

Assessment of the effect of wound closure technique on postoperative sequelae and complications after impacted mandibular third molar extraction

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ABSTRACT

Aims and Objectives: The aim of the study was to compare the effect of complete and partial wound closures on postoperative sequelae and complications after surgical removal of impacted mandibular third molars. **Patients and Methods:** One hundred and twenty patients who required 121 surgical extractions of mandibular impacted third molars were included in the study. Patients were randomly divided into 2 groups based on wound closure after surgery. In group 1 (complete wound closure, $n_1 = 60$) patients had their extraction sockets completely closed by mucosal flap while in group 2 (partial wound closure, $n_2 = 60$) patients had their extraction sockets partially closed. Data collected included maximum inter-incisal distance (MID) and facial width which were recorded both preoperatively and postoperatively. What also recorded were postoperative pain intensity and postoperative complications. **Results:** There were 50 (41.7%) males and 70 (58.3%) females (male to female ratio of 1:1.4); age range was 18 - 40 years and the mean was 26 ± 10 years. The mean ages of patients in both groups showed no significant difference (group 1 = 26.5 ± 7.2 ; group 2 = 27.1 ± 8.1). The pain was maximal at the first postoperative day review and it gradually reduced in intensity towards the preoperative values for both groups. The pain perception in patients in group 2 were however significantly lower than those of group 1 on days 1 and 3 but not statistically different on day 7. The mean difference in the postoperative and preoperative MID was greatest on the 1st postoperative day and gradu-

ally became smaller on the subsequent review days. Comparison of this mean difference between the 2 groups however showed a significant difference in the 2 groups only on day 7. Maximal swelling was noted in both groups on the third postoperative day. A comparison of the mean facial width between the two groups showed no statistically significant difference on all the review days. The postoperative complication rate was 5% in both groups. **Conclusions:** The results of the study indicate that there was a comparative reduction in postoperative sequelae namely pain and trismus after impacted mandibular third molar surgery when a partial wound closure technique was done. However, there was no significant difference in the postoperative complication rate between the two groups.

Keywords: Third Molar Surgery; Wound Closure Technique; Postoperative Sequelae and Complications

1. INTRODUCTION

The surgical objective in impacted mandibular third molar removal is to remove the tooth with minimal sequelae and complications [1-4]. Various methods have been suggested to prevent or control the postoperative sequelae following third molar surgery. These include modulating the time of surgery, the use of copious irrigation after surgery and the use of drains. There is however still a high frequency of undesirable sequelae after impacted mandibular third molar extractions [3,4].

Postoperative pain, swelling, and trismus are acute reversible sequelae of the surgical removal of impacted mandibular third molars. They are generally regarded as short-term outcomes of the third molar impaction sur-

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gery; however, they are reported to cause a significant deterioration in quality of life and job disruption [5,6]. The magnitude of these sequelae depends on the extent of inflammatory response resulting from the extent of tissue damage produced [5]. The magnitude of the inflammatory response is reported to depend on certain demographics including age, gender, oral health status, anatomic and operative factors such as increased surgical difficulty, magnitude of osteotomy and duration of surgery [7].

The technique of closure of mucoperiosteal flaps is also considered to be a factor in the magnitude of these sequelae [8-12]. Two techniques of closure of the mucoperiosteal flap following surgical extraction of the impacted teeth have been documented in literature. In complete closure (resulting in primary healing), the mucoperiosteal flap is completely or totally closed such that healing is by primary intention. In partial closure (resulting in secondary healing), the mucoperiosteal flaps are either partially closed or left completely open without suturing and healing is by secondary intention [8-12]. There is however no consensus of opinions on the effect of these techniques on these inflammatory sequelae of extractions [9,10,12].

A foreknowledge of possible intraoperative experience and treatment outcome prior to surgery will enable the psycho-emotional preparation of the patient and further help the patient to give informed consent before treatment especially in elective surgery. This study is intended to contribute to such knowledge by comparing the extent of postoperative sequelae that follow lower third molar surgery in our environment using the two methods of closure.

