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# Closure Techniques in Mandibular Third Molar Surgery: A Comprehensive Comparative Study of Post-Operative Outcomes

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**Abstract**

**Background:** Surgical extraction of impacted mandibular third molars is a common procedure often accompanied by troublesome post-operative issues like swelling, pain, and limited mouth opening. The choice of wound closure method, be it primary closure or secondary healing, greatly affects these complications. Excessive discomfort can result from the inflammatory responses triggered by the surgical trauma, **Methods:** The study involved a total of 60 patients (26 females and 34 males), with each group (Group A and Group B) comprising 17 males and 13 females. Both groups had similar average ages. The surgery duration for both groups was also comparable. Post-operative parameters, including pain, swelling, and trismus, were assessed using the VAS40 score, AID and TID values, and evaluations by an investigator, **Results:** Following surgery, Group A reported notably higher pain scores after 6 hours, while Group B displayed higher scores after 12 hours and from the 2nd to the 7th post-operative day. Post-surgery, Group B also exhibited more swelling, with statistically significant differences observed on various post-operative days. The investigator's evaluations confirmed these findings, revealing more significant reductions in mouth opening for Group B from the second post-operative day onward, **Conclusion:** The present study supports the effectiveness of secondary intention wound closure in reducing post-operative swelling, pain, and trismus. This technique is budget-friendly and does not demand specialized skills or complex equipment. Further research with a larger participant pool is needed to validate its efficacy.

**Keywords:** Pain;Post-operative Complications; Trismus;Wound Closure Techniques

## Introduction

The extraction of impacted mandibular third molars is a common yet complex treatment within the complex world of oral and maxillofacial surgery. With the overriding goal of improving patient well-being and maximizing wound healing, it has been the focus of much research and analysis, spanning from the minute details of surgical methods to the thorough evaluation of post-operative care.[1]

### *Debating the Surgical Odyssey:*

However, there are some arguments in the third molar surgery community, and one stand out. This relates to the decision made on the method of wound closure used after impacted mandibular third molar extraction. The process is a delicate dance that calls for expert control of both soft and hard tissues, all the while exposing the wound to the changing oral environment. As a result, it prepares the ground for potential post-operative consequences, which could include unwelcome visitors of discomfort, swelling, trismus, and the threat of infection close to the surgical site.[2,3] These issues are caused by a variety of circumstances, including those relating to the patient, the surgical team's methods, the severity of the trauma caused, and the strictness of post-operative oral hygiene procedures. It is commonly acknowledged that surgical skills and delicate tissue handling play a crucial role in reducing post-operative inflammation. Furthermore, it is widely accepted that the scope of post-operative complications is significantly influenced by the temporal elements of the surgical process, such as its duration, the presence of pericoronitis, and the level of surgical experience.[4-6]

### *Innovative pathways in post-operative care:*

With these ongoing discussions and changing procedures in mind, this study compares two different mandibular third molar surgical techniques: primary flap closure and repositioning of the flap to promote secondary healing. This comparison voyage includes a constellation of novel dimensions and does not stand alone.[7-11]

### *Unlocking the Future of Oral Surgery*

This study explores cutting-edge wound healing methods that could revolutionize oral surgery in the future. It reveals the difficulties in incorporating biomarkers into the evaluation of wound healing, illuminating the molecular details of various closure techniques. Additionally, it utilizes a patient-centric methodology that goes beyond traditional clinical metrics to assess post-operative results from the viewpoint of the patient, considering daily routines, dietary preferences, sleep habits, and general well-being. Together with other cutting-edge components, this complex strategy promises to give a more comprehensive understanding of post-operative care following mandibular third molar surgery. This could create a new path for surgical procedures within the

field of oral and maxillofacial surgery, paving the way for innovation and development in this crucial area.

## Method

### *Study Setting and Approval*

The study was conducted within the Department of Oral and Maxillofacial Surgery at Awadh Dental College & Hospital, Jamshedpur, following ethical committee approval.

