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ORIGINAL ARTICLE

Comparison between Partial Newmann Flap Versus Modified Partial Newmann Flap in Mandibular Third Molar Surgery

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ABSTRACT

Aim: To compare the outcomes of two different flap techniques, namely the Partial Newmann Flap (FNP) and the Modified Partial Newmann Flap (MPNF), in surgical extraction of mandibular third molars.
Methods: This randomised clinical study included 186 participants, 93 each group. The research comprised male and female patients aged 20–45 with lower mesioangular impacted third molar till 18–21. Patients with vertically impacted wisdom teeth, disto-angular impaction, horizontal impaction, pregnancy, trismus, pericoronitis, and oral submucous fibrosis were excluded. The student t-test compared mouth opening across groups, whereas the chi-square test compared discomfort and edoema.
Results: The mean age of the participants was 32.17±8.30 years. On the first day, the MPNF group reported significantly less moderate pain (34.41%) compared to the NPF group (56.99%) (p=0.001). On the third day, the MPNF group reported significantly more mild pain (55.91%) and less severe pain (1.08%) compared to the NPF group, which reported less mild pain (49.46%) and more severe pain (7.53%) (p=0.028). Similarly, mouth opening was significantly higher in the MPNF group than the NPF group on the 1st, 3rd, and 7th day. Swelling was significantly less in the MPNF group than the NPF group on the 1st and 3rd day.
Conclusion: The Modified Partial Newmann Flap may be a better alternative compared to the Partial Newmann Flap in terms of pain, swelling, and mouth opening during the disimpaction of lower third molars.
Keywords: Partial Newmann Flap, Modified Partial Newmann Flap, Mandibular Third Molar

INTRODUCTION

When a tooth fails to fully emerge in the dental arch within its expected time frame, it is referred to as tooth impaction[1,2]. This can occur due to various factors such as insufficient space, abnormal development or positioning, physical blockages along the path of eruption, and dense bone structure. Wisdom teeth are commonly impacted, likely due to a mix of genetic and environmental factors, as well as the size and location of neighboring teeth. Generally, the eruption time for third molar is from age 18 to 24 year[2].

It is estimated that 26% of the population has at least one impacted tooth[3]. One of the most common ways to address this issue is through surgical extraction of the impacted wisdom teeth. However, this procedure can lead to several complications, including pain, limited mouth opening, inflammation at the extraction site, and inadequate closure of the wound edges. These complications can negatively affect the overall health and well-being of the patient[4].

Following a tooth extraction, patients typically experience an increase in pain several hours later. Swelling, or edema, at the extraction site can cause considerable discomfort, although it generally diminishes with time[5]. Limited mouth opening is also a common occurrence lasting a few days or more due to the swelling of the surrounding muscles. This may hinder the ability to eat adequately for up to a week. To reduce the likelihood of these symptoms and complications, it is essential for dental surgeons to exercise meticulous skill and precise planning before commencing the procedure[6].

During the extraction of wisdom teeth, both soft and hard tissues can be physically injured. Damage can be caused by the reflection of soft tissues, such as flaps, as well as the exposure of underlying bone when raising a full-thickness flap. The design of the flap is a crucial factor that can impact the outcome of the extraction. To successfully expose the underlying impacted tooth, it is necessary to raise the soft tissue flap and remove the bone[7,8].

In order to achieve optimal visualization and access during lower wisdom tooth extraction, a full thickness flap is often utilized to reveal the adjacent 2nd molar. This surgical technique involves raising the soft tissue, referred to as a flap, to fully expose the surgical site and reduce patient discomfort by minimizing potential complications[9,10]. There are various incisions and flaps available for accessing and visualizing the impacted wisdom tooth, including the Envelope flap, Bayonet flap, L-shaped incision, triangular flap, Comma-shaped incision, Wards flap, modified Wards flap, S-shaped, Szmyd flap, and Berwick's tongue flap[11,12].

Our aim is to minimize the post-operative complications associated with surgical removal of impacted teeth, which often lead to pain, swelling, and limited mouth opening, all of which can significantly disrupt the patient's daily work and social life. To achieve this goal, the study focuses on the use of two flap types, namely, the partial Newmann flap (triangular flap with three corners or vertical incision) and the modified partial Newmann flap (modified triangular, bayonet, modified Szmyd, or L-shaped incision). By comparing the outcomes of these two flap types, the study aims to determine which approach is most effective in reducing the post-operative complications associated with surgical removal of impacted teeth, ultimately improving the overall quality of life for patients undergoing this procedure.