2. PATIENTS AND METHODS

The study was carried out at the exodontia Clinic of the Department of Oral and Maxillofacial Surgery, Lagos University Teaching Hospital, Idi-Araba, Lagos from October 2006 to March 2008. Approval for the study was obtained from the local ethics committee and informed consent was obtained from all participating patients. Patients with history suggestive of underlying systemic diseases and those with preoperative pain, pregnant or lactating patients as well as patients who were habitual smokers were excluded from the study. Patients were randomly placed in the two operative groups (complete and partial wound closure groups).

Baseline and postoperative pain assessment scale consisted of a four-point verbal rating scale-VRS. Namely:

- “No pain” (patient experienced no pain);
- “Mild pain” (pain almost unnoticeable);
- “Moderate pain” (noticeable pain, but patient could still engage in routine daily activities);

- “Severe pain” (pain very noticeable and disturbed patient’s daily routine).

These were analyzed on a 4 point verbal rating scale of 0 - 3 (0—no pain, 1—mild pain, 2—moderate pain, 3—severe pain). Only patients with no pain on presentation were admitted into the study.

The maximum inter-incisal distance (MID) measured with a calibrated sliding veneer caliper as distance between the upper and lower central incisors at maximum mouth opening was measured pre and postoperatively.

The facial width was measured by using a horizontal and vertical guide with a non-extensible measuring tape in contact with the skin. Initial preoperative facial width recording provided a baseline reference only. The procedure for obtaining facial width (swelling) was as follows [10]:

Patients’ were seated in a relaxed position on the dental chair with the inferior border of the mandible parallel to the floor. In the vertical measure (on the ipsilateral side of impacted tooth), a non extensible measuring tape was placed on the lateral canthus of the eye and its distance to the angle of the mandible (determined by palpating for the gonion on the side). The measurement was taken thrice and the average recorded in centimetres (cm).

The horizontal measurement was taken as the distance between the tip of the tragus on both ears measuring over the gonion of both sides. This was also taken in triplicate and the average recorded in centimetres (cm).

The facial width was taken as the average of the two measurements.

The percentage increase or decrease in facial swelling and trismus were obtained from the difference of the measurements made in the preoperative and postoperative period as follows:

$$\frac{\text{Postoperative measurement} - \text{preoperative measurement}}{\text{Preoperative measure}} \times 100 = \% \text{ change}$$

A standardized surgical protocol was followed for all patients; a 3 sided flap was raised in all procedures. In patients in group 1 (complete wound closure), the flap was repositioned using 3 interrupted sutures placed as follows one posterior to the extraction socket, the second at the interdental papilla distal to the second molar and the third at the attached gingival margin to close the anterior relieving incision (**Figure 1**). In group 2 (partial wound closure), the flap was repositioned, two interrupted sutures were placed one posterior to the extraction socket and the other distal to the second molar thereby leaving the socket open (**Figure 2**). No dressing was applied to the open socket. The total operating time was recorded in minutes for all surgeries.

The patients were reviewed on days 1, 3, and 7 post-

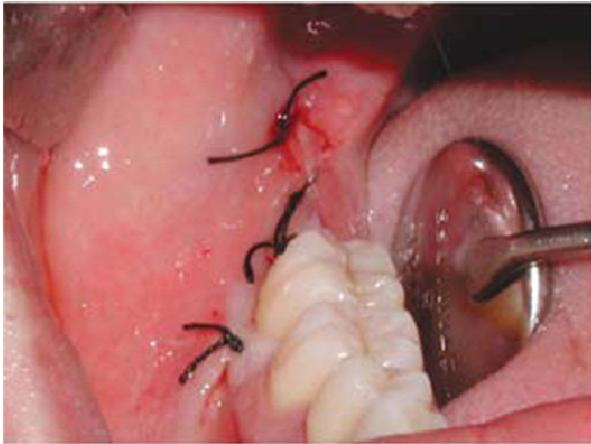


Figure 1. Complete closure.



Figure 2. Partial closure.

operatively, to assess pain, maximum inter-incisal opening and facial width. Post operative complications were also assessed and recorded. The collected data were analyzed using the statistical software package for the social sciences (SPSS) for Windows (version 15.0, SPSS Inc. Chicago, IL). Descriptive statistics were used as appropriate.

