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Passively Repositioned Closure Technique versus Conventional Closure Technique in Bilaterally Impacted Third Molar Surgery - A Comparative Study

Running Title: *Passive versus Conventional closure technique*

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Abstract: ***Aim: This study was performed to compare the efficacy of passively repositioned closure technique with that of conventional closure technique. Materials and Methods: 40 patients were selected with similar Warfe's difficulty assessment index for bilateral mandibular impacted third molar on either sides and divided into two groups- Group A – Those in which passively repositioned closure was used and Group B – Those in which conventional closure was used. Pain, trismus, swelling and periodontal health were evaluated preoperatively and then postoperatively 1st day, 3rd day, 1 week, 15 days and 1 month. Results: Statistical analysis showed that the passively repositioned closure technique provide lesser postoperative pain (93.6% vs 89.3%) and trismus (0.9% vs 3.5%) between Group A and Group B, respectively than conventional closure technique after third molar surgery. A linear result was seen in case of swelling (0.4% vs 0.1%) and periodontal health (15.5% vs 0%) between Group B and Group, respectively, postoperatively. Conclusion: Passively repositioned closure technique provide lesser postoperative pain and trismus than conventional closure technique after third molar surgery.***

Keywords: Rotary Handpiece, Bilateral Impaction, Passive closure

1. Introduction

The removal of impacted teeth is one of the most commonly performed surgical procedures by oral and maxillofacial surgeons all over the world. Impacted teeth are present in approximately 20% of the population, where mandibular third molars are most common. It has been well documented that impacted third molars, either partial or complete, are associated with several complications including pericoronitis, regional pain, trismus, distal caries, cysts, tumors and arch crowding.[1,2] Removal of third molars is associated with many postoperative complications like pain, swelling, trismus, nerve injury, bleeding, paresthesia, and dry socket. Depending on the complexity of procedure, response of patient varies.[1]

Methods to alleviate these complications have been the focus of several experimental studies. Techniques that allow for evacuation of inflammatory exudates appear to have received more attention in the past as these have been thought to result in less pain, swelling and trismus. These include closure techniques and suture configuration.[1]

In conventional closure technique, the incision margins are joined and the flap is repositioned to heal by primary intention. In passively repositioned closure technique, the wound margins are approximated by suturing in such a way that the flap is passively repositioned especially in the area immediately distal to the second molar which is allowed to heal by secondary intention.[3]

Several studies have suggested that postoperative complications are closely related to surgical suture techniques, surgical drainage and the use of anti-inflammatory drugs. In addition, some new interventions including collagen membranes, bromelain, betamethasone, hyaluronic acid, and ozone have been proposed for the control of postoperative complications of extraction of impacted mandibular third molar. In Primary closure, the socket is covered and sealed by an air tight mucosal flap. In Secondary closure, a 5–6 mm wedge of mucosa distal to the second molar is removed and the flap repositioned. Interrupted Sutures are used to form a triangular opening distal to the second molar, which creates passive drainage of the inflammatory exudate, and avoids placing drains.[4,5] There are studies that have shown significantly less postoperative pain, swelling and trismus in cases where healing was achieved by secondary intention in third molar surgery.[6] However, many authors stated that primany intention was better than secondary intention with regard to postoperative pain, swelling and trismus.[5] Hence, a need was felt to compare the two techniques of closure after third molar surgery.

In this prospective study, we have compared the effect of passively repositioned closure technique and conventional closure technique on pain, swelling, trismus and periodontal health in third molar surgery.

2. Materials and Methods

This was a comparative, cross-sectional, split-mouth study conducted on 40 patients who reported to the Department of Oral and Maxillofacial Surgery for the surgical extraction of impacted third molar.

The angulation, depth, ramus relationship and root morphology of mandibular third molars were assessed. After obtaining written informed consent, patients were scheduled for bilateral mandibular third molar surgery in two sessions, with 1 month interval inbetween. For the purpose of data collection, the impacted lower third molar surgeries on either sides were divided into two groups- Group A– Those in which passively repositioned closure was used. Group B– Those in which conventional closure was used. The allocation of surgical sites were randomly made.

