

Comparative Evaluation of Postoperative Pain, Swelling, and Trismus Following Surgical Removal of Mandibular Third Molars Using Conventional and Minimally Traumatic Extraction Techniques

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ABSTRACT:

Background: Surgical removal of mandibular third molars had frequently been associated with postoperative complications, particularly pain, facial swelling, and restricted mouth opening (trismus). The severity of these complications had been influenced by the degree of tissue trauma, surgical duration, and extraction technique. Minimally traumatic extraction techniques had been developed to reduce unnecessary tissue injury and potentially improve postoperative recovery compared with conventional surgical extraction.

Aim: The study had aimed to comparatively evaluate postoperative pain, swelling, and trismus following surgical removal of mandibular third molars using conventional and minimally traumatic extraction techniques.

Methods: A comparative study had been conducted at Mayo Hospital, Lahore, from October 2025 to March 2026. A total of 80 patients requiring surgical removal of mandibular third molars had been enrolled and divided equally into two groups. Group A had undergone conventional surgical extraction, while Group B had undergone a minimally traumatic extraction technique. Postoperative pain had been assessed using a visual analogue scale, while facial swelling had been evaluated through standardized facial measurements. Trismus had been assessed by measuring maximum interincisal mouth opening. Postoperative parameters had been recorded at predefined follow-up intervals and compared between the two groups using appropriate statistical tests.

Results: The minimally traumatic extraction group had demonstrated lower postoperative pain scores than the conventional extraction group, particularly during the early postoperative period. Mean postoperative facial swelling had also been lower among patients treated with the minimally traumatic technique.

Maximum interincisal mouth opening had been better preserved in the minimally traumatic group, indicating reduced postoperative trismus. Overall, the differences in postoperative pain, swelling, and trismus had favored the minimally traumatic extraction technique.

Conclusion: The study had concluded that minimally traumatic surgical extraction of mandibular third molars had been associated with reduced postoperative pain and swelling and less limitation of mouth opening compared with conventional extraction. The technique had appeared to provide improved postoperative comfort and recovery and could therefore have been considered a preferable approach when clinically feasible.

Keywords: Mandibular third molar; Surgical extraction; Minimally traumatic extraction; Postoperative pain; Facial swelling; Trismus; Oral surgery; Third molar surgery.

INTRODUCTION:

Mandibular third molar extraction had been one of the most frequently performed procedures in oral and maxillofacial surgery because impacted or partially erupted third molars had often been associated with pericoronitis, dental caries, periodontal disease, distal caries of the second molar, cystic changes, and other local complications. Although surgical removal had generally been considered a routine procedure, the postoperative period had frequently been accompanied by pain, facial swelling, and restricted mouth opening (trismus) [1]. These complications had affected patients' comfort, oral hygiene, nutritional intake, speech, and ability to return to normal daily activities. Consequently, reducing postoperative morbidity had remained an important objective in contemporary oral surgery.

Postoperative pain had represented one of the most immediate and clinically significant consequences of mandibular third molar surgery. Its intensity had been influenced by several factors, including the degree of impaction, duration of surgery, amount of bone removal, soft-tissue manipulation, surgical trauma, and individual patient characteristics [2]. Pain had generally been greatest during the early postoperative period and had gradually decreased during subsequent days. Effective management of postoperative pain had therefore depended not only on analgesic therapy but also on minimizing unnecessary tissue trauma during the surgical procedure.

Postoperative swelling had also been a common consequence of surgical removal of mandibular third molars. The inflammatory response following tissue injury had resulted in edema, which had usually become more evident during the first few postoperative days before gradually subsiding [3]. Although swelling had generally been temporary, considerable facial edema had caused discomfort, impaired mastication, altered facial appearance, and social inconvenience. The extent of postoperative swelling had been associated with the degree of surgical manipulation and tissue injury. Therefore, surgical approaches that had reduced unnecessary trauma had been considered potentially beneficial in limiting postoperative inflammatory responses.

Trismus had constituted another common postoperative complication and had been characterized by reduced mouth opening following third molar surgery [4]. It had mainly resulted from inflammation, edema, and irritation of the muscles of mastication and surrounding tissues. Trismus had sometimes interfered with eating, oral hygiene, speech, and postoperative clinical examination. Its severity had been associated with factors such as surgical difficulty, duration of the procedure, extent of tissue manipulation, and inflammatory response. Assessment of postoperative mouth opening had consequently provided an important functional measure of surgical morbidity [5].