The objective of this study was to compare the outcomes of two different flap techniques, the Partial Newmann Flap and the Modified Partial Newmann Flap, in surgical extraction of mandibular third molars.

METHODS AND MATERIALS

The study is designed as a randomized clinical trial and the sampling technique used is non-probability consecutive sampling. The study was taken place at the Oral & Maxillofacial Surgery Department, located in the Institute of Dentistry at Liaquat University of Medical & Health Sciences Jamshoro. Permission was granted by the Institutional Board to start this research. The

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duration was from 1st January 2021 to 30th December 2022**.** To detect a moderate effect size (odds ratio of 2) with 80% power and a two-sided alpha of 0.05, we needed a minimum sample size of 93 participants per group, or 186 participants in total for the RCT, calculated using the formula:
n=2*(Z_alpha/2+Z_beta)^2* p(1-p)/d^2= 2*(1.96 + 0.84)^2* 0.5(1-0.5) / (log2(2))^2 where n is the required sample size per group, Z_alpha/2 and Z_beta are critical values of the standard normal distribution, p is the expected proportion of the outcome in the control group, and d is the minimum detectable effect size (assumed to be an odds ratio of 2).

The study enrolled both male and female patients between 20 to 45 years of age who have mesioangular impacted lower jaw wisdom teeth until the age of 18-21 years. However, patients with certain conditions were excluded, including those with vertically impacted wisdom teeth, disto-angular impaction, horizontally impacted wisdom teeth, pregnancy, trismus and pericoronitis, and oral submucous fibrosis.

Patients who matched the inclusion criteria and gave informed signed permission were included in the trial after receiving clearance from the ethical review committee. Age, gender, pain, medical history, and the method of tooth extraction are just a few of the demographic and clinical factors that were discovered and documented in a proforma.

Patients were randomly allocated to either group using block randomization after the primary investigator recorded the history, clinical examination, and radiographs (OPG and periapical) and documented them in the proforma. The procedures were held out under local anaesthesia using the traditional nerve block anaesthesia technique of the inferior alveolar nerve, lingual nerve, and buccal nerve with two 1.8mL cartridges of 2% xylocaine with epinephrine 1: 100,000 (Medicaine; Korea) , under the supervision of the supervisor, with compliance to the basic protocol of preparation and draping.

The Modified Partial Newmann Flap (Group A) and Partial Newmann Flap (Group B) techniques employed a sterile carbon steel surgical blade #15 from Feather Safety Razor Co. Ltd, Japan. A straight elevator was used to lift the tooth, and if bone removal was required, a slow-speed turbine with a rose head round bur was used on the mesio-buccal and disto-buccal sides, with ample irrigation of 0.9% normal saline from Searle Ltd. Pakistan. After lifting the tooth with a straight elevator, any sharp bone was smoothed with a bone filer, and the wound was closed using 3-0 Vicryl suture from Johnson & Johnson, made in the USA. Hemostasis was achieved by placing a sterile folded gauze (2 x 2) over the surgical wound for 30 minutes.

In Partial Newmann Flap an incision is made in the retromolar triangle behind the last molar tooth. The incision starts distal to the second molar and follows the sulcus to the mesial aspect. A vertical releasing incision is then made, creating a triangular flap with three corners. The Modified Partial Newmann Flap is a variation of the Newman flap technique that aims to preserve the attached gingiva and the gingival sulcus in the cervical-vestibular area of the second molar. To do this, a second incision is made about two millimetres from the first, pointing forward and parallel to the second molar's neck. The vertical releasing incision is then created from the mesial surface of the tooth, moving downwards towards the vestibular sulcus.

Patients were prescribed standard antibiotics, including Amoxicillin (500mg TDS) and Metronidazole (400mg TDS), as well as NSAIDs (Ibuprofen 400mg TDS), for a period of five days. Following the surgery to extract the mesioangular impacted lower third molar tooth, observations were made on various factors, including the duration of the procedure, pain, swelling, and healing of the surgical tissue. Pain was assessed using the Wong Baker's scale or the VAS scale, which ranges from zero (no pain) to 10 (worst pain imaginable). A score of 1-3 indicates mild pain, 4-7 indicates moderate pain, and 8-10 indicates severe pain. Mouth opening was also measured using a millimeter ruler to determine the maximum distance between the maxillary and mandibular central incisors. Normal mouth opening ranges from 30-45mm. A proforma was used to record these observations, and every patient was scheduled for follow-up appointments on the 1st , 3rd , and 7th day after surgery.

