Comparison of complications following primary and secondary wound closure after surgical extraction of impacted mandibular third molars among patients visiting a tertiary care center, Gandaki Province

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ABSTRACT

Introduction: The surgical extraction of impacted mandibular third molars is often associated with post-operative complications and is affected by degree of impaction, surgical technique, operator's skills and wound closure method. The purpose of this study was to compare the effect of primary and secondary wound closure after surgical removal of impacted mandibular third molars. **Methods:** A hospital-based cross-sectional study was conducted in 40 patients and were divided into two groups using lottery method of 20 each. Twenty patients underwent primary closure of the wound while other 20 underwent secondary closure. Post-operative pain, swelling and trismus were evaluated on third and seventh day of extraction. **Results:** The mean age of the patient was 31.57 years. The mean VAS score for pain was more on third day in patients with primary closure (2.70±0.733). This finding was statistically significant (p<0.001). On seventh day, it was more for the patients with primary closure but was not statistically significant. The mean VAS score for swelling was more on third day in patients with primary closure (3.70±0.73). Furthermore, it was same on seventh day for both groups (0.50±0.51). Both of these findings were not statistically significant. The secondary closure group had a higher mean mouth opening than the primary closure group on third day (40.35±0.93) which was statistically significant (p<0.001). In seventh day, both groups had the same mean mouth opening (41.20±0.89) which was not statistically significant. **Conclusions:** The secondary wound closure technique had a significant advantage over primary wound closure concerning pain, swelling and trismus.

Keywords: Facial swelling, impacted third molar surgery, post-operative pain, primary wound closure, secondary wound closure.

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INTRODUCTION

The surgical extraction of impacted mandibular third molars is a common procedure in oral and maxillofacial surgery. Like other surgical procedures, it is also associated with postoperative outcomes such as trismus, pain, swelling and chewing activity which are due to the tissue inflammation visible at different levels which sometimes increases the recovery period as well as the cost of treatment.[1] Significant postoperative complications could be faced due to such healing process because of the impotency of exudation of inflammatory tissues to leak out.[2] Hence, it is important to close the wound by keeping the sharp estimation of wound edges which is routinely done by the surgeons. There are two types of wound closure during surgery: primary and secondary wound closure. In primary closure, the skin is closed at the end of the surgery, whereas in the secondary closure, the wound is left open at the end of surgery and heals by granulation and contraction.

Primary wound closure helps in convenient maintenance of effective oral hygiene, and hemorrhage control. However, suturing creates a

one-way valve that allows food debris to enter the socket but does not allow to escape.[3] This leads to local infection, inflammation, edema, clot necrosis, alveolar osteitis, and pain. Secondary wound closure with minimal manipulation of soft tissues, decreases time of surgery, leaving a self-drainage pathway for inflammatory exudate, and thereby reducing postoperative inflammation with impact on improving the oral health related quality of life index. Abundant data exists regarding the advantages of secondary wound closure technique after third molar surgery like less pain, swelling, and trismus.[2,4-7] To our knowledge, there are only few studies done regarding the comparison between secondary and primary wound closure after third molar surgery in our population.[8]

This study aimed to evaluate the techniques of primary wound closure as well as secondary wound closure after removal of mandibular third molar and the difference of both techniques in term of swelling, pain, and trismus among the patients visiting a teaching hospital.

METHODS

This was a hospital-based cross-sectional study conducted at the Department of Oral and Maxillofacial Surgery, Gandaki Medical College Teaching Hospital and Research Center, Pokhara, Nepal. The data collection was done from March 2024 to May 2024, after obtaining ethical approval from the Institutional Review Committee (Ref. No. 85/080/081-F). The nature of the study was explained to each participant and written consent was obtained. A convenience sampling technique was used to enroll the participants in the study. Sample size was calculated from the study by Khande et al.[6] and using the formula:$n=2(z\alpha+z\beta)2x(s)^2/d^2$ where, n= sample size required /group, Zα (z deviate corresponding to the α error rate) = 1.96, Zβ (z deviates corresponding to the β error rate) =0.84, S (standard deviation) = 0.38, d (mean difference between two groups) = 0.39 Considering 20% loss to follow-up, the total sample size in each group was calculated as 16 in each group. So, the total calculated sample size was ≈32 and recorded sample size was 40.

All the patients between age 20 to 40 years, referred to the Department of Oral and Maxillofacial surgery for removal of impacted mandibular third molar surgically were enrolled in this study. Patients with any comorbidities, pregnant patients, patient using antibiotics which will later affect the wound healing process and smokers were excluded from the study. Using lottery method, patients were divided into two groups. Primary and secondary closure technique were done in 20 patients each. The data were collected by interviewing, clinically examining and post-operative evaluation on third or seventh day of surgical extraction. The data were collected by single examiner. Consent was taken from every patient before surgery. Orthopantamogram was used to assess third molar angulation to the long axis of second molar.