3. RESULTS

One hundred and twenty patients satisfied the inclusion criteria and consented to participate in this study. The mean age of the sample population was 26 ± 10 years (range 18 - 40 years). Of the 120 study subjects, 50 (41.6%) were males while 70 (58.3%) were females (ratio 1:1.4). Group 1 had a mean age of 26.5 ± 7.2 while group 2 had a mean of 27.1 ± 8.1 . There was no statistical significant difference ($p > 0.05$) between the mean ages of the two groups.

4. PAIN PERCEPTION

The respective mean pain scores (days 1, 3 and 7) for the

two treatment groups are shown in **Figure 3**. There was a linear decrease in pain over the days of review. Pain was maximal on the first postoperative day review and it gradually reduced in intensity towards the preoperative values for both groups. Differences between the respective mean pain scores were analyzed to compare the means on each review day using the paired Independent Sample T test. Comparison of mean verbal response scale scores for both groups revealed a statistically significant difference between the groups at the 1st and 3rd postoperative days ($p < 0.05$), while there was no statistically different on the 7th day.

5. MAXIMUM INTER-INCISAL DISTANCE (MID)

The mean preoperative maximum inter-incisal distance (MID) was similar in the two groups (complete wound closure 4.6 ± 0.2 cm and partial wound closure 4.7 ± 0.2 cm). Patients in both groups had reduced MID in all the review days; also in both groups the MID was least in the 1st day postoperative and increased in the 2 subsequent review days in both groups. Comparison between the mean percentage differences of the MID on the postoperative days to the preoperative value in the 2 groups is as shown in **Table 1**. The changes in mean MID between the preoperative MID and postoperative MID in both groups were statistically significance except on day 7 in the partial closure group. On comparison between the 2 groups the mean change in MID was only significantly different on day 7.

6. FACIAL WIDTH

The mean preoperative Facial width was 14.6 ± 1.0 cm and 14.8 ± 0.8 cm, respectively for patients in the primary and partial wound closure groups. Patients in both groups had increased facial width dimensions in all the postoperative day with the greatest increase recorded on the 3rd day in both groups. Comparison between the

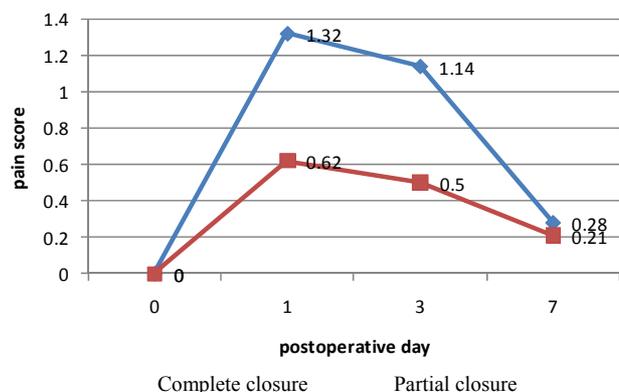


Figure 3. Graphic comparison of mean pain intensities in the 2 groups.

Table 1. Comparison of mean incisal distance (mid) on the 3 postoperative days in the 2 groups.

	Complete Closure	Partial Closure
Preop FW (cm)	4.6 ± 0.5	4.7 ± 0.6
1 st POD (cm)	2.2 ± 0.6	2.7 ± 0.6
Difference cm (%)	-2.4 (51.2%)	-2.0 (42.5%)
3 rd POD (cm)	2.3 ± 0.5	3.1 ± 0.7
Difference (%)	-2.3 (50.0%)	-1.6 (34.0%)
7 th POD (cm)	3.2 ± 0.7	3.8 ± 0.6*
Difference (%)	-1.4 (30.4%)	-0.9 (19.1%)

*p < 0.05.

mean percentage differences in the facial width on the postoperative days to the preoperative value in the 2 groups (**Table 2**) showed there was no statistical difference in any of the postoperative days.

