Original Research Paper

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Benefit of addition of clonidine to bupivacaine in post operative pain management in mandibular unilateral parasymphysis fracture : A comparative evaluation

Abstract:

Introduction: In mandibular trauma , mandibular parasymphysis fracture is most common. Commomly managed by open reduction and internal fixation(ORIF) under general anesthesia it is important to do adequate analgesia post operatively .

Materials and Methods: For post operative pain control we are providing post operative regional anaesthesia of the inferior alveolar nerve block (IANB) ,in this study the vasoconstrictor of choice Clonidine, an α2 adrenergic agonist, has demonstrated potential in improving the duration and quality of analgesia when added to local anaesthetics such as bupivacaine. This study assesses the post-operative results of combining clonidine and bupivacaine in IANB .

Result: Pain Score in the VAS scores were significantly lower in the clonidine group compared to the control group at all time points . Specifically, at 2 hours post-surgery, score in the clonidine group was 4.73 ± 1.4, compared to 7.47 ± 1.3 in the control group .At 6 hours, the clonidine group still had lower scores (3.1 ± 1.0 vs. 5.6 ± 1.3). At 12 and 24 hours, the clonidine group continued to report significantly lower pain scores. Duration of Analgesia: The mean duration of effective analgesia was significantly longer in the clonidine group as compared to the control group (5.5 ± 1.2 hours) .

Conclusion: The addition of clonidine to bupivacaine in inferior alveolar nerve blocks for mandibular parasymphysis fractures significantly enhances post-operative analgesia.

Key-words: clonidine, bupivacaine, mandibular parasymphysis fracture, post-operative pain

Introduction:

In oral and maxillofacial surgery, mandibular fractures—especially those affecting the parasymphysis—are the most frequent injuries[1] . Both the surgical procedure's success and the patient's comfort throughout the recovery period depend on efficient pain control. One of the most used regional anaesthesia methods for post operative pain control is inferior alveolar nerve block (IANB). Bupivacaine may be used post operatively, but the length and quality of analgesia may not always satisfy the patient's needs. By blocking the release of norepinephrine, clonidine, a selective α2-adrenergic receptor agonist, has been demonstrated to increase and prolong the analgesic effects of local anaesthetics. The aim of this study is to evaluate the post-operative outcomes of adding clonidine to bupivacaine in IANB for mandibular parasymphysis fractures, with a focus on pain scores, duration of analgesia, adverse events, and changes in heart rate.

Materials and Methods:

This was a prospective, randomized controlled trial conducted at Haldia institute of dental sciences and Research.

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Sixty adult patients (aged 18-60 years) with unilateral mandibular parasymphysis fractures who were scheduled for surgical repair were included in the study. All patients underwent preoperative assessment and provided written informed consent. Inclusion Criteria's are unilateral mandibular parasymphysis fractures, ASA (American Society of Anesthesiologists) physical status I and II, no known allergies to bupivacaine or clonidine, no history of cardiovascular, renal, or hepatic disorders and we excluded who have Pregnancy or lactation, Infection at the site of injection, Patients with contraindications to clonidine (e.g., hypotension, bradycardia). In both group surgery is done by same surgeon. Average operating time for both group is 2 hrs±10 mins, extraoral approach incision is used in both group of patients and miniplate osteosynthesis is done.

The patients were randomly assigned to one of two groups:

- **Group 1 (Control Group n=30):** Received 3 mL of 0.5% bupivacaine for the inferior alveolar nerve block.(Fig B)

- **Group 2 (Experimental Groupn=30):** Received 3 mL of 0.5% bupivacaine combined with 50 µg of clonidine for the inferior alveolar nerve block.(Fig A)

Preoperative Protocol:

All patients were advised to maintain nil per mouth (NPO) status for a minimum of 6 to 8 hours prior to surgery. Standard pre-anesthetic medications are given,. nasoendotracheal intubation done. The inferior alveolar nerve blocks were performed by the standard technique with 2% lignocaine and 1:80,000 adrenaline before giving incision .

Postoperative protocol:

After doing ORIF under GA surgical wound is closed by suturing with 3-0 vicryl, after that a post operative IANB were performed with only 3ml 0.5% bupivacaine in group 1 and 3ml 0.5% bupivacaine combined with 50 µg clonidine in group 2 postoperatively all the patient's were evaluated at 2, 6, 12, and 24 hours .

Pain intensity was evaluated using the Visual Analog Scale (VAS), ranging from 0 (no pain) to 10 (worst possible pain), at 2, 6, 12, and 24 hours following surgery. Duration of analgesia i.e the time from the end of surgery to the first request for rescue analgesics also measured .Heart Rate is also a valuable parameter in this study so the heart rate measurements were taken preoperatively, at the time of block administration, and at 2, 6, 12, and 24 hours postoperatively. If any adverse effects such as hypotension, bradycardia, sedation, nausea, or other systemic reactions occurs, that were recorded immediately.

Statistical Analysis is done by The chi-square test was used for categorical variables, and the Student's t-test was used for continuous variables. When the p-value is <0.05 , it was considered as statistically significant.