Inclusion Criteria

- Patients requiring surgical removal of bilateral impacted third molars with appropriate indications for the same.
- Patients with intraosseous impaction having similar Warfe's difficulty assessment index for bilaterally impacted third molars.
- Patients in good physical health with no clinically significant and relevant medical history.
- Patients understanding and willing to follow all study procedures.

Exclusion Criteria

- Patients unable or unwilling to sign the informed consent form.
- Patients with a history of allergy to the drug given during the course of the treatment.
- Immunocompromised individuals including those with severe debilitating diseases.
- Patients having a past history of deep vein thrombosis or current use of anticoagulants.
- Pregnant, lactating, or female participants taking oral contraceptives.

The ethical clearance for the study was provided by an institutionally approved ethical committee (IEC Ref No.: SDDHDC/IEC/2019/04A) and all subjects were informed about the nature of the study and the probable side effects from the drugs being administered. A written informed consent was obtained from all the patients.

3. Procedure

Pre-operative preparation of patient

A detailed medical and dental history and intraoral periapical radiographs of the surgical site were taken. Patient was prescribed antibiotics and analgesics preoperatively. Patient was asked to rinse with 0.2% chlorhexidine gluconate mouthwash 30 minutes prior to procedure. Patient's extra oral skin preparation was done using 5% Betadine solution. Patient was draped subsequently with sterile drapes. Local anesthesia was obtained using 2% lignocaine hydrochloride with 1:80000 adrenaline.

Surgical Technique

After administering local anesthesia of 2% lignocaine hydrochloride with 1:80,000 adrenaline, a modified ward's incision was made to reflect the flap. A triangular mucoperiosteal flap was raised using periosteal elevator to expose the tooth and surrounding bone. Bone guttering and tooth sectioning, if required, was done using straight fissure bur and tooth was removed.

In case of group A, the flap margins were passively repositioned by suturing at an area slightly distal to the distal surface of second molar so as to allow healing by secondary intention (Fig.1). In case of group B, the flap margins were closed in a conventional method without any gaps to allow healing by primary intention (Fig.2). 3-0 silk suture material was used on both the groups. Same medications were given postoperatively after removal of both third molars in both the groups: Cap. Amoxicillin 500 mg thrice daily for 5 days and Tab. Diclofenac 50 mg twice daily for 5 days. Patients were advised to take a soft diet for one week prior to surgery. Patient were recalled thereafter according to the study protocol and parameters were recorded. The patients were followed up for one month with recall visit at 1st, 3rd and 7th day.

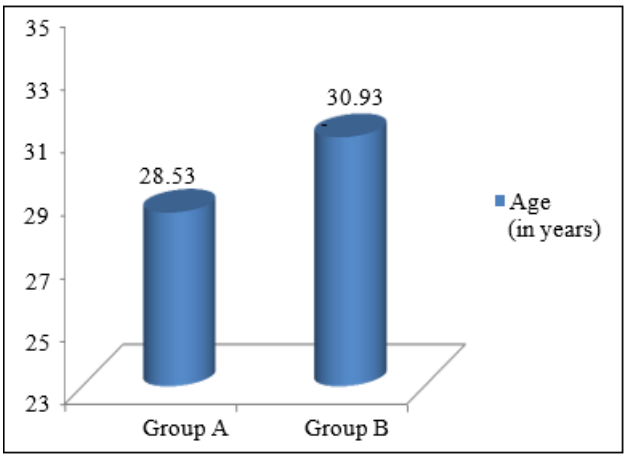
Figure 1: Suturing Done Using Passively Conventional Repositioned Closure Technique

Figure 2: Suturing Done Using Closure Technique

Data was analyzed using the statistical package SPSS 22.0 (SPSS Inc., Chicago, IL) and level of significance was set at $p<0.05$. Descriptive statistics was performed to assess the mean and standard deviation of the respective groups. Normality of the data was assessed using Shapiro Wilkinson test. Inferential statistics to find out the difference between and within the groups was done using STUDENT T TEST and ONE WAY ANOVA and TUKEYS POST HOC TEST. CHI SQUARE TEST was used to assess the difference in proportion.