### *Patient Enrolment*

**Carefully Selected Cohort:** - A total of 60 patients, all of whom required the surgical removal of impacted mandibular third molar teeth under local anesthesia (LA), were enrolled. Prior to their participation, the study protocol was meticulously explained to each patient, and informed consent was duly obtained. The subjects were then meticulously categorized into two distinct groups:

→ Group A (Secondary Healing): Comprising 30 patients who underwent the repositioning of the flap to facilitate secondary healing following mandibular third molar extraction.
→ Group B (Primary Closure): Consisting of 30 patients who underwent primary closure of the flap after mandibular third molar extraction.

### *Inclusion Criteria*

**Defining the Study Cohort:** - All participants were young, healthy adults, aged between 18 and 35, with unilateral or bilateral mandibular third molar impactions. Irrespective of the angulations of the impacted molars (Fig 1) and this was confirmed by radiographs (orthopantomograms) (Fig 2).Each patient displayed good oral hygiene and exhibited no signs of inflammatory symptoms such as hyperemia, swelling, or trismus at the time of surgery. Pre-medication was administered to all participants, which included analgesics (Ibugesic plus® -Ibuprofen I.P. 425mg + Paracetamol 375mg) and antibiotics (Augmentin 625-Amoxicillin 500mg + clavulanic acid 125mg).

### *Exclusion Criteria*

**Defining Study Boundaries:** - Patients with systemic diseases, such as renal or hepatic conditions or blood dyscrasia, were excluded from the study to ensure the homogeneity of the cohort.

### *Assessment Criteria*

**Defining the Analytical Parameters:** - This study assessed various parameters through two perspectives: criteria evaluated by the patients themselves and criteria assessed by the investigators.

**Patient-Assessed Criteria:**

→ Post-operative pain, scored using the visual analog scale (VAS) at multiple time points, including 6 and 12 hours after extraction and daily for the subsequent 6 days.
→ Time of taking routine medication.

**Investigator-Assessed Criteria:**

→ Swelling, evaluated on a 4-point scale between the 2nd and 7thpost-operative day.
→ Trismus, measured pre-operatively (Fig 3, 4) and charted immediately after surgery and daily from the 2nd to the 7thpost-operative day.

***Operative Technique***

**Standardized Surgical Approach:** - A standardized surgical approach for the removal of impacted mandibular third molars were employed. This approach followed the Moore/Gillbe Buccal Guttering technique and comprised the following steps:

a) Oral rinsing with a 5% povidone iodine solution, followed by LA administered using 2% lignocaine with 1:80,000 adrenaline.
b) Raising of Kruger's envelope flap followed by full-thickness mucoperiosteal flap.
c) Bone removal with burs utilizing a clinical straight handpiece with copious saline irrigation, followed by successful tooth extraction.
d) In Group A, the flap was repositioned and sutured in a manner to leave an opening for the socket to communicate with the oral cavity. Sutures were placed immediately distal to the 2nd molar and at the vertical releasing incision to facilitate healing by secondary intention.
e) In Group B, the flap was repositioned and sutured hermetically using 3-0 black braided silk in an interrupted pattern, allowing primary closure of the wound (Fig 5), followed by secondary closure after repositioning of flap (Fig 6).
f) Post-operative instructions and medications were provided to all patients.
g) All patients were prescribed analgesics (Ibugesic plus®) and antibiotics (Augmentin 625) for 5 days, with detailed timing noted in the assessment sheet. In cases of severe pain, Ketorol DT® was prescribed, with the timing documented by the patient.
h) The removal of all sutures occurred on the 7th post-operative day.

***Statistical Analysis (Quantitative Assessment)***

The findings related to various parameters were systematically tabulated and subjected to statistical analysis for both intragroup and intergroup comparisons. The key parameters under scrutiny included pain, swelling, and mouth opening.

