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Original Research Article

Modified lingual split technique versus conventional buccal bone cutting for the surgical removal of impacted third molar

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Abstract

Background: Impacted mandibular third molar removal is one of the most common oral surgical procedures. Various surgical techniques have been developed to minimize postoperative complications such as pain, swelling, trismus, and delayed bone healing. This study aimed to compare the Modified Lingual Split Technique with the Conventional Buccal Bone Cutting Technique for the surgical extraction of impacted mandibular third molars.
Materials and Methods: A prospective comparative study was conducted on 20 patients, randomly assigned into two groups: Group A (Modified Lingual Split) and Group B (Conventional Buccal Bone Cutting). Clinical parameters including postoperative pain (VAS), swelling, trismus, bleeding time, wound healing, and bone healing (radiographic) were assessed at multiple time intervals: 24 hours, 7 days, 15 days, 4 weeks, and 8 weeks. Data were analyzed using SPSS v29.0, with statistical significance set at $p<0.05$.
Results: Both groups were demographically comparable. Group A demonstrated significantly reduced swelling at 7 and 15 days ($p=0.006$ and $p=0.002$), shorter bleeding time ($p<0.001$), and less trismus at 7 days postoperatively ($p<0.001$). Although wound healing and bone regeneration were more favorable in Group A, the differences were not statistically significant. Pain scores progressively decreased in both groups, with no significant intergroup variation.
Conclusion: The Modified Lingual Split Technique showed better clinical outcomes in terms of swelling reduction, faster trismus recovery, shorter bleeding time, and improved healing patterns compared to the Conventional Buccal Bone Cutting Technique. While both methods are effective, the lingual split technique may offer advantages in reducing postoperative morbidity and enhancing recovery.

Keywords: Mandibular third molar, Lingual split technique, Buccal bone cutting, Impaction, Surgical extraction, Bone healing, Postoperative complications

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1. Introduction

A tooth that is partially or completely unerupted and is positioned against another tooth, bone, or soft tissue in order to impede future eruption is referred to as an impacted tooth, according to William's definition.[1] Impacted teeth fail to erupt or grow into their predicted oral cavity location. Adjacent teeth, dense bone or soft tissue, size of the mandible or maxilla with lack of jaw space, aberrant eruption path, abnormal tooth bud positioning, differential root growth between mesial and distal roots, or pathological lesions may cause etiology. Food impaction, pericoronitis, caries, discomfort, and pathology can result from impacted teeth. Thus, impacted third molar prophylactic removal is becoming widespread.[2]

Impacted mandibular third molar extraction is a complicated surgery with multiple steps to limit damage, prevent difficulties, and speed healing. Both the buccal traditional burs approach and the modified lingual split method are used. Depending on the tooth's anatomical placement and the surgeon's skill, each method has pros and cons.[3] The most popular chisel technique is the 'lingual split bone technique', which fractures a portion of distolingual bone around the impacted teeth to remove it.[4] In conventional buccal method the bone was removed using a low-speed micrometer and a rose head round bur/straight fissure bur. A vertical cut was created using a straight-fissure bur and saltwater as coolant.[5]

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Bone removal and tooth sectioning were identified as risk factors for problems after third molar extraction.[6] Bony impactions necessitate more extensive treatments that involve bone removal and broader flap reflection, hence increasing the likelihood of injuring nearby structures.[7] The majority of patients will endure pain and edema following surgery, peaking on the first postoperative day, and will typically resume work after 2 to 3 days, with discomfort diminishing to approximately 25% at that time. Unless influenced by dry socket, a complication of wound healing that extends postoperative pain. Long-term problems may encompass periodontal issues, including bone loss on the distal aspect of the second molar subsequent to wisdom teeth extraction. It is rare in the young but observed in 43% of those aged 25 years or older.

This study seeks to furnish clinical evidence on the most efficacious strategy for the extraction of impacted third molars by a comparative analysis of the two methods. The results may enhance surgical protocols, diminish patient morbidity, and elevate overall treatment outcomes. Furthermore, comprehending the bone healing processes associated with each procedure will enhance postoperative care and promote long-term oral health.

2. Material and Methods

A prospective comparative study was conducted at the Department of Oral and Maxillofacial Surgery, People's College of Dental Sciences and Research Centre, Bhopal, to evaluate wound healing, postoperative complications, and bone healing following the removal of impacted mandibular third molars using two techniques: Modified Lingual Split Technique (Group A) and Conventional Buccal Bone Cutting Technique (Group B)**.** Ethical clearance was obtained from the Institutional Ethics Committee. 20 patients (aged 14–35 years) were randomly assigned into two groups (n=10 each) based on predefined inclusion and exclusion criteria. Written informed consent was obtained from all patients after thoroughly explaining the research protocol. Comprehensive demographic and clinical data were recorded for each participant.

For data collection Patients underwent preoperative radiographic assessment (IOPA/OPG) Preoperative laboratory investigations comprised hemoglobin levels, total and differential leukocyte counts, bleeding time, clotting time, blood glucose levels, and other relevant tests as deemed necessary to ensure patient fitness for surgery. Local anesthesia was administered, and third molars were extracted using the designated techniques for each group. All surgical procedures were performed by skilled and experienced oral surgeons. Parameters such as pain (VAS scale), swelling, trismus, wound healing, and bone healing were assessed at 24 hours, 7 days, 15 days, 4 weeks, and 8 weeks postoperatively. Digital photographs and radiographs were used for documentation.

2.1. Statistical analysis

Data were analyzed using SPSS v29.0. Descriptive statistics, independent t-tests, chi-square tests were employed. A p-value < 0.05 was considered statistically significant.

3. Results

The study included 20 patients (10 in each group), with comparable demographic profiles. The mean age in Group A (Modified Lingual Split) was 24.30±1.89 years, and in Group B (Conventional Buccal Bone Cutting) was 25.30±1.89 years, with no statistically significant difference (p=0.252). Gender distribution was also comparable between the groups (p=0.639). The types of impaction (mesio-angular, vertical, horizontal, and disto-angular) were similarly distributed in both groups (p=0.912).

Table 1: Comparison of mean swelling among group A (Lingual Split) and group B (Buccal Bone Cutting) at different time interval (n=20)

Swelling	**Mean±SD**		**t- value**	**p-value**
	Group A (Lingual Split) (n=10)	**Group B (Buccal Bone Cutting)(n=10)**		
Pre-operative	9.12±0.24	9.12±0.13	0.000	1.000
Post-operative (After 24 hours)	10.26±0.09	10.26±0.01	0.033	0.974
Post-operative (After 7 days)	9.36±0.24	9.740±0.29	-3.128	0.006
Post-operative (After 15 days)	8.96±0.05	9.160±0.17	-3.536	0.002*

*Statistically significant

Table 2: Comparison of wound healing among group A (Lingual Split) and group B (Buccal Bone Cutting) after 15 days (n=20)

Wound healing	**n (%)**		χ^2	**p-value**
	Group A (Lingual Split)(n=10)	Group B (Buccal Bone Cutting) (n=10)		
Completed	10(100%)	9(90%)	1.053	0.305
Not completed	0(0.0%)	1(10%)		

Table 3: Comparison of mean bleeding time among group A (Lingual Split) and group B (Buccal Bone Cutting) (n=20)

Parameters	Mean±SD/n (%)		t- value	p-value
	Group A (Lingual Split) (n=10)	Group B (Buccal Bone Cutting)(n=10)		
Bleeding time	5.62±0.30	6.36±0.15	-6.884	0.000*

*Statistically significant

Table 4: Comparison of mean trismus among group A (Lingual Split) and group B (Buccal Bone Cutting) at different time interval (n=20)

Trismus	Mean±SD		t- value	p-value
	Group A (Lingual Split)(n=10)	Group B (Buccal Bone Cutting) (n=10)		
Pre-operative	43.10±1.287	42.20±1.229	1.599	0.127
Post-operative (After 24 hours)	32.60±1.578	31.20±2.150	1.660	0.114
Post-operative (After 7 days)	37.80±0.632	34.40±.966	9.311	0.000*

