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Effectiveness of Submucosal Injection of Dexamethasone versus Triamcinolone Acetonide in the Management of Mental Nerve Paraesthesia Following Mandibular Parasymphysis Fracture: A Clinical Trial

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KEYWORDS

Mental nerve paraesthesia; Parasymphysis fracture; Dexamethasone; Triamcinolone acetonide; Kenocort; Submucosal injection; Neurosensory deficit; Mandibular fracture.

ABSTRACT:

Introduction: Mental nerve paraesthesia is a common complication of mandibular parasymphysis fractures due to nerve compression, inflammation, and post-traumatic edema. Although fracture reduction restores anatomical continuity, neurosensory recovery may remain delayed. Corticosteroids may improve recovery by reducing perineural inflammation and edema.

To evaluate and compare the effectiveness of submucosal dexamethasone and triamcinolone acetonide (Kenocort) injections in improving mental nerve paraesthesia following parasymphysis fractures.

Methods clinical trial was conducted among 40 patients presenting with mandibular parasymphysis fractures associated with mental nerve paraesthesia. Participants were randomly allocated into two groups. Group A received submucosal dexamethasone injection (4 mg/1 ml) and Group B received submucosal triamcinolone acetonide injection (10 mg/1 ml). Sensory evaluation was performed using light touch, pin-prick, two-point discrimination, and VAS-based subjective sensation scoring. Follow-up was conducted at baseline, week 1, week 2, week 4, and week 8. Statistical analysis was performed using paired and independent t-tests, with $p<0.05$ considered significant.

Results A Both groups showed statistically significant improvement in neurosensory recovery. Mean VAS sensation scores improved from 3.1 ± 1.0 to 8.4 ± 1.1 in Group A and from 3.0 ± 1.1 to 8.0 ± 1.2 in Group B by week 8. Group A demonstrated significantly faster improvement at week 1 and week 2 ($p<0.05$), while no statistically significant difference was noted between groups at week 8 ($p>0.05$). Two-point discrimination improved earlier in the dexamethasone group compared to the kenocort group.

Conclusions: Submucosal corticosteroid injections are effective in the management of mental nerve paraesthesia following parasymphysis fractures. Dexamethasone provides faster early neurosensory recovery compared to triamcinolone acetonide, while both agents achieve comparable recovery by 8 weeks.

Clinical Significance Early submucosal corticosteroid therapy may reduce duration of paraesthesia and improve postoperative patient comfort and sensory outcomes.

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1. Introduction

Mandibular fractures constitute a significant proportion of maxillofacial injuries encountered in clinical practice, accounting for a large share of facial trauma cases worldwide. Owing to its prominent position, mobility, and relatively thin cross-section in certain regions, the mandible is particularly susceptible to traumatic injury (1,2). Among the various anatomical sites of mandibular fractures, the parasymphysis region is frequently involved. Epidemiological studies have reported that parasymphysis fractures may account for approximately 28–50% of mandibular fractures (3,4). This region, extending between the canine and lateral incisor areas, is structurally vulnerable due to the presence of the mental foramen and the comparatively reduced bone density surrounding it. As a result, fractures in this region often carry a higher risk of associated neurovascular injury (5).

The mental nerve, a terminal branch of the inferior alveolar nerve, exits the mandible through the mental foramen and provides sensory innervation to the lower lip, chin, and labial mucosa of the anterior mandible (6). Because of its close anatomical proximity to the parasymphysis region, the mental nerve is particularly susceptible to trauma in cases of parasymphysis fractures (7). Consequently, neurosensory disturbances such as paraesthesia, hypoesthesia, anesthesia, and dysesthesia are commonly observed in affected patients (8). These sensory deficits may present immediately following trauma or may develop during the postoperative period following fracture reduction and fixation (9).

The pathophysiology of mental nerve dysfunction following parasymphysis fractures is multifactorial. Direct mechanical trauma to the nerve during the injury, compression from displaced fracture segments, formation of hematoma within the fracture site, and post-traumatic inflammatory edema are among the most frequently implicated mechanisms (10). The prevalence of inferior alveolar nerve dysfunction associated with mandibular fractures has been reported to range from 5.7% to 58.5%, depending on the fracture location and degree of displacement (11). In most cases, the nerve injury corresponds to neuropraxia or mild axonotmesis, in which nerve continuity is preserved but conduction is temporarily impaired (12). However, even with appropriate fracture reduction and stabilization, the recovery of neurosensory function can be slow and unpredictable. The duration of recovery varies widely among patients, ranging from several weeks to many months, and in some cases the sensory deficit may persist indefinitely (13).