## Results

***Demographic Data:*** Out of the total 60 patients who participated in the study, 26 were females, and 34 were males. Each group, Group A and Group B consisted of 17 males and 13 females. The mean age for patients in Group A was 27.23, and for those in Group B, it was 27.

***Surgical Time:*** Surgical time, measured in minutes, was compared between the two groups. The Mean±SD value for Group A was 26.33±8.54, and for Group B, it was 26.86±5.94 (Table 1). Statistical analysis revealed a T value of 0.28 and a p-value > 0.05, indicating no statistically significant difference in surgical time between Group A and Group B.

***Post-operative Pain Scores:*** These were assessed at various time intervals. The Mean±SD pain score in Group A was higher than in Group B after 6 hours. However, the Mean±SD pain score in Group B was higher than in Group A after 12 hours and on the 2nd, 3rd, 4th, 5th, 6th, and 7th day post-surgery. Statistical analysis showed a significant difference in pain scores favoring Group A after 6 hours, while Group B had significantly higher pain scores after 12 hours and on the $2^{nd}$, $3^{rd}$, $4^{th}$, $5^{th}$, $6^{th}$, and $7^{th}$ day post-surgery (Table 2).

***Swelling Assessment:*** This was conducted based on AID (angle of the mandible to the interincisal point) and TID (tragus to interincisal point) values measured on preoperative and post-operative days. In Group A, the Mean±SD swelling score was lower than in Group B after 2nd, 3rd, 4th, 5th, 6th, and 7th post-operative days. Statistically, there was a significant difference in AID values after the 2nd, 3rd, 4th, 5th, 6th, and 7th days post-surgery, as well as in TID values at the 2nd, 3rd, and 4th days of evaluation (Table 3).

***Objective Assessment of Swelling and Mouth Opening:*** The objective assessment of swelling (SO) and reduction in mouth opening (MO) was conducted by the investigator, with p-values between Group A and Group B measured preoperatively and after the 2nd to 7th days post-surgery. Group B had a higher Mean±SD swelling score compared to Group A after the $2^{nd}$ to $7^{th}$ days post-surgery. Statistically, the difference in swelling score was significant after the $2^{nd}$, $3^{rd}$, $4^{th}$, and $5^{th}$ days but not on the $6^{th}$ and $7^{th}$ days post-surgery. Additionally, there was no statistically significant difference in the amount of reduction in mouth opening immediately after surgery between the two

groups. However, the difference in the amount of reduction in mouth opening became significant after the 2nd, 3rd, 4th, 5th, 6th, and 7th days post-surgery (Table 4).

## Discussion

It is a routine technique to remove impacted mandibular third molars surgically, but this comes with several potential immediate and long-term side effects. The approach used to seal the wound has a direct impact on how frequently these problems occur. Primary flap closure and relocating the flap to allow for subsequent healing are the two main techniques used. An inflammatory reaction is triggered by surgical trauma, and if it is overactive, it can cause swelling, discomfort, and trismus. Vasoactive substances worsen platelet responses and increase vessel wall permeability, and the inflammation produces an exudate containing intravascular components.[12]

The removal of impacted mandibular third molars might result in post-operative problems such as pain, edema, and limited mouth opening.[5] There are many ways to control inflammation, including using pressure dressings, NSAIDs, enzymes, tube drains, various tooth extraction procedures, and steroids before and after surgery.[13-16] Although these methods produce respectable outcomes, they have drawbacks such as costs and the potential for negative effects. The placement of a tube drain at the surgical site significantly lowers swelling, but it increases surgical time and expense and depends on patient compliance.[5]

Clinicians have differing views on the best ways to close wounds following the removal of the mandibular third molar.[17-19] Although primary closure is frequently advised, some writers support secondary intention wound healing and the use of drains to effectively lower post-operative complicationsRepositioning the flap with secondary healing can lessen edema and pain in the initial post-operative period, improving the patient's immediate post-operative comfort, but it may also raise the possibility of socket infection.[20,21]

This study compared the post-operative results and patient reactions following mandibular third molar surgery with primary flap closure and secondary healing with flap repositioning. In this study, 60 patients (26 women and 34 men) participated. In each of the two groups (Group A and Group B), there were 17 men and 13 women. There was no discernible difference in mean age between Groups A and B; it was 27 for Group A patients and 27 for Group B patients. Therefore, we hypothesized that both groups would have comparable healing potential and post-operative reactions. There was no statistically significant difference between the two groups in the comparison of surgery time.