*Statistically significant

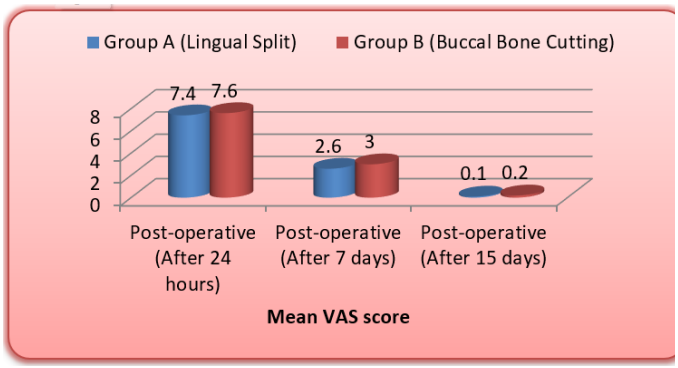

Figure 1: Comparison of pain scale among group A (Lingual Split) and group B (Buccal Bone Cutting) at different time interval (n=20)

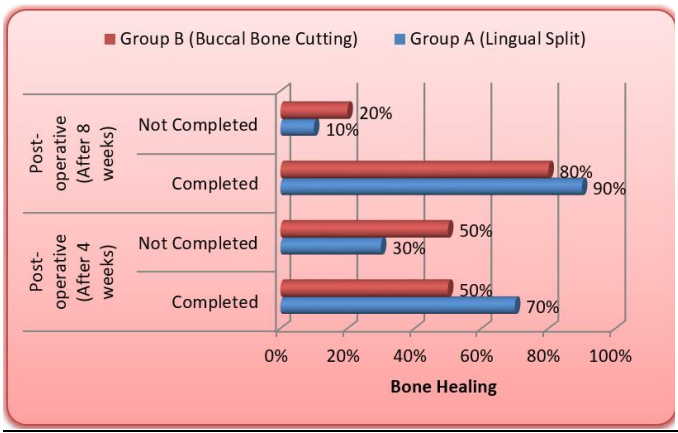

Figure 2: Comparison of post-operative radiographic evaluation (bontablee healing) among group A (Lingual Split) and group B (Buccal Bone Cutting) (n=20)

1. **Swelling:** Postoperative swelling was significantly reduced in Group A at 7 and 15 days postoperatively compared to Group B (p=0.006 and p=0.002, respectively), indicating faster resolution of inflammation with the modified lingual split technique. (**Table 1**)
2. **Wound Healing:** At the 15-day follow-up, complete wound healing was observed in all patients in Group A (100%) and in 90% of patients in Group B. Although this difference was not statistically significant (p=0.305), the trend favored the lingual split technique. (**Table 2**)
3. **Bleeding Time:** Group A demonstrated a significantly shorter bleeding time (5.62±0.30 minutes) compared to Group B (6.36±0.15 minutes), with the difference being statistically significant (p<0.001), suggesting better intraoperative hemostasis in the lingual split group. (**Table 3**)
4. **Trismus:** There was no significant difference in mouth opening preoperatively or at 24 hours postoperatively. However, at 7 days, Group A showed significantly less trismus than Group B (p<0.001), indicating quicker functional recovery. (**Table 4**Table 4)
5. **Pain (VAS Scores):** Both groups showed a progressive reduction in postoperative pain over time. Although Group A exhibited slightly lower mean pain scores at each interval (24 hours, 7 days, and 15 days), the differences were not statistically significant (p>0.05). (**Figure 1**)
6. **Bone Healing:** Radiographic evaluation at 4 weeks revealed 70% complete bone healing in Group A versus 50% in Group B. At 8 weeks, healing was observed in 90% of Group A and 80% of Group B. Although these differences were not statistically significant (p=0.361 and p=0.264, respectively), Group A demonstrated a more favorable trend in bone regeneration. (**Figure 2**)

Overall, the Modified Lingual Split Technique showed better outcomes in terms of swelling reduction, faster wound healing, lower bleeding time, improved trismus recovery, and

enhanced radiographic bone healing compared to the Conventional Buccal Bone Cutting Technique, with several findings reaching statistical significance.