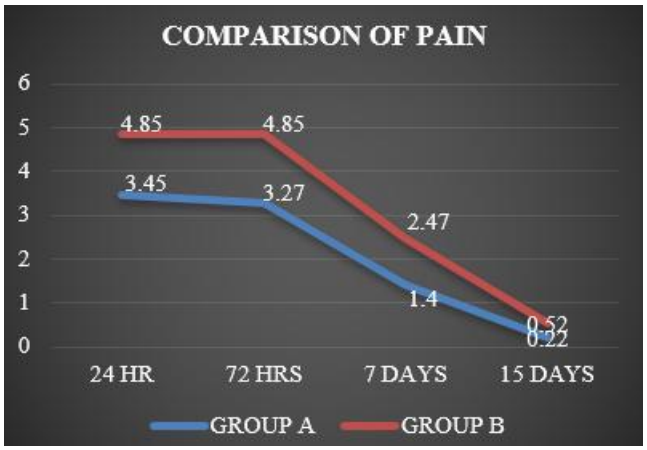
4. Observations and Results

The present study comprised of 40 patients, distributed equally into groups A (those in which passively repositioned closure was used) and group B (those in which conventional closure was used). The mean age was calculated to be 28.53±5.67 and 30.93±6.54 years respectively (graph 1). Graph 2 and Graph 3 shows the comparison of pain and mouth opening among the study groups, respectively. Both Group A & Group B showed significant difference in pain score at all paired intervals ($p<0.05$) except 24 hrs vs 72 hrs ($p>0.05$). Percentage wise difference in pain score was more reported in Group A compared to Group B (93.6% vs 89.3%). Both the groups reported significant difference in mouth opening score at all the paired time intervals ($p<0.05$) except pre-op vs 15 days & 24 hrs vs 72 hrs intervals ($p>0.05$). Percentage wise difference in mouth opening was more reported in Group B compared to Group A (3.5% vs 0.9%).

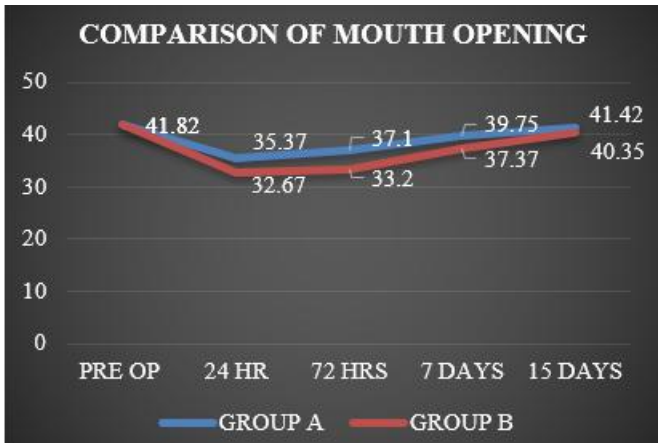


Graph 1: Mean Age among the Study Groups

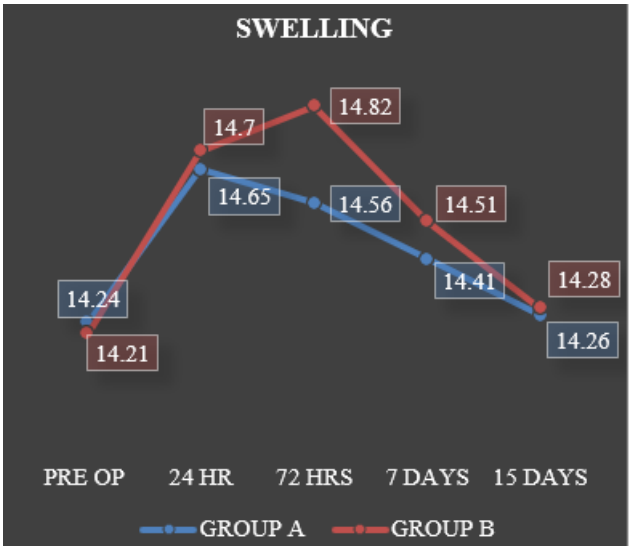
Graph 4 and Group 5 shows the comparison of swelling and periodontal health among the study groups, respectively. Analysis using ANOVA test within the group showed no significant difference in swelling and periodontal health score in both the groups ($p<0.05$). Percentage wise difference in swelling was more reported in Group B compared to Group A (0.4% vs 0.1%). Neither Group A nor Group B reported any significant difference at all the paired time intervals ($p>0.05$). Percentage wise difference in periodontal health score was more reported in Group B compared to Group A (15.5% vs 0%).