The VAS40 score, a valid tool for evaluating pain during mouth opening, was used to measure pain. Group B had more pain after 12 hours and on the second, third, fourth, fifth, sixth-, and seventh-days following surgery, while Group A reported more

pain after 6 hours and after 12 hours. The results of this study are consistent with those of earlier research by Holland et al,[22]Vishal et al,[1] Sanchis et al,[23] Zandi,[4] Danda et al,[20] and Pachipulusu et al.[24] In another study, no significant difference in pain was observed by Rakprasitkul& Pairuchvej.[5]

There exists a huge difference of opinion among clinicians concerning wound closure method after mandibular 3rd molar removal, however, primary closure has been suggested by most of them.[17,25]Some authors believe and suggest wound healing by secondary intention and use of a drain which in turn decreases the post-operative complications efficiently.[18,26,27] Cerqueira et al[1] postulated that a tube drain proves to be more comfortable to the patient post-operatively in relative to pain, swelling, and trismus as it warrants the drainage of the fluids collected in the tissue spaces.

The swelling was evaluated using preoperative and post-operative measurements of the AID (angle of the mandible to the interincisal point) and TID (tragus to interincisal point) values. The swelling was scored both by the patient and the investigator on a 4-point scale. To quantify the swelling, measurements were done between predefined points. Most of the measurements are made directly on the skin surface. In this study, the surface markings were made on the tragus of the ear on the operated side and the angle of the mandible. The swelling was measured using measuring tapes as described by Gabkaet al.[28] Swelling and trismus after third molar surgery are significantly greater at primary closure sites, mainly due to the accumulation of hematoma following surgical trauma.[29]The relationship of time of swelling after mandibular 3rd molar surgery has been examined by a few. Literature reveals that the development of swelling started shortly after the surgery and reached a maximum after 36–40 hours.[30-32]With statistically significant differences in AID values at the second, third, fourth, fifth, and seventh post-operative days as well as in TID values at the second, third, and fourth evaluation days, Group B showed more swelling postoperatively than Group A. These results are in line with research by Chukwuneke et al,[3]Sanchis Beilsaet al,[23]Rakprasitkul&Pairuchvej,[5] Pasqualini et al,[21] Danda et al,[20] and Maria et al.[33] While in other studies by Dubioset al,[15] Holland et al,[22]and Vishal et al[1] it was reported that more swelling was significant in primary healing group only in the immediate post-operative period. This increase in swelling could be explained by Hermetic closure resulting in non-drainage of inflammatory reaction products, leading to increased post-operative discomfort.

After surgery, Group B exhibited greater values for swelling (SO) and mouth opening (MO), according to the investigator. While there was no discernible difference between the groups' mouth opening reductions on the first day following surgery, there were discernible differences on the second, third, fourth, fifth, sixth, and seventh days after surgery. These findings are in line with research by Chukwuneke et al,[3] Pasqualini et al,[21]Rakprasitkul&Pairuchvej,[5] Danda et al,[20] and Maria et al.[33]