The data were analyzed using the R programming version 4.1.2. Percentages and frequencies were calculated for categorical variables such as gender, swelling, and pain, while mean and standard deviation were calculated for numerical variables such as age and mouth opening. A chi-square test was performed to compare categorical outcomes, while an independent t-test was used for numerical variables between the two interventions (Newman flap versus modified Newman flap). The level of significance for all analyses was set at $p<0.05$.

RESULTS

The mean age was 32.17±8.30 years with range from 18 from 47 years. There is almost an equal distribution of gender between the Modified Newmann and Newmann characteristics, with 48 females (51.61%) in the Modified Newmann and 49 females (52.69%) in the Newmann characteristics. There is no significant difference in gender distribution between the two group($p>0.99$). The age group of 21-30 has the highest number of individuals in the Modified Newmann (n=37, 39.78%) and the age group of 31-40 has the highest number of individuals in the Newmann (n=41, 44.09%). There is no significant difference in age distribution between the Modified Newmann and Newmann characteristics for this age group ($p=0.12$) (Table 1).

The pain day 1 show that the modified Newmann group reported significantly more mild pain (45.16%) and less moderate pain (34.41%) compared to the Newmann group, who reported less mild pain (20.43%) and more moderate pain (56.99%) ($p = 0.001$). The pain day 3 show that the modified Newmann group reported significantly more mild pain (55.91%) and less severe pain (1.08%) compared to the Newmann group, who reported less mild pain (49.46%) and more severe pain (7.53%) ($p = 0.028$). However the difference for pain at day 7 between two flap designs was not statistically significant ($p=0.73$) (Table 2).

The results indicate that the modified Newmann group reported significantly less swelling (82.80% absent) compared to the Newmann group (66.67% absent) on day 1 ($p = 0.018$). Additionally, the Newmann group reported more swelling (33.33% present) compared to the modified Newmann group (17.20% present). Similarly for day 3 the results show that the modified Newmann group reported significantly less swelling (55.91% absent) compared to the Newmann group (82.80% absent) ($p < 0.001$). Additionally, the Newmann group reported more swelling (17.20% present) compared to the modified Newmann group (44.09% present). However the frequency of swelling was not different statistically for day 7($p=0.61$) (Table 3).

The mean mouth opening measurements using modified Newmann were higher than using Newmann on all three days (Day 1: 46.71 ± 6.11 vs. 43.78±5.58, Day 3: 35.68 ± 10.08 vs. 31.85 ± 8.19, Day 7: 41.95 ± 8.77 vs. 37.53±8.35). The mean mouth opening decreased from Day 1 to Day 3 and then increased from Day 3 to Day 7 for both methods. The differences between the two methods were significant with p-values of <0.001, 0.005, and <0.001 for Day 1, Day 3, and Day 7, respectively (Table 4).

Table 1: Distribution of gender and age of the participants in both groups

variable	Characteristic	Modified Newmann, (n=93)	Newmann, (n=93)	p-value
Gender	female	48 (51.61)	49 (52.69)	>0.999
	male	45 (48.39)	44 (47.31)	
Age	10-20	7 (7.53)	11 (11.83)	0.12
	21-30	37 (39.78)	26 (27.96)	
	31-40	24 (25.81)	41 (44.09)	
	41-50	25 (26.88)	15 (16.13)	

Table 2: Comparison of pain between two designs of flaps

Variable	Characteristic	modified Newmann, (n=93)	Newmann, (n=93)	p-value*
Pain day1	mild	42 (45.16)	19 (20.43)	0.001
	moderate	32 (34.41)	53 (56.99)	
	No pain	8 (8.60)	13 (13.98)	
	severe	11 (11.83)	8 (8.60)	
Pain day 3	mild	52 (55.91)	46 (49.46)	0.028
	moderate	20 (21.51)	29 (31.18)	
	No pain	20 (21.51)	11 (11.83)	
	severe	1 (1.08)	7 (7.53)	
Pain day 7	mild	50 (53.76)	55 (59.14)	0.738
	moderate	19 (20.43)	20 (21.51)	
	No pain	21 (22.58)	15 (16.13)	
	severe	3 (3.23)	3 (3.23)	