Results:

1. Pain Scores:

VAS scores were consistently lower in the clonidine group compared to the control group at all measured intervals (Table 1). For instance, at 2 hours after surgery, the clonidine group reported a mean VAS score of 4.73 ± 1.4, whereas the control group had a mean score of 7.47 ± 1.3, showing a statistically significant difference ($p = 0.0001$).At 6 hours, the clonidine group still had lower VAS scores (3.1 ± 1.0 vs. 5.6 ± 1.3, $p = 0.0001$). At 12 and 24 hours, the clonidine group continued to report significantly lower pain scores ($p = 0.0001$) (Figure 1).

2. Duration of Analgesia:

The average duration of effective pain relief—measured from the conclusion of surgery to the patient's initial request for additional analgesia—was notably longer in the clonidine group (10.4 ± 1.6 hours) compared to the control group (5.5 ± 1.2 hours), with this difference being statistically significant ($p = 0.0001$) (Figure 2).

3. Heart Rate:

A significant difference in heart rate was observed between the two groups. At 2 hours postoperatively, the clonidine group exhibited a reduced mean heart rate of 62 ± 4 bpm, in contrast to 75 ± 5 bpm in the control group ($p < 0.01$). This lower heart rate persisted at 6 and 12 hours in the clonidine group but returned to baseline levels by 24 hours (Figure 3).

4. Adverse Events:

Mild adverse events were reported more frequently in the clonidine group, though they were transient and self-limited. These included

- **Hypotension:**

  20% of patients in the clonidine group experienced a transient drop in systolic blood pressure by more than 10%, which resolved with fluid administration.

- **Bradycardia:**

  15% of clonidine group patients had a heart rate drop below 60 bpm, which resolved without intervention.

- **Sedation:**

  10% of patients in the clonidine group reported mild sedation, which improved within hours post-surgery.In contrast, the control group experienced no significant adverse events related to the block.

Discussion:

The addition of clonidine to bupivacaine in the inferior alveolar nerve block postoperatively after ORIF GA of mandibular parasymphysis fractures significantly improved postoperative pain control[1], as evidenced by lower pain scores and prolonged analgesia in the clonidine group. The results are consistent with previous studies that have shown clonidine's efficacy as an adjuvant to local anesthetics in various surgical settings[2].

The longer duration of analgesia in the clonidine group is likely due to clonidine's ability to enhance the effects of local anesthetics by acting on central and peripheral α2-adrenergic receptors[2]. This action reduces the release of norepinephrine, leading to prolonged block effects and better postoperative pain control[3].

However, the clonidine group did experience mild but transient adverse effects, such as hypotension, bradycardia, and sedation[4-6]. These side effects are consistent with clonidine's pharmacological profile, as it lowers sympathetic tone and can affect the cardiovascular system[5]. Nevertheless, these side effects were not clinically significant and were easily managed[5].

The observed decrease in heart rate in the clonidine group is also in line with its known cardiovascular effects[6]. Although this is generally considered a benign effect, it is important for clinicians to monitor heart rate and blood pressure in patients receiving clonidine as an adjuvant to local anesthesia[7-8].(Table.1) for the Comparative Evaluation of Post-Operative Outcome for 60 patients (30 in each group), evaluating pain scores(by VAS) at specific time intervals, duration of analgesia, and the need for rescue analgesics**:**

Parameter	Group A (Bupivacaine Only)	Group B (Bupivacaine + Clonidine)	Statistical Significance (p-value<0.05)
Number of Patients (n)	30	30	NA
Pain Score (2 hrs post-op)	7.47 ± 1.3	4.73 ± 1.4	0.0001
Pain Score (6 hrs post-op)	5.6 ± 1.3	3.1 ± 1.0	0.0001
Pain Score (12 hrs post-op)	6.4 ± 1.4	3.7 ± 1.2	0.0001
Pain Score (24 hrs post-op)	6.9 ± 1.5	4.3 ± 1.1	0.0001
Duration of Analgesia (hrs)	5.5 ± 1.2	10.4 ± 1.6	0.0001
Need for Rescue Analgesics (%)	80% (24 patients)	40% (12 patients)	0.0001

Conclusion:

The addition of clonidine to bupivacaine in inferior alveolar nerve blocks for mandibular parasymphysis fractures significantly enhances post-operative analgesia by improving pain scores and extending the duration of anesthesia. While mild and transient adverse events, including hypotension, bradycardia, and sedation, were noted, these were clinically insignificant and resolved with standard management. The findings suggest that clonidine is a valuable adjuvant to local anesthetics in mandibular fracture surgeries and may offer improved post-operative pain control with minimal risk.

Fig A:

Fig A : 1-3 shows unilateral isolated mandibular body fracture treated with ORIF under GA with a single 2.5 mm miniplate in the lower border of mandible , 4 shows post operative radiograph, 5 showes post op IANB nerve block injected with (clonidine 50mcg + 0.5% bupivacaine. 6. Vitals are recorded shows significant decrease in HR which is selflimiting after few hours.

Fig B

[Fig.1-4 Represents unilateral isolated mandibular angle fracture which is managed with ORIF under GA where post op IANB block given with 0.5% bupivacaine only 5. Represent post op radiograph 6.shows short duration of analgesic effect .]

Consent:

Written informed consent was obtained from the patients for publication of this research article and accompanying images.

Limitations of Our Study:

Less number sample size is the limitation of this study.

Conflict of Interest: None.

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