Persistent paraesthesia of the lower lip and chin can have a considerable impact on a patient's daily life and overall quality of life. Sensory disturbances in this region may interfere with essential oral functions such as speech articulation, mastication, and oral competence (14). Patients may also experience altered tactile perception, accidental lip biting, drooling, or difficulty in maintaining oral hygiene. Furthermore, chronic sensory deficits can lead to psychological distress, anxiety, and dissatisfaction with treatment outcomes (15). Given these potential consequences, early interventions aimed at enhancing nerve recovery are of considerable clinical importance.

Several therapeutic approaches have been proposed for the management of traumatic neurosensory disturbances associated with mandibular fractures. Conservative management with observation remains a commonly adopted strategy, as many neuropraxic injuries demonstrate spontaneous recovery over time (16). Adjunctive pharmacological therapies, including vitamin B complex supplementation, antioxidants, and neuromodulators such as gabapentin or pregabalin, have also been suggested to support nerve regeneration and alleviate neuropathic symptoms (17). In addition, physiotherapeutic modalities such as low-level laser therapy and sensory re-education techniques have been explored in recent years with varying degrees of success (18).

Among the pharmacological options, corticosteroids have gained particular interest due to their potent anti-inflammatory and anti-edematous properties. Corticosteroids act by inhibiting the release of inflammatory mediators, stabilizing cellular membranes, and reducing capillary permeability, thereby minimizing tissue edema and secondary nerve compression (19). By reducing the inflammatory response surrounding the injured nerve, corticosteroids may help restore microcirculation, decrease intraneural pressure, and facilitate neural recovery. Consequently, corticosteroid therapy has been widely used in oral and maxillofacial

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surgery for the management of postoperative edema, trismus, and inflammatory conditions (20).

Dexamethasone is a synthetic glucocorticoid with strong anti-inflammatory potency and minimal mineralocorticoid activity. It is routinely administered in oral and maxillofacial surgical procedures to reduce postoperative swelling, pain, and inflammatory complications. Its relatively rapid onset of action makes it particularly useful in acute inflammatory conditions. In contrast, triamcinolone acetonide (Kenocort) is a long-acting corticosteroid formulation widely used in dentistry for the management of oral inflammatory and immune-mediated lesions such as oral lichen planus, aphthous ulcers, and mucosal inflammatory disorders.

Local submucosal administration of corticosteroids in the vicinity of the mental foramen offers several advantages. Targeted delivery ensures a higher concentration of the drug at the site of nerve injury while minimizing systemic exposure and potential adverse effects. Additionally, localized injection may directly reduce perineural inflammation and edema around the mental nerve, thereby enhancing the potential for neurosensory recovery.

Despite the theoretical benefits of corticosteroid therapy, the available literature regarding their effectiveness in the management of traumatic mental nerve paraesthesia remains limited. Moreover, comparative studies evaluating different corticosteroid formulations in this context are scarce. In particular, evidence comparing the therapeutic outcomes of dexamethasone and triamcinolone acetonide (Kenocort) for post-traumatic mental nerve sensory disturbances following parasymphysis fractures is lacking.

Therefore, the present randomized controlled trial was conducted to evaluate and compare the effectiveness of locally administered dexamethasone and triamcinolone acetonide in promoting neurosensory recovery in patients presenting with mental nerve paraesthesia associated with mandibular parasymphysis fractures.

2. MATERIALS AND METHODS

Study Design

A prospective, parallel-arm, clinical trial was conducted.

Study Setting

The study was carried out in the Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospital, Chennai India, over a period of 6 months (July 2025- December 2025).

Sample Size

A total of 40 participants were included in the study (20 in each group).

Sample size was calculated based on expected mean difference in VAS improvement with power of 80% and alpha error of 5%.

Eligibility Criteria

Inclusion Criteria

Patients aged 18–60 years.