*chi-square test

Table 3: Comparison of pain between two designs of flaps

Swelling	Characteristic	Modified Newmann, (n=93)	Newmann, (n=93)	p-value*
Day 1	absent	77 (82.80)	62 (66.67)	0.018
	present	16 (17.20)	31 (33.33)	
Day 3	absent	52 (55.91)	77 (82.80)	<0.001
	present	41 (44.09)	16 (17.20)	
Day 7	absent	72 (77.42)	68 (73.12)	0.61
	present	21 (22.58)	25 (26.88)	

*Chi-square test

Table 4: Comparison of mouth opening between two flap designs

Mouth opening	modified Newmann, (n=93)	Newmann, (n=93)	p-value*
Day 1, Mean ± SD	46.71 ± 6.11	43.78 ± 5.58	**<0.001**
Day 3, Mean ± SD	35.68 ± 10.08	31.85 ± 8.19	**0.005**
Day 7, Mean ± SD	41.95 ± 8.77	37.53 ± 8.35	**<0.001**

*Student t test

DISCUSSION

The study investigated the differences between modified Newmann and Newmann flap designs in third molar surgery in terms of age, gender, pain, swelling, and mouth opening measurements after undergoing flap surgery. The results show that there is no significant difference in gender and age distribution between the two groups. However, the modified Newmann group reported significantly less pain and swelling and higher mouth opening measurements compared to the Newmann group on days 1 and 3, but no significant difference on day 7. The findings suggest that the modified Newmann design may be a better choice for flap surgery, as it results in less pain and swelling and better mouth opening measurements during the early postoperative period.

It is common to experience pain, trismus, and facial swelling after undergoing surgical removal of a third molar tooth. These are typically caused by inflammation resulting from the surgery. The main factor contributing to surgical trauma during third molar extraction is the lifting of a mucoperiosteal flap to properly see and reach the tooth. Various studies have been conducted to examine different flap designs as well as the impact of primary and secondary healing following the procedure[13,14].

The Newmann flap technique is used during third molar surgery for patients with mouth opening difficulties. It promotes quicker recovery to normal probing depth and better primary healing compared to other flap designs, reducing the incidence of post-surgery dehiscence[15]. The Newmann flap eases the removal of bone tissue and circling of structures during surgery. It is a beneficial option for third molar surgery, offering advantages over other flap designs.[16] The drawbacks of Newmann flap technique are heightened inflammation, trismus, and facial pain, along with added intricacy in the creation and suturing of the flap. Furthermore, there is an elevated risk of bone reabsorption, hematoma formation, and the emergence of distal pockets in adjacent teeth[16].

The modified triangle, bayonet, or L-shaped incision is used in the modified partial Newmann flap. Study by Kirtiloglu et al[17] have demonstrated its superiority in terms of primary healing compared to the triangular flap, while Koyuncu et al.[18] have reported significantly reduced postoperative pain during the first four days compared to the envelope flap. Silva et al[19] have also observed that this flap leads to less traumatic surgery than the partial Newmann flap, resulting in better wound healing and a more comfortable postoperative recovery with less edema and dehiscence. However, it is noteworthy that Borgonovo et al[20] have suggested that the Modified Partial Newmann Flap, like the triangular flap, may be suitable for patients with restricted mouth opening.

After conducting a comparative analysis of the two interventions, our study found that the modified Newmann flap demonstrated significant superiority over the Newmann flap not only in promoting mouth opening but also in reducing swelling and pain. These results highlight the important role that the modified Newmann flap can play in improving postoperative recovery and enhancing patient comfort. To the best of our knowledge, no previous study has directly compared these two interventions in terms of their efficacy on mouth opening, swelling, and pain. However, our findings are consistent with previous studies that have reported better wound healing and reduced postoperative

complications with the use of modified flaps as compared to conventional envelop flaps[11,13]. It is important to note that further research with larger sample sizes and controlled confounding factors is warranted to validate these findings and provide more in-depth understanding of the benefits of modified Newmann flap in postoperative recovery.

It is important to note that our research had several drawbacks. First off, the sample size was somewhat tiny, which may have a negative impact on how generalizable the results were. Secondly, other factors such as age, sex, and comorbidities could potentially influence mouth opening measurements but were not controlled for in this study.

CONCLUSION

The current study offers some evidence suggesting that the use of modified Newmann flap is more efficacious in promoting mouth opening and reducing swelling and pain compared to the Newmann flap following surgery.

Conflict of interest: Nothing to declare

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