Overall postoperative complication rate was 5%, and the rate was equal in both groups. There were two cases (1.7%) of dry socket in partial closure group. One case (0.83%) of increased intra-operative bleeding was recorded in the primary closure group. Three patients (2.5%) had paraesthesia of the lingual nerve; one of these patients was in the partial closure and the other two in the primary closure group. Two patients recovered from the injuries before the seventh postoperative day review, the third patient was lost to follow-up.

7. DISCUSSION

The mean age of 26 ± 10 years in this study agrees with that of previous researchers that reported extractions of the third molars to be more common in patients in their third decade of life in this environment [7,13-15]. In the present study, third molar extraction was associated with significant postoperative discomfort but few healing complication. The postoperative discomfort reached its peak by the end of the third postoperative day and improved progressively afterwards up to the 7th day postoperatively. This is also consistent with the pattern reported by earlier reports [4,6,16]. Postoperative discomfort mainly in form of swelling, pain and trismus was affected by the type of wound closure technique in this study. This observation is however controversial with some authors' agreements [10-12] and others disagreeing [8,9]. The reason for this discrepancy is unclear.

Pain from postoperative inflammation is generally believed to be the most important factor responsible for the discomfort experienced by patients after impacted mandibular third molar surgery [17-23]. It is generally reported to be brief, peaking in intensity in the early postoperative period within the first 24 hours post extraction [20]. In this study, pain-assessment scales consisted of a four-point verbal rating scale (no pain, mild pain, moder-

Table 2. Comparison of mean facial width on the 3 postoperative days in the 2 groups.

	Complete Closure	Partial Closure
Preop FW (cm)	14.6 ± 1.0	14.8 ± 0.6
1 st POD (cm)	15.6 ± 0.7	15.4 ± 0.7
Difference cm (%)	1.0 (6.8%)	0.6 (4.1%)
3 rd POD (cm)	16.0 ± 0.7	15.5 ± 0.8
Difference (%)	2.6 (9.6%)	0.7 (4.7%)
7 th POD (cm)	14.9 ± 0.7	14.9 ± 0.6
Difference (%)	0.3 (2.1%)	0.1 (0.6%)

ate pain, severe pain). The verbal rating scale was used in this study because it was easily understood by the patients. This system though reported not to be as effective as the visual analogue scale (VAS) is reported to be simple to administer and score [21]. The result of this study revealed that the highest pain intensity in this study was recorded on the first postoperative day review; it gradually decreased in value in both groups during the course of postoperative review. The pattern of pain in both groups decreased in a linear fashion with partial wound closure exhibiting a lower peak (**Figure 3**). This is in agreement with the other various reports in literature [4, 11,24]. Result of this study also showed pain to be significantly less on all the postoperative review days in patients who had partial wound closure compared to complete wound closure. The findings were statistically significant (p < 0.05) for the first two review days and are in agreement with the reports of Bamgbose *et al.* [23].

Postoperative trismus was measured as a percentage decrease in mouth opening. There was a decrease in maximum mouth opening ability on all postoperative review in both groups and the decrease was statistically significant until the 3rd postoperative day. This implied that the impact of surgical extraction on patients' ability to open their mouths is quite considerable even for some days after treatment. This was found to be consistent with reports from some earlier studies [2,18,25]. Patients in partial closure however seemed to experience better mouth opening postoperatively than those in the complete closure group in all the 3 postoperative review days (**Table 1**). The difference in MID in the 2 groups seems to suggest that the partial closure resulted in better mouth opening postoperatively although the difference became statistically significant only on the 7th day. The result however was in contrast with another study that reported no statistically significant difference in mouth opening between patients with or without postoperative drains after wound closure [4]. In the said study however there was some degree of open drainage of the sockets in both groups of patients, whilst in our study there was complete closure of the wound allowing for very little drain-

age from the wound in the primary closure group. This may be responsible for the differences noted.

Comparison of the differences between the 1st, 3rd and 7th postoperative day reviews showed no statistical difference between the two groups. It also showed that by the 7th day the facial swelling had virtually resolved. Swelling seemed to be at its maximum on the 3rd postoperative day followed by a slow reduction over the subsequent days (**Table 2**). This finding is in agreement with some previous researchers [11,26,27] who all reported maximal facial swelling at 72 hours. However, some other studies reported maximal swelling at 48 hours postoperatively [13,22]. The differences may be due to variation in individual inflammatory responses.