4. Discussion

Many methods can be used to remove impacted third molars, each with pros and cons, to reduce surgical morbidity and improve patient satisfaction. Lower third molar extraction causes discomfort, edema, trismus, alveolar osteitis, pocket formation next to the second molar, and inferior alveolar nerve paraesthesia8. A prospective comparative study examined wound healing, post-operative complications, and bone healing after the Modified Lingual Split Technique and Conventional Buccal Bone Cutting Technique were used to remove impacted mandibular third molars.

Postoperative swelling is a major issue, especially in mandibular third molar surgery. The Lingual Split approach reduces swelling faster than the other, even though both cause similar swelling immediately after surgery.[9] Found decreased edema in subjects treated with lingual split method, but not significantly.

Postoperative recovery from third molar extractions depends on wound healing. After 15 days, Lingual Split (Group A) and Buccal Bone Cutting (Group B) wound healing rates differed, but not significantly. Regulated bone separation and little soft tissue injury in the Lingual Split operation maintain vascularity and speed epithelialization.[10] Buccal Bone Cutting, which involves bone excision and periosteal separation, may reduce vascular supply and granulation tissue growth.[11].

Managing bleeding is crucial during surgery, especially for impacted third molars. The Lingual Split group had a significantly lower mean bleeding time than the Buccal Bone Cutting group. Buccal Bone Cutting involves bone drilling, which increases periosteal stripping and blood vessel injury, prolonging bleeding[12]. Controlled bone fracture in the Lingual Split technique reduces soft tissue disruption and periosteal injury, reducing bleeding time. The lingual split method, which avoids piezoelectric cutting, accelerates hemostasis by compressing bone at the fracture site. Lingual Split osteotomy may be better for bleeding patients or those on anticoagulants because to its shorter bleeding time.[13] Buccal Bone Cutting surgeons may use less invasive approaches and cautery-assisted hemostasis to reduce hemorrhage.

Postoperative trismus, or restricted mouth opening, is prevalent after third molar extractions. Muscle trauma, surgery, and inflammation cause it. Lingual Split and Buccal Bone Cutting procedures differ in trismus recovery, especially at 7 days postoperatively. Singh KI et al.[9] also found that lingual split method reduced postoperative trismus, though not statistically. Kashyap A et al.[14] found similar results. Lingual split may cause less trismus because to less tissue stress and a more direct approach to the tooth, while buccal bone cutting may cause more edema and pain.

Third molar extractions depend on pain treatment for patient recovery and surgical success. Postoperative pain is often measured using the Visual Analogue Scale (VAS), where higher values indicate more pain. In this study, the Lingual Split and Buccal Bone Cutting techniques reduced pain gradually over time, with no statistically significant differences at any postoperative time point ($p > 0.05$). It appears that surgical method does not affect postoperative pain. Singh KI et al.[9] and Kashyap et al.[14] also showed no significant difference in pain perception between different surgical methods. Inflammatory reactions, soft tissue injuries, and muscle spasm cause peak pain within 24–48 hours postoperatively, according to their investigations. By day 7, mending reduces pain, and by day 15, it's minimal. Some studies suggest that the lingual split approach may reduce postoperative pain faster, although the difference is not statistically significant, supporting the conclusion that both treatments are equally beneficial. Several variables explain why both procedures have similar pain levels. Inflammatory responses are the main cause of postoperative pain, and bone manipulation and periosteal elevation produce inflammatory mediators.[9] Second, studies demonstrate that maintaining cortical bone with bone lid procedures has no effect on pain perception.[14] Finally, standardized postoperative pain management techniques like NSAIDs, cold therapy, and antibiotics ensure equivalent pain experiences for both groups. Kashyap et al.[14] stressed that postoperative pain is better controlled by analgesia than surgery.

After third molar extraction, bone repair is critical. Lingual Split had a greater rate of bone healing at 4 weeks (70% vs. 50%) and 8 weeks (90% vs. 80%) than Buccal Bone Cutting, while the differences were not statistically significant. Erdem M.K et al.[15] found similar results. Lingual Split may heal faster due to less periosteal disruption, retained vascular supply, and reduced inflammation. Buccal Bone Cutting removes more bone and takes longer to repair, delaying recovery. Both methods showed considerable bone regeneration by 8 weeks, proving that with adequate surgery and postoperative care, either may recover.

5. Source of Funding

None.

6. Conflict of Interest

None.

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