Before surgical procedure, mouth opening as well as facial swelling was assessed to set a baseline. Local anesthesia of 3ml (2% lidocaine HCl with 1:200000 adrenaline) was given to the patients (long buccal nerve block and an inferior alveolar nerve block). Ward's incision was used to perform all extraction surgeries. From the anterior border's elevated point of mandibular ramus, incision was initiated to the distobuccal cusp's distal surface of mandibular 2nd molar which continued laterally to the buccal side's sulcus of second molar of mandible. For flap relieving process, the incision was made vertically. Using periosteal elevator, the mucoperiosteum flap was raised and by guttering method, the removal of alveolar bone was performed under irrigation using a round bur. As per requirement, fissure bur was used for tooth sectioning and Coupland elevator was used for extraction of tooth portion. After hemostasis, primary/ secondary closure was done in accordance with the lottery.

The primary closure of the socket was performed by placing two sutures on the distal arm of the incision and one on the mesial arm of the incision. (Figure 1) Secondary closure of the socket was performed by removing a wedge of mucosa distal to the second molar and by placing one suture on the mesial arm of the incision and another suture on the distal arm of the incision.[7] (Figure 2) The sockets were secured using 3-0 silk sutures. Post-operative prescriptions of amoxicillin 500 mg and diclofenac sodium 50 mg, three times daily for five and three days, respectively, was given to all patients.

Follow-up of patients were recorded at third and seventh post-operative day to assess level of pain, swelling and trismus. For subjective evaluation, a card describing predetermined values of pain & swelling[9,10] was given to all patients and they were asked to fill the record every day for seven subsequent days starting six hours post-operatively making reference to the predetermined value. The data of third and seventh day were taken into consideration.

Figure 1: Primary closure of wound

Figure 2: Secondary closure of wound

Visual analog scale (VAS) was used subjectively to assess pain and swelling which was rated on a scale from 0 (no pain) to 5 (extreme severe pain) for pain and 0 (no swelling) to 5 (extremely sever swelling).[9,10] Vernier calipers was used to measure maximum interincisal distance to assess trismus.

The obtained data were entered into a Microsoft Excel sheet. The collected data was entered in Statistical package for social sciences (SPSS) version 16.0. Independent sample t- test was used to explore the difference between two groups in terms of pain, swelling and trismus.

RESULTS

Out of 40 patients, 25(65.0%) were males. The mean age of the patients was 31.57 years. The mean VAS score for pain was more on third day in patients with primary closure (2.70±0.73) than with secondary closure (1.30±0.47). This finding was statistically significant (p<0.001). Similarly, the mean VAS score for pain on seventh day was more for the patients with primary closure but this was not statistically significant. (Table 1)

Table 1: Comparison of pain level on third and seventh day after surgery

Post-operative day	Primary Closure	Secondary Closure	p-value*
Third day	2.70±0.73	1.30±0.47	<0.001**
Seventh day	0.50±0.51	0.45±0.51	0.75

*Independent t-test **p<0.001 denotes statistical significance

The mean VAS score for swelling was more on third day in patients with primary closure (3.70±0.73) compared to those with secondary closure (1.65±0.67). Furthermore, mean VAS score for swelling on seventh day was same for both groups (0.50±0.51). However, all these findings were not statistically significant. (Table 2)

Table 2: Comparison of swelling on third and seventh day after surgery

Post-operative day	Primary Closure	Secondary Closure	p-value*
Third day	3.70±0.73	1.65±0.67	<0.001**
Seventh day	0.50±0.51	0.50±0.51	1

*Independent t-test; **p<0.001 denotes statistical significance

The secondary closure group had a higher mean mouth opening than the primary closure group on third day. (40.35±0.93) The difference was statistically significant (p<0.001). In seventh day both groups had the same mean mouth opening (41.20±0.89) which was not statistically significant. (Table 3)

Table 3: Comparison of trismus measurement on third and seventh day after surgery

Post-operative day	Primary Closure	Secondary Closure	p-value*
Third day	37.75±1.33	40.35±0.93	<0.001**
Seventh day	41.20±0.89	41.20±0.89	1

*Independent t-test; **p<0.001 denotes statistical significance

DISCUSSION

The extent of pain, swelling and trismus are the primary indicators of patient discomfort during the postoperative period following the removal of third molars. These symptoms are a normal inflammatory response to the surgical trauma involved in the extraction procedure and are the most frequent adverse effects reported by patients. Their severity can significantly impact a patient's quality of life during recovery, affecting daily activities such as eating, speaking, and oral hygiene procedures. Because these factors are central to the patient's experience of recovery, they are the main parameters used in most clinical studies to evaluate the effectiveness of different surgical techniques or pain management interventions.