An overall complication rate of 5% was recorded in this study which was within the range recorded in literature [7]. The complication rate in both groups was equal in consonance with previous studies in literature [4,18]. This might imply that wound closure methods have little or no effect on the rate of complications after the third molar removal.

REFERENCES

- [1] Renton, T., Smeeton, N. and McGurk, M. (2001) Factors predictive of difficulty of mandibular third molar surgery. *British Dental Journal*, **190**, 607-610.
- [2] Jackse, N., Bankaoglu, V., Wimmer, G. and Eskici, A. (2002) Primary wound healing after third molar surgery: Evaluation of 2 different flap designs. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*, **93**, 7-12.
<http://dx.doi.org/10.1067/moe.2002.119519>
- [3] Saglam, A.A. (2003) Effect of tube drain with primary closure technique on postoperative trismus and swelling after removal of fully impacted mandibular third molars. *Quintessence International*, **34**, 143-147.
- [4] Cerqueira, P.R., Vansconcelos, B.C. and Bessa-Nogueira, R.V. (2004) Comparative study of the effect of a tube drain in impacted lower third molar surgery. *Journal of Oral and Maxillofacial Surgery*, **62**, 57-61.
[http://dx.doi.org/10.1016/S0278-2391\(03\)00675-X](http://dx.doi.org/10.1016/S0278-2391(03)00675-X)
- [5] Adeyemo, W.L. (2006) Do pathologies associated with impacted lower third molar justify prophylactic removal. A critical review of the literature. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*, **102**, 448-452.
<http://dx.doi.org/10.1016/j.tripleo.2005.08.015>
- [6] Blondeau, F. and Daniel, M.G. (2007) Extraction of impacted mandibular third molars: Postoperative complications and their risk factors. *Journal of the Canadian Dental Association*, **73**, 235e-325e.
- [7] Gbotolorun, O.M., Olojede, A.C.O., Arotiba, G.T., Ladeinde, A.L., Akinwande, J.A. and Bamgbose, B.O. (2007) Impacted mandibular third molars: Presentation and postoperative complications at the Lagos University Teaching Hospital. *Nigerian Quarterly Journal of Hospital Medicine*, **17**, 26-29.
<http://dx.doi.org/10.4314/nqjhm.v17i1.12537>
- [8] Suddhasthira, T., Chaiwat, S. and Sattapongsda, P. (1991) The comparison study of primary and secondary closure technique after removal of impacted mandibular third molars. *Thai Journal of Oral and Maxillofacial Surgery*, **5**, 67-77.
- [9] Akota, L., Alvsaker, B. and Bjorland, T. (1998) The effect of locally applied gauze drain impregnated with chlortetracycline ointment in mandibular third molar surgery. *Acta Odontologica Scandinavica*, **56**, 25-34.
<http://dx.doi.org/10.1080/000163598423027>
- [10] Chukwuneka, F.N., Oji, C. and Saheeb, B.D. (2008) A comparative study of the effect of using a rubber drain on postoperative discomfort following lower third molar surgery. *International Journal of Oral and Maxillofacial Surgery*, **37**, 341-344.
<http://dx.doi.org/10.1016/j.ijom.2007.11.016>
- [11] Pasqualini, D., Cocero, N., Castella, A., Mela, L. and Braco, P. (2005) Primary and secondary closure of the surgical wound after removal of impacted mandibular third molars: A comparative study. *International Journal of Oral and Maxillofacial Surgery*, **34**, 52-57.
<http://dx.doi.org/10.1016/j.ijom.2004.01.023>
- [12] Waite, P.D. and Cherala, S. (2006) Surgical outcomes for sutureless surgery in 366 impacted third molar patients. *Journal of Oral and Maxillofacial Surgery*, **64**, 669-673.
<http://dx.doi.org/10.1016/j.joms.2005.12.014>
- [13] Akinwande, J.A. (1991) Mandibular third molar impaction—A comparison of two methods of predicting surgical difficulties. *Nigerian Dental Journal*, **10**, 3-7.
- [14] Oginni, F.O., Ugboko, V.I., Assam, E. and Ogunbodede, E.O. (2002) Postoperative complaints following impacted third molar surgery in Ile Ife, Nigeria. *South Afr Dent J*, **57**, 264-268.
- [15] Olasoji, H.O., Odusanya, S.A. and Ojo, M.A. (2002) Indications for the extraction of impacted third molars in a semi urban Nigeria Teaching Hospital. *Nigerian Postgraduate Medical Journal*, **8**, 136-139.
- [16] Ness, G.M. and Peterson, L.J. (2004) Impacted teeth. In: *Principles of Oral and Maxillofacial Surgery*, Vol. 1 (5th Ed.), WB Saunders Co, Philadelphia, London, Toronto, 250-311.
- [17] Ruta, D.A., Bissias, E. and Ogston, S. (2000) Assessing health outcomes after extraction of third molars. The postoperative symptom severity (PoSSe) Scale. *British Journal of Oral and Maxillofacial Surgery*, **38**, 480-487.
<http://dx.doi.org/10.1054/bjom.2000.0339>
- [18] Saheeb, B.D.O. and Obuekwe, O.N. (2001) An audit of mandibular third molar. *Nigerian Journal of Surgical Research*, **3**, 66-74.
- [19] Yuasa, H. and Suguira, M. (2004) Clinical preoperative findings after removal of impacted mandibular third molars; prediction of postoperative facial swelling and pain based on preoperative variables. *British Journal of Oral and Maxillofacial Surgery*, **42**, 209-214.
<http://dx.doi.org/10.1016/j.bjoms.2004.02.005>
- [20] Victoria, A.M. (2002) Relation of patient and surgical