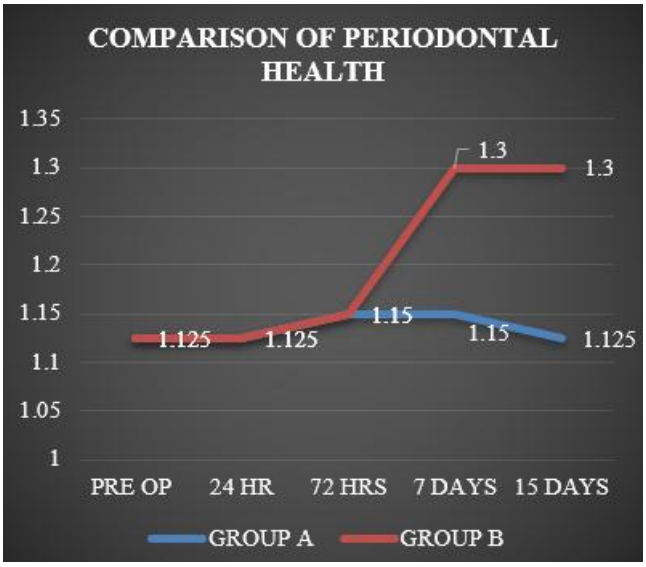
Graph 2: Comparison of Pain between the Opening Study Groups ($P<0.05$)



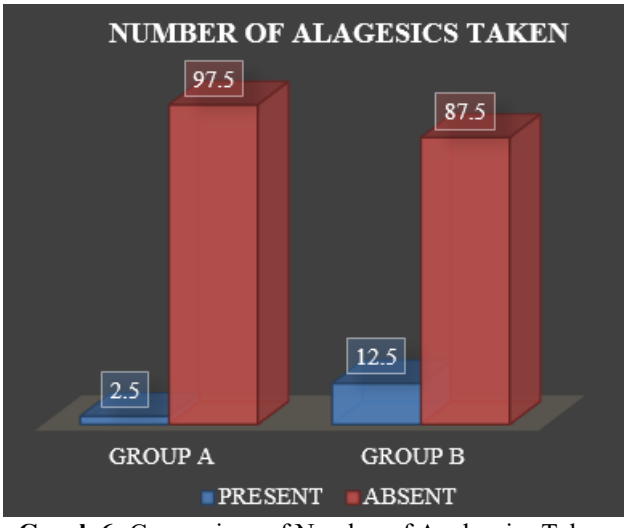
Graph 3: Comparison of Mouth Study Groups ($P<0.05$).



Graph 4: Comparison of Swelling between the Health Study Groups (P<0.05)



Graph 5: Comparison of Periodontal between the Study Groups (P<0.05).



Graph 6: Comparison of Number of Analgesics Taken among the Study Groups (P<0.05).

Graph 6 shows any drug taken among the study groups. Chi square test analysis reported there was a significant difference in proportion of the participants in taking the drugs between the groups (p<0.05).

