{Facial measurement} = \frac{\text{Horizontal measurement} + \text{Vertical measurement}}{2}$$

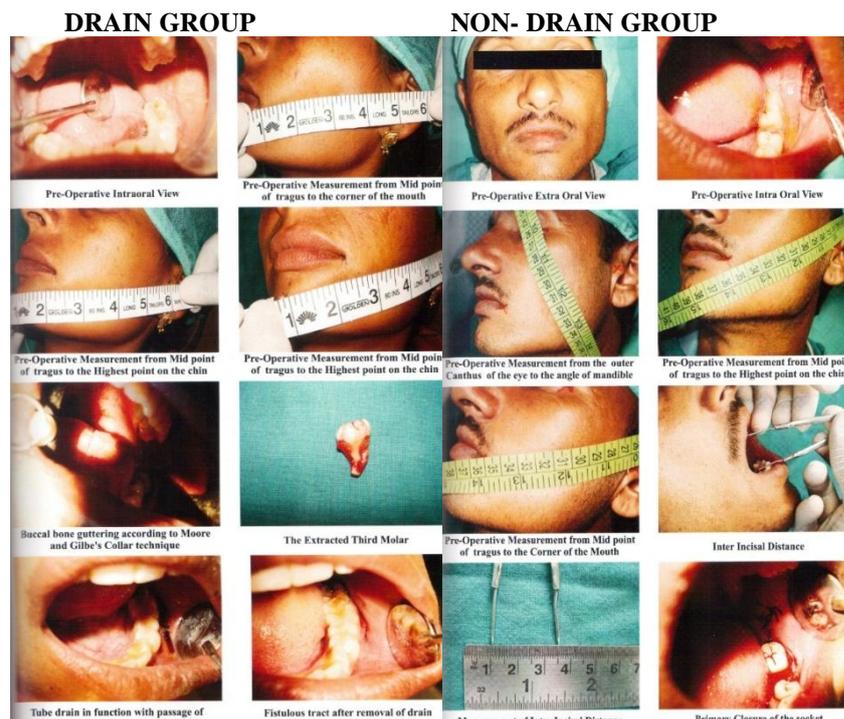
$$\text{Percent of facial swelling} = \frac{\text{postoperative measure} - \text{preoperative measure}}{\text{Pre operative measure}} \times 100$$

2. **Trismus** : The measurement of the opening of the mouth was taken to evaluate the post-operative trismus. The distance between the incisal edges of the maxillary and mandibular central incisor were measured with the help of a divider and scale with the mouth opened to its fullest. The amount of trismus was then taken and measured on the 2nd and 7 post-operative day.

3. Percentage of trismus = $\frac{\text{pre operative measurement} - \text{post operative measurement}}{\text{Pre operative measurement}} \times 100$

On the 3 post-operative day the drain was removed from the drain group by cutting the securing suture. On the 7 post-operative day, the sutures were removed from both the groups and all the cases were evaluated clinically for overall response to the treatment based on the symptoms given by the patient.

1. **Duration of surgery** : The time taken from the placement of the incision to the placement of the last suture was noted in both the groups.



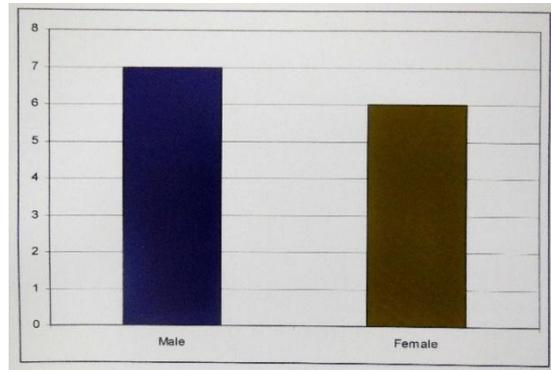
VI. Results

This randomized study was conducted at the department of Oral and Maxillofacial Surgery, Jaipur Dental College, Jaipur, to evaluate the efficacy of primary closure and a small surgical drain to primary closure alone to record the I post-operative complications after the removal of impacted mandibular third molar. 25 patients were randomly divided into Drain and No drain group. After the removal of impacted mandibular third molar a small surgical drain was placed in the socket before primary closure was done in the drain group and was removed on the third post-operative day. In the no-drain group only primary closure was done. The following parameters were checked pre-operatively, 2nd and 7th postoperative day.

- Swelling

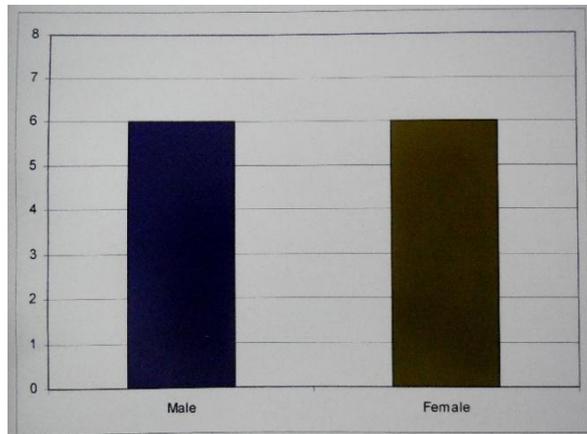
- Trismus
- Duration of the surgery

Out of 25 patients 13 patients were in drain group and 12 were in no-drain group. The drain group consisted of 7 males and 6 females with age ranging from 18 to 39 years with a mean of 26.84 years.



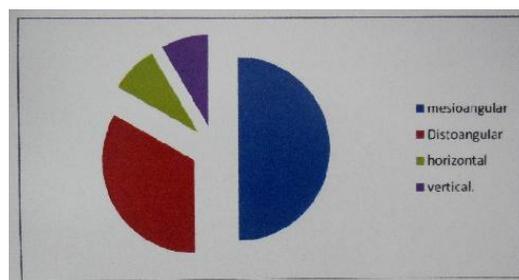
Graph 1 : Sex (Drain group)

The no-drain group consisted of 6 males and 6 females with age ranging from 17 years to 48 years with a mean age of 29.41 years.



Graph 2 : Sex (no drain group)

Out of 13 patients with impacted mandibular third molar in drain group, there 5 were mesioangular, 5 distoangular, 2 horizontal, 1 vertical



Group4 3: types of impaction (with drain)

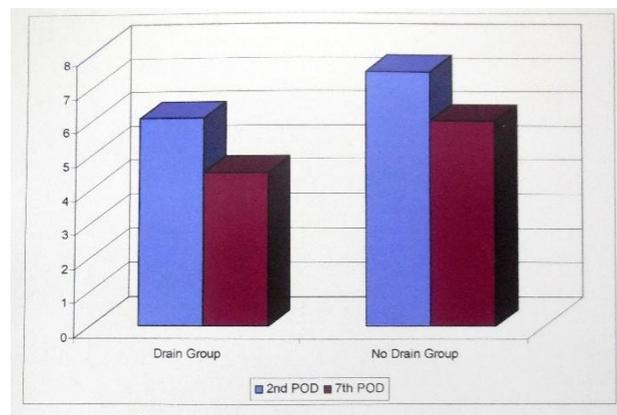
Out of 12 patients with impacted mandibular third molar in no- drain group, there were 5 mesioangular, 3 distoangular, 3 vertical, 1 horizontal,



Graph 4 : types of impaction (no drain)

The percentage of facial swelling was determined on the 2nd and 7th postoperative day and the mean value was calculated 6.07 % on 2nd post-operative day, *46% on the 7th post-operative day in the drain group.

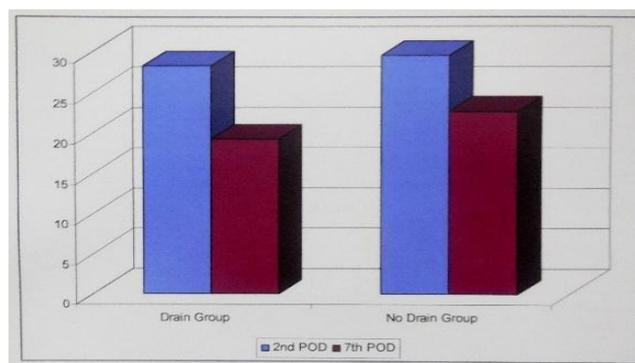
In no-drain group, the mean value was 7.43% on 2nd post-operative day and .97% on 7th day respectively.



3rd POD 7th POD

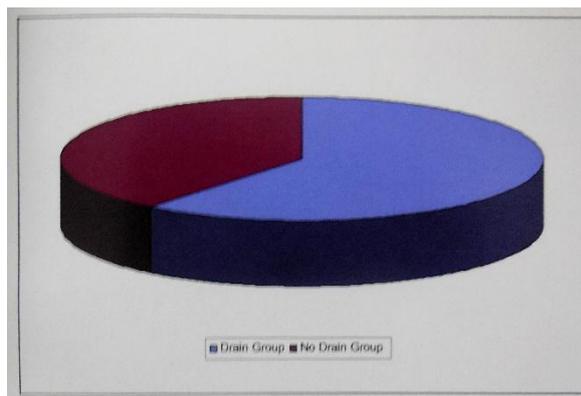
Graph 5: Percentage of facial swelling (drain and No drain group)

The percentage of trismus was measured on the 2nd and 7th post-operative day. In the drain group, the mean value was 28.32 % on the 2nd postoperative and 19.27% on the 7th post-operative day. In no-drain group, the mean value was 29.56 % on the 2 postoperative day and 22.68% on the 7th postoperative day.



Graph 6 : Percentage of trismus

The time taken from the placement of incision to the placement of the last suture was noted in both groups, the mean time was 53.61 minutes in drain group and 34.66 minutes in no-drain group.



Graph 6: Percentage of trismus

VII. Discussion

Removal of impacted third molars involves surgical manipulation of both soft and bony tissues. The common minor complaints following third molar surgery are pain swelling and trismus⁴⁶. For decades research has been done to find new ways to alleviate these complaints.

Postoperative swelling is not as uncomfortable as postoperative pain, but it hampers patients in their daily activities. As corroborated by other researchers, we found swelling to reach a peak on day 1 post surgery¹¹.

The literature supports the use of a variety of treatment modalities to reduce swelling following third molar surgery. NSAID's reduce postoperative swelling as was found by Amin in 1983. Steroids also reduce postoperative swelling significantly², Ice pack therapy does not reduce postoperative swelling significantly. Placing a tube drain in the wound reduces the post surgery swelling significantly. Trismus reduced by steroids according to some studies²⁶.

The oral surgeon's experience is a factor that can influence the amount of side effects after third molar extraction. A study by Capuzzi and colleagues⁹ factors that influence recovery after surgery—sex, age, smoking habits, degree of difficulty of the extraction, use of birth control pills, experience of the duration of surgery and antibiotic prophylaxis—concluded that sex, age and n experience of the surgeon do influence the degree of pain. The objective of this study is to compare the efficacy of insertion of a small surgical tube drain with primary closure to a simple primary closure after removal of impacted of impacted mandibular third molar, on 25 patient undergoing surgical removal of impacted mandibular third molar divided into two groups : drain group and no drain group, conducted in department of Oral and Maxillofacial Surgery, Jaipur Dental College, Jaipur. After third molar the signs and symptoms of pain, swelling and trismus may reflect the formation of prostaglandin E2, bradykinin, histamine and serotonin from membrane phospholipids released as a result of surgery. It thus seems reasonable to suppose that severity of swelling and trismus should be related to the aggressiveness of the surgery. Upto certain level, swelling is associated with normal wound healing after an operation. The more extensive the operative procedure, the more of post operative complications that may be expected. It is known that post-operative swelling is a physical change in the volume of the tissues. It was observed in our study that there was significant difference in the post-operative percentage of facial swelling when comparing the drain group to that of the no drain group, i.e. the percentage of facial swelling on the 2 post-operative day is % in drain group, however it is % in no drain group.

In the same way on the 7th post-operative day is % in drain group and % in no drain group, which is similar to the study conducted by S. Rakprasitkul¹ 1977, Saglam et al 2003 and Cerqueira PR et al 2004.

Trismus, i.e. decreased mouth opening capacity may be caused by refractory muscle spasm related to inflammatory process. However, this theory is not confirmed in literature.

In our study there is no significant change in trismus when comparing the drain and no drain groups and is again similar to the study conducted by **Saglam et al 2003** and **Cerqueira PR et al 2004**.

The duration of the surgery was found to be longer in the drain group, due to the time needed for insertion of the small surgical tube drain, the prolonged duration of the surgery could have induced more post-operative problems, but these were less in drain group, which is similar to the results to that of S. **Rakprasitkul et al 1997**. Thus this study has indicated that group which had the third molar removed with primary closure and surgical tube drain had much less swelling compared to the group in which only primary closure was done. However, there was no significant change in trismus between the two groups.

VIII. Conclusion

This randomized clinical trial was conducted in the department of Oral and Maxillofacial Surgery, Jaipur Dental College, Jaipur to compare the efficacy of insertion of a small surgical tube drain with primary closure to a simple primary closure after removal of impacted mandibular third molar. The study consisted of 25 patients, of which 13 patients belong to the drain group and 12 patients belong to the no drain group. Patients were evaluated preoperative, 2nd and 7th post-operative day for percentage of facial swelling and percentage of trismus. It was observed that the percentage of facial swelling was less in the drain group in comparison with the no drain group. However there was no significant change in trismus between the two groups. Considering the previous studies and the experience of the present one it could be reasonably be concluded that the use of a small surgical tube drain after removal of impacted mandibular third molar appears to be the ideal approach or strategy for reducing for reducing the post-operative facial swelling.

References

- [1]. Abel Garcia Garcia, Francisco Gude Sampedro, Jose Gandara Rey and Mercedes Gallas Torreira "Trismus and pain after removal of impacted lower third molars". *J. Oral Maxillofac Surg.* 1997; 55: 1223-1226.
- [2]. Allen L. Sisk and Gerald J. Bonnington "Evaluation of methylprednisolone and flurbiprofen for inhibition of the postoperative inflammatory response". *Oral Surg Oral Med Oral Pathol.* 1985 Aug; 60(2): 137-45.
- [3]. Allen L. Sisk, Wade B. Hammer, David W. Shelton and Edwin D. Joy "Complications following removal of impacted third molars". *J. Oral Maxillofac Surg.* 1986; 855-859.
- [4]. Ailing C.C, Helfrick J.F, Ailing R.D. "Impacted Teeth". Philadelphia: W.B.Saunders: 1993.
- [5]. Ailing C.C & Osborn D.B. "Maxillofacial trauma". Philadelphia: Lea & Febiger 1988.
- [6]. Archer W.H. "Oral Surgery: A Step-By-Step Atlas of Operative Techniques". W.B, Saunders Company, Philadelphia, 1966; 4th ed. Chapter 4: 122-237.
- [7]. Begg P.R. "Stone Man's Dentition". *Am J. Orthod.* 1954; 40: 298-312.
- [8]. Caci F., Gluck GM "Double-blind study of prednisolone and papase as inhibitors of complications after oral surgery". *J Am Dent Assoc.* 1976 Aug; 93(2): 325-7.
- [9]. Capuzzi P, Montebugnoli L, Vaccaro MA. "Extraction of impacted third molars: a longitudinal prospective study on factors that affect postoperative recovery". *Oral Surg Oral Med Oral Pathol* 1994; 77: 341-3.
- [10]. Carlo Clauser I Roberto Barone "Effects of incision and flap reflection on postoperative pain after the removal of partially impacted mandibular third molar". *Quintessence Int.* 1994; 25: 845-849.
- [11]. Cerqueira PR, Vasconcelos BC, Bessa-Nogueira RV. "Comparative study of the effect of a tube drain in impacted lower third molar surgery". *J. Oral Maxillofac. Surg.* 2004 Jan; 62(1): 57-61.
- [12]. Charles Richard Bloomer, Abilene "Alveolar osteitis prevention by immediate placement of medicated packing". *Oral Surg. Oral Med. Oral Radiol Endod* 2000; 90: 282-284.
- [13]. C.S. Holland "The development of a method of assessing swelling following third molar surgery". *Br J Oral Surg.* 1979 Nov; 17(2): 104-14.
- [14]. David D. Dubois, Marvin E. Pixler and Robert J. Chinnis "Comparison of primary and secondary closure techniques after removal of impacted mandibular third molars". *J. Oral Maxillofac. Surg.* 1982 Oct; 40(10): 631-4.
- [15]. de Barbander E.C and G. Cattaneo "The effects of surgical drain together with a secondary closure technique on postoperative trismus, swelling and pain after mandibular third molar surgery". *Int. J. Oral Maxillofac. Surg.* 1988; 17: 119-121.
- [16]. Donoff B. "Manual of oral and maxillofacial surgery". St. Louis: Mosby. 1992.
- [17]. Edward A. Neupert and John R. Gordon "Evaluation of dexamethasone for reduction of postsurgical sequelae of third molar removal". *J Oral Maxillofac Surg.* 1992 Nov; 50(11): 1177-82.
- [18]. Emanuel S. Troullos, Kenneth M. Hargreaves, Donald P. Butler and Raymond A. Dionne "Comparison of nonsteroidal anti-inflammatory drugs, ibuprofen and flurbiprofen with methylprednisolone and placebo for acute pain, swelling and trismus". *J. Oral Maxillofac. Surg.* 1990; 945-952.
- [19]. Farman A.G. "Tooth Eruption and Dental Impaction". *Panoramic imaging news* 2004; 2:1-9.
- [20]. Fernando Gallardo, Mariana Carstens and Marina Ayarza "Analgesic and antiinflammatory effects of glucamethacin (a nonsteroidal antiinflammatory analgesic) after the removal of impacted third molars". *Oral Surg Oral Med Oral Pathol.* 1990 Feb; 69(2): 157-60.
- [21]. Fernando S., C.M. Hill, R. Walker "A randomized double blind comparative study of low level laser therapy following surgical extraction of lower third molar teeth". *Br. J. Oral & Maxillofac. Surg.* 1993; 31:170-172.
- [22]. Fisher S.E., J.M. Frame and P.G.J, Rout "Factors affecting the onset and severity of pain following the surgical removal of unilateral impacted mandibular third molar teeth". *Br Dent J.* 1988 Jun 11; 164(11): 351-4.
- [23]. Frame J.W., Sheila E. Fisher, N.J. Pickvance, A.M. Skene "A double-blind placebo-controlled comparison of three ibuprofen/codeine combinations and aspirin". *Br J Oral Maxillofac. Surg.* 1986 Apr; 24(2): 122-9.
- [24]. Frame J.W., CR. Evans, G.R. Flaum, R. Langford and P.G. Rout "A comparison of ibuprofen and dihydrocodeine in relieving pain following wisdom teeth removal" *Br Dent J.* 1989 Feb 25; 166(4): 121-4.
- [25]. Gary F. Bouloux and Arumugam Punnia-Moorthy "Bupivacaine versus lidocaine for third molar surgery :A double-blind, randomized, crossover study". *J. Oral Maxillofac. Surg.* 1999; 57: 510-514.
- [26]. Holland CS. and MO Nottingham "The influence of Closure or dressing of third molar sockets on the post-operative swelling and pain". *Br. J. Oral & Maxfac Surg.* 1984; 22:65-71.
- [27]. Howard Davis W., Davis A. Hochwald and Ronald M. Kaminishi "Modified distolingual splitting technique for removal of impacted mandibular third molars: technique". *Oral Surg Oral Med Oral Patho.* 1983 Jul; 56(1): 2-8.
- [28]. Ian W. Cameron "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". *Br J Oral Surg.* 1980 Sep; 18(2): 112-24.
- [29]. Ilze Akota, Bard Alvasaker and Tore Bjornland "The effect of locally applied gauze drain impregnated with chlortetracycline ointment in mandibular third-molar surgery". *Acta Odontol scan.* 1998; 56: 25-29.

- [31]. Jeffrey Stephens R., George R. App and Denis W. Foreman "Periodontal evaluation of two mucoperiosteal flaps used in removing impacted mandibular third molars". *J Oral Maxillofac Surg.* 1983 Nov; 41(11): 719-24.
- [32]. KajFinne and AgnetaKlamfeldt "Removal of lower third molar germs by lateral trepanation and conventional technique. A comparative study". *Int J Oral Surg.* 1981 Aug; 10(4): 251-4.
- [33]. KugelbergCF. "Third molar surgery". *Oral and Maxillofacial Surgery and Infections* 1992; 2;III:9-16.
- [34]. LiewelynJ., M. Ryan, C. Santosh "The use of magnetic resonance imaging to assess swelling after the removal of third molar teeth". *Br. J. Oral Maxillofac. Surg.* 1996; 34: 419-423.
- [35]. LoukotaR.A. "The effect of pre-operative perioral skin preparation with aqueous povidone-iodine on the incidence of infection after third molar removal". *Br J Oral Maxillofac Surg.* 1991 Oct; 29(5): 336-7.
- [36]. LytieJ. J. "Etiology and indications for the management of impacted teeth". *Oral Maxillofac Surg. CHn North Am.* 1993; 5 : 63-75.
- [37]. Manno Miles and Paul J. Desjardins "Reduction of postoperative facial swelling by low- dose methylprednisolone: an experimental study". *J Oral Maxillofac Surg.* 1993 Sep; 51(9): 987-91.
- [38]. Martin P.J. de Boer, Gerry M. Raghoobar, BoudewijnStegenga, Pieter J. Schoen, Geert Boering "Complications after mandibular third molar extraction". *Quintessence Int.* 1995; 26: 779-784.
- [39]. Mead S V. "Oral Surgery" 4th ed., St. Louis: CV Mosby 1954 : 507-510.
- [40]. Middlehurst R.J., G.R. Barker, J.P. Rood "Postoperative morbidity with mandibular third molar surgery: a comparison of two techniques". *J Oral Maxillofac Surg.* 1988 Jun; 46(6): 474-6.
- [41]. Messer EJ, Keller J.J "The use of intraoral dexamethasone after extraction of mandibular third molars". *Oral Surg Oral Med Oral Pathol.* 1975 Nov; 40(5): 594-8.
- [42]. Mohammed M. Amin and Daniel M, Laskin " Prophylactic use of indomethacin for prevention of post-surgical complications after removal of impacted third molars". *Oral Surg Oral Med Oral Pathol.* 1983; 55:448-451.
- [43]. Nageshwar"Comma incision for impacted mandibular third molars". *J. Oral Maxillofac. Surg.* 2002; 60: 1506-150
- [44]. National Institute of Health. "NIH consensus development conference for Removal of third molars". *J Oral Surgery* 1980; 38: 235-236,§"
- [45]. Nitzan DW Tan O Sela A. "Pericoronitis: a reappraisal of its' clinical and microbiological aspects". *J Oral Maxillofac Surg.* 1985; 43: 510-516
- [46]. Norbert Jakse, VedatBankaglu, Gemot Wimmer, AntranikEskici and ChristofPerti"Primary wound healing after lower third molar surgery: Evaluation of 2 different flap designs". *Oral Surg. Oral Med. Oral Pathol*2002;93:7-12.
- [47]. Oikarinen V, Guven O, Silaste H. "Similarly Impacted Second and Third Maxillary and Mandibular Molars in a Pair of Monozygotic Twins". *Dentomaxillofac. Radiol.* 1990; 19 : 133 -134.
- [48]. Ordu M, Aktas I, Yalcin S, Azak AN, Evlioglu G, Disci R, Ernes Y"Comparative study of the effect of tube drainage versus methylprednisolone after third molar surgery". *Oral Surg Oral Med Oral Pathol Oral RadiolEndod*, 2006; 101(6):96-100.
- [49]. Pasqualini D, Cocero N, Castella A, Mela L,Bracco P. "Primary and secondary closure of the surgical wound after removal of impacted mandibular third molars: a comparative study". *Int J Oral MaxillofacSurg*, 2005; 34(1): 52-57.
- [50]. Peterson L.J, Ellis III E, Hupp J.R, Toker M.R, "Principles of Management of Impacted Teeth", *Contemporary Oral &Maxillofacial • Surgery* 3rd ed. St. Louis: Mosby; 1998; 215-48.
- [51]. Rakprasitkul S., V. Pairuchvej "Mandibular third molar surgery with primary closure and tube drain". *Int. J. Oral Maxillofac. Surg.* 1997; 26: 187-190.
- [52]. Raymond A. Dionne, Stephen A. Copper "Evaluation of preoperative ibuprofen for postoperative pain after removal of third molars". *Oral Surg Oral Med Oral Pathol.* 1978 Jun; 45(6): 851-6.
- [53]. Richardson M. "The Etiology and Prediction of Mandibular Third Molar Impaction". *Angle Orthod.* 1977; 47: 165-72.
- [54]. Robert A. Bruce, George C. Frederickson, Gilbert S. Small "Age of patients and morbidity associated with mandibular third molar surgery". *J Am Dent Assoc.* 1980 Aug; 101(2): 240-5.
- [55]. Roynesdal A.K., T. Bjornland, P. Barkvoll, H.R. Haanaes "The effect of soft-laser application on postoperative pain and swelling. A double-blind, crossover study". *Int J Oral Maxillofac Surg.* 1993 Aug; 22(4): 242-5.
- [56]. Saglam A.A. "Effects of tube drain with primary closure technique on postoperative trismus and swelling after removal of fully impacted mandibular third molars". *Quintessence Int.* 2003; 34: 143- 147.
- [57]. Sisk AL, Hammer WB, Shelton DW, Joy ED Jr. "Complications following removal of impacted third molars: the role of the experience of the surgeon". *J Oral MaxillofacSurg* 1986; 44:855-9.
- [58]. Southard TE. "Third molars and incisor crowding: when removal is unwarranted". *JADA* 1992; 123:75-79.
- [59]. venerikNorbolt, EsbenAagaard, Peter svensson and steenSindet-Pedersen "Evaluation of trismus, bite force and pressure algometry after third molar surgery : a placebo controlled study of Ibuprofen", *J. Oral Maxillofac. Surg.* 1998; 56: 420-427.
- [60]. Thomas R. Flynn, C. William Hoekstra, Felix R. Lawrence "The use ofdrains in oral and maxillofacial surgery: a review and a new approach". *J Oral Maxillofac Surg.* 1983 Aug; 41(8): 508-11.
- [61]. UcoK. "Stereophotogrammetric assessment of the effect of tenoxicam on facial swelling subsequent to third molar surgery". *Int. J. Oral Maxillofac Surg.* 1997; 26: 380-382.
- [62]. VanWowern NV and Nielsen HO. "The fate of impacted lower third molars after the age of 20". *Int J Oral Maxillofac Surg.* 1989;18(5):277-280.
- [63]. YehC.J. "Simplified split bone technique for removal of impacted mandibular third molars". *Int J. Oral &Maxillofac. Surg.* 1995; 24: 348-350.
- [64]. Yamaoka M. Tambo A. FurusawaK"Incidence of Inflammation in Completely Impacted Lower Third Molars". *Aus. Dent. J.* 1997; 42:153-5.