- variables to postoperative pain and inflammation in the extraction of third molars. *Medicina Oral*, **7**, 360-369.
- [21] Bello, S.A., Adeyemo, W.L., Bamgbose, B.O., Obi, E.V. and Adeyinka, A.A. (2011) Effect of age, impaction types and operating time on inflammatory tissues reactions following lower third molar surgery. *Head & Face Medicine*, **7**, 8. <http://dx.doi.org/10.1186/1746-160X-7-8>
- [22] Ong, K.S. and Seymour, R.A. (2004) Pain measurement in humans. *Surgeon-Journal of The Royal Colleges of Surgeons of Edinburgh and Ireland*, **2**, 15-27.
- [23] Bamgbose, B.O., Akinwande, J.A., Adeyemo, W.L., Ladeinde, A.L. and Arotiba, G.T. and Ogunlewe M.O. (2005) Effects of co-administered dexamethasone and diclofenac potassium on pain, swelling and trismus following third molar surgery. *Head & Face Medicine*, **1**, 11. <http://dx.doi.org/10.1186/1746-160X-1-11>
- [24] Rakprasitkul, S. and Pairuchvej, V. (1997) Mandibular third molar surgery with primary closure and tube drain. *International Journal of Oral and Maxillofacial Surgery*, **26**, 187-190. [http://dx.doi.org/10.1016/S0901-5027\(97\)80817-X](http://dx.doi.org/10.1016/S0901-5027(97)80817-X)
- [25] Capuzzi, P., Montebugnoli, L. and Vaccaro, M. (1994) Extraction of impacted third molars: a longitudinal prospective study on factors that affect postoperative recovery. *Oral Surgery, Oral Medicine, Oral Pathology*, **77**, 341-343. [http://dx.doi.org/10.1016/0030-4220\(94\)90194-5](http://dx.doi.org/10.1016/0030-4220(94)90194-5)
- [26] Ordulu, M., Aktas, I., Yalcin, S., Azak, A.N., Evliogh, G., Disci, R. and Emes, Y. (2006) Comparative study of the effect of tube drainage versus methylprednisolone after third molar surgery. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*, **101**, 96-100. <http://dx.doi.org/10.1016/j.tripleo.2005.09.002>
- [27] Bielsa, S.J.M., Bazan, S.H. and Diago, M.P. (2008) Flap repositioning versus conventional suturing in third molar surgery. *Medicina Oral Patologia Oral y Cirugia Bucal*, **13**, 138-142.