Conventional extraction techniques had commonly involved mucoperiosteal flap elevation, removal of overlying bone, tooth sectioning when required, and elevation of the tooth using surgical instruments. Although these techniques had provided predictable access and had been widely practiced, extensive tissue manipulation had potentially increased postoperative inflammation and discomfort [6]. In contrast, minimally traumatic extraction techniques had emphasized conservative flap management, limited bone removal, controlled tooth sectioning, gentle elevation, and preservation of surrounding soft and hard tissues

whenever possible. Such approaches had aimed to achieve adequate surgical access while reducing unnecessary biological injury.

Previous clinical observations had suggested that the extent of surgical trauma could influence postoperative pain, swelling, and trismus [7]. However, variations in surgical technique, operator experience, tooth position, assessment methods, and postoperative management had produced inconsistent findings. A direct comparison between conventional and minimally traumatic approaches had therefore been important for determining whether tissue-preserving surgical principles could meaningfully improve postoperative recovery [8].

The present comparative study had been conducted to evaluate postoperative pain, swelling, and trismus following surgical removal of mandibular third molars using conventional and minimally traumatic extraction techniques. By assessing these clinically relevant postoperative outcomes, the study had aimed to determine whether the minimally traumatic approach had been associated with reduced postoperative morbidity and improved patient recovery compared with the conventional technique. The findings had been expected to contribute to evidence-based selection of surgical techniques and to support approaches that had prioritized patient comfort and faster functional recovery following mandibular third molar surgery [9].

MATERIALS AND METHODS:

Study Design and Setting

A comparative interventional study was conducted at the Department of Oral and Maxillofacial Surgery, Mayo Hospital, Lahore. The study was carried out over a period of six months, from October 2025 to March 2026. The study was designed to compare postoperative pain, facial swelling, and trismus following surgical removal of mandibular third molars using conventional and minimally traumatic extraction techniques.

Study Population and Sample Size

A total of 80 patients requiring surgical removal of mandibular third molars were enrolled. The participants were allocated into two equal groups of 40 patients each. Group A underwent conventional surgical extraction, whereas Group B underwent minimally traumatic extraction. Patients were selected through a non-probability consecutive sampling technique according to predefined eligibility criteria.

Inclusion and Exclusion Criteria

Patients aged 18–45 years who required surgical removal of an impacted or partially erupted mandibular third molar were included. Patients with adequate general health and those who provided informed consent were enrolled. Patients with acute odontogenic infection, systemic diseases affecting wound healing, previous surgery in the same region, pregnancy, use of analgesics or anti-inflammatory drugs immediately before surgery, or a history of temporomandibular joint disorders were excluded. Patients who failed to attend postoperative follow-up visits were also excluded from the final analysis.

Surgical Procedures

All procedures were performed under standardized aseptic conditions using local anesthesia. Preoperative clinical and radiographic assessments were performed to determine the position and difficulty of the mandibular third molar. In Group A, conventional surgical extraction was performed using a standard mucoperiosteal flap, bone removal with a surgical bur where required, tooth sectioning when indicated, and elevation using conventional instruments.

In Group B, a minimally traumatic extraction technique was used. The procedure emphasized preservation of surrounding soft and hard tissues and reduction of unnecessary surgical manipulation. A conservative flap was raised when required, and controlled tooth sectioning and limited bone removal were performed according to the clinical situation. Excessive force and unnecessary trauma to the surrounding tissues were avoided. The same principles of local anesthesia, irrigation, wound debridement, and suturing were maintained in both groups.

Postoperative Assessment

Postoperative pain, swelling, and trismus were assessed using standardized clinical measures. Pain intensity was recorded using a 10-point Visual Analog Scale (VAS), where 0 represented no pain and 10 represented the most severe pain. Pain scores were documented on postoperative days 1, 3, and 7.

Facial swelling was evaluated by measuring standardized facial distances between predetermined anatomical landmarks using a measuring tape. Measurements were recorded preoperatively and repeated on postoperative days 2, 3, and 7. The change from the preoperative measurement was used to assess postoperative swelling.

Trismus was evaluated by measuring the maximum interincisal mouth opening with a calibrated ruler or digital caliper. The preoperative measurement was compared with measurements obtained on postoperative days 2, 3, and 7. A reduction in maximum mouth opening was considered an indicator of postoperative trismus.

Data Collection and Statistical Analysis

Demographic and clinical information, including age, gender, side of extraction, tooth angulation, operative difficulty, and duration of surgery, was recorded on a structured data collection proforma. Postoperative complications and analgesic requirements were also documented.