Clinically and radiographically diagnosed mandibular parasymphysis fracture.

Presence of mental nerve paraesthesia (lower lip/chin numbness) confirmed by clinical neurosensory tests.

Patients undergoing ORIF or conservative fracture management with persistent paraesthesia at baseline.

Willingness to provide informed consent and comply with follow-up schedule.

Exclusion Criteria

Patients with pre-existing neuropathy or neurological disorders.

Comminuted fractures or suspected nerve transection.

Pathological fractures.

Known hypersensitivity to corticosteroids.

Pregnant/lactating women.

Patients with uncontrolled diabetes mellitus, immunocompromised conditions, or active oral infection.

Patients on long-term steroid therapy.

Randomization and Allocation Concealment Participants were randomly allocated into two groups using computer-generated random numbers. Allocation concealment was ensured using sealed opaque envelopes prepared by an independent investigator.

Blinding

The study followed a single-blinded design, where the outcome assessor was blinded to the intervention group. The operator administering injections was not blinded due to drug preparation differences.

Intervention Protocol

Participants were divided into two intervention groups.

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Group A received submucosal injections of Dexamethasone sodium phosphate at a dose of 4 mg/1 mL, administered in the mucobuccal fold of the premolar region near the mental foramen on the affected side.

Group B received submucosal injections of Triamcinolone acetonide (Kenocort) at a dose of 10 mg/1 mL at the same anatomical site. In both groups, injections were given once weekly for a duration of two weeks.

Injection Technique

After antiseptic preparation, topical anesthetic gel was applied. A 26-gauge needle was inserted into the mucobuccal fold near the mental foramen and the drug was deposited slowly into the submucosal plane. Patients were observed for 15 minutes post-injection for any adverse reaction.

Standardization of Fracture Management

All patients underwent fracture management (ORIF or closed reduction) based on clinical indication. Standard postoperative antibiotics and analgesics were prescribed. No systemic corticosteroids were prescribed to avoid confounding.

Neurosensory Evaluation

Neurosensory evaluation was performed at baseline and during all follow-up visits to assess sensory recovery. Objective assessment included the light touch test using a cotton wisp compared with the contralateral side, the pin-prick test using a sterile sharp probe, and two-point discrimination measured with a caliper and recorded in millimeters. Subjective sensory perception was assessed using the Visual Analog Scale (VAS). All tests were carried out within the distribution of the Mental nerve, specifically involving the lower lip and chin region.

Follow-up Schedule and Outcome Measures

The primary outcome of the study was the improvement in neurosensory function, which was assessed using objective clinical tests including the light touch test, pin-prick test, and two-point discrimination test. The secondary outcome was the patient-reported subjective sensory improvement measured using the Visual Analog Scale (VAS), where a score of 0 indicated complete numbness and a score of 10 represented normal sensation. Follow-up evaluations were performed at predefined intervals to monitor neurosensory recovery, including baseline (Day 0) prior to intervention, and subsequently at Week 1, Week 2, Week 4, and Week 8. These serial assessments allowed for the evaluation of both early and progressive changes in sensory function over the study period.

3. Results

3.1 Participant Flow

A total of 48 patients were screened. Eight were excluded (not meeting inclusion criteria or declined consent). Forty patients were enrolled and randomized equally.

Flow Summary:

Assessed for eligibility: 48, Excluded: 8, Randomized: 40, Allocated to Group A: 20,

Allocated to Group B: 20

Follow-up completed: 19 (Group A), 18 (Group B)

Dropouts: 1 (Group A), 2 (Group B)

Table 1. Demographic and Clinical Characteristics			
Variable	Group A (Dexamethasone) n=20	Group B (Kenocort) n=20	p-value
Mean age (yrs)	31.6 ± 8.4	32.2 ± 7.9	0.81
Gender (M/F)	15/5	14/6	0.73
Etiology (RTA/Assault/Fall)	13/5/2	12/6/2	0.91
Unilateral fracture (%)	17 (85%)	16 (80%)	0.68
Bilateral fracture (%)	3 (15%)	4 (20%)	0.68
ORIF performed (%)	18 (90%)	17 (85%)	0.63