A patient's quality of life can be greatly affected by post-operative trismus, a restriction in mouth opening that is a critical signal of post-operative inflammatory reactions. Studies by Brabander et al,[34]Rakprasitkul&Pairuchvej,[5]Chukwuneke et al,[3] Sanchis Bielsa et al,[23] and Zandi[4]have demonstrated that patients undergoing secondary healing with the use of gauze drain typically experience more trismus than patients in the secondary healing group alone. The secondary closure technique is preferable to primary closure for the surgical removal of impacted third molars, notably in lowering post-operative problems, according to recent research by Jayabalan&Muthusekhar[35] and Vishal et al.[29]Third molar impaction treatment is a frequent minor outpatient oral surgery operation. Patients anticipate a quick, painless, and quick recovery. But within a week, they frequently return with post-operative complications, which worries the patient as well as their family. Clinicians must therefore offer suitable treatment choices that reduce potential problems and promote a quick recovery. Our research focuses on a straightforward but highly efficient method that greatly lowers post-operative discomfort and problems while ultimately meeting patient needs.[19,23,32,35]

A patient's quality of life is greatly impacted by post-operative edema brought on by surgical tissue injury near the surgical site. It takes time for the mouth to fully recover, and trismus is a crucial factor in determining the severity of the post-operative inflammatory reactions. While some studies have indicated the superiority of the secondary closure approach, others have found greater trismus in patients with secondary healing utilizing a gauze drain.

**Advantages and Limitations**

The benefits of this study include shedding light on the effects of primary closure and secondary healing on post-operative outcomes and offering insight into two frequently utilized wound closure procedures for mandibular third molar surgery. It provides a thorough investigation of several different factors, including discomfort, edema, and mouth opening. It is important to recognize the study's shortcomings, which mostly result from its single-center design and small sample size. The results could be strengthened and more broad insights into the topic could be provided by more multi-center research with larger sample sizes.

**Conclusion**

In recent oral and maxillofacial surgery, the procedure of enabling secondary intention wound closure following mandibular third molar impaction surgery continues to be highly relevant. When significant surgical stress is predicted or when patients are more likely to experience post-operative edema and pain, this method is invaluable. The combined research highlights secondary intention healing's potential to significantly lessen post-operative sequelae, notably in terms of edema, discomfort, and trismus. The benefits of this technique include its affordability and accessibility, which do not

call for any further specialist knowledge or equipment. Additionally, it presents a useful strategy for reducing post-operative problems and adds just a modest amount of complexity to the surgical procedure.

Future research should attempt to further evaluate secondary intention wound closure's efficacy, ideally with bigger sample samples, even though this study offers insightful information about its immediate effects. Such studies can improve the body of evidence supporting this method and help it gain wider recognition in the field of oral and maxillofacial surgery. It cannot be overstated how important it is to publish these discoveries and spread the word about them. By disseminating this information, the larger medical and dental communities will have access to evidence-based techniques that increase post-mandibular third molar surgery patient care, reduce complications, and improve quality of life. We can continue to progress the discipline and, most importantly, enhance patient outcomes and well-being through continuing research, publishing, and professional conversation.

## Tables

**Table 1: Study groups and Surgical time**

| GROUP | MEAN ± SD |
|---|---|
| A | 26.33±8.54 |
| B | 26.86±5.94 |

t value- 0.28, p value- >0.05

**Table2: Statistical evaluation of post-operative pain score between the two groups**

| n-30 | GROUP A MEAN ± SD | GROUP B MEAN ± SD | T VALUE | P VALUE | SIGNIFICANCE |
|---|---|---|---|---|---|
| 6 HOUR | 3.36±1.04 | 3.03±1.01 | 1.28 | <0.001 | SIGNIFICANT |
| 12 HOUR | 2.76±0.95 | 3.9±0.86 | 4.9 | <0.001 | SIGNIFICANT |
| 2ND DAY | 1.83±0.87 | 3.7±1.38 | 7.2 | <0.001 | SIGNIFICANT |
| 3RD DAY | 0.96±0.87 | 2.93±1.03 | 8.15 | <0.001 | SIGNIFICANT |
| 4TH DAY | 0.56±0.72 | 2.13±1.05 | 6.8 | <0.001 | SIGNIFICANT |
| 5TH DAY | 0.23±0.55 | 1.43±0.95 | 6.0 | <0.001 | SIGNIFICANT |
| 6TH DAY | 0.1±0.3 | 0.93±0.77 | 5.2 | <0.001 | SIGNIFICANT |
| 7TH DAY | 0±0 | 0.5±0.56 | 4.91 | <0.001 | SIGNIFICANT |