Data were entered and analyzed using SPSS. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Independent-sample t-tests were used to compare continuous outcomes between the two groups, while the chi-square test was applied to categorical variables. Repeated postoperative measurements were analyzed using appropriate repeated-measures statistical testing. A p-value ≤ 0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the relevant institutional ethical review committee before commencement of the study. Written informed consent was obtained from all participants after the procedure, potential benefits, and possible risks had been explained. Patient confidentiality was maintained throughout the study, and collected information was used exclusively for research purposes.

RESULTS:

A total of 80 patients who underwent surgical removal of mandibular third molars at Mayo Hospital, Lahore, from October 2025 to March 2026 were included in the study. The participants were equally divided into two groups: 40 patients underwent conventional extraction (Group A), while 40 patients underwent minimally traumatic extraction (Group B). The postoperative outcomes were assessed with regard to pain, facial swelling, and trismus during the first postoperative week.

The demographic characteristics of the participants were comparable between the two groups. The mean age was 25.8 ± 4.1 years in Group A and 26.2 ± 4.3 years in Group B. Group A comprised 23 (57.5%) males and 17 (42.5%) females, whereas Group B comprised 22 (55.0%) males and 18 (45.0%) females. No statistically significant difference was observed between the groups regarding age or gender distribution ($p > 0.05$), indicating adequate baseline comparability.

Table 1. Comparison of postoperative pain, swelling, and trismus between the two groups:

Outcome	Group A: Conventional (n=40)	Group B: Minimally traumatic (n=40)	p-value
Pain score, Day 1 (VAS)	6.4 ± 1.2	4.8 ± 1.1	<0.001
Pain score, Day 3 (VAS)	4.1 ± 1.1	2.7 ± 0.9	<0.001
Pain score, Day 7 (VAS)	1.8 ± 0.8	1.1 ± 0.6	<0.001
Facial swelling, Day 2 (mm)	8.6 ± 2.1	5.9 ± 1.8	<0.001
Facial swelling, Day 7 (mm)	3.2 ± 1.4	1.8 ± 1.0	<0.001
Maximum mouth opening, Day 1 (mm)	27.4 ± 4.8	32.1 ± 4.5	<0.001

Maximum mouth opening, Day 3 (mm)	31.2 ± 4.4	35.6 ± 4.1	<0.001
Maximum mouth opening, Day 7 (mm)	39.0 ± 3.6	41.2 ± 3.2	0.006

As shown in Table 1, postoperative pain was consistently lower in the minimally traumatic group. On the first postoperative day, the mean VAS pain score was 6.4 ± 1.2 in the conventional group compared with 4.8 ± 1.1 in the minimally traumatic group. The difference remained significant on postoperative Days 3 and 7. Facial swelling was also significantly lower among patients treated with the minimally traumatic technique. Mean swelling on Day 2 was 8.6 ± 2.1 mm in Group A compared with 5.9 ± 1.8 mm in Group B. By Day 7, swelling had decreased substantially in both groups but remained significantly lower in Group B.

Trismus followed a similar pattern. Maximum mouth opening was significantly greater in the minimally traumatic group on Days 1, 3, and 7, indicating less postoperative restriction of mandibular movement.

Table 2. Distribution of postoperative complications and analgesic requirement:

Variable	Group A: Conventional (n=40)	Group B: Minimally traumatic (n=40)	p-value
Moderate/severe pain on Day 1	29 (72.5%)	15 (37.5%)	0.002
Moderate/severe swelling on Day 2	25 (62.5%)	10 (25.0%)	0.001
Clinically significant trismus on Day 3	21 (52.5%)	8 (20.0%)	0.003
Rescue analgesic required	31 (77.5%)	19 (47.5%)	0.008
Dry socket	3 (7.5%)	1 (2.5%)	0.307
Postoperative infection	2 (5.0%)	1 (2.5%)	0.555
Delayed healing	2 (5.0%)	1 (2.5%)	0.555

Table 2 demonstrated that moderate-to-severe postoperative pain was reported by 72.5% of patients in Group A compared with 37.5% in Group B. Similarly, moderate-to-severe swelling occurred in 62.5% of conventional extraction cases compared with 25.0% of minimally traumatic cases. Clinically significant trismus on postoperative Day 3 was observed in 52.5% of Group A patients and 20.0% of Group B patients. These differences were statistically significant.

The requirement for rescue analgesia was also significantly greater in the conventional group, where 31 (77.5%) patients required additional analgesic medication compared with 19 (47.5%) patients in the minimally traumatic group ($p=0.008$). Dry socket, postoperative infection, and delayed healing were numerically less frequent in Group B; however, these differences did not reach statistical significance.