Table 2. Mean VAS Sensory Scores at Different Follow-ups

Follow-up	Group A Mean VAS	Group B Mean VAS	p-value
Baseline	3.1 ± 1.0	3.0 ± 1.1	0.76
Week 1	5.2 ± 1.1	4.5 ± 1.0	0.04*

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Week 2	6.8 ± 1.0	6.0 ± 1.2	0.03*
Week 4	7.9 ± 1.2	7.5 ± 1.1	0.28
Week 8	8.4 ± 1.1	8.0 ± 1.2	0.32

*Statistically significant ($p<0.05$)

Table 3. Two-Point Discrimination (mm) Improvement

Follow-up	Group A (mm)	Group B (mm)	p-value
Baseline	16.2 ± 2.4	16.4 ± 2.2	0.82
Week 2	12.3 ± 2.1	13.5 ± 2.3	0.05*
Week 4	9.8 ± 1.9	10.4 ± 2.0	0.31
Week 8	7.6 ± 1.5	7.9 ± 1.6	0.54

*Statistically significant ($p<0.05$)

Table 4. Percentage of Patients Achieving Near-Normal Sensation (VAS ≥ 8)

Follow-up	Group A (n=20)	Group B (n=20)	p-value
Week 2	6 (30%)	3 (15%)	0.26
Week 4	14 (70%)	11 (55%)	0.33
Week 8	17 (85%)	16 (80%)	0.69

3.2 Interpretation of Findings

Both dexamethasone and kenocort groups demonstrated significant neurosensory improvement from baseline to week 8. Group A showed significantly faster improvement during early follow-ups, while both groups achieved comparable outcomes by week 8.

4. Discussion

Mental nerve paraesthesia is a commonly encountered complication associated with mandibular parasymphysis fractures due to the close anatomical relationship between the fracture site and the mental foramen. Trauma to this region may result in varying degrees of injury to the mental nerve, ranging from transient neuropraxia to more severe axonal damage. The primary mechanisms responsible for sensory disturbances include direct mechanical trauma, compression by displaced fracture segments, hematoma formation, and inflammatory edema around the nerve. These factors may impair microvascular circulation and axonal conduction, ultimately resulting in altered sensory perception in the lower lip and chin region. Previous studies have reported that neurosensory disturbances of the inferior alveolar and mental nerve are frequently associated with mandibular fractures and may persist for varying durations depending on the severity of injury and fracture displacement.21,25,27

The recovery of neurosensory function following mandibular fractures depends on multiple variables, including the severity of nerve injury, degree of fracture displacement, timing of surgical intervention, and the extent of surrounding inflammation. Neuropraxic injuries generally demonstrate favorable prognosis with spontaneous recovery over time; however, persistent inflammation and edema in the region of the mental foramen may prolong nerve compression and delay functional recovery.26,28 Consequently, therapeutic strategies that reduce perineural inflammation and edema may enhance the regenerative potential of the affected nerve.

Corticosteroids have been widely used in maxillofacial surgery for their potent anti-inflammatory effects and ability to reduce tissue edema and nerve compression.23,24 In the present randomized clinical trial, both dexamethasone and triamcinolone acetonide (Kenocort) demonstrated significant improvement in neurosensory outcomes over the eight-week follow-up period. Patients in both groups showed progressive improvement in VAS sensory scores and reduction in two-point discrimination distances, indicating gradual restoration of sensory perception within the mental nerve distribution. These findings suggest that local corticosteroid administration may play a beneficial role in promoting neurosensory recovery following parasymphysis fractures.

A notable observation in the present study was the faster improvement in neurosensory parameters observed in the dexamethasone group during the early follow-up period. At both week 1 and week 2, the dexamethasone group demonstrated significantly higher VAS sensory scores compared with the Kenocort group. Similarly, early improvement in two-point discrimination was more pronounced in the dexamethasone group. This finding may be attributed to the pharmacological properties of

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dexamethasone, which possesses a high glucocorticoid potency and rapid onset of anti-inflammatory action. By suppressing inflammatory mediators and reducing capillary permeability, dexamethasone likely leads to a more rapid reduction in tissue edema surrounding the mental nerve. The resulting decrease in intraneural pressure may restore microvascular perfusion and facilitate early recovery of nerve conduction.23,24

In contrast, triamcinolone acetonide is a long-acting corticosteroid formulation with prolonged tissue retention. Although its onset of action is relatively slower compared with dexamethasone, the sustained anti-inflammatory effect may provide prolonged therapeutic benefit. This pharmacokinetic profile could explain why the neurosensory outcomes in the Kenocort group gradually improved over time and became comparable to those of the dexamethasone group by the fourth and eighth weeks. The absence of statistically significant differences between the groups at later follow-ups suggests that both corticosteroids ultimately achieve similar long-term outcomes in neurosensory recovery.