5. Discussion

The closure technique is an operative factor that has been linked to early postoperative complications after third molar surgery. The method, in which room is provided for the evacuation of the inflammatory exudates, will obviously result in less pain, swelling, and trismus. The technique has variously been described as partial closure, secondary closure, and secondary healing by different investigators. The published data have described several methods of achieving partial closure, including excision of mucosa immediately distal to the second molar to create a window, which serves as an outlet for the inflammatory exudates. Other methods have included a combination of mucosa excision and placement of drains, incorporation of drains that could be in the form of a gauze or rubber, and a "sutureless" technique in which no form of suturing is performed. These methods are associated with one or more limitations.[4,6]

A technique in which no form of suturing is performed has been described by "Waite and Cherala". They reviewed the outcomes of surgical extraction of 1,280 third molars in 366 patients without suture placement. They reported less pain because the technique allowed for open drainage of the extraction sockets. This emerging technique has the advantages of reducing the operative time and less tissue manipulation. A sutureless technique might, however, be limited to cases in which minimal incisions are used for third molar surgery.[4]

Partial closure, using a single suture, is simple, cost-effective, free of additional medication, less traumatic, and saves operative time.[4] A surgeon can use single suture to achieve this primary closure, and, sometimes, a modification to the flap design is necessary to facilitate advancing the flap over the extraction socket. Placement of a dressing, or insertion of a drain into the lower third molar surgical wound have been used to modify wound healing, and alleviate post-operative complications.[4]

Conflicting opinions have been expressed in the literature concerning the technique of wound closure after removal of impacted mandibular third molar. In secondary healing, the socket remains in communication with the oral cavity whereas in primary healing the socket is covered & sealed hermetically by a mucosal flap. Primary wound closure may cause postoperative edema, pain, facial swelling & trismus. The extent of swelling and the severity of pain are the chief indicators of patient comfort during the post-operative period after third molar removal.[7]

Facial swelling was determined by the method defined by Amin and Laskin- the horizontal distance from the lower attachment of the earlobe to corner of the mouth and the vertical distance between the angle of the mandible to the outer canthus of the eye using thread. This method is obviously not as accurate as computerized tomography scanning or magnetic resonance imaging for making precise measurements of facial soft tissue volume, but it is a simple

cost-effective and time-saving method which provides numerical data for determination of soft tissue contour changes.[6]

In a study of **Osunde et.al.** in 2011, single suture closure technique was better than multiple suture technique with regards to postoperative pain, swelling and trismus.[4] In a study by **Osunde et.al.** in 2012, postoperative pain and swelling was found to be significantly less in the group in which sutureless technique was employed.[6]

In a study by **Maria A et.al.** in 2011, the procedure of choice after removal of impacted third molar is a secondary closure and healing by secondary intention. A secondary closure appears to minimize the postoperative edema, pain and trismus and thus contributes to enhanced patient comfort.[8] This was consistent with a study of **Shivpuri A. et.al.** in 2017, in which he compared the effect of primary vs secondary wound closure technique after removal of impacted mandibular third molars on postoperative sequelae and results showed that secondary healing after surgical removal of impacted mandibular third molars may have considerable advantages over primary healing in terms of post-surgical quality of life.[7]

In a study of **Dubois D.D. et.al,** in 1982, secondary closure appears to minimize immediate postoperative edema and pain, and thus contributes to enhanced patient comfort. Further, the postoperative care and hygiene of secondary closure was more easily managed by the patient than a primary closure site that has dehisced.[8]

The present study comprised of 40 patients, distributed equally into group A (those in which passively repositioned closure was used) and group B (those in which conventional closure was used) compared the effect of suture-less (secondary closure) and multiple sutures (primary closure) techniques on postoperative pain, swelling and trismus.[6] The aim of the study was to determine whether statistically significant differences was present in the level of postoperative pain, swelling, mouth opening and periodontal health.