**Table 3: Statistical evaluation of assessment of post-operative swelling measured from angle of the mandible to interincisal point (aid) and tragus to interincisal point (tid) between the two groups**

| TIME | GROUP A(AID) MEAN± SD | GROUP B(AID) MEAN± SD | P VALUE | GROUP A(TID) MEAN± SD | GROUP B(TID) MEAN± SD | P VALUE |
|---|---|---|---|---|---|---|
| 2ND DAY | 1.48±0.60 | 1.96±0.59 | <0.001** | 0.30±0.30 | 0.79±0.36 | <0.001** |
| 3RD DAY | 0.92±0.58 | 1.65±0.57 | <0.001** | 0.11±0.70 | 0.48±0.32 | <0.001** |
| 4TH DAY | 0.48±0.44 | 1.1±0.61 | <0.001** | 0.036±0.11 | 0.15±0.22 | <0.001** |
| 5TH DAY | 0.21±0.32 | 0.63±0.49 | <0.001** | 0±0 | 0±0 | >0.05 |
| 6TH DAY | 0.02±0.09 | 0.29±0.35 | <0.001** | 0±0 | 0±0 | >0.05 |
| 7TH DAY | 0±0 | 0.11±0.21 | <0.001** | 0±0 | 0±0 | >0.05 |

** p-value significant

**Table 4: Assessment score of post-operative swelling observed (so) and reduction in mouth opening (mo) by the investigator between the two groups**

| TIME | GROUP A(SO) MEAN± SD | GROUP B(SO) MEAN± SD | P VALUE | GROUP A(MO) MEAN± SD | GROUP B(MO) MEAN± SD | P VALUE |
|---|---|---|---|---|---|---|
| After Surgery | 0±0 | 0±0 | >0.05 | 0.42±0.46 | 0.47±0.35 | >0.05 |
| 2ND DAY | 3.13±0.56 | 3.6±0.61 | <0.001** | 1.2±0.65 | 2.05±0.79 | <0.001** |
| 3RD DAY | 2.4±0.61 | 2.8±0.63 | <0.001** | 0.65±0.65 | 1.54±0.78 | <0.001** |
| 4TH DAY | 1.76±0.72 | 2.5±0.63 | <0.001** | 0.25±0.45 | 0.93±65 | <0.001** |
| 5TH DAY | 1.33±0.72 | 1.93±0.57 | <0.001** | 0.07±0.17 | 0.45±0.53 | <0.001** |
| 6TH DAY | 1.33±0.47 | 1.36±0.48 | >0.05 | 0±0 | 0.22±0.33 | <0.001** |
| 7TH DAY | 1.03±0.17 | 1.16±0.37 | >0.05 | 0±0 | 0.11±0.24 | <0.05 |