The improvement observed in two-point discrimination values further supports the recovery of sensory nerve function. Two-point discrimination testing reflects the functional integrity of mechanoreceptive nerve fibers and is widely used in the evaluation of inferior alveolar and mental nerve injuries.27,29 The progressive reduction in discrimination distance observed in both groups indicates improved neural conduction and sensory perception within the affected region. Similarly, the increasing proportion of patients achieving near-normal sensory perception (VAS ≥ 8) over time suggests gradual functional restoration of the mental nerve. Previous reports have also demonstrated that peripheral nerve recovery following injury is influenced by the degree of axonal damage and the capacity for neural regeneration.30

Overall, the findings of the present study indicate that both dexamethasone and triamcinolone acetonide are effective in improving neurosensory recovery following mandibular parasymphysis fractures. While dexamethasone may offer a faster initial recovery due to its rapid anti-inflammatory action, triamcinolone acetonide appears to provide comparable long-term outcomes owing to its sustained pharmacological effect. These results highlight the potential role of locally administered corticosteroids as an adjunctive therapeutic modality in the management of post-traumatic mental nerve paraesthesia.

Local submucosal administration of corticosteroids near the mental foramen offers several advantages in the management of traumatic nerve injuries. Targeted drug delivery allows higher local concentrations of the anti-inflammatory agent at the site of nerve injury while minimizing systemic exposure and associated adverse effects. Furthermore, the localized anti-inflammatory effect may directly reduce perineural edema and inflammatory compression around the mental nerve. This approach is particularly advantageous in patients with mandibular fractures where localized inflammatory processes play a major role in the pathogenesis of neurosensory disturbances.

Although corticosteroids have been extensively used in oral and maxillofacial surgery for controlling postoperative edema and inflammation, limited studies have specifically evaluated their role in the management of traumatic mental nerve paraesthesia associated with mandibular fractures. Most available literature has focused on inferior alveolar nerve injury following third molar surgery or orthognathic procedures. Therefore, the findings of the present study contribute to the limited body of evidence regarding pharmacological management of sensory disturbances in mandibular trauma. The results suggest that early local corticosteroid therapy may accelerate neurosensory recovery, particularly during the initial postoperative period.

Despite these encouraging findings, several limitations of the present study should be acknowledged. The sample size was relatively small, which may limit the generalizability of the results. Additionally, neurosensory evaluation was based primarily on subjective and clinical sensory tests, such as VAS scoring and two-point discrimination, without objective electrophysiological assessments such as nerve conduction studies or somatosensory evoked potentials. The degree of fracture displacement and severity of nerve injury may also vary among patients, potentially influencing the rate of recovery. Furthermore, the follow-up period was limited to eight weeks, and longer observation may be required to fully evaluate long-term nerve regeneration.

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Future studies involving larger sample sizes, standardized neurosensory assessment protocols, and objective electrophysiological measurements are recommended to further validate these findings. Long-term follow-up studies may also help determine whether early corticosteroid therapy can reduce the incidence of persistent sensory deficits following mandibular fractures.

Overall, the results of the present study suggest that local corticosteroid administration is a promising adjunctive therapeutic approach for enhancing neurosensory recovery in patients with mental nerve paraesthesia associated with parasymphysis fractures. While dexamethasone appears to provide faster early improvement, both dexamethasone and triamcinolone acetonide demonstrate comparable outcomes in long-term sensory recovery.

5. CONCLUSION

Submucosal corticosteroid injection is an effective adjunctive method for management of mental nerve paraesthesia following parasymphysis fracture. Dexamethasone results in faster early neurosensory recovery compared to kenocort, while both agents show comparable improvement at 8 weeks. Early administration of local steroids may reduce the severity and duration of post-traumatic paraesthesia.

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