These postoperative pain and swelling evaluation were not in accordance with the study by **Dubey K.G. et.al.** in 2019, who compared primary and secondary closure of surgical wounds after removal of mandibular molar. According to him, there was no significant difference in pain between primary and secondary healing, but oedema was less at secondary healing site.[9] However, in a study by **Dr. Alkadi S. et.al.** in 2018, showed similar results to our study that one-suture technique for lower third molar surgery is superior to the suture-less technique in reduction of post-operative pain and improving wound healing during early postoperative period. He further added that there was no difference between the two techniques in reduction of postoperative swelling.[4]

The findings of the present syudy are in accordance with the study of **Anighoro E.O. et.al.** in 2013, who assessed the effect of wound closure technique on postoperative sequaele and complications after impacted mandibular third molar extraction. According to him, there was comparartive reduction in postoperative trismus and pain after impacted mandibular third molar surgery when a partial wound closure technique was done.[3]

But in a study by **Nayak S.S. et.al.** in 2020, the results showed that sutureless anterior releasing incision decreases the postoperative swelling and edema, but the periodontal healing was poor when compared to sutured anterior releasing incision cases. He further added that the type of closure technique did not have any significant influence on trismus and pain.[10]

Postoperative evaluation of periodontal health was done after 1 month and 3 months, respectively. The findings of the present study are in accordance with the study of **Monaco G et.al.** in 2009, in which he evaluated two different flap designs after mandibular third molar removal in young patients. The results showed that no difference in periodontal healing were noted between two different flap designs.[11]

This is consistent with the study done by **Centinkaya BO. et.al.** in 2009, which supported these findings as the intergroup comparison showed that 6 months probing pocket depth (PPD) and clinical attachment loss (CAL) values of distal surfaces were significantly higher in the simple suture group when compared with the achor suture group.[11] The findings of the present study are also in accordance with the study of **Pachipulusu P.K. et.al.** in 2005, whose results showed that irrespective of any closure technique, there is no difference in terms of periodontal healing.[12] However, there was a difference in the results according to the study of **Nayak S.S. et.al.** in 2020, which showed that the periodontal healing was poor when compared to sutured anterior releasing incision cases.[10]

Statistical analysis showed that significant difference was reported in proportion of the participants in taking the drugs between the groups ($p < 005$). Other postoperative complications like Dry socket and infection were seen during this study. 4 cases of dry socket were reported in which 3 patients developed dry sockets in Group B , and 1 patient suffered dry socket at the single suture side. No cases of infection were seen in either group. These results are in slight accordance with the study performed by **Dr. Alkadi S, Prof. Stassen L.** in 2018, in which 7 cases of dry socket were reported, 3 patients developed bilateral dry sockets, and one patient suffered dry socket at the suture-less side. No cases of infection arouse during the evaluation period of the study.[4]

The results of the present study showed a slight improvement in the postoperative parameters of pain and trismus in patients who had undergone the single suture technique compared with the multiple suture technique. A linear result was seen in case of swelling and periodontal health postoperatively in both the groups. The present study showed that, on an average, passively repositioned closure technique provide better healing, lesser postoperative pain and trismus than conventional closure technique after third molar surgery.

6. Summary and Conclusion

The results of the present study showed a slight improvement in the postoperative parameters of pain and trismus in patients who had undergone the single suture technique compared with the multiple suture technique. A linear result was seen in case of swelling and periodontal health postoperatively in both the groups. The present study showed that, on an average, passively repositioned closure technique provide lesser postoperative pain and trismus than conventional closure technique after third molar surgery.

7. Limitations of the Study

Limitations of the present study includes smaller sample size, did not compare paresthesia and intraoperative bleeding. The present study considered the mean value to statistically analyze the time taken for all the procedures, no attempt was made to analyze the time taken according to the difficulty of extraction. Hence there is need for further studies with larger sample size to compare the surgical outcome of third molar surgery using conventional rotary handpiece and piezotome in third molar surgery.

Strength: This study being a cross over study, all the participants included with similar Pederson's difficulty Index and were exposed to both the techniques (Passive closure and Conventional closure technique) within the interval of one month. Inferential statistics to find out the difference between and within the groups was done using STUDENT T TEST and ONE WAY ANOVA and TUKEYS POST HOC TEST. CHI SQUARE TEST was used to assess the difference in proportion.

Declaration of Patient Consent: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: NIL

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