The data were recorded in third day because it is often considered the most critical day where symptoms such as pain and swelling gets peaked due to the natural progression of the inflammatory response. Monitoring on third day helps in early detection if pain and other symptoms worsen instead of improve. Also by third day, initial healing processes, such as the formation of granulation tissue in secondary closure sites or early epithelial migration in primary closure sites, are underway.[4] By seventh day, pain and swelling significantly reduces and continue to fade under normal healing conditions. This time point confirms the patient is recovering well or highlights a potential ongoing issue.[5]

Pain is a subjective experience influenced by various factors such as the patient's age, cultural background, educational level, previous pain experiences, and individual pain threshold and tolerance. Therefore, the assessment of pain is quite challenging.[11] The VAS has been established as a reliable and sensitive tool for recording pain intensity.[12] This study showed that the pain was more in patients with primary closure group compared to the secondary closure group in both third and seventh day. This was supported by several studies.[9,10,13,14] Primary closure after a third molar extraction can lead to more pain than secondary closure because it traps inflammatory fluid and blood in the socket, while secondary closure allows for drainage. This trapped

fluid in a primary closure may put pressure on nerves, while secondary closure, or leaving the socket to heal by secondary intention, reduces pain, swelling, and the risk of complications like infection. However, in some studies showed that pain was greater in primary closer group on all seven days after surgery.[6,15]

In this study, swelling decreases substantially from the third to the seventh day in both surgical closure groups. Patients with primary closure had significantly more swelling compared to those with secondary closure. These findings are consistent with other studies done in literature.[10,14] Facial swelling is a relatively constant postoperative finding which could be due to the accumulation of inflammatory exudate within facial tissues, hematoma collection or both. Partial wound closure ensures drainage, minimizes immediate postoperative edema, thereby reducing patient's discomfort.[16] In contrast to these findings, study done by Holland et al.[17] showed better healing in primary closure group.

In this study, the secondary closure group had a higher mean mouth opening than the primary closure group on third day and by seventh day both groups had the same mean mouth opening. This is in accordance with other studies.[18-20] Trismus being distressing and painful for the patient, it may also limit the dentist to perform any required oral examination or provide treatment that required proper access within the oral cavity. Postoperative pain is also a cause of limitation in mouth opening following third molar surgery.[21] Other factors such as low-grade infection post-administration of local anesthetic agents; multiple needle penetrations correlate with a greater incidence of postinjection trismus, especially if the barbed needle, and the most commonly involved muscle is medial pterygoid during inferior alveolar nerve block; elevation of flap beyond the external oblique ridge and at times, the patient hurts his/her own tongue or cheek under the effect of anesthesia resulting in reflex trismus.[22] Trismus may also result in an increased risk of aspiration as it interferes with normal swallowing mechanics (dysphagia) and the ability to manage food, liquids, and even saliva effectively.

This study found that secondary healing provided greater patient comfort with respect to the pain, swelling and trismus which is consistent with the findings of other reports.[5,22] The different type and degree of impactions could have different complications. Hence, categorization of the complication in accordance with the type of impaction could have added value to the finding of our study. The comparison of the delayed presentation complications if any among the two groups was not possible due to short follow-up duration of the study. Similarly, the study was conducted within the Nepalese subpopulation. However, further studies with larger sample sizes and longer follow-up periods are recommended to more comprehensively evaluate the effect of secondary wound closure on postoperative morbidity following impacted mandibular third molar surgery.

CONCLUSIONS

This study concluded that the secondary wound closure technique offers a significant advantage over primary closure with respect to post-operative complications like pain, swelling and trismus. Thus, we recommend to reassess our practice in third molar surgery and consider secondary wound closure technique as a cost-effective alternative to reduce postoperative morbidity of third molar surgery especially in developing countries like Nepal. We also suggest to perform a multicentric long-term study involving general dentists and patients to find out long-term complications and reproducibility of the result in routine practices.

CONFLICTS OF INTEREST: None declared

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AUTHORS' CONTRIBUTIONS

DCP is the principal investigator of this study. UK contributed to the study design, methods and writing of the manuscript. DCP undertook data collection, led the analysis and writing of the manuscript with major contributions from UK. DCP did data cleaning and monitoring aspects of the protocol. All authors read and contributed to the writing of the paper and have read and approved the final manuscript.

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