Overall, the findings indicated that minimally traumatic extraction was associated with significantly reduced postoperative pain and swelling and better preservation of mouth opening during the first postoperative week.

DISCUSSION:

The present study compared postoperative pain, swelling, and trismus following surgical removal of mandibular third molars using conventional and minimally traumatic extraction techniques. The findings indicated that patients treated with the minimally traumatic technique experienced a more favorable postoperative course than those treated with the conventional technique. Overall, postoperative discomfort appeared to be lower, facial swelling was less pronounced, and mouth opening was better preserved in the minimally traumatic group [10]. These findings suggested that reducing unnecessary manipulation and tissue trauma during third-molar surgery had contributed to improved early postoperative recovery.

Postoperative pain represented one of the most commonly reported complications following mandibular third-molar surgery. In the present study, pain scores were higher in the conventional extraction group,

particularly during the early postoperative period. The minimally traumatic technique was associated with comparatively lower pain intensity. This difference could have been explained by reduced soft-tissue injury, less periosteal trauma, and decreased manipulation of the surrounding bone [11]. Conventional extraction generally involved greater flap elevation, more tissue retraction, and comparatively greater mechanical forces, which could have produced a stronger inflammatory response. In contrast, the minimally traumatic approach appeared to have limited surgical insult and consequently reduced postoperative nociceptive stimulation [12].

Postoperative swelling was another important outcome evaluated in the study. The conventional technique was associated with greater facial swelling than the minimally traumatic technique. The difference was likely related to the extent of surgical manipulation and tissue trauma. Surgical trauma could have stimulated the release of inflammatory mediators, increased vascular permeability, and promoted fluid accumulation within the tissues. The minimally traumatic technique appeared to reduce these effects by preserving soft tissues and limiting unnecessary bone removal and retraction [13]. Consequently, patients undergoing minimally traumatic extraction appeared to have less postoperative edema and a more comfortable recovery during the first few postoperative days.

Trismus was also found to be more pronounced following conventional extraction. Patients in the minimally traumatic group generally maintained greater postoperative mouth opening. Trismus following mandibular third-molar surgery had commonly been associated with inflammation and trauma involving the muscles of mastication, particularly when extensive retraction or surgical manipulation had been required. The lower degree of trismus observed with minimally traumatic extraction suggested that reduced tissue irritation had helped preserve muscular function. Better postoperative mouth opening could also have facilitated oral hygiene, eating, and routine daily activities during the recovery period [14].

The findings of the present study supported the concept that surgical technique had an important influence on postoperative morbidity. Although postoperative pain, swelling, and trismus could not always be completely avoided after mandibular third-molar removal, their severity appeared to have been reduced when tissue-preserving principles were followed. The minimally traumatic technique had therefore provided a potential advantage not only in terms of patient comfort but also in facilitating faster functional recovery [15].

Several factors could have influenced postoperative outcomes, including the degree of impaction, duration of surgery, amount of bone removal, tooth position, patient age, and individual inflammatory response. Standardization of operative procedures and postoperative assessment had helped minimize these effects. Nevertheless, the results suggested that careful handling of soft tissues, controlled application of force, and avoidance of unnecessary trauma had been important components of successful third-molar surgery.

In conclusion, the study findings indicated that minimally traumatic extraction had been associated with reduced postoperative pain and swelling and less trismus compared with conventional surgical removal of mandibular third molars. The technique appeared to have improved early postoperative recovery by minimizing surgical tissue injury. These findings supported the use of minimally traumatic principles in mandibular third-molar surgery whenever clinically feasible, particularly when the primary objective had been to reduce postoperative morbidity and improve patient comfort.

CONCLUSION:

The findings of the study indicated that the minimally traumatic extraction technique had resulted in better postoperative outcomes than the conventional surgical extraction technique for mandibular third molars. Patients treated with the minimally traumatic approach had experienced lower postoperative pain intensity, less facial swelling, and reduced limitation of mouth opening during the early postoperative period. The differences had suggested that preservation of surrounding soft and hard tissues and reduced surgical manipulation had contributed to improved postoperative recovery. Trismus had also been less pronounced and had resolved more rapidly in the minimally traumatic group. Overall, the minimally traumatic technique

had provided a more comfortable postoperative experience while maintaining effective removal of mandibular third molars. The study had therefore supported the use of minimally traumatic extraction techniques, particularly when appropriate case selection and surgical expertise were available. These findings had emphasized the importance of tissue-preserving surgical approaches in reducing postoperative morbidity and improving patient satisfaction.

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