** p-value significant

## Figures And Legends

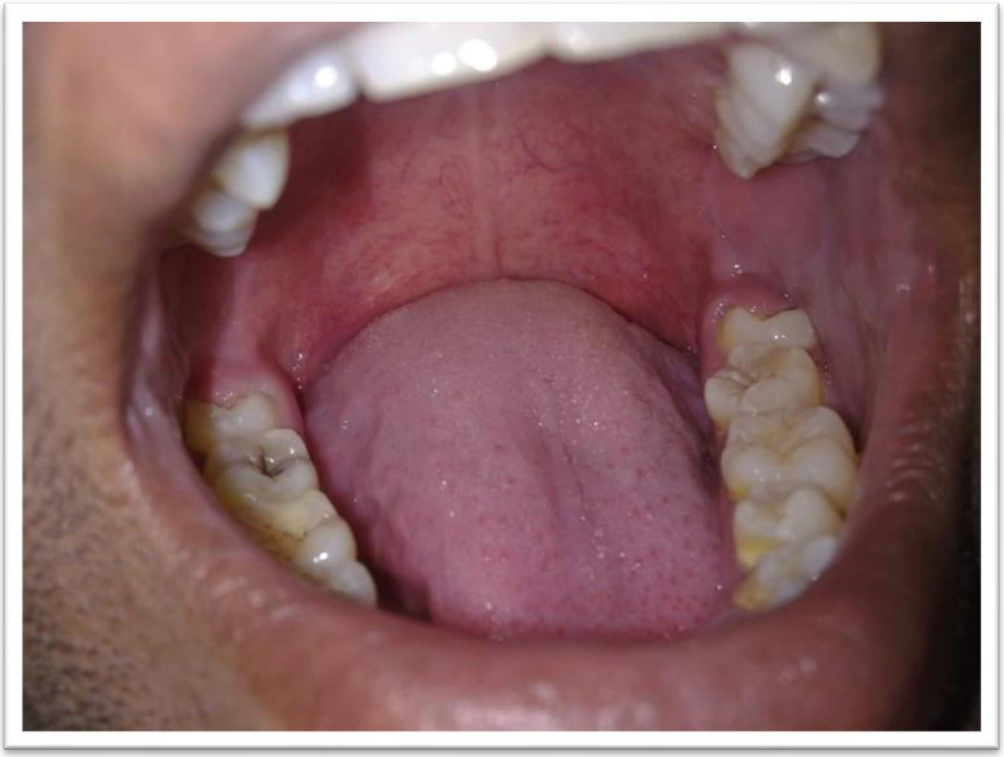

**Fig 1:- Preoperative photograph showing impacted mandibular third molars**

**Fig 2:-Orthopantomograph (OPG) showing impacted mandibular third molars**

**Fig 3:- Measurement of angle to interincisal point**

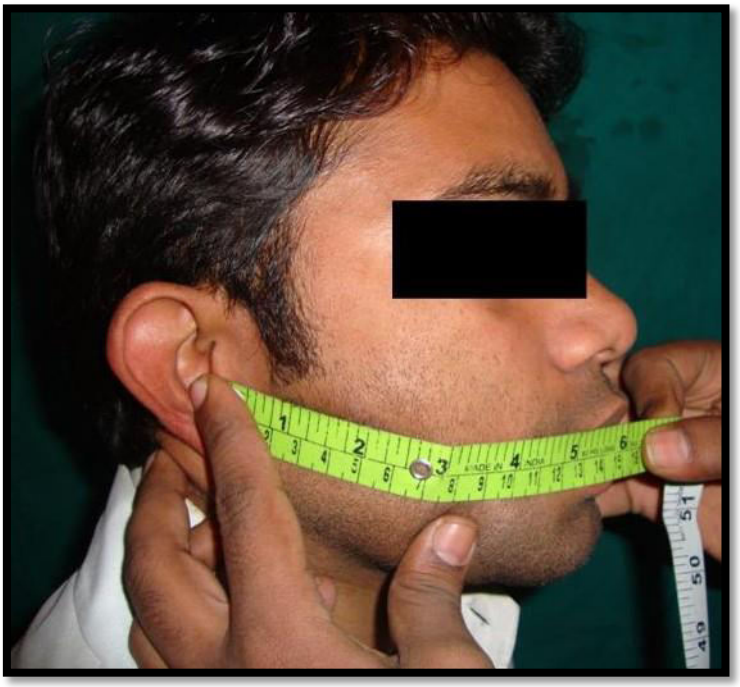

**Fig 4: Measurement of tragus to interincisal point**

**Fig 5: Primary closure of the wound**

**Fig 6: Secondary closure after repositioning of flap**

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