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Original Research Paper

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# "A PROSPECTIVE RANDOMISED STUDY FOR EVALUATION OF LOW DOSE DEXMEDETOMIDINE AND NEOSTIGMINE ALONG WITH BUPIVACAINE EPIDURALLY FOR POSTOPERATIVE ANALGESIA IN LOWER LIMB ORTHOPEDIC SURGERIES"

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## ABSTRACT

**Introduction:** Pain is an unpleasant sensory experience associated with actual or potential damage to the body, or perception of such damage. It is a subjective experience. The perception of pain varies with the intensity of the stimulus and the affective or emotional state of the individual. Memories of events associated with extreme pain persist for a long time. **Aim:** To compare the duration of postoperative analgesia in neostigmine and dexmedetomidine along with bupivacaine epidurally in lower limb orthopaedic surgeries. **Materials And Methodology:** This study was conducted at Katuri Medical College & Hospital, Chinakondrupadu on 60 patients undergoing lower limd orthopedic surgeries. Informed consent was obtained from patients included in the study. