"COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS"

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partial fulfillment of the requirements
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THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI – 600 032

2014 - 2017

ENDORSEMENT BY HEAD OF THE DEPARTMENT / HEAD OF THE INSTITUTION

This is to certify that the Dissertation entitled **"COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS"** is a bonafide work done by **Dr. MUGDHA BUDHKAR**, Post Graduate student (2014-2017) in the Department of Oral and Maxillofacial Surgery, under the guidance of **Dr. P. SRIMATHI, MDS.,** Professor, Department of Oral and Maxillofacial Surgery, Tamil Nadu Government Dental College and Hospital, Chennai – 600 003.

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DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled **"COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS"** is a bonafide and genuine research work carried out by me under the guidance of **Dr. P. SRIMATHI, MDS., Professor,** Department of Oral and Maxillofacial Surgery, Tamil Nadu Government Dental College and Hospital, Chennai -600003**.**

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Last but not the least I would like to seek the blessings of the Almighty without whose grace this endeavour wouldn't have been possible.

TRIPARTITE AGREEMENT

This agreement herein after the “Agreement” is entered into on this day _____ between the Tamil Nadu Government Dental College and Hospital represented by its **Principal** having address at Tamil Nadu Government Dental College and Hospital, Chennai - 600 003, (Hereinafter Referred to as, “The College”)

And

Dr. P. SRIMATHI, aged 57 years working as Professor and HEAD of Department of Oral & Maxillofacial surgery, at the college, having residence address at Mylapore Chennai. (herein after referred to as “the Principal investigator”)

And

Dr. MUGDHA BUDHKAR aged 27 years currently studying as Post Graduate Student in the Department of Oral & Maxillofacial surgery, Tamil Nadu Government Dental College and Hospital, Chennai-03 (herein after referred to as the “PG Student and co- investigator”).

Whereas the PG student as part of her curriculum undertakes to research **on “COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS”** for which purpose the Principal Investigator shall act as principal investigator and the college shall provide the requisite infrastructure based on availability and also provide facility to the PG student as to the extent possible as a Co-investigator.

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Witnesses

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1.

2.

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Ref No: R. C. NO: 0420/DE/2016 date : 06-08-2016

Sub: IEC review of the research proposals,

Title of the work: **Comparison of three incision designs and its influence on post-operative complications in surgical removal of mandibular third molars**

Principal Investigator: Dr. Mugdha Budhkar
III year MDS

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Tamil Nadu Govt. Dental College & Hospital , Chennai-3

Thank you for submitting your research proposal , which was considered at the Institutional Ethics Committee meeting held on the 01.07. 2016, at TN Govt. Dental College and the documents related to the study referred above were discussed and the modifications done as suggested and reported to us through your letter dated 02- 08 -2016 have been reviewed. The decision of the members of the committee , the secretary and the Chairperson IEC of TN Govt. Dental College is here under:

Approved	Approved and advised to proceed with the study
Approved with suggestions	----------
Revision	----------

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ABSTRACT

Background : Surgical removal of impacted mandibular third molars involves manipulation of both hard and soft tissues, so it is usually associated with a number of post-operative complications. Trismus, pain, swelling, lingual nerve damage and compromised periodontal status of the preceding second molar are complications which are unpleasant and uncomfortable for the patients. Therefore, reducing the incidence of complications becomes necessary. Flap designs are modified in order to minimize the post-operative complications.

Aim of the study : The aim of this study was to compare the effects of three types of flap designs used during surgical removal of impacted mandibular third molars and to investigate the consequences between Comma-shaped incision or Koener's incision over the standard Ward's incision in terms of post-operative complications.

Materials and Methods: A prospective, randomized in vivo study was conducted in the DEPARTMENT OF ORAL AND MAXILLOFACIAL SURGERY, TAMILNADU GOVERNMENT DENTAL COLLEGE AND HOSPITAL, CHENNAI. Sixty healthy patients with unilateral or bilateral partially impacted mandibular third molars were selected for this study. Patients were randomly divided into three groups namely group 1, group 2 and group 3. Ward's incision, Comma-shaped incision and Koener's incision were used in group 1, group 2 and group 3 respectively. The influence of these incisions on ease of access, time required for surgery, post-operative mouth opening, swelling, pain and wound healing was evaluated.

Results: The results of this study show difference with respect to accessibility to surgical site, time required for the surgery, post-operative decrease in mouth opening, post-operative swelling and post-operative pain. Ward's incision provided excellent access to the surgical site as compared to comma shaped incision and Koener's incision. Time required for the surgery was least with the use of comma shaped incision, while it was more with Ward's incision amongst three incision groups. Post-operative mouth opening, post-operative swelling and post-operative pain were

affected more adversely with the use of Ward's incision while these parameters were least adversely affected with the use of Comma shaped incision, Koener's incision being the intermediate. Significant differences were not noted with respect to post-operative pocket depth distal to second molar, wound dehiscence, wound infection, dry socket and paresthesia.

Conclusion: Comma shaped incision is more preferable when compared to Ward's and Koener's incision, although it may require some practice initially and a more broader study group of patients under each category is recommended.

Keywords: Impacted mandibular third molar, flap design, Ward's incision, Comma shaped incision, Koener's incision, post-operative complications.

ABBREVIATIONS

M3	**:**	Mandibular third molars
FIG	**:**	Figure
VAS	**:**	Visual Analogue Scale
N	**:**	Count
P Value	**:**	Value of Significance
ANOVA	**:**	Analysis of Variance
SD	**:**	Standard Deviation
OPG	**:**	Orthopantomogram

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Surgical removal of impacted third molar is the most frequently performed minor oral surgical procedure, since third molars are present in 90% of the population with 33% having at least one impacted third molar.

Surgical removal involves manipulation of both hard and soft tissues, so it is usually associated with a number of post-operative complications. Trismus, pain, swelling, lingual nerve damage, and compromised periodontal status of the preceding second molar are complications that occur too frequently to be ignored. These are unpleasant and uncomfortable for the patients. Therefore, reducing the incidence of complications becomes imperative which is possible only with a thorough knowledge of the various factors affecting them.[1]

Flap design is one important factor which influences the severity of these complications. Flap design is important, not only for allowing optimal visibility and access to the impacted tooth, but also for subsequent healing of the surgically created defect. The most important factor in designing a flap is naturally the position of the third molar and thereby the planned removal as well as the sectioning plane for the tooth, when performed. The flap must be able to be retracted to a safe distance from the planned osteotomies and tooth division planes, allowing good visibility and surgical accessibility to the region in question. Furthermore the flap should be created with due respect to critical anatomical structures such as distal periodontium of the second molar, lingual nerve and the buccinator muscle. The flap should also have a wide base that ensures a good blood supply.[2]

Incision and flap design in any surgical procedure is based on time-tested principles. Incision lines should not, as far as possible, lie over prospective bony defects or cut across major muscle or tendon insertions. They should be minimally extensive. However, the distal part in standard Ward's incision which is conventionally used for surgical removal of impacted mandibular third molars comes close to or even cuts across the insertion of the temporalis tendon which is an important cause of post-surgical trismus. The flap usually lies over the bone defect that is formed after removal of the impacted tooth which sometimes leads to delayed healing and consequent pain and infection.

The comma-shaped incision allows reflection of a distolingually based flap adequately exposing the entire third molar area. The resulting surgical field allows a surgeon to use the conventional buccal bone removal method or the lingual split technique with relative ease. After the process of removing the impacted tooth is complete, the flap can easily be placed back in position and secured with 1 or occasionally 2 sutures. No part of the wound lies on the resultant bone defect; nor does it approach the retromolar pad or the insertion of the temporalis muscle tendon.[1]

The Koener's incision or envelope flap allows good exposure of the surgical site and the sulcular incision can be extended anteriorly if required. Owing to the broad base, blood supply is excellent and the design facilitates easy closure and reapproximation. Potential problems of the envelope flap include damage to the periodontal ligament when creating a sulcular incision around a tooth, increased osteoclastic activity when raising a mucoperiosteal flap with

potential local bone loss and a higher risk of wound dehiscence in the postoperative period compared with the modified triangular flap.[3]

In this study, a comparison was made between three incision designs and the post-operative complications were reviewed following surgical removal of mandibular third molars.

AIM OF THE STUDY:

To compare and evaluate three different incision designs i.e. standard Ward's incision, Koener's incision and comma shaped incision in lower third molar impaction surgeries by assessing their clinical outcomes.

OBJECTIVES OF THE STUDY:

To evaluate the following parameters -

1. Ease of access
2. Time required for surgery
3. Post-operative mouth opening
4. Post-operative swelling
5. Post-operative pain
6. Wound dehiscence
7. Pocket depth distal to second molar
8. Wound infection
9. Dry socket
10. Paraesthesia

INCIDENCE OF IMPACTED TEETH

Robert M. Kramer and Arthur C. Williams (1970)[5], did a study and found that Third molar impactions represent 94.8 per cent of all impactions. They also found that unilateral third molar impactions are almost as frequent as bilateral third molar impactions. Among the roentgenograms examined, 18.2 per cent demonstrate one or more impactions. Maxillary third molar impactions (62.57 percent) are in the majority, in comparison with mandibular third molar impactions (47.44 per cent). Unilateral third molar impactions are almost as frequent as bilateral third molar impactions. The Negro population investigated in this survey maintains an impaction ratio similar to that seen in previous Caucasian studies. The order of incidence of impactions is maxillary third molar, mandibular third molar and maxillary cuspid, followed by the remaining impactions. There appears to be no sex predisposition for impactions.

Kalle Aitasalo, Risto Lehtinen and Erkki Oksala (1972)[6] did an orthopantomographic study. Impacted teeth were found in 14.1% of the patients. The teeth most frequently impacted were the third molars, 76.1% and of these, no difference between the maxilla and mandible was observed. The prevalence of impacted maxillary cuspids was noted to be significantly higher than that of the mandibular cuspids. The percentage of the other impacted teeth was only 3.6 %. No difference in sex in the prevalence of third molars was observed. The number of impacted third molars predominated in the age-group 20-29 years, and a percentage decrease in their number was observed with the increase of age, obviously due to extractions.

Pushpinder S. Grover and Lewis Lorton (1985)[7] did a survey of the panoramic radiographs of 5000 army recruits. Of the 5,000 persons surveyed, 96.5% (4,825) had radiographic evidence of one or more unerupted/ impacted teeth. An affected person had an average of 2.28 unerupted,/impacted (u/i) teeth. There were 176 persons (3.5%) with no evidence of third molars or history of extractions. Although the greatest (98%) involved the third molars, there were 225 other impacted or malerupted teeth.

DIFFICULTY IN SURGICAL REMOVAL OF IMPACTED MANDIBULAR THIRD MOLARS

T. Renton , N. Smeeton and M. McGurk (2001)[8] did a prospective study in which univariate analysis identified increased patient age, ethnic background, male gender, increased weight, bone impaction, horizontal angulation, depth of application, unfavourable root formation, proximity to inferior alveolar canal and surgeon as factors increasing operative time.

H. Yuasa, T. Kawai and M. Sugiura (2002)[9] did analysis on pre-operative factors that complicate the surgical removal of impacted mandibular third molars. They found that difficulty in extraction is associated with depth, ramus relationship or space available, width of root or combination of these factors.

Chi H. Bui, Edward B. Seldin, and Thomas B. Dodson (2003)[10] did retrospective study consisted of patients who had 1 or more 3rd molars removed. Risk factors were grouped into demographic, general health, anatomic, and operative. Increasing age, a positive medical history, and the position of the M3 relative to the inferior alveolar nerve were associated with an increased risk for complications.

Srinivas M. Susarla and Thomas B. Dodson (2004)[11] did a study indicating the difficulty of M3s extractions is governed primarily by anatomic and operative factors with minimal influence from demographic factors.

Oladimeji A. Akadiri and Ambrose E. Obiechina (2009)[12] did comparison of selected articles which showed that showed that demographic variable, age; operative variables: surgeon procedure type and number of teeth extracted; and ratiographic variable, depth angulation; and root morphology, are the most consistent determinants of difficulty.

INDICATION TO REMOVE MANDIBULAR THIRD MOLARS

Thomas Osborn, George Frederickson, Irwin A and Thomas Torgerson (1985)[13] did a prospective study of complications related to mandibular third molar surgery. Non-functional tooth(32.9%) being the most common indication. Others included pericoronal infection(6.0%), orthodontic reasons (16.6%), pain(2.!%), caries (1.9%), cyst(0.3%).

Nordenram A, Hultin M, Kjellman O, Ramstrom G (1987)[14] did a study on indications for surgical removal of 2,630 impacted mandibular third molars. Pathological changes were seen in about 60% with pericoronitis as the most common diagnosis. Root resorption of the adjacent molar was seen in 4.7% and cysts in 4.5%. Orthodontic indications were noted in 10.7%. In about 20% of cases prophylactic indications were given as the reason for extraction.

L. Lysell and M. Rohlin (1988)[15] did a study of indications used for removal of the mandibular third molar. The most frequent indication, 27%, was the prophylactic removal of the third molar. Orthodontic considerations, another form

of removal of an asymptomatic third molar than the prophylactic removal, consisted of 14%. Whereas caries or pulpitis of the third molar made up 13%, other pathological entities like cysts, tumours and root resorption of the second molar amounted to less than 3% each.

Kerstin Knutson, Berndt Brehmer, Leif Lysell, Madeleine Rohlin, Malmo and Kristianstad (1996)[16] did a prospective study on pathoses associated with mandibular third molars subjected to removal. Pericoronitis was found in 64% of cases, caries in third molar in 31%, periodontitis in association with 8%, caries in the second molar in 5%, root resorption in second molar with 1%.

PREDICTION OF INFERIOR ALVEOLAR NERVE DAMAGE

Ana Cláudia Amorim Gomes, Belmiro Cavalcanti do Egito Vasconcelos, Emanuel Dias de Oliveira Silva, Arnaldo de França Caldas, Ivo Cavalcante Pita Neto (2008)[17] did study on Sensitivity and Specificity of Pantomography to Predict Inferior Alveolar Nerve Damage During Extraction of Impacted Lower Third Molars. Panoramic radiography does not provide the reliable images required for predicting nerve lesions in third molar surgery.

FLAP DESIGNS USED IN MANDIBULAR THIRD MOLAR SURGERY

According to **Nodine (1925)**, **Novitsky** was the first **(1890)** to raise the flaps and remove bone.[18]

Steele (1895) split the gum behind the third molar and removed bone with a sharp drill.[18]

A **vertical flap** was described by **Thoma** [19] for complete soft tissue impaction in which the posterior limb runs from the lingual side of the retromolar triangle about 2mm behind the second molar. The anterior limb extends over the alveolar ridge and down on the buccal side. He also stated that the advantage of the flap is a gingival collar left intact distal to the second molar.

A **modification of Thoma's vertical flap**[20] was made by making a horizontal incision brought in contact with the distal surface of the distobuccal cusp of the mandibular second molar.

It was observed that **Ward's** and **modified Ward's incision** [21] provide excellent visual and mechanical access and can be closed by means of suture inserted between buccal and lingual soft tissues alone. This avoids the need to a suture in the buccal sulcus, a procedure which at times gives rise to considerable difficulty.

The incisions used to expose impacted mandibular third molars that have been described in textbooks and various studies can be broadly grouped under triangular and envelope types. Regardless of variations in the anterior end of the incisions, all extend posteriorly from the distal aspect of the preceding second molar towards the ascending ramus. The length and angulation of this extension depend on the position of the third molar and the proximity and the lateral flare of the ramus.[22]

It has been stated that though envelope flap is widely used, a releasing incision can be made to gain wider access to remove a deeply placed impacted tooth, as the envelope flap may not provide adequate access. However the envelope flap usually is associated with fewer complications and tends to heal

more rapidly with less pain than the three cornered flap and also when a releasing incision is made a small buccal artery is sometimes encountered and this may be mildly bothersome during the early portion of surgery.[23]

Nageshwar (2002)[1] gave new Comma Incision for Impacted Mandibular Third Molars. Swelling was defined as the percentage ratio of increase in linear measurement between centre of tragus and corner of mouth, centre of tragus to soft tissue pogonion and lateral canthus of eye to the angle of mandible. The new incision and flap design were seen as superior overall.

RISK INDICATORS FOR POST-OPERATIVE COMPLICATIONS

Allen L. Sisk, Wade, Hammer, David W. Shelton, Edwin D. Joy (1988)[24] studied the incidence of Complications associated with the removal of impacted third molars in a group of 500 patients. complications were more numerous after the removal of third molars classified as partial bony or complete bony impactions and that less-experienced surgeons had a significantly higher incidence of such complications.

M. Peñarrocha et al (2001)[25] evaluated the association between oral hygiene before surgery and pain, inflammation and trismus after the surgical removal of 190 impacted lower third molars. The patients with the poorest oral hygiene reported higher pain levels throughout the postoperative period and more analgesic consumption in the first 48 hours. In contrast, oral hygiene appeared to exert no influence on either trismus or inflammation.

Ingibjorg S. Benedikt et al (2003)[26] did study to identify risk indicators for extended operation time and postoperative complications after removal of mandibular third molars. Females were at higher risk for postoperative pain and dry socket than males. Older patients were at higher risk for extended operation time than younger patients. Radiographically fully impacted molars increased the risk of postoperative general infection. If the nerve was visible during surgery there was a higher risk of a high VAS score, postoperative pain, and general infection than if the nerve had not been visible.

Thiago de Santana-Santos et al (2013)[27] carried out prospective study on **prediction of postoperative facial swelling, pain and trismus following third molar surgery based on preoperative variables.**The amount of facial swelling varied depending on gender and operating time. Trismus varied depending on gender, operating time and tooth sectioning. The influence of age, gender and operating time varied depending on the pain evaluation period.

POST-OPERATIVE COMPLICATIONS

Sterling K. Schow (1974)[28] did evaluation of postoperative localized osteitis in mandibular third molar surgery. a significantly increased incidence of localized oateitis was found to occur in women taking oral contraceptives and in those cases in which surgical access demanded elevation of a mucoperiosteal flap to expose the external oblique ridge of the mandible.

R. Jeffrey Stephens et al (1983)[29] did a study to compare the results of two types of access flap used in removing impacted mandibular third molars. Analyses of variance indicated that there was no significant difference between the two flap

techniques and, therefore, the choice of flap technique is one of operator preference. There was a significant decrease in mean sulcus depth at all measured points for either flap technique, indicating a generally healthier condition around mandibular second molars 12 weeks after the surgical removal of mandibular third molars.

D. A. Mason et al (1988)[30] carried out prospective study on the effects of surgical, operator and anatomical variables on the incidence and duration of lingual dysaesthesia after the surgical removal of impacted lower third molars under general anaesthesia. Lingual dysaesthesia was found in some degree following operations, an incidence of 11.5%. Anatomical and surgical factors which had an effect on the incidence of lingual dysaesthesia.

Tarek L. Al-Khateeb et al (1991)[31] studied the relationship between the indications for the surgical removal of impacted third molars and the incidence of alveolar osteitis. It was found that several factors seem to contribute to the development of alveolar osteitis; however, the most significant related finding was that the reason for the extraction, that is, whether the extraction was undertaken for therapeutic or prophylactic reasons.

Peter .E. Larsen (1992)[32] performed a prospective study of risk factors associated with the development of alveolar osteitis (dry socket) postoperatively. Patients treated by the inexperienced surgeon and those using tobacco had a significantly greater incidence of alveolar osteitis. Previously identified risk factors of increased age, female sex, oral contraceptive use, and increased surgical time were not associated with an increased incidence of dry socket.

Matte Chiapasco, Lorenzo De Cicco, and Guido Marrone, Milan (1993)[33] performed a retrospective analysis of complications and side effects associated with surgery for 1000 mandibular and 500 maxillary impacted third molars. The incidence of intraoperative complications and side effects of mandibular third molar surgery was 1.1% and 4% for maxillary third molar surgery whereas postoperative complications were 4.3% and 1.2%, respectively.

J. Savin, G. R. Ogden (1997)[34] prepared a preliminary report on aspects affecting quality of life in the early postoperative period after third molar surgery. Results showed that within the first postoperative week some patients can experience a deterioration in their quality of life, that extends beyond the traditionally recognized side effects and which shows little improvement in the first postoperative week.

Allen E Fielding, Dominic R Rachiele, Gordon Frazier (1997)[35] studied Lingual nerve paresthesia following third molar surgery. 76.05% reported having had patients with lingual anesthesia, dysesthesia, or paresthesia. Of all the reported cases, 18.64% of the cases failed to resolve.

Eduard Valmaseda-Castellón, Leonardo Berini-Aytés and Cosme Gay-Escoda (2000)[36] did study to determine the incidence of inferior alveolar nerve (IAN) damage after surgical removal of lower third molars to identify the causes and to construct a predictive model to assess the risk of IAN injury. Patient age, ostectomy of the bone distal to the third molar, the radiologic relationship between the roots of the third molar and the mandibular canal, and deflection of the mandibular canal increased the risk of IAN damage. Older patients were at a higher risk for suffering permanent injuries.

Eduard Valmaseda-Castellón, Leonardo Berini-Aytés and Cosme Gay-Escoda (2000)[37] conducted a nonrandomized prospective study. Anatomical factors such as lingual angulation of the third molar, surgical maneuvers such as retraction of the lingual flap or vertical tooth sectioning, and surgeon inexperience all increase the risk of lingual nerve damage, although permanent lesions seem to be very rare.

Norbert Jakse et al (2002)[38] did prospective study to evaluate the primary wound healing of 2 different flap designs. The study confirms evidence that the flap design in lower third molar surgery considerably influences primary wound healing. . In the envelope-flap group, wound dehiscences developed in 57% of the cases. With the modified triangular- flap technique, only 10% of the wounds gaped during wound healing. The modified triangular flap is significantly less conducive to the development of wound dehiscence.

C. McGrath et al (2003)[39] did study on Changes in life quality following third molar surgery in the immediate postoperative period. Both oral health related quality of life measures identified a significant deterioration in quality of life on POD1 and this remained evident on POD2 , POD3 , POD4 and POD5. Deterioration in life quality over the study period was associated with postoperative clinical findings : swelling and trismus.

Hidemichi Yuasa, **Masayuki Sugiura (2004)**[40] studied prediction of postoperative facial swelling and pain based on preoperative variables. The amount of facial swelling varied depending on age and sex. Severe pain was associated with depth and preoperative index of difficulty. Average pain was associated with preoperative index of difficulty.

Lucía Lago-Méndez (2007)[41] studied Relationships Between Surgical Difficulty and Postoperative Pain in Lower Third Molar Extractions. A statistically significant relationship was observed between surgical difficulty (as rated on the scale) and postoperative pain. Longer interventions generally produced more pain.

D. Glenn Kirk et al(2007)[42] did prospective split mouth study to investigate the influence of flap design on postoperative trismus, pain, and swelling. There were no statistical differences between the flap designs in terms of severity of postoperative pain or trismus. A statistically significant difference was observed in postoperative swelling at 2 days, with the modified triangular flap design being associated with increased swelling. The envelope flap design was associated with a higher incidence of alveolar osteitis.

Giuseppe Monaco et al (2009)[4] evaluated the influence of 2 different flap designs on periodontal healing and postoperative complications, after inferior third molar removal in young patients. They observed statistically significant differences in probing depth between triangular and envelope flaps 7 days after the extraction of third molars with no root development, this was not important from a clinical perspective, because periodontal healing at 3 and 6 months was comparable. They believed that this is also the case with the extraction of third molars with fully formed roots. Another important finding was the presence of a debilitating postoperative period in most of the patients who underwent extraction, contrary to the beliefs of many surgeons.

Özgür Erdogan et al (2011)[43] did study on influence of two different flap designs on the sequelae of mandibular third molar surgery. The facial swelling measurements and VAS scores were lower in the envelope flap group compared to the triangular flap group. There was no significant difference between the two flap designs in operation time, maximum interincisal opening, and the number of analgesics taken.

Z. H. Baqain et al (2012)[44] did a split mouth randomized clinical study on Flap design and mandibular third molar surgery. Facial swelling and the reduction in mouth opening were significantly greater in the early postoperative period with pyramidal flap designs. There was no significant difference in pain scores, plaque accumulation and bleeding on probing indices between the two flap designs . Probing depth was significantly greater with envelope flaps in the early postoperative period.

Banu Özveri Koyuncu and Erdog˘an Çetingül (2013)[45] did a study to estimate the influence of flap design on alveolar osteitis (AO) and postoperative side effects following third molar surgery. The envelope flap design was associated with a higher incidence of AO that was not statistically significant. On the second day, postoperative pain and swelling was observed as significantly different with the envelope flap technique.

Saravana kumar B, Sarumathi T, Veerabahu M, Uma Raman (2013)[2] did comparative study of standard incision and comma shaped incision and its influence on post operative complications in surgical removal of impacted third molar. The results of the study showed that the new incision design was preferable over the conventional method, considering the lesser degree of post–operative complications.

Javad Yazdani et al (2014)[46] did a comparison of the Influence of Two Different Flap Designs on Pain and Swelling after Surgical Extraction of Impacted Mandibular Third Molars. The flap design had no significant influence on pain and swelling after surgical extraction of impacted mandibular third molars.

Adarsh Desai et al (2014)[3] did prospective comparative study to compare two incision designs for surgical removal of impacted mandibular third molar. No statistical differences were noted between the groups in terms of visibility, accessibility, excessive bleeding during surgery, healing of flap, sensitivity of adjacent teeth, and dry socket. A statistically significant difference was observed in post-operative hematoma, wound gaping, and distal pocket in adjacent tooth, which was significant in Ward's triangular incision group in comparison to Koener's envelope incision group.

U.Yolcu, A. H. Acar (2015)[47] did study to introduce a new flap design in the surgical removal of impacted mandibular third molars – a lingually based triangular flap – and to compare this flap design with the routinely used triangular flap. In terms of the severity of postoperative facial swelling and trismus, there were no statistically significant differences between the flap designs ($P > 0.05$). The alternative flap exhibited higher pain scores at 12 h post-surgery ($P < 0.05$). In addition, the alternative flap group exhibited less wound dehiscence, although this was not statistically significant. Moreover, all wound dehiscence in this group occurred on sound bone.

MANDIBULAR THIRD MOLAR

The mandible consists of a horseshoe shaped body and two flat, broad rami. Each ramus is surmounted by two processes, viz. coronoid process and condylar process.

The lower third molar tooth is situated at the distal end of the body of the mandible where it meets a relatively thin ramus. This meeting point constitutes a line of weakness and a fracture may occur if undue force is exerted during elevation of impacted third molar. The tooth is embedded between the thick buccal alveolar bone and a thin lingual cortical plate. When the mandible is viewed from below, it will be seen that the wisdom tooth socket lies on a prominent ledge or shelf of lingual bone. In many instances the lingual bone consists of a thin cortical plate less than 1 mm in thickness. The buccal bone is predominantly formed by the buccal cortical plate of mandible and the external oblique ridge, the latter being the site of insertion of buccinator muscle. Reduction of the buccal plate will not permit the same ease of surgical access and its loss tends to weaken the mandible. The external oblique ridge is a bulky prominence and it impedes the buccal surgical approach to the wisdom tooth.

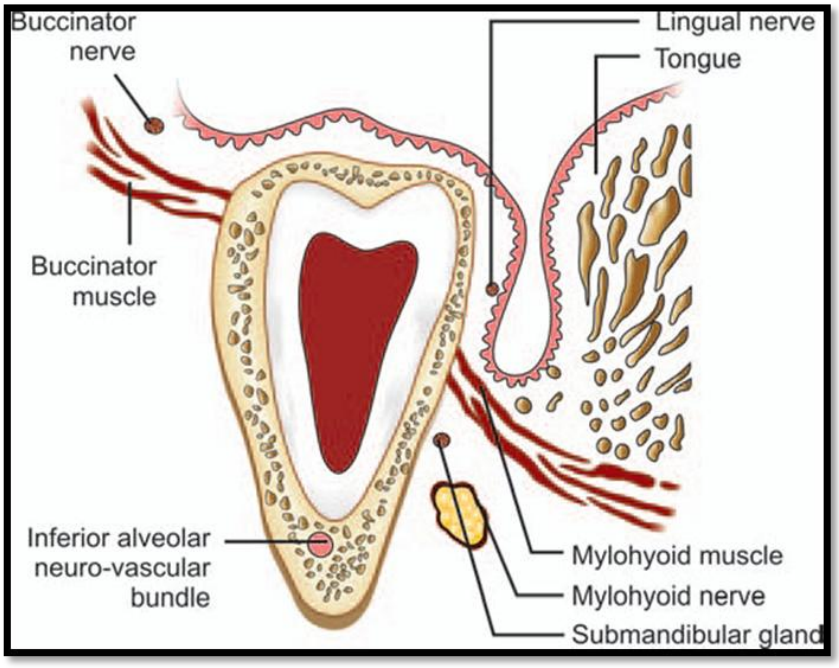


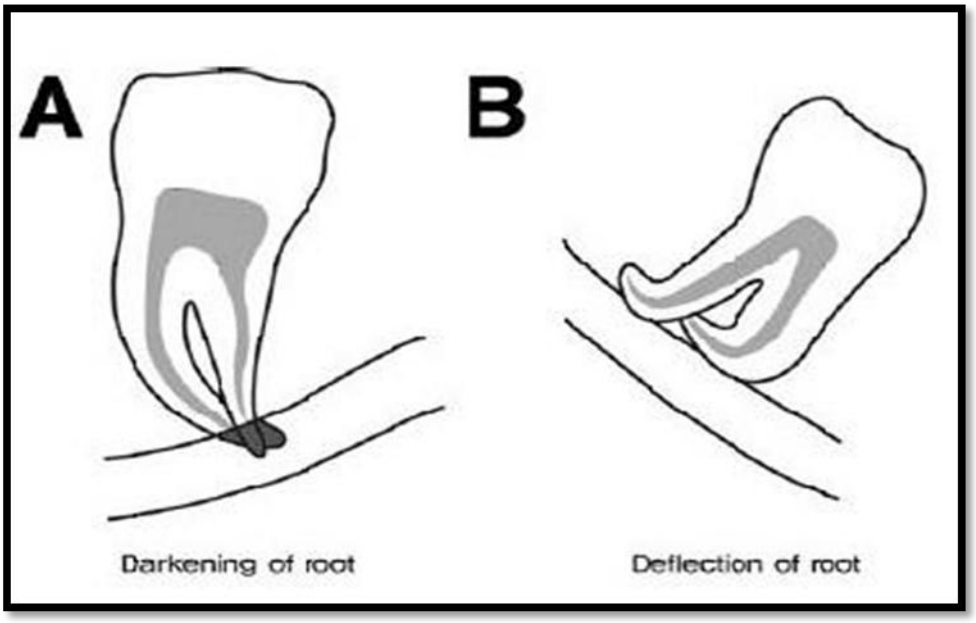
Figure 1: Schematic diagram showing coronal section through the third molar region and the relationship of important anatomical structures to impacted mandibular third molar

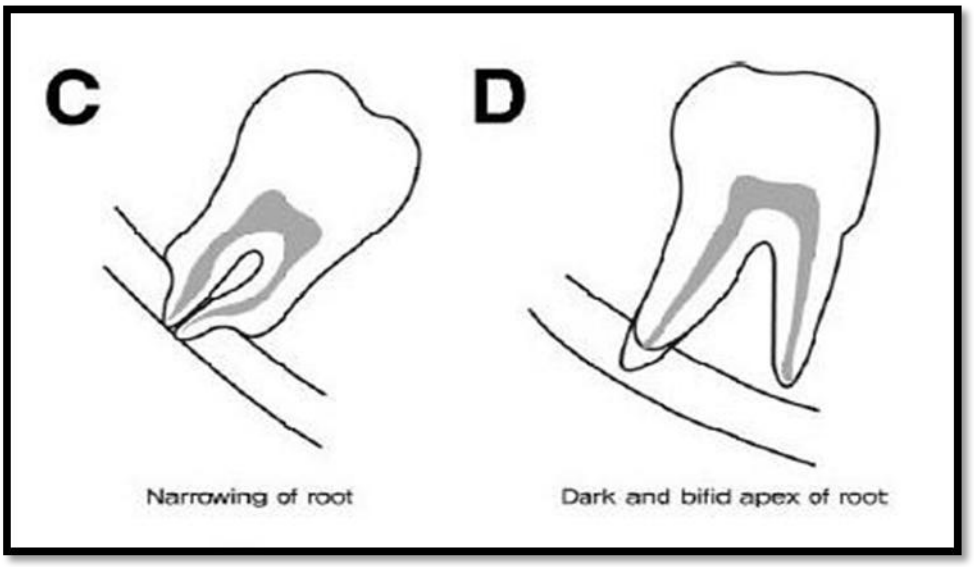
Neurovascular Bundle

Below or alongside the roots of the third molar is the mandibular canal. The canal is usually positioned apically and slightly buccal to the third molar roots. The canal encloses the neurovascular bundle. The neurovascular bundle contains the inferior alveolar artery, vein and nerve enclosed in a fascial sheath. Since the calcification of the mandibular canal is completed before formation of the roots of third molar, the growing roots may impinge on the canal causing its deflection.

Occasionally roots are indented by the mandibular canal, and rarely penetration of the roots of the wisdom tooth by this structure may occur. In the latter case, the neurovascular bundle will be torn during extraction of the tooth.

Sometimes the apices may reach the superior wall of the canal and protrude into it. From its start at the mandibular foramen, the canal and its contents are surrounded by a thin layer of bone with a configuration similar to lamina dura and this is radiographically detectable. In cases where the roots of the third molar are in direct contact with the neurovascular bundle, the lamina dura may be partially or totally absent.





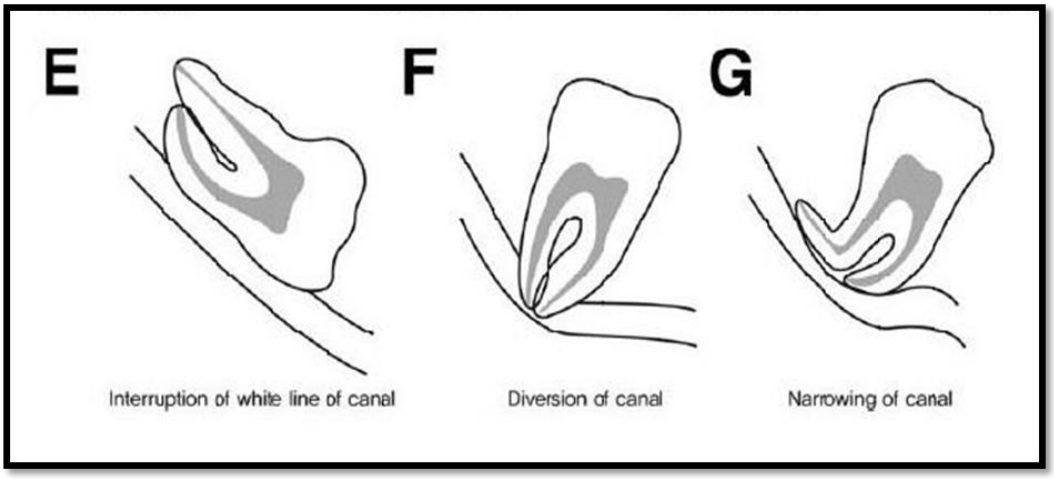


Figure 2: Rood's Radiographic Predictors of Potential Tooth Proximity to the Inferior Alveolar Canal (Rood JP, Shehab BA. The radiological prediction of inferior alveolar nerve injury during third molar surgery. Br J Oral Maxillofac Surg. 1990; 28:20-5)

Retromolar Triangle

Behind the third molar is a depressed roughened area which is bounded by the lingual and buccal crests of alveolar ridge; the retromolar triangle. Lying lateral to the retromolar triangle is a shallow depression, the retromolar fossa. Either in the retromolar triangle or in the fossa an opening may be present through which emerge branches of the mandibular vessel. This branch supplies the temporalis tendon, buccinator muscle and adjacent alveolus. The retromolar pad, which is the soft tissue covering the retromolar area is predominantly made up of loose connective tissue. The tendinous insertion of temporalis muscle terminates as two limiting prongs on the borders of the retromolar triangle.

Facial Artery and Vein

The facial artery and anterior facial vein cross the inferior border of the mandible just anterior to the masseter muscle and have a close relationship to the second and third molar.

Lingual Nerve

The lingual nerve lies on the medial aspect of the third molar. Frequently lingual nerve courses submucosally in contact with the periosteum covering the lingual wall of the third molar socket or it may run below and behind the tooth. The proximity of this important nerve to the third molar places it in danger during the surgical removal of wisdom tooth. Injury to lingual nerve will lead to prolonged anaesthesia or paresthesia of the anterior two-thirds of the tongue.

Mylohyoid Nerve

This nerve leaves the inferior alveolar nerve just before the latter enters the mandibular foramen. It then penetrates the spheno-mandibular ligament and proceeds close to the mandible in the mylohyoid groove. In 16% of the cases the nerve may be enclosed in a canal. The nerve may be damaged during lingual approach for the removal of impacted mandibular third molar.

Long Buccal Nerve

This nerve emerges through the buccinator muscle and then passes anteriorly on its outer surface. When the mouth is wide open, the level at which the nerve passes through the muscle corresponds to the upper part of the retromolar fossa. Rarely injury to the nerve can occur when the posterior part of the incision is placed too laterally. This results in anesthesia of the lower part of the buccal mucosa in the molar region.

Musculature

The various muscles surrounding the third molar region are:

- Buccinator - anteriorly
- Temporalis - distally
- Masseter - laterally
- Medial pterygoid and mylohyoid – medially

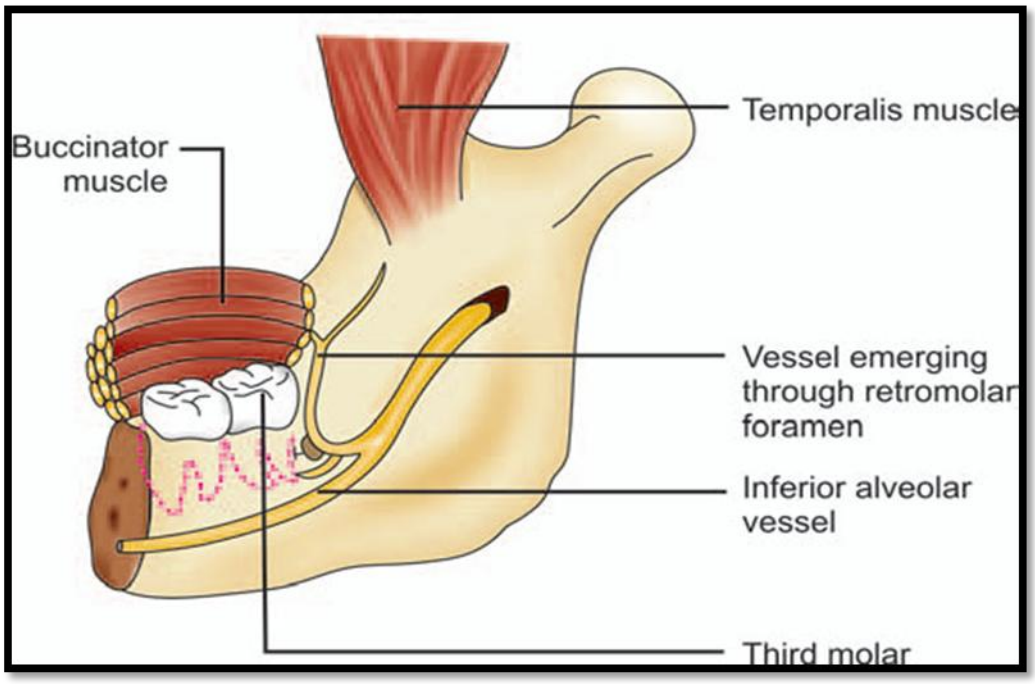


Figure 3 : Schematic diagram showing Buccinator and temporalis muscles

Buccinator muscle: This horseshoe-shaped muscle forms the musculature of the cheek. It is inserted along the external oblique ridge and continues along the pterygomandibular raphe. It is attached to the maxilla at the level of the apices of molar roots. During the surgical removal of deeply impacted third molar, the insertion of attachment of buccinator on the external oblique ridge may have to be severed. This predisposes to marked postoperative swelling, trismus and pain.

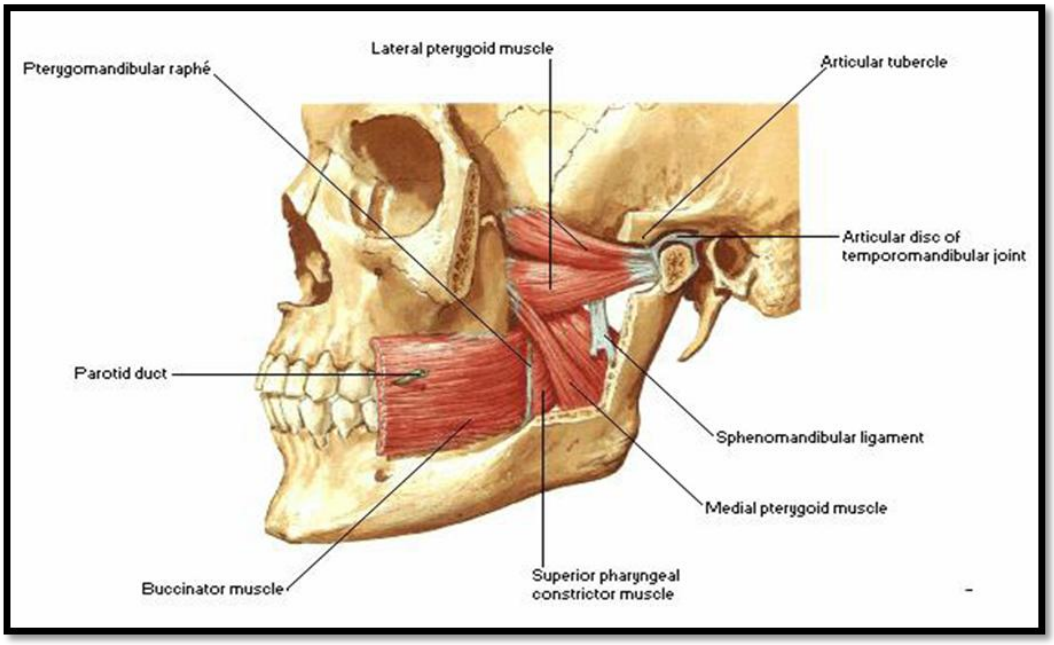


Figure 4 : Schematic diagram showing Pterygoid muscles and Buccinator muscle

Temporalis muscle: This fan-shaped muscle is inserted on the coronoid process and anterior border of mandible. Two tendons can be noticed where the muscle attaches to the anterior border of mandible. The outer tendon is inserted to the anterior border of coronoid process. The inner tendon is attached to the temporal crest of mandible. The retromolar fossa is found in between these tendons. During buccal approach for the removal of third molars, the outer tendon has to be sectioned to enable reflection of the flap. This in turn will facilitate adequate bone removal from the buccal and distal side.

Masseter: This muscle is inserted into the lateral side of the ramus from the coronoid process up to the angle. The muscle is rarely involved in third molar surgery. Postoperative edema may extend posteriorly to involve the muscle leading to trismus and pain. Additionally, preoperative or postoperative infection may lead to submasseteric abscess formation.

Medial pterygoid muscle: This is inserted on the medial aspect of mandible in the angle region. Even though not directly involved in third molar surgery, while using a lingual approach postoperative edema may result in trismus due to secondary involvement of the muscle.

Mylohyoid muscle: This muscle is inserted on the mylohyoid line from canine to the third molar region. In the lingual approach, the insertion of the muscle is partly severed. This leads to transient swallowing difficulty. Moreover, postoperative infection can spread to sublingual or submandibular space.

WAR LINES

Position and depth of impacted tooth: This is determined by a method described by George Winter. In this technique three imaginary lines are drawn on the radiograph. These lines are described as **'white', 'amber' and 'red' lines.**

The first line or 'white' line is drawn along the occlusal surface of the erupted mandibular molars and extended posteriorly over the third molar region. **The white line indicates the axial inclination or position of impacted tooth**. For example, the 'white' line will be parallel to the occlusal surface of a vertically impacted tooth. While in case of a disto-angular impaction, the occlusal surface of the tooth and 'white' line are seen to converge as if to meet in front of the third molar. The 'white' line also provides an indication regarding the depth at which the tooth is lying in mandible, when compared to the erupted second molar.

The second imaginary line or **'amber' line** is drawn from the surface of the bone lying distal to the third molar to the crest of the interdental septum between the first and second molar. When drawing this line it is important to differentiate between the shadow cast by the external oblique ridge and that cast

by the bone lying distal to the tooth. It is important to note that the posterior end of the 'amber' line is drawn on the shadow cast by the bone in the retromolar fossa and not that cast by the external oblique ridge which lies above and in front of it. **The 'amber' line indicates the margin of the alveolar bone enclosing the tooth**. Hence, when soft tissues are reflected, only that portion of the tooth shown on the film to be lying above and in front of the 'amber' line will be visible; while the reminder of the tooth will be encased within the alveolar bone.

The third line or 'red' line is used to measure the depth at which the impacted tooth lies within the mandible. It is a perpendicular dropped from the 'amber' line to an imaginary 'point of application' of an elevator. With the exception of disto-angular impaction, the cementoenamel junction on the mesial surface of the impacted tooth is used for this purpose. In a deeply impacted tooth, the 'red' line will be longer and more difficult will be the surgical procedure. It has been noted that for every 1 mm increase in the length of 'red' line, extraction becomes about three times more difficult.

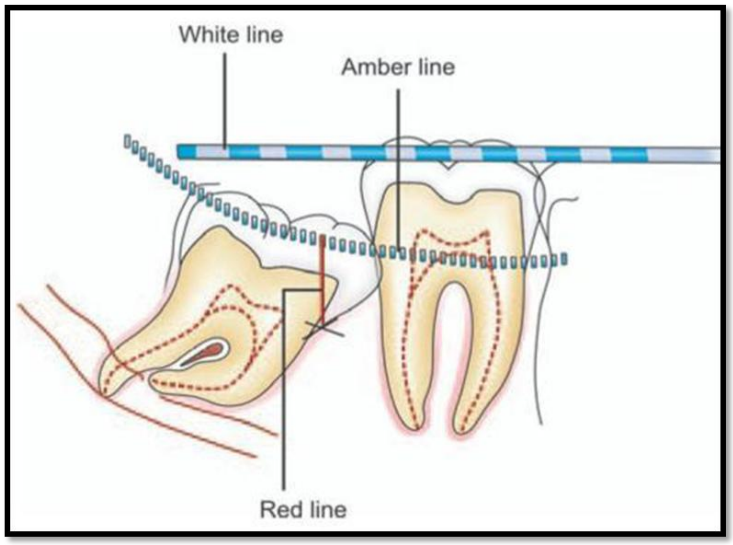


Figure 5: Winter's 'WAR' lines for assessment of difficulty in removal of impacted mandibular third molar

SELECTION OF PATIENTS

The present study was undertaken at the Department of Oral and Maxillofacial Surgery, Tamil Nadu Government Dental College & Hospital; Chennai, after obtaining approval from the Institutional Ethics Committee (IEC). A total of 60 patients divided into 3 groups; both male and female, aged between 18 and 45 years, who had impacted mandibular third molars were randomly selected for this study.

INCLUSION CRITERIA

1. Patients willing for voluntary participation and have signed informed consent.
2. Age group of 18-45 years
3. Both males and females
4. Patients with bilateral or unilateral partially impacted third molars
5. ASA Grade 1 patients

EXCLUSION CRITERIA

1. Infected impacted third molars
2. Immune-compromised patients
3. Medically compromised patients
4. Pregnancy and lactating mothers
5. Patients allergic to amide and ester type of local anesthetics
6. Patients with traumatic injuries

SAMPLE SIZE: 60

- **GROUP 1**: Standard Ward's incision in 20 patients
- **GROUP 2**: Comma-shaped incision in 20 patients
- **GROUP 3**: Koener's incision in 20 patients

STUDY DESIGN

Ethics clearance was obtained from the Institutional ethics committee and the ethical principles were followed throughout the course of the study. Subjects for the study were selected randomly if they satisfied the inclusion criteria with no discrimination on the basis of sex, caste, religion or socio-economic status. After explaining the study procedure written informed consent in the regional language (Tamil) was obtained from all the subjects selected for the study. Examination was preceded by a thorough medical and dental history of the patients.

STUDY PROTOCOL

- Obtaining medical history and informed consent
- Complete clinical examination by using diagnostic instrument set
- Extra-oral and intra-oral examination
- Pre-operative radiographic evaluation of selected region (OPG)
- Pre-surgical preparation
- Surgical procedure
- Post-operative review
- Post-operative care
- Clinical re-evaluation on 1^{st} post-operative day, 3^{rd} post-operative day, 7^{th} post-operative day, after 2 weeks, after 1 month and after 2 months.

ARMAMENTARIUM

- Diagnostic instrument set
- Impaction kit
- Micromotor
- Straight handpiece and 703 bur
- Sterile bowl
- Suture material: 3-0 Black Braided Silk

SURGICAL PROCEDURE

Transalveolar extraction of mandibular third molars

The procedure was performed with proper aseptic precautions. A single operator carried out all the procedures.

All the patients were advised chlorhexidine mouthwash for oral rinsing before the procedure. Standard scrubbing and painting procedures were done with betadine. Standard draping procedures were followed.

Intra orally inferior alveolar nerve block was given along with lingual and buccal nerve block using 2% Lignocaine with adrenaline 1:80,000.

GROUP 1: A standard Ward's incision was placed distal to second molar continued over the alveolar crest (if the tooth is completely embedded)/ along the buccal gingival sulcus of third molar, upto the distal aspect. Distal releasing incision is started from the distal most point of the third molar across the external oblique ridge into the buccal mucosa. Anteriorly the incision was extended upto the distal of first molar if needed for better exposure.

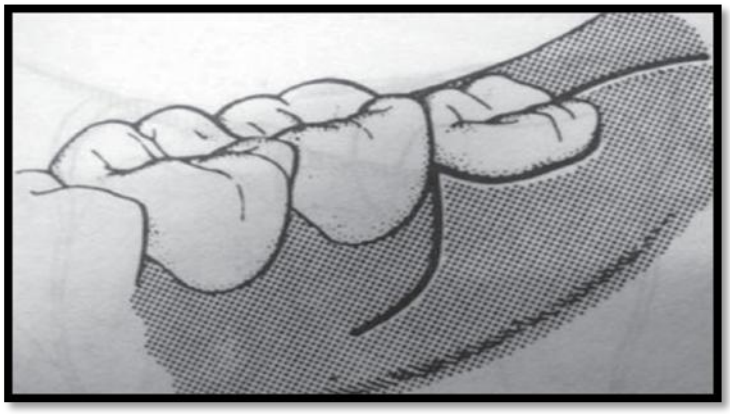


Figure 1: Ward's incision

GROUP 2 : Comma-shaped incision was placed starting from a point at the depth of this stretched vestibular reflection posterior to the distal aspect of the preceding second molar, the incision was made in an anterior direction. The incision was made to a point below the second molar, from where it was smoothly curved up to meet the gingival crest at the distobuccal line angle of the second molar. The incision was continued as a crevicular incision around the distal aspect of the third molar.

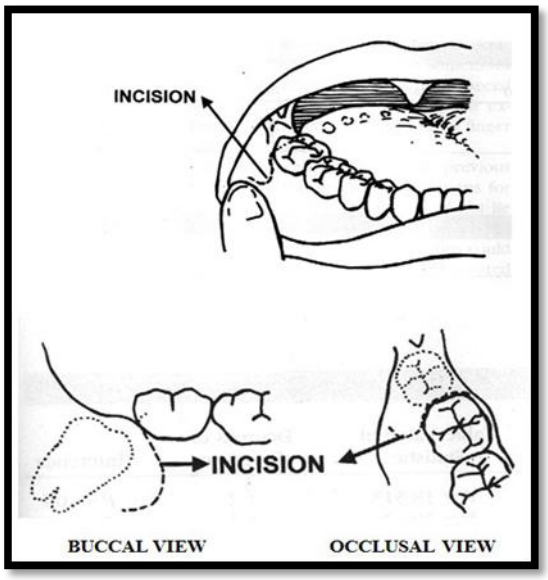


Figure 2: Comma shaped incision

GROUP 3 : Koener's incision was given with the distal extension commencing near the external oblique ridge on the lateral aspect of the mandible. The incision was brought forward and medially towards the middle of the distal surface of mandibular second molar, which was 0.75 inch long with distal incision. The incision was drawn anteriorly along the free margin of the second molar, which terminated at the mesiobuccal line angle of that tooth.

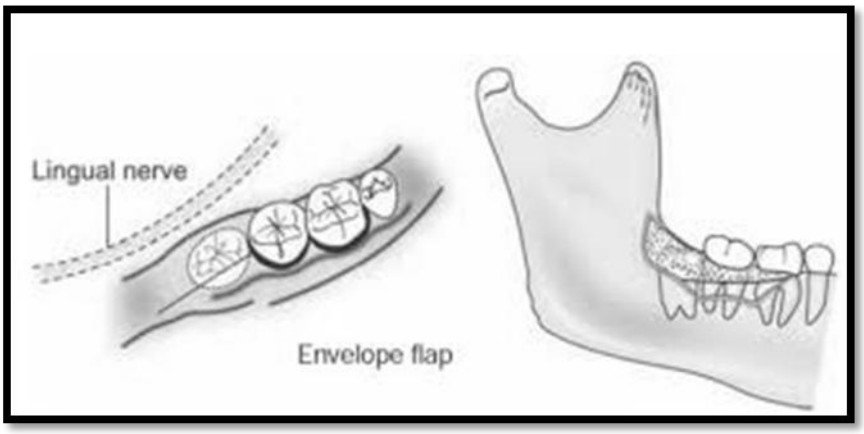


Figure 3: Koener's incision

A full thickness mucoperiosteal flap was raised and the crown of third molar exposed. With the help of a micro motor, straight hand piece and using 703 bur sufficient bone was removed forming a gutter on the mesial, buccal and distal aspects of the tooth with copious saline irrigation. The tooth was elevated and lifted from the socket. In some cases the tooth was sectioned and retrieved. The socket was carefully examined for remnants of tissue and then the follicular tissue if present was curetted out from the socket. Bony edges were trimmed and smoothened. The socket was irrigated with saline and betadine. The wound was closed primarily with 3–0 black braided silk after obtaining adequate haemostasis.

Patients were put on an antibiotic course commencing 1 day before surgery to be continued post-operatively for 3 days.

Postoperative Instructions

All the patients were given routine post-operative instructions. They were given Cap. Amoxicillin 500 mg QID, Tab. Metronidazole 400 mg TDS, Tab. Diclofenac 50 mg BID and Tab. Ranitidine 150 mg BID for 3 days.

FOLLOW-UP AND OBSERVATION

All the patients were evaluated:

- One day prior to the surgery
- First postoperative day
- Third day postoperatively
- Seventh day postoperatively
- Two weeks postoperatively
- One month postoperatively
- Two months postoperatively

Ease of access and time required for surgery was measured intra-operatively.

Mouth opening was measured pre-operatively and post-operatively as inter-incisal distance using scale.

Pre-operative facial measurements were taken between centre of tragus to corner of mouth, centre of tragus to soft tissue pogonion and lateral canthus of the eye to angle of mandible and Post-operative facial swelling was measured as percentage increase in these facial measurements.

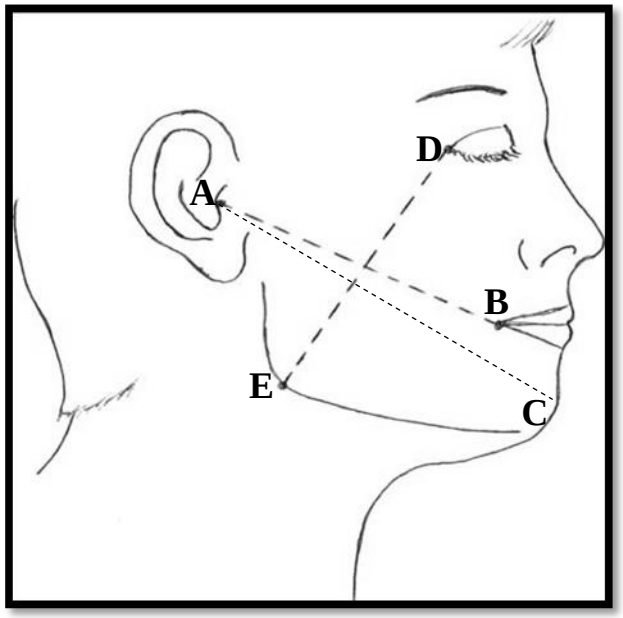


Figure 4: Points for facial measurements

A – Centre of tragus

B – Corner of mouth

C – Soft tissue pogonion

D – Lateral canthus of eye

E – Angle of mandible

The patients were asked to rate the pain intensity on a 10-point Visual Analogue scale (VAS).

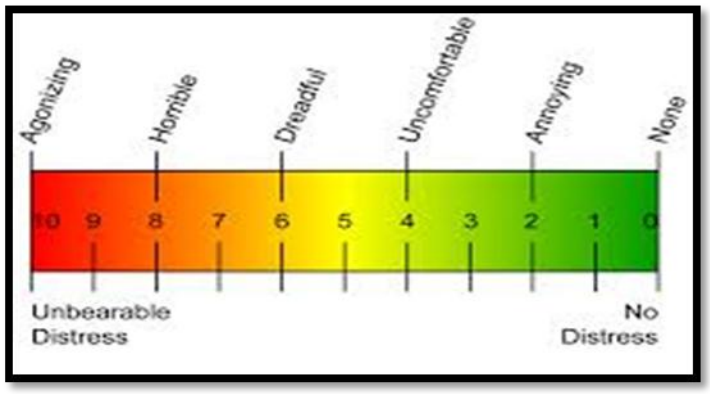


Figure 5: Visual Analogue Scale

Pocket depth distal to preceding second molar was measured using William's probe.

Post-operatively wound dehiscence, wound infection, dry socket and paresthesia or anaesthesia were assessed clinically.

FIG 1: ARMAMENTARIUM

INSTRUMENTS :

1. 5 ml disposable syringe

2. Towel clip

3. Suction tip

4. BP handle

5. Mouth mirror

6. Probe

7. Sterile bowl

8. Molt periosteal elevator

9. Howarth periosteal elevator

10. Austin retractor

11. Mayo's dissecting scissor

12. Curved mosquito forceps

13. Curved stout artery forceps

14. Straight elevator

15. Set of Cryer's elevators

16. Set of Winter's cross bar elevators

17. Mouth prop

18. Toothed tissue holding forceps

19. Non-toothed tissue holding forceps

20. Needle holder

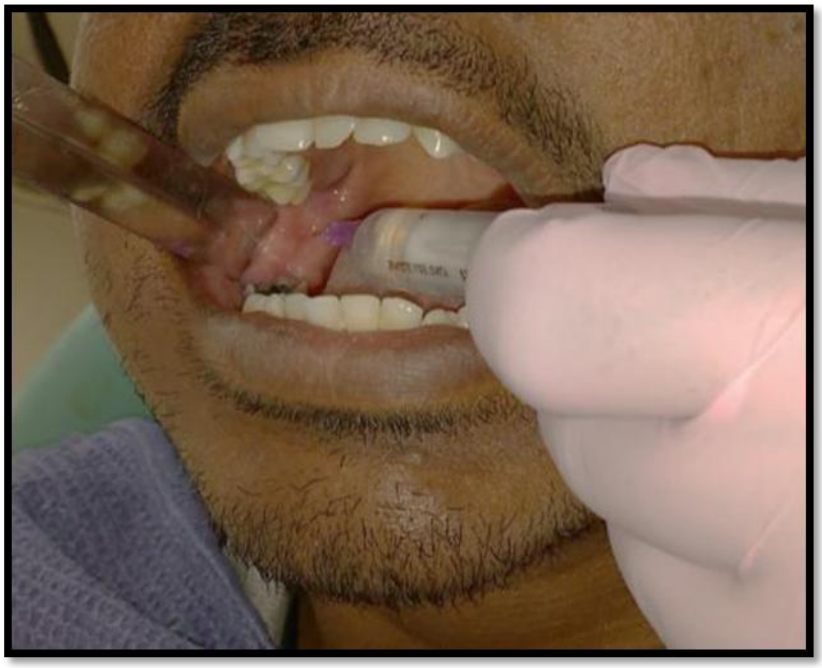
21. Suture cutting scissor

FIG 2: SCALE AND DIVIDER

FIG 3: WILLIAMS PROBE

SURGICAL PROCEDURE

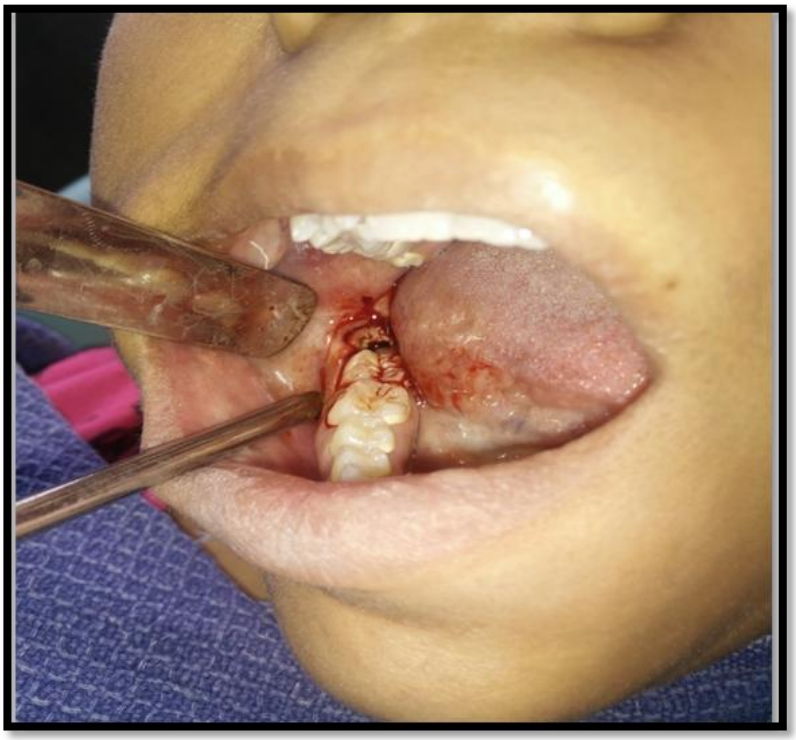
Step 1: INJECTION OF LOCAL ANESTHESIA



Step 2: WARD'S INCISION (GROUP 1)

COMMA SHAPED INCISION (GROUP 2)

KOENER'S INCISION (GROUP 3)



Step 3: MUCOPERIOSTEAL FLAP ELEVATION

Step 4: BONE REMOVAL USING MICROMOTOR AND HANDPIECE

Step 5: ELEVATION OF MANDIBULAR THIRD MOLAR USING STRAIGHT ELEVATOR

Step 6: POST-EXTRACTION SOCKET

Step 7: PRIMARY CLOSURE USING 3-0 BLACK SILK (GROUP 1)

PRIMARY CLOSURE USING 3-0 BLACK SILK (GROUP 2)

PRIMARY CLOSURE USING 3-0 BLACK SILK (GROUP 3)

GROUP I

CASE REPORT

NAME : Mr. Raja

AGE/SEX : 22 years/ Male

CHIEF COMPLAINT : Pain in the left lower back tooth region

HISTORY OF PRESENTING ILLNESS : Intermittent pain present in left lower back tooth for past six months which increased in intensity in the last one week

PAST MEDICAL HISTORY : Non contributory

PAST SURGICAL HISTORY : Non contributory

PAST DENTAL HISTORY : Non contributory

GENERAL EXAMINATION :

1. Patient is moderately built and nourished
2. Patient is conscious, alert, oriented
3. No signs of pallor, icterus, cyanosis, clubbing, edema and regional lymphadenopathy

LOCAL EXAMINATION

INTRA-ORAL EXAMINATION : 1) Mouth opening- 50 mm

2) Impacted- 38, 48

3) Dental caries- 37

INVESTIGATION

OPG : Impacted 38, 48

DIAGNOSIS : Impaction 38, 48

TREATMENT PLAN : Transalveolar extraction of 38 under local anesthesia using Ward's incision

Figure 1: PRE-OPERATIVE FRONTAL VIEW

Figure 2: PRE-OPERATIVE OPG

Figure 3: WARD'S INCISION

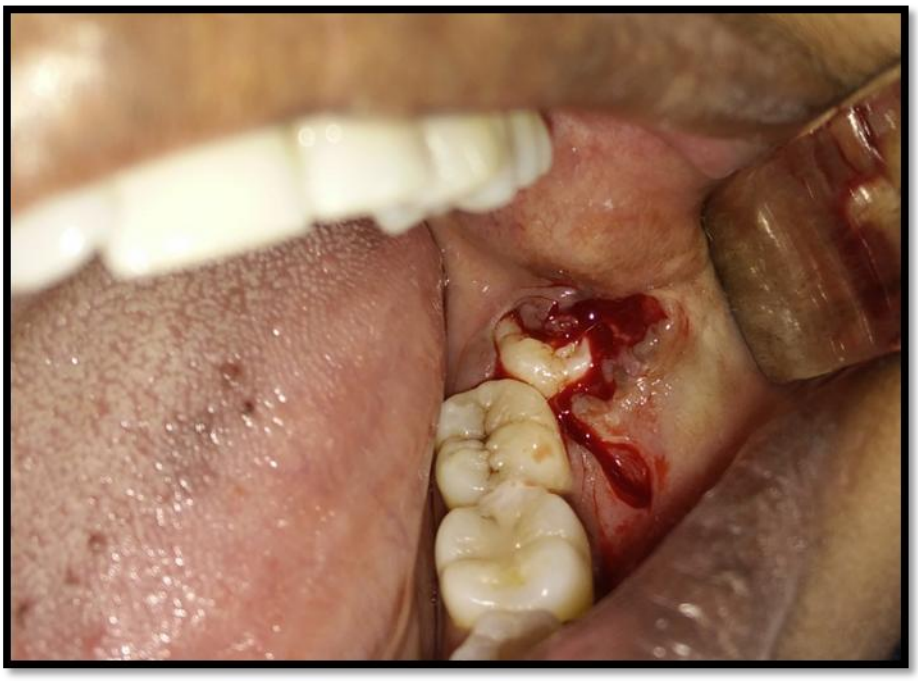


Figure 4 : MUCOPERIOSTEAL FLAP

Figure 5: CLOSURE

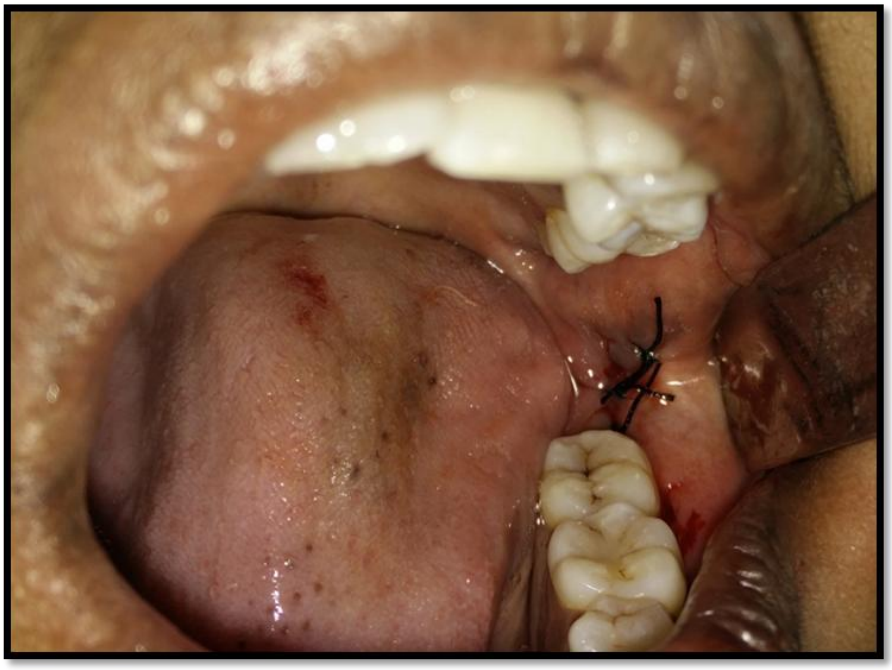
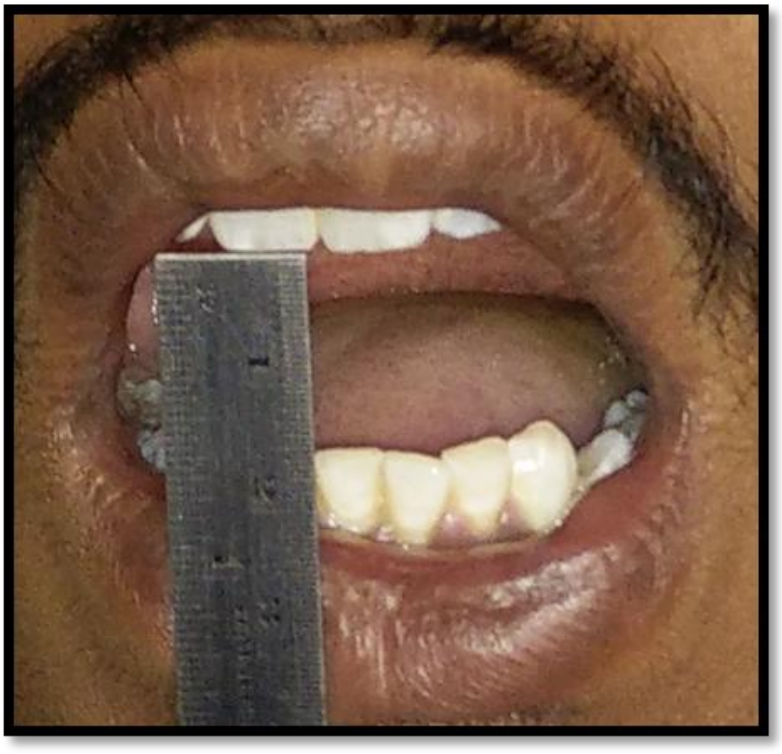


Figure 6: POST-OPERATIVE WOUND HEALING IN WARD'S INCISION

Figure 7 : POST-OPERATIVE MOUTH OPENING



GROUP 2

CASE REPORT

NAME : Ms. Amudha

AGE/SEX : 23 years/ Female

CHIEF COMPLAINT : Pain in the left lower back tooth region

HISTORY OF PRESENTING ILLNESS : Pain present in left lower back tooth for past three days

PAST MEDICAL HISTORY : Non contributory

PAST SURGICAL HISTORY : Non contributory

PAST DENTAL HISTORY : Non contributory

GENERAL EXAMINATION :

1) Patient is moderately built and nourished
2) Patient is conscious, alert, oriented
3) No signs of pallor, icterus, cyanosis, clubbing, edema and regional lymphadenopathy

LOCAL EXAMINATION

INTRA-ORAL EXAMINATION : 1) Mouth opening- 39 mm

2) Impacted- 38

3) Crowded mandibular incisors

INVESTIGATION

OPG : Impacted 38

DIAGNOSIS : Impaction 38

TREATMENT PLAN : Transalveolar extraction of 38 using comma-shaped incision under local anesthesia

Figure 1: PRE-OPERATIVE FRONTAL VIEW

Figure 2: PRE-OPERATIVE

OPG

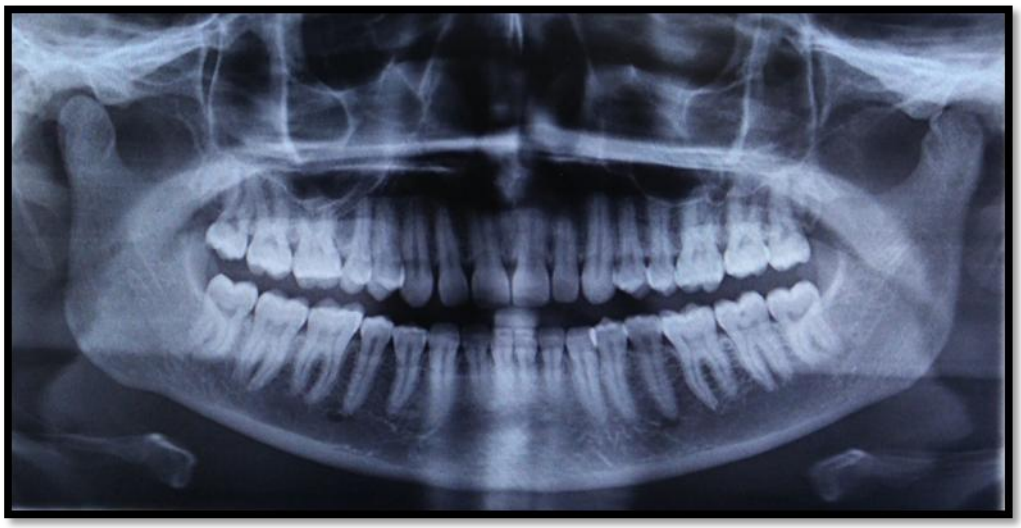


Figure 3: COMMA SHAPED INCISION

Figure 4 : MUCOPERIOSTEAL FLAP

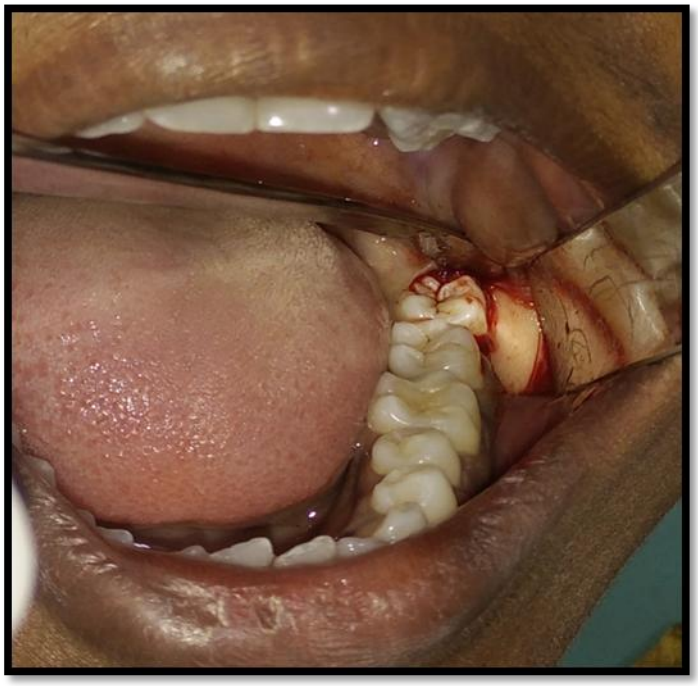


Figure 5: CLOSURE

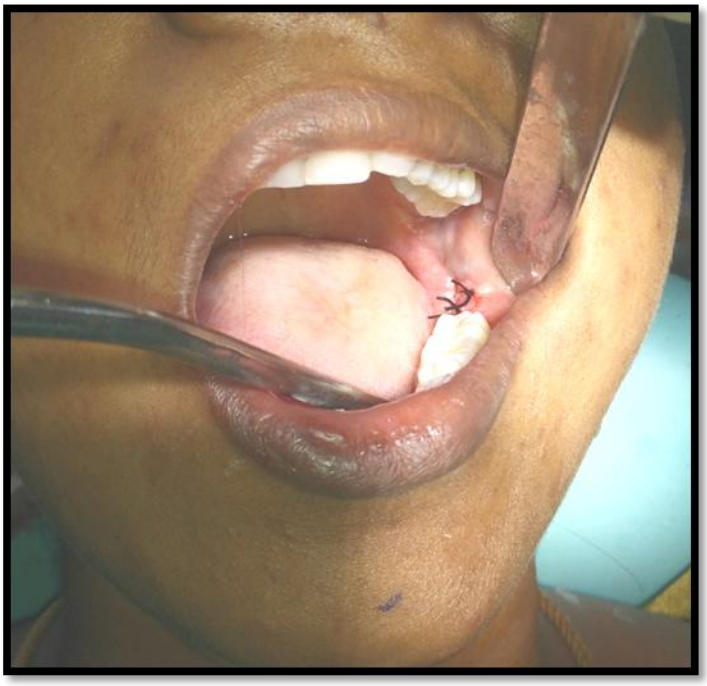


Figure 6: POST-OPERATIVE HEALING IN COMMA-SHAPED INCISION

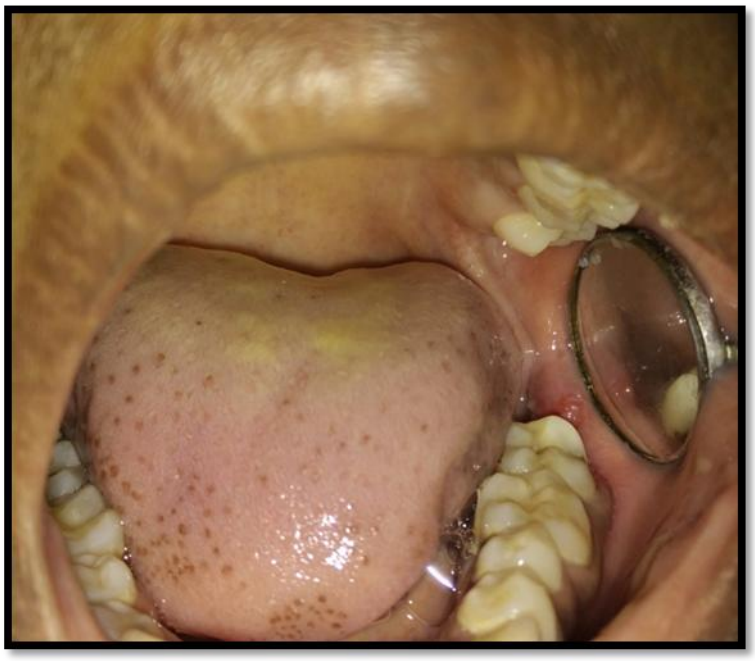


Figure 7 : POST-OPERATIVE MOUTH OPENING

GROUP 3

CASE REPORT

NAME : Mr. Rajesh

AGE/SEX : 27 years/ Male

CHIEF COMPLAINT : Pain in the right lower back tooth region

HISTORY OF PRESENTING ILLNESS : Pain while eating in the right lower back tooth for past one month

PAST MEDICAL HISTORY : Non contributory

PAST SURGICAL HISTORY : Non contributory

PAST DENTAL HISTORY : Non contributory

GENERAL EXAMINATION :

1) Patient is moderately built and nourished
2) Patient is conscious, alert, oriented
3) No signs of pallor, icterus, cyanosis, clubbing, edema and Regional lymphadenopathy

LOCAL EXAMINATION

INTRA-ORAL EXAMINATION : 1) Mouth opening- 47 mm

2) Impacted- 48

INVESTIGATION

OPG : Impacted 48

DIAGNOSIS : Impaction 48

TREATMENT PLAN : Transalveolar extraction of 48 under local anesthesia using Koener's incision

Figure 1: PRE-OPERATIVE FRONTAL VIEW

Figure 2: PRE-OPERATIVE OPG

Figure 3: KOENER'S INCISION

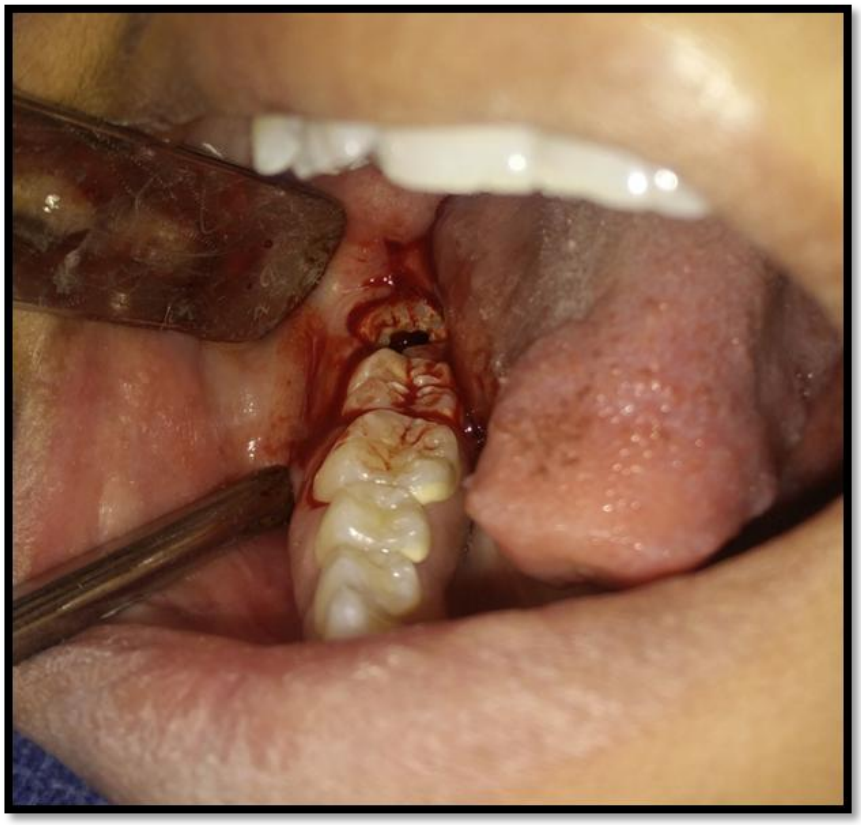


Figure 4: MUCOPERIOSTEAL FLAP

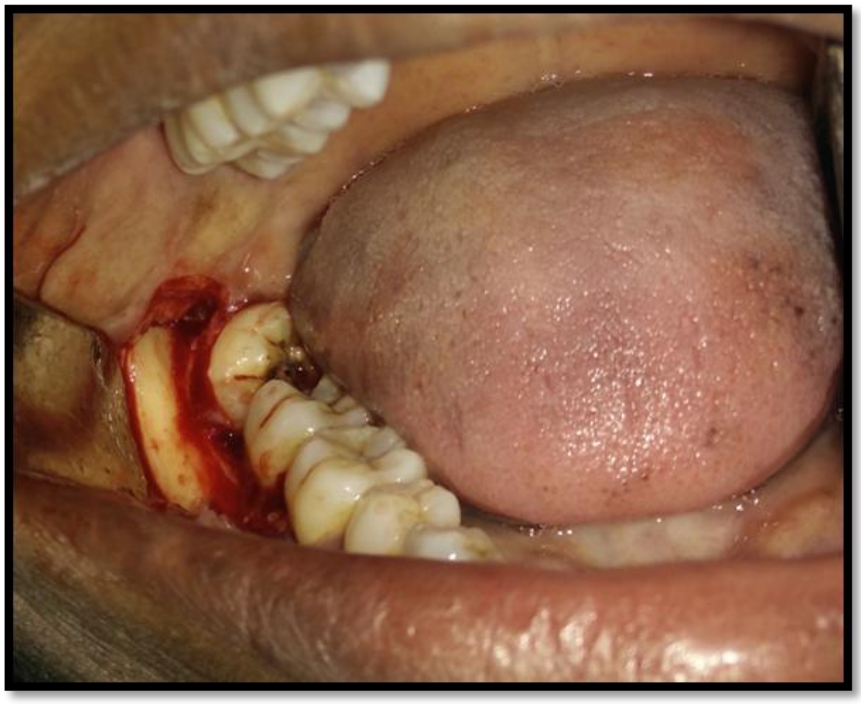


Figure 5: CLOSURE

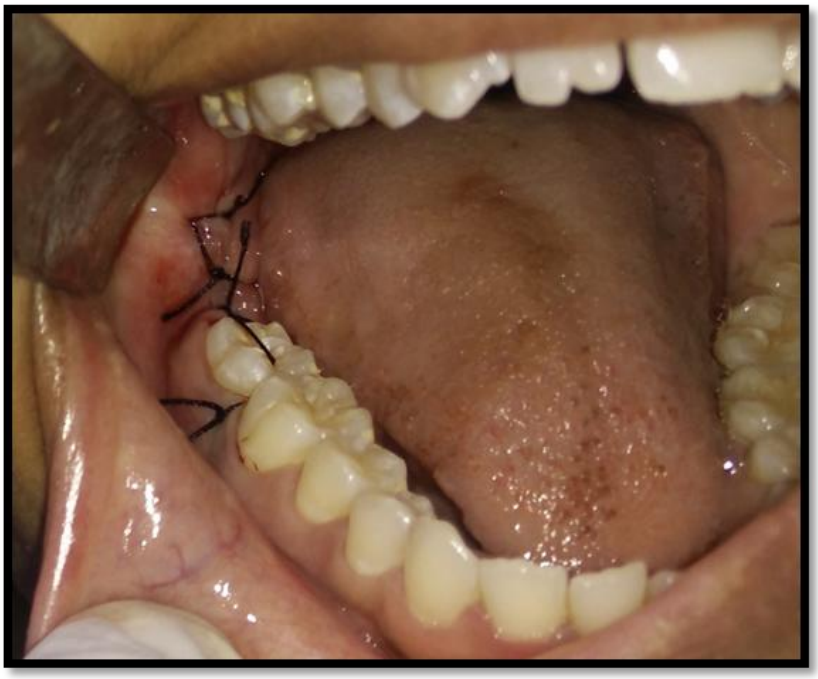


Figure 6: POST-OPERATIVE HEALING

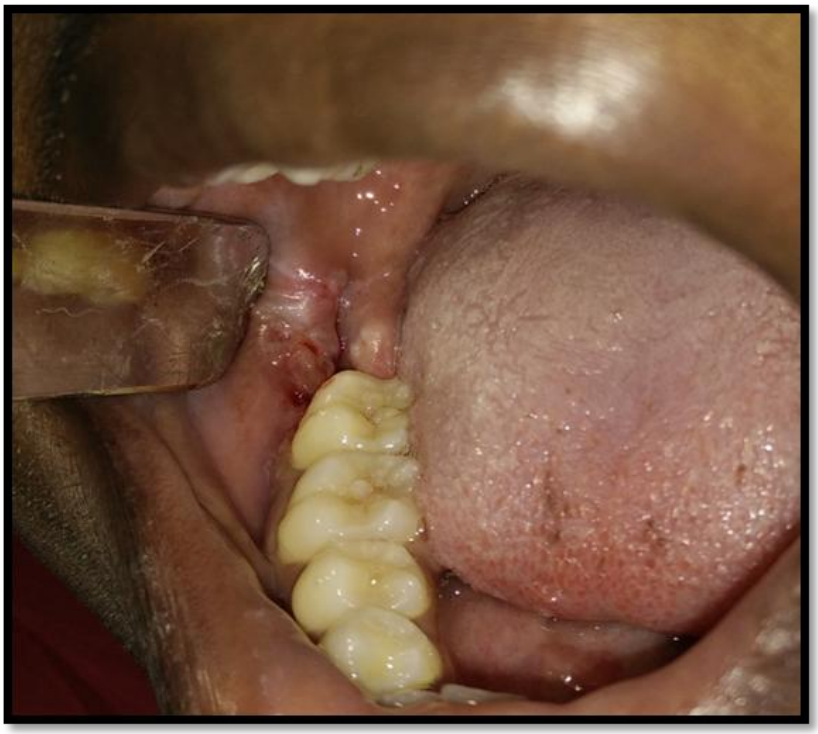
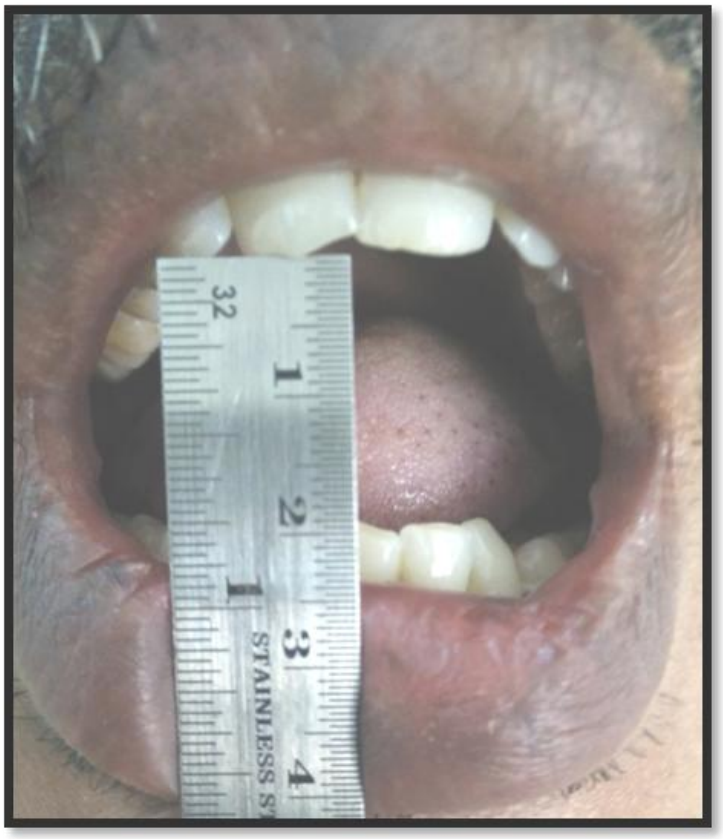


Figure 7 : POST-OPERATIVE MOUTH OPENING



This study consisted of a total of 60 patients divided into 3 groups who underwent surgical removal of impacted mandibular third molars using three different incisions, **Ward's incision** in **Group 1**(20 patients) , **Comma-shaped incision** in **Group 2** (20 patients) and **Koener's incision** in **Group 3** (20 patients).

Group 1 had 12 male and 8 female patients , mean age was 28.6 years. In group 2 there were 9 male and 11 female patients, mean age being 32.6 years whereas group 3 had 14 male and 6 female patients, mean age was 28.4 years. . The observations for **age and sex distribution** are tabulated in **Table 1**.

The patients were followed up at 1st day, 3rd day, 7th day, 2nd week, 1st month and 2nd month post-operatively and the following parameters were assessed –

1: Ease of access
2: Time required for surgery
3: Post-operative mouth opening
4: Post-operative swelling
5: Post-operative pain
6: Pocket depth distal to second molar
7: Wound dehiscence
8: Wound infection
9: Dry socket
10: Paraesthesia

The values were tabulated and subjected to statistical analysis.

1.Ease of access was excellent in all 20 patients in group 1(100%). In group 2 it was excellent in 10(50%) and moderate in 10 (50%) patients. In group 3 it was excellent in 14 (70%) while moderate in 6 (30%) patients. The observations are tabulated in **table 2** and **3** and graphically represented in **graph 1.**

2.Mean time required for surgery in group 1 was 20.75 minutes, in group 2 was 13 minutes and in group 3 was 17.75 minutes. The observations are tabulated in **Table 4 and 5.**

3.Post-operative mouth opening was assessed by measuring percentage decrease in mouth opening.

The mean percentage decrease in mouth opening on 1st post-operative day in group 1 was 47.56, in group 2 was 22.83 and in group 3 was 19.56.

The mean percentage decrease in mouth opening on 3rd post-operative day in group 1 was 43.79, in group 2 was 19.20 and in group 3 was 17.80.

The mean percentage decrease in mouth opening on 7th post-operative day in group 1 was 20.85, in group 2 was 5.05 and in group 3 was 4.83.

The mean percentage decrease in mouth opening in 2nd week in group 1 was 6.46, in group 2 was 1.29 and in group 3 was 1.24.

The mean percentage decrease in mouth opening after 1st month in group 1 was 4.62, in group 2 was 0.21 and in group 3 was 0.28.

The mean percentage decrease in mouth opening after 2nd month in group 1 was 2.98 , in group 2 was 0.21 and in group 3 was 0.05.

The observations are tabulated in **table 5** and graphically represented in **graph 2**.

4.Post-operative swelling was measured using percentage increase in facial measurements.

The mean percentage increase in facial measurements on 1st post-operative day in group 1 was 16.64, in group 2 was 8.73 and in group 3 was 10.33.

The mean percentage increase in facial measurements on 3rd post-operative day in group 1 was 15.22, in group 2 was 7.30 and in group 3 was 9.81. The mean percentage increase in facial measurements on 7th post-operative day in group 1 was 6.54 , in group 2 was 1.88 and in group 3 was 3.32.

The mean percentage increase in facial measurements in 2nd week in group 1 was 2.60 , in group 2 was 0.62 and in group 3 was 0.58 .

The mean percentage increase in facial measurements after 1 month in group 1 was 1.04, in group 2 was 0.18 and in group 3 was 0.10.

The mean percentage increase in facial measurements after 2nd month in group 1 was 0.41 , in group 2 was 0.04 and in group 3 was 0.0 .

The observations are tabulated in **table 6** and graphically represented in **graph 3**.

5.Post-operative pain was measured on Visual Analogue Scale (0-10).

The mean pain score on VAS scale on 1st post-operative day for group 1 was 6.4, group 2 was 5.3 and for group 3 was 5.4.

The mean pain score on VAS scale on 3rd post-operative day for group 1 was 6.0 , group 2 was 4.6 and for group 3 was 4.7 .

The mean pain score on VAS scale on 7th post-operative day for group 1 was 3.8, group 2 was 1.9 and for group 3 was 1.9.

The mean pain score on VAS scale in 2nd post-operative week for group 1 was 1.8 , group 2 was 0.6 and for group 3 was 0.75.

The mean pain score on VAS scale after 1 month post-operatively for group 1 was 0.9 , group 2 was 0.05 and for group 3 was 0.3.

The mean pain score on VAS scale after 2 months post-operatively for group 1 was 0.45, group 2 was 0.0 and for group 3 was 0.1.

The observations are tabulated in **table 7** and graphically represented in **graph 4**.

6.Pocket depth distal to 2nd molar was measured pre-operatively and post-operatively upto 2 months using William's probe.

Mean pre-operative pocket depth in group 1 was 8.8, in group 2 was 9.45 and in group 3 was 8.15.

Mean pocket depth on 1st post-operative day in group 1 was 9.95, in group 2 was 9.7 and in group 3 was 9.6.

Mean pocket depth on 3rd post-operative day in group 1 was 9.95, in group 2 was 9.7 and in group 3 was 9.6.

Mean pocket depth on 7th post-operative day in group 1 was 9.95, in group 2 was 9.7 and in group 3 was 9.6.

Mean pocket depth in 2nd week in group 1 was 9.95, in group 2 was 9.7 and in group 3 was 9.6.

Mean pocket depth after 1st month in group 1 was 9.95, in group 2 was 9.7 and in group 3 was 9.6.

Mean pocket depth after 2nd month in group 1 was 9.8, in group 2 was 9.7 and in group 3 was 9.55.

The observations are tabulated in **table 8** and graphically represented in **graph 5.**

7.Wound dehiscence was present in 1 patients from group 1 (5%) , in 0 patients from group 2 (0%) and in 1 patients from group 3 (5%). The observations are tabulated in **table 9, 10** and graphically represented in **graph 6**.

8.Wound infection was present in 1 patient from group 1 (5%) , in 0 patient from group 2 (0%) and in 1 patient from group 3 (5%). The observations are tabulated in **table 11, 12** and graphically represented in **graph 7**.

9.Dry socket was present in 1 patients from group 1 (5%), in 0 patient from group 2 (0%) and in 0 patient from group 3 (0%). The observations are tabulated in **table 13, 14** and graphically represented in **graph 8**.

10.Paresthesia was present in 1 patient from group 1 (5%) , in 1 patient from group 2 (5%) and in 2 patients from group 3 (10%). The observations are tabulated in **table 15,16** and graphically represented in **graph 9**.

STATISTICAL ANALYSIS:

Software used: SPSS, Version 16.0

Concept of P value

- If the P value is 0.000 to 0.010 it implies (Highly Significant)
- If the P value is 0.011 to 0.050 it implies (Significant)
- If the P value is 0.051 to 1.000 it implies (Not Significant)
- If the P value is .000 then put as <0.001

STATISTICAL TESTS USED:

- Qualitative data - Chi Square Test
- Quantitative data- ANOVA

TABLE 1 : AGE & SEX DISTRIBUTION

GROUP	PATIENTS (n)	MALE (n)	FEMALE (n)	MEAN AGE (yrs)
Group 1	20	12	8	28.6
Group 2	20	9	11	32.6
Group 3	20	14	6	28.4

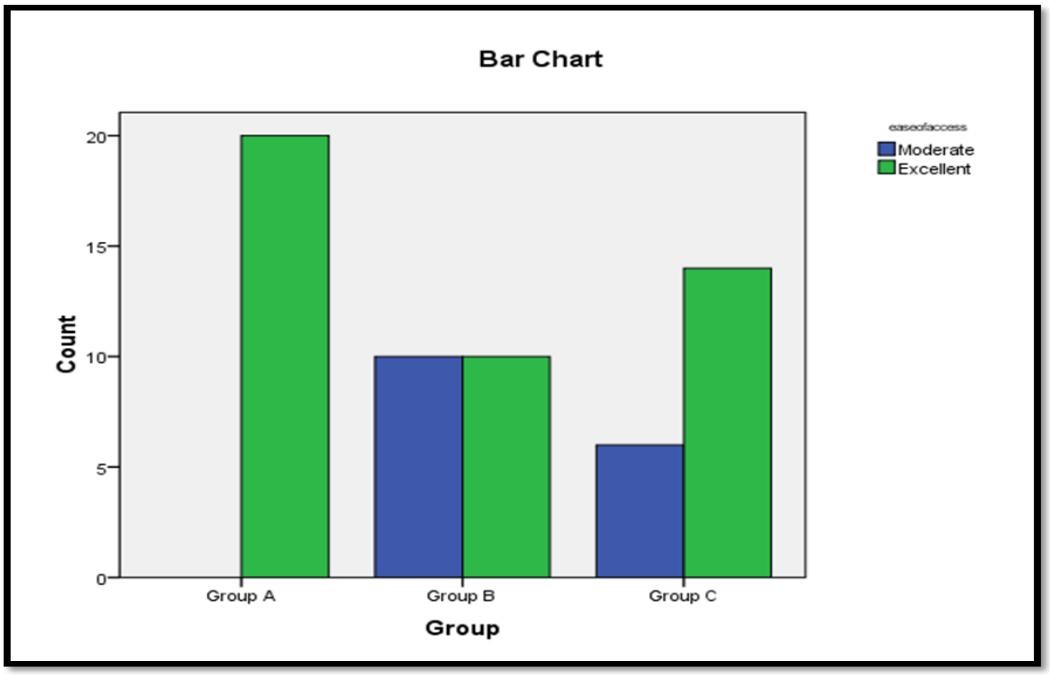
TABLE 2 : EASE OF ACCESS

GROUP		EASE OF ACCESS		TOTAL
		MODERATE	EXCELLENT	
GROUP 1	COUNT (n)	0	20	20
	PERCENTAGE	0	100	100
GROUP 2	COUNT (n)	10	10	20
	PERCENTAGE	50	50	100
GROUP 3	COUNT (n)	6	14	20
	PERCENTAGE	30	70	100

TABLE 3: P VALUE FOR EASE OF ACCESS

Chi-Square Tests			
	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	12.955[a]	2	**.002**
Likelihood Ratio	17.429	2	.000
Linear-by-Linear Association	4.526	1	.033
N of Valid Cases	60		

GRAPH 1 : EASE OF ACCESS



Group A : Ward's Incision
Group B : Comma Shaped Incision
Group C : Koener's Incision

TABLE 4 : TIME REQUIRED FOR SURGERY

	GROUP	N	MEAN	STD DEVIATION	P VALUE*
TIME REQUIRED (MINUTES)	**GROUP 1**	**20**	20.75	4.37547	**.000**
	GROUP 2	**20**	13.00	3.40279	**.000**
	GROUP 3	**20**	17.75	3.79577	**.000**

*** ANOVA**

TABLE 5 : PERCENTAGE DECREASE IN MOUTH OPENING

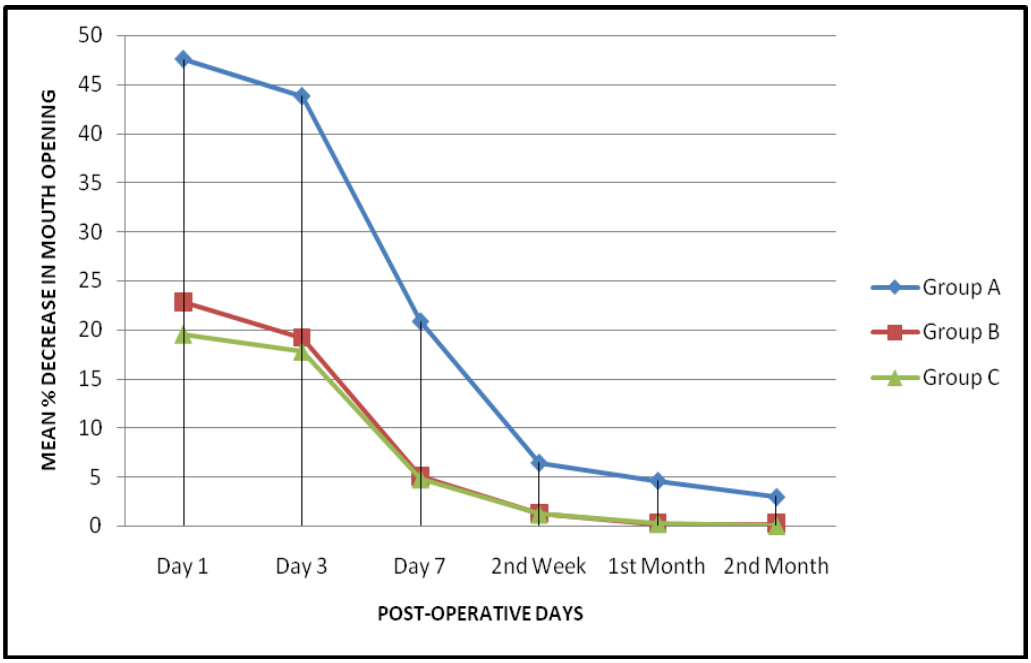
% decrease in mouth opening	GROUP						P VALUE*
	Group 1(%)		Group 2(%)		Group 3(%)		
	MEAN	SD	MEAN	SD	MEAN	SD	
1st post-op day	47.56	9.00	22.83	9.93	19.56	8.57	**.000**
3rd post-op day	43.79	11.69	19.20	8.66	17.80	7.76	**.000**
7th post-op day	20.85	10.44	5.05	3.01	4.83	3.26	**.000**
2nd post-op week	6.46	3.82	1.29	2.18	1.24	1.13	**.000**
1st post-op month	4.62	3.71	0.21	0.67	0.28	0.47	**.000**
2nd post-op month	2.98	3.12	0.21	0.67	0.05	0.16	**.000**

Percentage decrease in mouth opening =

$$\frac{(\text{Preoperative measurement} - \text{Postoperative measurement}) \times 100}{\text{Preoperative measurement}}$$

*** ANOVA**

GRAPH 2 : PERCENTAGE DECREASE IN MOUTH OPENING



Group A : Ward's Incision
Group B : Comma Shaped Incision
Group C : Koener's Incision

TABLE 6: PERCENTAGE INCREASE IN FACIAL MEASUREMENTS

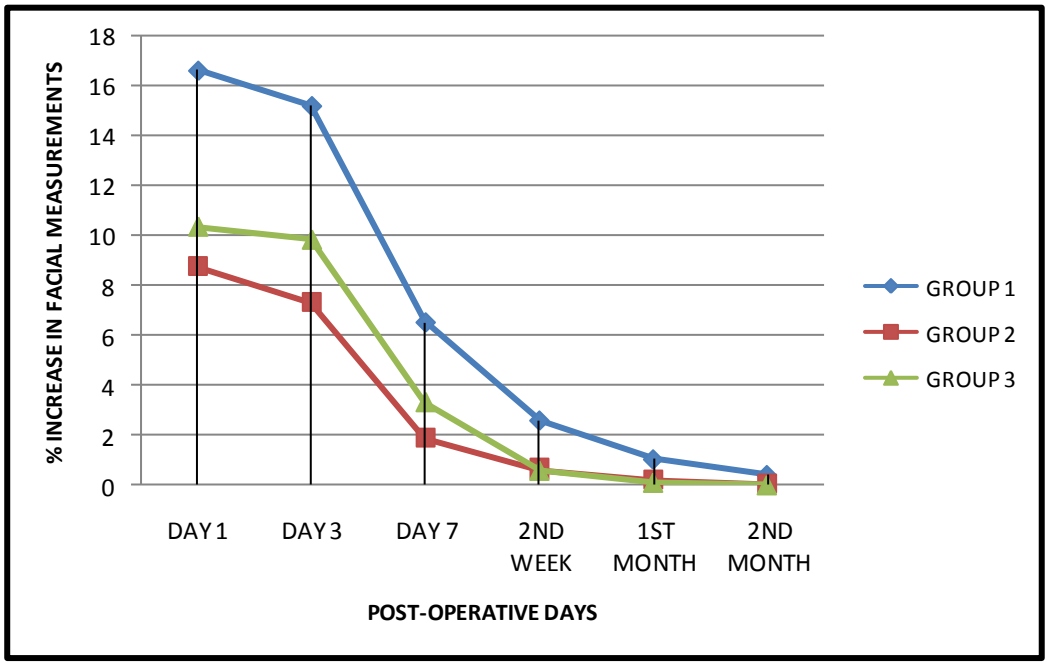
% increase in facial measurements	GROUP						P VALUE*
	Group 1(%)		Group 2(%)		Group 3(%)		
	MEAN	SD	MEAN	SD	MEAN	SD	
1st post-op day	16.64	4.38	8.73	3.13	10.33	4.88	**.000**
3rd post-op day	15.22	5.14	7.30	2.84	9.81	4.68	**.000**
7th post-op day	6.54	4.12	1.88	.89	3.32	3.10	**.000**
2nd post-op week	2.60	1.89	0.62	0.55	0.58	0.69	**.000**
1st post-op month	1.04	0.75	0.18	0.34	0.10	0.17	**.000**
2nd post-op month	0.41	0.45	0.04	0.13	0.00	0.00	**.000**

Percentage increase in facial swelling =

$$\frac{(\text{Postoperative measurement} - \text{Preoperative measurement}) \times 100}{\text{Preoperative measurement}}$$

*** ANOVA**

GRAPH 3 : PERCENTAGE INCREASE IN FACIAL MEASUREMENTS



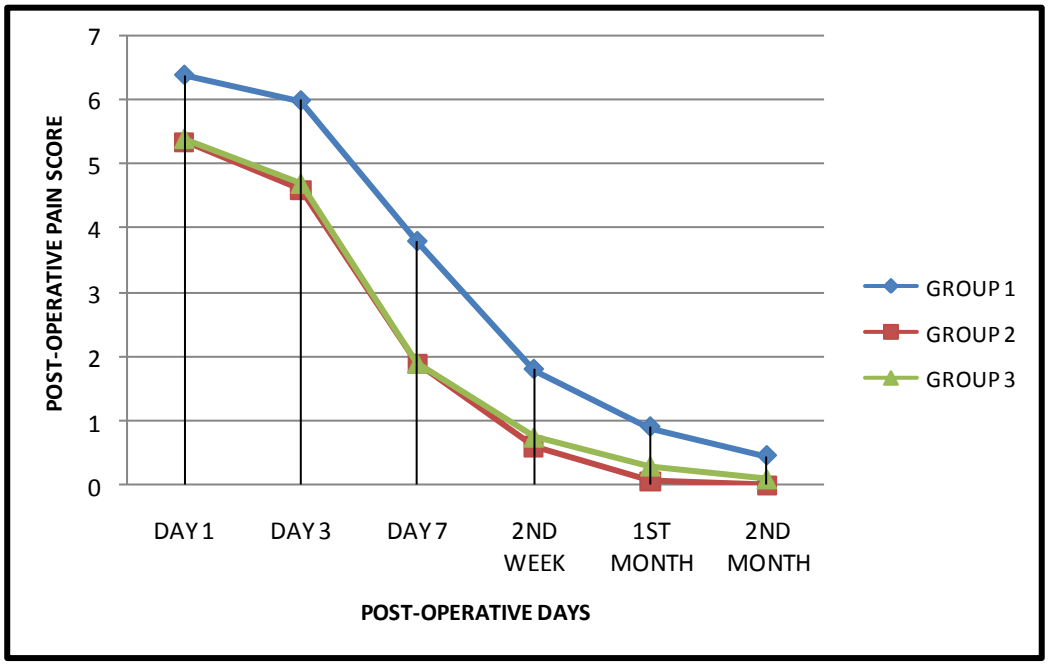
Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

TABLE 7 : POST-OPERATIVE PAIN

PAIN SCORE	GROUP						P VALUE*
	Group 1		Group 2		Group 3		
	MEAN	SD	MEAN	SD	MEAN	SD	
1st post-op day	6.40	1.04	5.35	0.87	5.40	1.18	**.003**
3rd post-op day	6.00	1.02	4.60	0.94	4.70	1.17	**.000**
7th post-op day	3.80	1.47	1.90	0.96	1.90	1.11	**.000**
2nd post-op week	1.80	1.19	0.60	0.59	0.75	0.55	**.000**
1st post-op month	0.90	0.71	0.05	0.22	0.30	0.47	**.000**
2nd post-op month	0.45	0.68	0.00	0.00	0.10	0.30	**.005**

*** ANOVA**

GRAPH 4 : POST-OPERATIVE PAIN



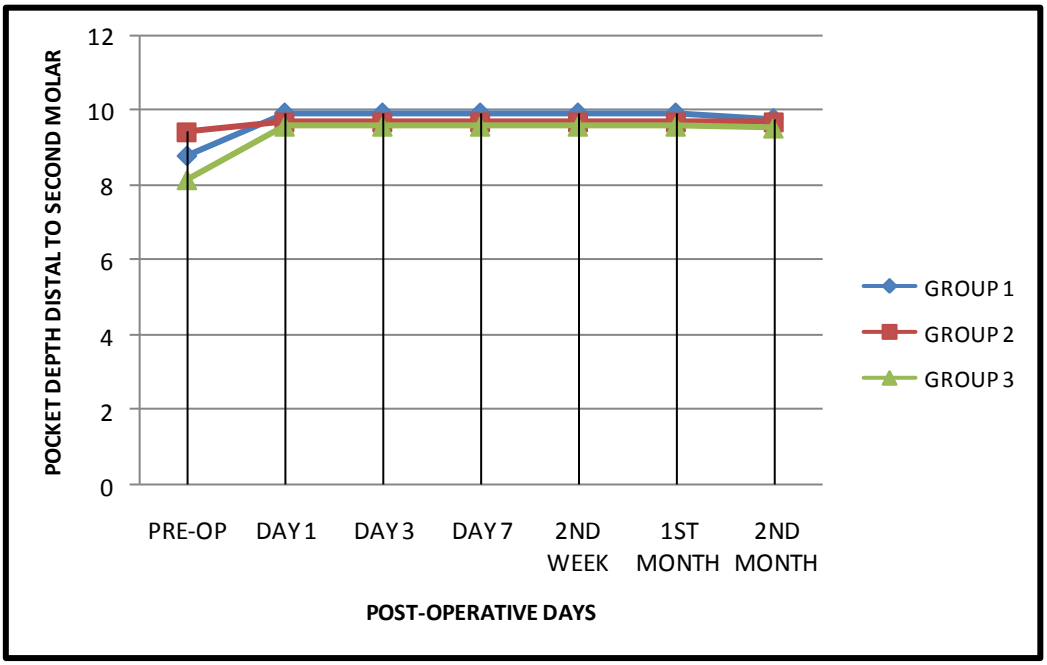
Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

TABLE 8 : POCKET DEPTH DISTAL TO 2ND MOLAR

POCKET DEPTH DISTAL TO 2ND MOLAR	GROUP						P VALUE*
	Group 1(mm)		Group 2(mm)		Group 3(mm)		
	MEAN	SD	MEAN	SD	MEAN	SD	
Pre-operative	8.80	1.36	9.45	1.05	8.15	1.59	**.014**
1st post-op day	9.95	1.05	9.70	1.03	9.60	1.14	**.573**
3rd post-op day	9.95	1.05	9.70	1.03	9.60	1.14	**.573**
7th post-op day	9.95	1.05	9.70	1.03	9.60	1.14	**.573**
2nd post-op week	9.95	1.05	9.70	1.03	9.60	1.14	**.573**
1st post-op month	9.95	1.05	9.70	1.03	9.60	1.14	**.573**
2nd post-op month	9.80	1.05	9.70	1.03	9.55	1.09	**.756**

*** ANOVA**

GRAPH 5 : POCKET DEPTH DISTAL TO 2ND MOLAR



Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

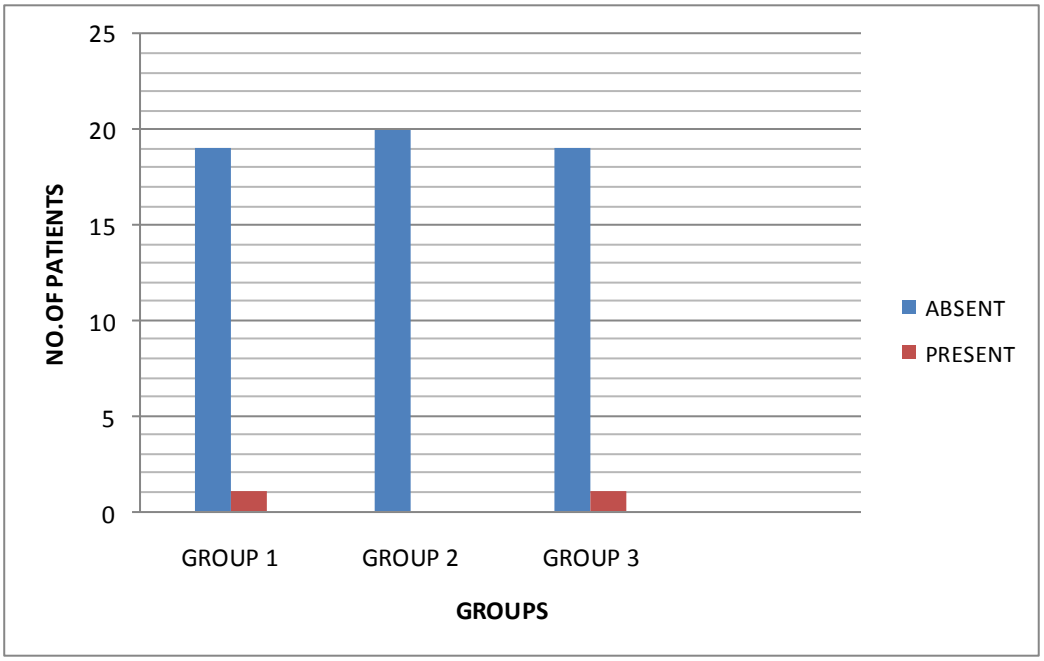
TABLE 9 : WOUND DEHISCENCE

GROUP		DEHISCENCE		TOTAL
		ABSENT	PRESENT	
GROUP 1	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100
GROUP 2	COUNT (n)	20	0	20
	PERCENTAGE	100	0	100
GROUP 3	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100

TABLE 10 : P VALUE FOR WOUND DEHISCENCE

Chi-Square Tests			
	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	.476[a]	2	**.788**
Likelihood Ratio	.478	2	.787
Linear-by-Linear Association	.468	1	.494
N of Valid Cases	60		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.00.			

GRAPH 6 : WOUND DEHISCENCE



Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

TABLE 11 : WOUND INFECTION

GROUP		INFECTION		TOTAL
		ABSENT	PRESENT	
GROUP 1	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100
GROUP 2	COUNT (n)	20	0	20
	PERCENTAGE	100	0	100
GROUP 3	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100

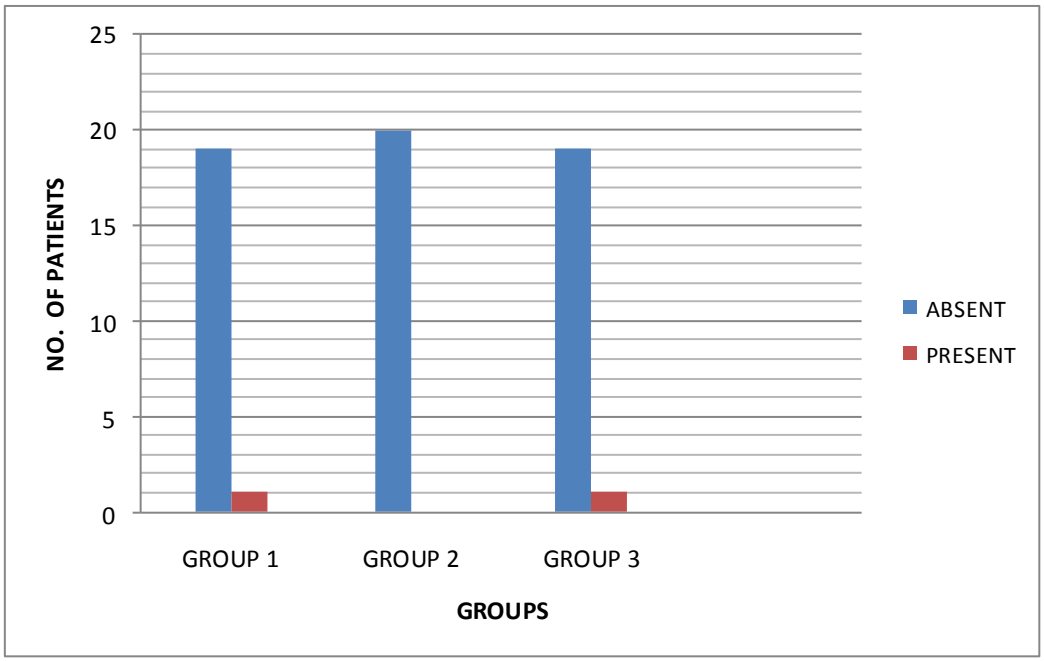
TABLE 12 : P VALUE FOR WOUND INFECTION

Chi-Square Tests			
	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	.536[a]	2	**.765**
Likelihood Ratio	.507	2	.776
Linear-by-Linear Association	.395	1	.530
N of Valid Cases	60		

a. 3 cells (50.0%) have expected count less than 5.

The minimum expected count is 1.33.

GRAPH 7 : WOUND INFECTION



Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

TABLE 13 : DRY SOCKET

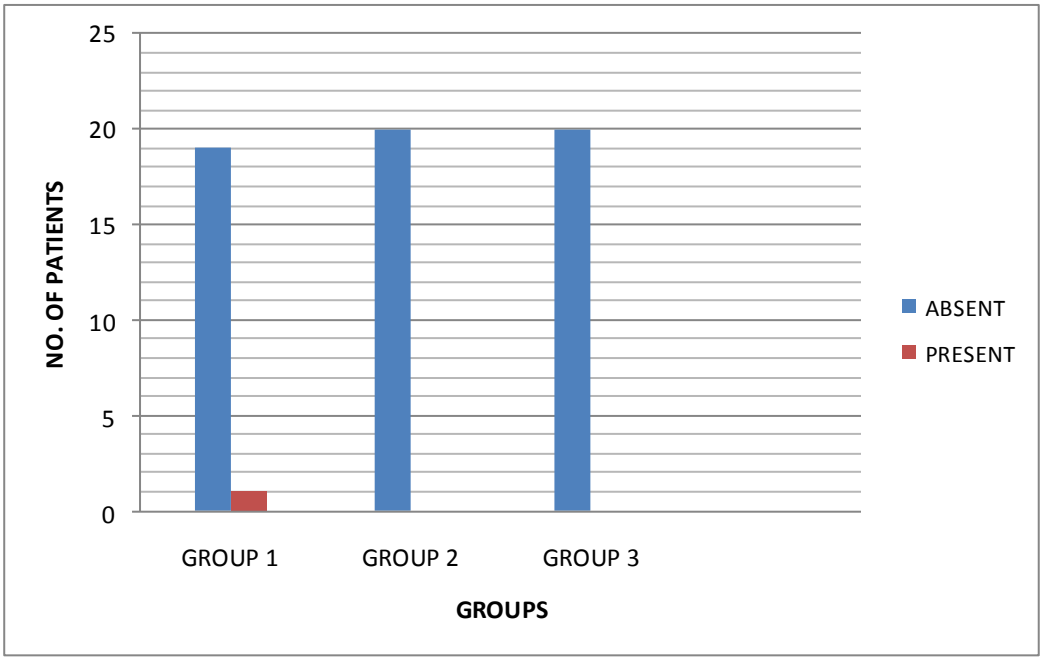
GROUP		DRY SOCKET		TOTAL
		ABSENT	PRESENT	
GROUP 1	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100
GROUP 2	COUNT (n)	20	0	20
	PERCENTAGE	100	0	100
GROUP 3	COUNT (n)	20	0	20
	PERCENTAGE	100	0	100

TABLE 14 : P VALUE FOR DRY SOCKET

Chi-Square Tests			
	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	.436[a]	2	**.804**
Likelihood Ratio	.473	2	.789
Linear-by-Linear Association	.000	1	1.000
N of Valid Cases	60		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 1.67.

GRAPH 8 : DRY SOCKET



Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

TABLE 15 : PARAESTHESIA

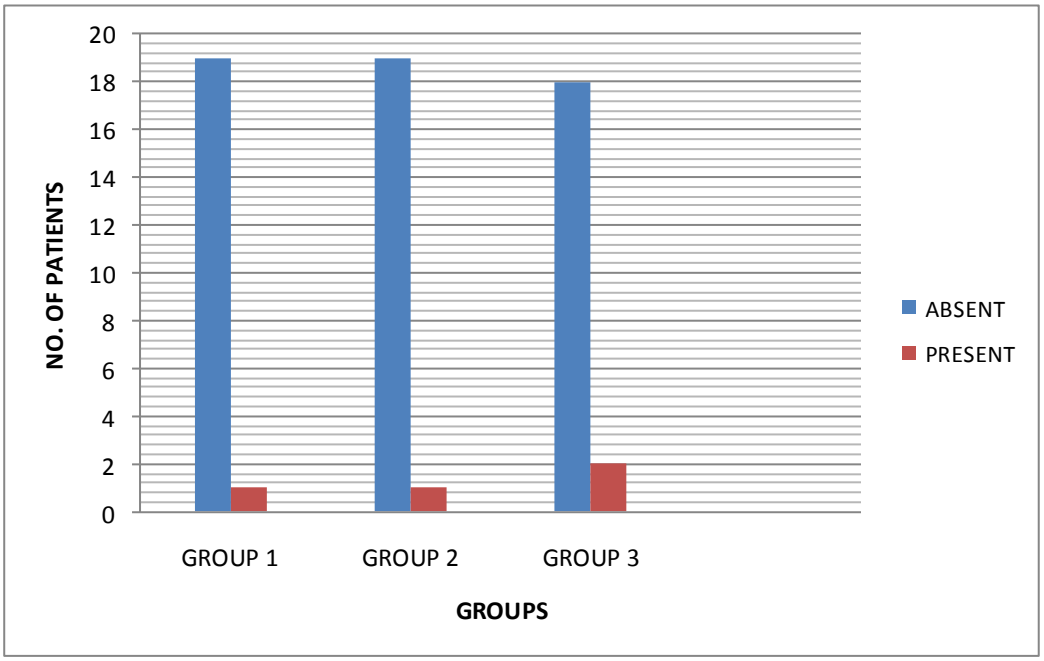
GROUP		PARESTHESIA		TOTAL
		ABSENT	PRESENT	
GROUP 1	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100
GROUP 2	COUNT (n)	19	1	20
	PERCENTAGE	95	5	100
GROUP 3	COUNT (n)	18	2	20
	PERCENTAGE	90	10	100

TABLE 16 : P VALUE FOR PARAESTHESIA Chi-Square Tests

	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	1.294[a]	2	**.524**
Likelihood Ratio	1.470	2	.479
Linear-by-Linear Association	.000	1	1.000
N of Valid Cases	60		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 2.33.

GRAPH 9 : PARAESTHESIA



Group 1 : Ward's Incision
Group 2 : Comma Shaped Incision
Group 3 : Koener's Incision

In the immediate post-operative period following surgical removal of third molars, patients complain about pain, swelling and reduction in mouth opening.[49] Third molar surgery has been associated with a variety of complications. Flap design is one of the factors influencing the severity of these complications.[50]
The incision of the mucosa, the reflection of a mucoperiosteal flap and the surgical time are generally thought to be the main variables related to post-operative complaints.[49]

The incisions used to expose impacted mandibular third molars can be broadly grouped under triangular and envelope types.[1] The various types of flaps used include L-shaped flap, Bayonet shaped flap, S shaped flap and Vestibular tongue shaped flap.
The ideal criteria for incisions are

1. It should be minimally extensive
2. It should not lie over the prospective bony defects
3. It should not cut across the major muscles and tendon insertion.

Therefore it is reason enough to consider alternative incision and flap design.[1]

Edema, pain and trismus following wisdom tooth removal are influenced by various factors such as difficulty of the surgical procedure involved, age and gender of the patient and experience of the surgeon.[51]

The present study compares three different incision designs in terms of intraoperative ease of access and time required, post-operative trismus, post-

operative swelling, post-operative pain, post-operative pocket depth distal to second molar and post-operative wound healing.

In the present study, ease of access was assessed in terms of visibility and accessibility. The results showed that access was excellent in all surgeries performed using Ward's incision. But it was excellent in 50% and moderate in 50% of surgeries which were performed using Comma-shaped incision. Access was excellent in 70% and moderate in 30% of surgeries which were performed using Koener's incision. The result showed that Ward's incision provides excellent access to the surgical site as compared to comma-shaped incision and Koener's incision, while comma incision provides least access amongst the three incision designs. The results are in accordance with the study done by Monaco et al[4] who noted triangular flaps provide easier access.

The results showed significant difference in terms of time required for the surgery. The mean time required in minutes for surgery was 20.75 min in surgeries performed by Ward's incision while it was 13 min and 17.75 min in surgeries performed using comma-shaped incision and Koener's incision respectively. Least time was required for surgeries performed using comma incision. More time was required for surgeries performed by Ward's incision and Koener's incision being the intermediate. These results are in contradiction with a study done by Giuseppe Monaco et al[4] who noted that time required for surgeries performed using Koener's incision was more as compared to Ward's incision. This disparity may be due to other factors like depth and position of the tooth, reflection of flap and experience of the surgeon.

The inter-incisal distance has been used as a measure of trismus in previous studies, although most of the studies did not specify the measurement device used. In the present study scale and divider were used to measure inter-incisal distance. The percentage difference in reduction of mouth opening was calculated on 1st, 3rd, 7th post-op days, 2nd post-op week, 1st and 2nd post-op month. The mean percentage difference was calculated. The results were significant showing Ward's incision affected post-operative mouth opening to the maximum level when compared with comma incision and Koener's incision, while comma incision and Koener's incision affected post-operative mouth opening almost similarly. The results are in accordance with a study done by Saravana kumar et al[2]. These results are in contradiction to a study done by Nageshwar[1], which noted similar effect on mouth opening post-operatively irrespective of the incision used. The reason for this disparity may be attributed to various other factors like duration of surgery and reflection of flap for longer duration.

In a clinical study by Nageshwar et al[1] and Desai et al[3] it was noted that swelling is mostly related to the incision, reflection of the mucoperiosteal flap and the duration of the procedure. This pattern probably results from the prolonged manipulation of the open wound . The present study is in accordance with this study. In the present study, the percentage increase in facial measurements was calculated on 1st, 3rd, 7th post-op days, 2nd post-op week, 1st and 2nd post-op month and the mean was taken. The results showed that increased post-operative swelling was observed after surgeries performed using Ward's incision as compared to comma incision and Koener's incision. Comma incision affected

facial measurements least amongst the three incision designs. These results are in contradiction to study done by Saravana kumar et al[2].

In the present study, post-operative pain was assessed on 1st, 3rd, 7th post-op days, 2nd post-op week, 1st and 2nd post-op month by using a Visual Analogue Scale (VAS), which ranges from 0-10 in ascending order of pain, as it takes little time to describe to the patient and it is easily understood by the patient. The results showed significant difference in three incision groups, pain scores being highest after surgeries preformed using Ward's incision. Post-operative pain scores were almost similar after surgeries performed using comma incision and Koener's incision. This is in accordance with the studies done by Nageshwar et al and Sarvanakumar et al [1,2] which noted less pain in comma incision group.

In the present study pocket depth distal to preceding second molar was measured using William's probe. The mean pocket depth was calculated on 1st, 3rd, 7th post-op days, 2nd post-op week, 1st and 2nd post-op month. The results showed no significant difference amongst the three incision groups. The results are in accordance with the study by Saravana kumar et al[2] where they found no significant difference amongst Ward's incision and comma incision. But the results are in contradiction with the study by Nageshwar et al[1] who noted higher incidence of periodontal sequelae after use of Ward's incision as compared to comma incision. Another study done by Giuseppe Monaco et al[4] and Z. H. Baqain [44] ,also contradicts present study results, in which it was noted that higher incidence of increased probing depth in surgeries in which envelope flap is used as compared to triangular flaps.

In the present study, out of 20 surgeries performed using Ward's incision 1 case was found to develop wound dehiscence in the post-operative period. Out of 20 surgeries performed using comma incision no case was found to develop wound dehiscence in the post-operative period, while out of 20 surgeries performed using Koener's incision 1 case was found to develop wound dehiscence in the post-operative period. The difference amongst the three incision groups was not significant. This is in accordance with a study by Monaco et al[4].

In the present study, out of 20 surgeries performed using Ward's incision 1 case was found to develop wound infection in the post-operative period. Out of 20 surgeries performed using comma incision no case was found to develop wound infection in the post-operative period, while out of 20 surgeries performed using Koener's incision 1 case was found to develop wound infection in the post-operative period. The difference amongst the three incision groups was not significant. This is in accordance with a study by Monaco et al[4].

In the present study, out of 20 surgeries performed using Ward's incision 1 case was found to develop dry socket in the post-operative period. Out of 20 surgeries performed using comma incision no case was found to develop dry socket in the post-operative period, while out of 20 surgeries performed using Koener's incision no case was found to develop dry socket in the post-operative period. The difference amongst the three incision groups was not significant. This result is in contradiction with the study done by Kirk et al[42] who noted higher incidence of dry socket amongst envelope flaps.

In the present study, out of 20 surgeries performed using Ward's incision 1 case was found to develop paresthesia in the post-operative period. Out of 20 surgeries performed using comma incision 1 case was found to develop paresthesia in the post-operative period, while out of 20 surgeries performed using Koener's incision 2 cases were found to develop paresthesia in the post-operative period. The paraesthesia was not permanent and resolved after 2 months. The difference amongst the three incision groups was not significant. This parameter has not been assessed in comparison with three incision groups in previous studies.

This study clearly indicated that the incision design does affect the post-operative consequences following surgical removal of impacted mandibular third molars.

Ward's incision provided excellent accessibility and visibility to the surgical site but it adversely affected post-operative mouth opening, swelling and pain. **Time required to perform surgery using comma incision was less** as compared to Ward's incision and Koener's incision. Though **Comma shaped incision** provided less access, it proved to be **least affecting the post-operative mouth opening, swelling and pain**. Koener's incision proved to be moderately affecting these parameters. There was no significant difference found amongst the three incision groups in terms of pocket depth distal to second molar, wound dehiscence, wound infection, dry socket and paresthesia post-operatively.

A study was conducted in the department of Oral and Maxillofacial Surgery at Tamil Nadu Government Dental College and Hospital, Chennai on 60 patients with impacted mandibular third molars which were removed surgically using three different kinds of incisions and several parameters were studied post-operatively in these cases to assess the clinical outcomes.

60 patients were divided into three groups namely Group 1, Group 2 and Group 3. Under Group 1 the impacted mandibular third molars were removed surgically using the conventional Ward's incision, under Group 2 Comma shaped incision was used and under Group 3 Koener's incision was used. Post-operative sequelae were assessed on the 1st, 3rd, 7th day, 2nd week, 1st month and 2nd month for all the operated patients. The purpose of this study was to evaluate the merits and demerits of all the three incision designs.

The results of this study show difference with respect to accessibility to surgical site, time required for the surgery, post-operative decrease in mouth opening, post-operative swelling and post-operative pain.

Significant differences were not noted with respect to post-operative pocket depth distal to second molar, wound dehiscence, wound infection, dry socket and paraesthesia.

The present study gives the following inferences -

1. **Ward's incision** provided **excellent access** to the surgical site as compared to comma shaped incision and Koener's incision.

2. **Time required** for the surgery was **least** with the use of **comma shaped incision**, while it was more with Ward's incision amongst three incision groups.
3. Post-operative mouth opening, post-operative swelling and post-operative pain were affected more adversely with the use of Ward's incision while these parameters were least adversely affected with the use of Comma shaped incision, with Koener's incision giving the intermediate results.

The present study is in accordance with the previous studies done by Nageshwar et al[1], Saravana kumar et al[2] and Adarsh Desai et al[3].

The conclusion of this study shows that Comma shaped incision is more preferable when compared to Ward's and Koener's incision, although it may require some practice initially and a more broader study group of patients under each category is recommended.

1. **Comma Incision for Impacted Mandibular Third Molars** Nageshwar, BDS, MDS J Oral Maxillofac Surg 60:1506-1509, 2002
2. **To Compare Standard Incision and Comma Shaped Incision and Its Influence on Post–Operative Complications in Surgical Removal of Impacted Third Molars** Saravana kumar B, Sarumathi T, Veerabahu M, Uma Raman Journal of Clinical and Diagnostic Research. 2013 Jul, Vol-7(7): 1514-1518
3. **Comparison of two incision designs for surgical removal of impacted mandibular third molar: A randomized comparative clinical study** Adarsh Desai, Rushit Patel, Kiran Desai, Nirav Bharatbhai Vachhani, Kruti A Shah and Raj Sureja Contemp Clin Dent. 2014 Apr-Jun; 5(2): 170–174.
4. **Mandibular Third Molar Removal in Young Patients: An Evaluation of 2 Different Flap Designs** Giuseppe Monaco, DMD, Giuseppe Daprile, DMD, Loredana Tavernese, DMD, Giuseppe Corinaldesi, MD, DMD and Claudio Marchetti, MD, DDS J Oral Maxillofac Surg 67:15-21, 2009
5. **The incidence of impacted teeth A survey at Harlem Hospital** Robert M. Kramer, D.D.S. and Arthur C. Williams, D.D.S., M.X. ,M.P.H.,New York, N. Y. Journal of Oral surg. February, 1970
6. **An orthopantomographic study of prevalence of impacted teeth** Kalle Aitasalo, Risto Lehtinen, Erki oksala Int. J oral Surg 1972:1:117-120
7. **The incidence of unerupted permanent teeth and related clinical cases** Pushpinder S Grover, Lewis Lorton (ORAL SURG. ORAL MED. ORAL PATHOL. 59~420-425, 1985)

8. **Factors predictive of difficulty of mandibular third molar surgery** T. Renton , N. Smeeton and M. McGurk British Dental Journal 2001; 190: 607–610
9. **Classification of surgical difficulty in extracting impacted third molars** H. Yuasa, T. Kawai, M. Sugiura BJOMS 2002: 40: 26-31
10. **Types, Frequencies, and Risk Factors for Complications After Third Molar Extraction** Chi H. Bui, Edward B. Seldin, and Thomas B. Dodson J Oral Maxillofac Surg 61:1379-1389, 2003
11. **Risk Factors for Third Molar Extraction Difficulty** Srinivas M. Susarla, AB and Thomas B. Dodson, DMD, MPH J Oral Maxillofac Surg 62:1363-1371, 2004
12. **Assessment of Difficulty in Third Molar Surgery—A Systematic Review** Oladimeji A. Akadiri, BDS and Ambrose E. Obiechina, BDS J Oral Maxillofac Surg 67:771-774, 2009
13. **A Prospective Study of Complication Related to Mandibular Third Molar Surgery** Thomas Osborn, George Frederickson, Irwin A and Thomas Torgerson J Oral Maxlllofac Surg 43 767-769, 1965
14. **Indications for surgical removal of the mandibular third molars-Study of 2,630 cases** Nordenram A, Hultin M, Kjellman O, Ramstrom G Swedish dental journal [1987, 11(1-2):23-29]
15. **A study of indications used for mandibular third molar** L. Lysell and M. Rohlin Int J. Oral Maxillofac. Surg. 1988; 17: 161-164.
16. **Judgement on removal of asymptomatic mandibular third molars: Influence of position, degree of impaction, and patient's age** Kerstin Knutson, Berndt Brehmer, Leif Lysell, Madeleine Rohlin, Malmo

and Kristianstad Journal Acta Odontologica Scandinavica Volume 54, 1996 - Issue 6

17. **Sensitivity and Specificity of Pantomography to Predict Inferior Alveolar Nerve Damage During Extraction of Impacted Lower Third Molars** Ana Cláudia Amorim Gomes, DDS, PhD, MSc, Belmiro Cavalcanti do Egito Vasconcelos, DDS, PhD, MSc, Emanuel Dias de Oliveira Silva, DDS, Arnaldo de França Caldas, Jr, DDS, PhD, MSc, and Ivo Cavalcante Pita Neto, DDS J Oral Maxillofac Surg 66:256-259, 2008
18. **The impacted lower wisdom tooth** - Mac Gregor AJ 1st edition: oxford 1985
19. **Oral surgery** - Thoma KH 5th edition vol 1: 1969
20. **Management of impactions** - Kruger GO Dent Clin North Am 1959;19:707
21. **Minor oral surgery 3rd edition** Geoffrey Howe 1985
22. **Impacted teeth** - Alling CC, Helfrick JE, Alling RD: Philadelphia PA Saunders 1993
23. **Contemporary oral and maxillofacial surgery** Peterson LJ, Ellis E, Hupp JR, Tucker MR., 4th edition 2003
24. **Complications Following Removal of Impacted Third Molars: The Role of the Experience of the Surgeon** Allen L. Sisk, DDS, Wade Hammer, DDS,T David W. Shelton, DMD,T And Edwin D. Joy, Jr., DDS J Oral Maxillofac Surg 44:855-659. 1966
25. **Oral hygiene and postoperative pain after mandibular third molar surgery** M. Peñarrocha, MD, PhD, J. M. Sanchis, U. Sáez, C. Gay and J.

V. Bagán, (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92:260-4)

26. **Mandibular third molar removal: Risk indicators for extended operation time, postoperative pain, and complications** Ingibjo¨rg S. Benediktsdo´ ttir, DDS, PhD, Ann Wenzel, DDS, PhD, dr.odont, Jens K. Petersen, DDS, Ms, and Hanne Hintze, DDS, PhD (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004;97:438-46)
27. **Prediction of postoperative facial swelling, pain and trismus following third molar surgery based on preoperative variables** Thiago de Santana-Santos , Jadson-Alípio-Santana de Souza-Santos, Paulo-Ricardo-Saquete Martins-Filho, Luiz-Carlos-Ferreira da Silva, Emanuel-Dias de Oliveira e Silva , Ana-Claudia-Amorim Gomes Med Oral Patol Oral Cir Bucal. 2013 Jan 1;18 (1):e65-70.
28. **Evaluation of postoperative localized osteitis in mandibular third molar surgery** Sterling K. Schow Oral Surg. September, 1974 Volume 38 Number 3
29. **Periodontal Evaluation of Two Mucoperiosteal Flaps Used in Removing Impacted Mandibular Third Molars** R. Jeffrey Stephens, George R. App, And Dennis W. Foreman J Oral Maxillofac Surg 41:719-724, 1983
30. **Lingual nerve damage following third molar surgery** D A Mason Int J Oral and Maxillofac Surg 1988 ; 17: 290-294
31. **The Relationship Between the Indications for the Surgical Removal of Impacted Third Molars and the Incidence of Alveolar Osteitis** Tarek L. Al-Khateeb, Bds, Phd, Akmal I. El-Marsafi, Dds,T And Norman

P. Butler, Ma, Mds, Ffdrcsi, Fdsrcs(Eng), Drd(Edin) J Oral Maxilicfac Surg 49:141-145.199

32. **Alveolar osteitis after surgical removal of impacted mandibular third molars** Peter .E. Larsen, DDS (ORAL SIJRC ORAL MED ORAL PATHOL 1992;73:393-7)
33. **Side effects and complications associated with third molar surgery** Matte Chiapasco, MD Ya Lorenzo De Cicco, MD and Guido Marrone, MD (ORAL SURG ORAL MED ORAL PATHOL 1993;76:412-20)
34. **Third molar surgery- a preliminary report on aspects affecting quality of life in the early postoperative period** J. Savin, G. R. Ogden British journal of oral and maxillofacial Surgerv (1997) 35, .246-253
35. **Lingual nerve paresthesia following third molar surgery** Allen E Fielding, DMD, Dominic R Rachiele, DMD, Gordon Frazier, DMD (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1997;84:345-348)
36. **Lingual nerve damage after third lower molar surgical extraction** Eduard Valmaseda-Castellón, DDS, Leonardo Berini-Aytés, DDS, MD, PhD and Cosme Gay-Escoda, DDS, MD, PhD (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;90:567-73)
37. **Inferior alveolar nerve damage after lower third molar surgical extraction: A prospective study of 1117 surgical extractions** Eduard Valmaseda-Castellón, DDS, Leonardo Berini-Aytés, DDS, MD, PhD and Cosme Gay-Escoda, DDS, MD, PhD (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92:377-83)

38. **Primary wound healing after lower third molar surgery: Evaluation of 2 different flap designs** Norbert Jakse, MD, DDS, Vedat Bankaoglu, DDS, Gernot Wimmer, MD, Antranik Eskici, MD, DDS and Christof Pertl, MD, DDS (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002;93:7-12)

39. **Changes in life quality following third molar surgery — the immediate postoperative period** C. McGrath, M. B. Comfort, E. C. M. Lo and Y. Luo British Dental Journal Volume 194 No. 5 March 8 2003

40. **Clinical postoperative findings after removal of impacted mandibular third molars: prediction of postoperative facial swelling and pain based on preoperative variables** Hidemichi Yuasaa , Masayuki Sugiura British Journal of Oral and Maxillofacial Surgery (2004) 42, 209—214

41. **Relationships Between Surgical Difficulty and Postoperative Pain in Lower Third Molar Extractions** Lucía Lago-Méndez, DDS, Márcio Diniz-Freitas, DDS, PhD, Carmen Senra-Rivera, PhD, Francisco Gude-Sampedro, MD, PhD, José Manuel Gándara Rey, MD, DDS, PhD, and Abel García-García, MD, DDS, PhD J Oral Maxillofac Surg 65:979-983, 2007

42. **Influence of two different flap designs on incidence of pain, swelling, trismus, and alveolar osteitis in the week following third molar surgery** D. Glenn Kirk, BDS, MDS, PGDipClinDent, Peter N. Liston, BDS, FDSRCS, Darryl C. Tong, BDS, MBChB, MSD, FFDRCSI, FDSRCS and Robert M. Love, BDS, MDS, PhD, FRACDS, Linton, Taranaki and Dunedin (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;104:e1-e6)

43. **Influence of two different flap designs on the sequelae of mandibular third molar surgery** Özgür Erdogan & Ufuk Tatlı & Yakup Üstün & Ibrahim Damlar Oral Maxillofac Surg (2011) 15:147–152
44. **Flap design and mandibular third molar surgery: a split mouth randomized clinical study** Z. H. Baqain, A. Al-Shafii, A. A. Hamdan, F. A. Sawair: Int. J. Oral Maxillofac. Surg. 2012; 41: 1020–1024.
45. **Short-term clinical outcomes of two different flap techniques in impacted mandibular third molar surgery** Banu Özveri Koyuncu, DDS, PhD, and Erdog˘an Çetingül, DDS, PhD (Oral Surg Oral Med Oral Pathol Oral Radiol 2013;116:e179-e184)
46. **Comparison of the Influence of Two Different Flap Designs on Pain and Swelling after Surgical Extraction of Impacted Mandibular Third Molars** Javad Yazdani, Masume Amani, Tannaz Pourlak, Davood Maghbooliasl J Am Sci 2014;10(4s):88-93
47. **Comparison of a new flap design with the routinely used triangular flap design in third molar surgery** U. Yolcu, A.H. Acar Int J Oral Maxillofac Surg (2015)
48. **A practical guide to management of impacted teeth** K George Varghese First Edition: **2010**
49. **Effect of incision and flap reflection on post-operative pain after removal of partially impacted mandibular third molars** Clauser C, Barone R Quintessence Int.1994 Dec 25(12) : 845-9
50. **Marginal flap versus paramarginal flap in impacted mandibular third molar surgery: a prospective study** Suarez Cunqueiro M, Gutwald R,

Reichman J, Otero-cepeda Oral Surg Oral Med Oral Pathol Oral Endod 2003 :95;403-8

51. **Peri-operative dexamethasone reduces post-surgical sequelae of wisdom tooth removal: a split mouth randomized double masked clinical trial** F. Graziani, F.D Aiuto, P.G Arduino, M. Tonelli, M. Gabrielle Int. J. Oral Maxillofac Surg 2006; 35:241-246

ANNEXURE I - CASE REPORT FORM

COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS

PATIENT'S NAME : _____

AGE/ SEX : _____

PATIENT'S IDENTIFICATION NO : _____

CONTACT ADDRESS : _____ _____

CONTACT NO : _____

INSTITUTION : TN Govt. Dental College & Hospital, Chennai - 600 003.

CENTRE : Dept. of Oral & Maxillofacial Surgery, TN. Govt. Dental College and Hospital, Chennai - 600 003.

PATIENT'S IDENTIFICATION/ O P NO : _____ DATE: _____

DETAILS OF SURGERY

PROCEDURE FOLLOWED : Transalveolar extraction of impacted mandibular third molar

DURATION OF SURGERY :

ANY OTHER INFORMATION :

DETAILS OF DRUG THERAPY :

POST-OPERATIVE ASSESSMENT :

NAME OF THE INVESTIGATOR :

SIGNATURE OF INVESTIGATOR :

ANNEXURE II - CASE SHEET PERFORMA

COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS

PATIENT'S NAME : _____

AGE/ SEX : _____

PATIENT'S

IDENTIFICATION NO : _____

CONTACT ADDRESS : _____

CONTACT No : _____

INSTITUTION : TN Govt. Dental College & Hospital,

Chennai - 600 003.

CENTRE : Dept. of Oral & Maxillofacial Surgery,

TN. Govt. Dental College and Hospital,

Chennai - 600 003

CHIEF COMPLAINT:

HISTORY OF THE PRESENTING ILLNESS:

CLINICAL FINDINGS:

INVESTIGATIONS:

TREATMENT:

Procedure followed : Transalveolar extraction of impacted mandibular third molar

FOLLOW UP

NAME OF THE INVESTIGATOR :

SIGNATURE OF INVESTIGATOR:

ANNEXURE III

INFORMED CONSENT FORM

COMPARISON OF THREE INCISION DESIGNS AND ITS INFLUENCE ON POST-OPERATIVE COMPLICATIONS IN SURGICAL REMOVAL OF MANDIBULAR THIRD MOLARS

Participant ID No:

"I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this study and understand that I have the right to withdraw from the study at any time without in any way it affecting my further medical care."

Date	Name of the participant	Signature/thumb impression of the participant

[The literate witness selected by the participant must sign the informed consent form. The witness should not have any relationship with the research team; If the participant doesn't want to disclose his / her participation details to others, in view of respecting the wishes of the participant, he / she can be allowed to waive from the witness procedure (This is applicable to literate participant ONLY). This should be documented by the study staff by getting signature from the prospective participant]

_____

_____

"I have witnessed the accurate reading of the consent form to the potential participant and the individual has had opportunity to ask questions. I confirm that the individual has given consent freely"

_____	_____	_____
Date	Name of the witness	Signature of the witness

_____	_____	_____
Date	Name of the interviewer	Signature of the interviewer

ANNEXURE IV

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராயச்சியின் தலைப்பு

வாய்பூட்டு சரிசெய்த நோயாளிகளுக்கு வாயினுள் எலும்பு நீட்டும் முறையின் மூலம் கீழ்தாடை எலும்பினை நீட்டுதல்- ஒரு ஆய்வு.

பெயர் புறநோயாளி எண்

வயது/ பால் ஆராய்ச்சி சேர்க்கை எண்

முகவரி

தொலைபேசி

நான் ..... வயது ..... என்னுடைய சுய நினைவுடனும் மற்றும் முழு சுதந்திரத்துடனும் இந்த மருத்துவ ஆராய்ச்சியில் என்னை சேர்த்துக்கொள்ள ஒப்புதல் அளிக்கிறேன்.

கீழ்காணப்படும் நிபந்தனைகளுக்கு நான் சம்மதிக்கிறேன்.

நான் இந்த ஆராய்ச்சியின் நோக்கம் மற்றம் செயல்முறைகள் பற்றி முழுமையாக தெரிவிக்கப்பட்டுள்ளேன்.

இந்த பரிசோதனைக்காக எனது தாடையில் ஒரு கருவி பொருத்தப்படும் என அறிகிறேன்.

பொருத்தப்பட்ட கருவி 6 மாத காலம் வரை தாடையில் வைக்கப்படும் என அறிகிறேன்.

என் உடல் நலம் பாதிக்ப்பட்டாலோ அல்லது எதிர்பாராத வழக்கத்திற்கு மாறான நோய்குறிகள் தென்பட்டாலோ அதற்கு சிகிச்சை பெற்றுக்கொள்வதற்கும் முழு உரிமை உள்ளதாக அறிகிறேன்.

நான் ஏற்கனவே உட்கொண்ட மற்றும் உட்கொள்கின்ற மருந்துகளிந் விபரங்களை ஆராய்ச்சியாளரிடம் தெரிவித்துள்ளேன்.

என் மருத்துவ குறிப்பேடுகளை இந்த ஆராய்ச்சியில் பயன்படுத்திக்கொள்ள சம்மதிக்கிறேன். இந்த ஆராய்ச்சி மையமும் ஆராய்ச்சியாளரும் என்னுடைய விபரங்கள் அனைத்தையும் இரகசியமாக வைப்பதாக அறிகிறேன்.

.....	.....	.....
நேயாளியின் பெயர்	கையொப்பம்	தேதி
.....	.....	.....
ஆராய்ச்சியாளர் பெயர்	கையொப்பம்	தேதி

ANNEXURE V

Master Chart : Group I Clinical Parameters

Sl. No	Age / Sex	Ease of Access	Time Required	Dehiscence	Infection	Dry Socket	Paresthesia
1	29/M	2	20	Absent	Absent	Absent	Absent
2	32/F	2	25	Absent	Absent	Absent	Absent
3	23/M	2	15	Absent	Absent	Absent	Absent
4	26/M	2	20	Absent	Absent	Absent	Absent
5	34/M	2	20	Absent	Absent	Absent	Absent
6	22/F	2	15	Absent	Absent	Absent	Absent
7	23/F	2	25	Present	Present	Absent	Absent
8	30/M	2	15	Absent	Absent	Absent	Absent
9	32/F	2	25	Absent	Absent	Absent	Present
10	29/M	2	25	Absent	Absent	Absent	Absent
11	27/M	2	25	Absent	Absent	Absent	Absent
12	21/F	2	30	Absent	Absent	Absent	Absent
13	38/F	2	15	Absent	Absent	Absent	Absent
14	37/F	2	20	Absent	Absent	Absent	Absent
15	33/M	2	20	Absent	Absent	Absent	Absent
16	29/M	2	15	Absent	Absent	Absent	Absent
17	26/M	2	20	Absent	Absent	Present	Absent
18	29/M	2	25	Absent	Absent	Absent	Absent
19	25/F	2	20	Absent	Absent	Absent	Absent
20	29/M	2	20	Absent	Absent	Absent	Absent

Master Chart : Group I Clinical Parameters

Sl. No	% Decrease in mouth opening						% Increase in Swelling						Pain Score						Pocket Depth					
	D 1	D 3	D 7	2 W	1M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M
1	38.7	42.8	20.4	2.0	2.0	2.0	11.5	8.6	3.2	0.8	0.2	0.2	7	7	6	4	2	2	10	10	10	10	10	10
2	58.3	58.3	39.5	16.6	16.6	12.5	15.8	17.0	9.1	5.5	0.8	0.2	6	6	6	4	2	2	11	11	11	11	11	11
3	45.2	37.7	15.1	9.4	9.4	5.6	7.9	8.2	1.8	1.5	1.2	1.2	6	5	5	3	2	1	5	10	10	10	10	8
4	66.6	66.6	40	13.3	6.6	6.6	18.4	17.5	7.3	2.3	1.7	1.1	7	7	5	4	1	0	8	12	12	12	12	11
5	57.8	55.2	28.9	7.8	5.2	5.2	20.4	20.4	10.2	3.0	1.3	1.0	7	7	4	2	1	1	8	10	10	10	10	10
6	58.9	56.4	23.1	10.2	7.6	5.1	13.9	14.7	5.7	0.8	0.2	0	4	4	2	1	0	0	10	10	10	10	10	10
7	44.8	42.8	20.4	2.0	2.0	2.0	10.4	9.9	4.7	2.1	0.7	0.5	6	6	5	1	0	0	10	10	10	10	10	10
8	40	40	24	4	0	0	19.6	21.2	14.6	6.8	2.8	1.2	6	5	1	1	0	0	9	10	10	10	10	10
9	48.9	40.4	14.8	2.1	2.1	2.1	15.9	13.2	5.6	2.6	0.5	0.2	8	6	3	1	1	0	10	10	10	10	10	10
10	56.4	51.2	28.2	7.6	5.1	5.1	20.6	20.6	13.5	3.0	1.3	0.6	7	7	4	2	1	1	8	10	10	10	10	10
11	42.3	42.3	25	7.6	3.8	0	20.0	21.6	15.0	7.2	2.5	0.3	6	5	3	1	1	0	9	10	10	10	10	10
12	45.2	40.4	9.5	4.7	2.3	0	23.2	19.0	3.5	1.6	0.3	0	8	7	4	1	1	0	10	10	10	10	10	10
13	39.5	33.3	16.6	6.2	4.1	2.0	18.6	18.6	3	2.1	1.5	0	7	7	5	2	1	0	8	9	9	9	9	9
14	37.5	12.5	6.2	3.1	0	0	22.9	21.9	7.0	1.9	0.6	0	5	4	2	0	0	0	8	10	10	10	10	10
15	39.5	37.2	11.6	7.1	2.3	0	19.8	7.6	2.8	1.4	0.5	0	7	7	5	1	0	0	9	9	9	9	9	9
16	51.3	43.2	10.8	2.7	2.7	0	10.9	7.2	2.6	0.5	0.2	0	5	5	2	1	0	0	7	8	8	8	8	8
17	45.2	40.4	9.5	4.7	4.7	2.3	11.1	9	4.2	1.2	1.2	0.6	6	6	2	1	1	0	10	12	12	12	12	12
18	57.4	57.4	40.4	6.3	4.2	2.1	15.8	14.4	9.1	3.5	1.7	0.5	6	6	4	3	2	1	8	8	8	8	8	8
19	43.7	43.7	20.8	6.2	6.2	4.1	18.6	17.4	3.9	2.1	0	0	6	6	5	2	1	0	9	9	9	9	9	9
20	33.3	33.3	11.9	4.7	4.7	2.3	16.7	15.8	3.5	1.6	0.9	0	8	7	3	1	1	1	9	11	11	11	11	11

D1 – Day 1, D3 – Day 3, D7- Day 7, 2W – 2nd week, 1M – 1st month, 2M – 2nd Month

Master Chart : Group II Clinical Parameters

Sl. No	Age / Sex	Ease of Access	Time Required	Dehiscence	Infection	Dry Socket	Paresthesia
1	34/F	2	15	Absent	Absent	Absent	Absent
2	32/M	1	10	Absent	Absent	Absent	Absent
3	28/M	2	10	Absent	Absent	Absent	Absent
4	32/F	2	15	Absent	Absent	Absent	Absent
5	26/F	1	15	Absent	Absent	Absent	Absent
6	40/F	1	20	Absent	Absent	Absent	Present
7	35/M	1	10	Absent	Absent	Absent	Absent
8	36/M	2	15	Absent	Absent	Absent	Absent
9	37/F	2	15	Absent	Absent	Absent	Absent
10	29/M	1	15	Absent	Absent	Absent	Absent
11	31/F	2	10	Absent	Absent	Absent	Absent
12	34/M	1	10	Absent	Absent	Absent	Absent
13	29/F	1	10	Absent	Absent	Absent	Absent
14	18/F	2	10	Absent	Absent	Absent	Absent
15	36/M	1	20	Absent	Absent	Absent	Absent
16	29/F	1	10	Absent	Absent	Absent	Absent
17	30/M	2	15	Absent	Absent	Absent	Absent
18	28/F	2	15	Absent	Absent	Absent	Absent
19	31/F	2	10	Absent	Absent	Absent	Absent
20	44/M	1	10	Absent	Absent	Absent	Absent

Master Chart : Group II Clinical Parameters

Sl. No	% Decrease in mouth opening						% Increase in Swelling						Pain Score						Pocket Depth					
	D 1	D 3	D 7	2 W	1M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M
1	20.9	23.2	6.9	0	0	0	3.7	3.1	1.2	0.3	0	0	6	6	2	1	0	0	11	11	11	11	11	11
2	13.6	11.3	6.8	0	0	0	7.6	3.9	1.4	0.8	0	0	5	5	3	1	0	0	10	10	10	10	10	10
3	16.6	11.1	2.7	0	0	0	7.3	6.7	1.7	0	0	0	4	3	1	0	0	0	8	8	8	8	8	8
4	4.7	4.7	2.3	0	0	0	3.7	3.4	1.3	0.5	0.5	0	6	6	5	2	1	0	8	10	10	10	10	10
5	11.6	9.3	4.6	2.3	0	0	7.6	3.9	1.4	0.8	0	0	4	4	2	1	0	0	10	10	10	10	10	10
6	25.5	16.2	4.6	2.3	0	0	2.6	3.2	0.5	0	0	0	5	4	1	0	0	0	10	10	10	10	10	10
7	25.5	25.5	4.2	2.1	2.1	2.1	12.6	10.9	0.8	0.2	0.2	0.2	4	3	1	0	0	0	8	8	8	8	8	8
8	25.5	25.5	4.2	2.1	0	0	13.2	10.3	2.8	1.1	1.1	0.5	5	4	2	1	0	0	8	8	8	8	8	8
9	40.9	38.6	13.6	9.1	2.2	2.2	6	5.4	2.4	1.2	0.9	0	4	3	1	0	0	0	9	10	10	10	10	10
10	33.3	30.7	10.2	2.5	0	0	13	9.5	2.7	1.2	0.6	0	7	5	3	1	0	0	11	11	11	11	11	11
11	24.4	18.3	2.0	2.0	0	0	9.4	8.8	3.2	0.5	0	0	6	6	2	1	0	0	10	10	10	10	10	10
12	25	15	5	0	0	0	12.5	10.8	1.1	0	0	0	6	5	2	1	0	0	9	10	10	10	10	10
13	46.6	33.3	3.3	3.3	0	0	10.7	9.8	2.9	1.3	0	0	6	5	2	0	0	0	11	11	11	11	11	11
14	31.1	24.4	6.6	0	0	0	11.1	10.8	2.7	0.9	0.3	0	5	4	1	0	0	0	10	10	10	10	10	10
15	18.6	18.6	6.9	0	0	0	8.1	6.1	1.6	0.8	0	0	5	5	2	0	0	0	10	11	11	11	11	11
16	13.6	11.3	4.5	0	0	0	11.2	10.9	3.7	1.8	0	0	5	4	1	0	0	0	9	9	9	9	9	9
17	22.9	20.8	4.1	0	0	0	8.7	5.9	1.6	0.5	0	0	6	5	2	1	0	0	10	10	10	10	10	10
18	23.0	17.9	2.5	0	0	0	7.8	6.5	0.9	0	0	0	6	5	2	1	0	0	10	10	10	10	10	10
19	14.2	11.9	0	0	0	0	8.8	7.6	1.2	0	0	0	6	5	1	0	0	0	8	8	8	8	8	8
20	18.4	15.7	5.2	0	0	0	8.1	7.8	1.7	0	0	0	6	5	2	1	0	0	9	9	9	9	9	9

Master Chart : Group III Clinical Parameters

Sl. No	Age / Sex	Ease of Access	Time Required	Dehiscence	Infection	Dry Socket	Paresthesia
1	28/M	2	20	Absent	Absent	Absent	Absent
2	31/M	2	15	Absent	Absent	Absent	Present
3	22/F	2	15	Absent	Absent	Absent	Absent
4	27/M	2	20	Present	Present	Absent	Absent
5	24/M	2	20	Absent	Absent	Absent	Absent
6	30/M	2	20	Absent	Absent	Absent	Present
7	37/F	1	20	Absent	Absent	Absent	Absent
8	29/M	2	20	Absent	Absent	Absent	Absent
9	28/M	1	25	Absent	Absent	Absent	Absent
10	28/F	1	10	Absent	Absent	Absent	Absent
11	34/F	1	15	Absent	Absent	Absent	Absent
12	31/M	2	15	Absent	Absent	Absent	Absent
13	23/M	1	20	Absent	Absent	Absent	Absent
14	20/M	2	15	Absent	Absent	Absent	Absent
15	29/M	2	20	Absent	Absent	Absent	Absent
16	36/M	2	20	Absent	Absent	Absent	Absent
17	38/F	2	20	Absent	Absent	Absent	Absent
18	30/M	1	15	Absent	Absent	Absent	Absent
19	25/M	2	10	Absent	Absent	Absent	Absent
20	26/F	2	20	Absent	Absent	Absent	Absent

Master Chart : Group III Clinical Parameters

Sl. No	% Decrease in mouth opening						% Increase in Swelling						Pain Score						Pocket Depth					
	D 1	D 3	D 7	2 W	1M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M	D 1	D 3	D 7	2 W	1 M	2 M
1	22.0	17.9	0	0	0	0	8.1	8.7	1.2	0	0	0	4	3	1	0	0	0	8	8	8	8	8	8
2	0	0	0	0	0	0	2.2	2.8	0	0	0	0	3	2	0	0	0	0	8	10	10	10	10	10
3	20.9	18.6	9.3	2.3	0	0	5.7	5.7	1.9	0	0	0	4	3	1	0	0	0	8	10	10	10	10	10
4	18.3	14.2	2.0	0	0	0	6.3	5.0	0.6	0	0	0	6	5	2	1	0	0	11	11	11	11	11	11
5	13.3	11.1	0	0	0	0	7.5	7.5	1.2	0	0	0	5	4	1	0	0	0	8	8	8	8	8	8
6	31.8	31.8	4.5	0	0	0	16.6	16.6	13.8	2.4	0	0	5	4	1	0	0	0	8	10	10	10	10	10
7	30.2	25.5	7.0	1.7	0	0	8.2	7.1	1.4	0.7	0	0	6	5	3	1	0	0	7	10	10	10	10	10
8	25	20.8	3.3	0	0	0	6.3	4.9	1.6	0.5	0	0	4	3	1	0	0	0	9	10	10	10	10	10
9	21.6	19.1	1.9	0.6	0.2	0	5.9	5.9	1.7	0	0	0	6	6	3	1	0	0	5	8	8	8	8	8
10	34.5	29.8	3.8	1.2	0.8	0	14.9	13.6	7.4	1.7	0.3	0	7	6	3	1	1	0	8	11	11	11	11	11
11	17.9	15.5	5.2	0.7	0.1	0	10.8	9.5	2.2	0.7	0	0	6	6	4	1	0	0	7	7	7	7	7	7
12	14.7	13.2	6.9	2.5	0	0	18.2	15.9	2.6	0.5	0.2	0	7	5	1	1	1	0	9	10	10	10	10	10
13	24.7	21.6	7.9	2.4	0.8	0.2	9.2	9.2	3.6	.8	0.3	0	5	5	2	1	0	0	8	9	9	9	9	9
14	13.3	13.3	3.3	0.6	0	0	12.5	12.5	3.8	0.3	0	0	6	6	4	1	0	0	10	11	11	11	11	11
15	12.2	13.6	6.5	1.3	0.5	0	15.3	13.3	5.9	0.1	0	0	5	5	2	2	1	0	11	11	11	11	11	11
16	10.7	10.7	4.4	1.8	0.2	0	7.2	7.2	4.9	1.3	0.5	0	6	5	2	1	1	1	6	9	9	9	9	9
17	21.7	21.7	9.4	3.7	1.4	0.6	18.5	18.5	4.6	1.4	0.4	0	7	6	2	1	1	1	10	10	10	10	10	10
18	26.7	26.7	11.5	2.7	1.3	0.2	6.3	5.4	3.2	0.2	0	0	5	5	3	1	1	0	7	10	10	10	10	10
19	7.3	7.3	3.6	1.9	0	0	8.6	8.6	1.3	0	0	0	4	5	1	1	0	0	9	9	9	9	9	9
20	22.7	22.7	5.2	0.8	0	0	17.2	17.2	2.6	0.3	0.1	0	7	5	1	1	0	0	6	10	10	10	10	10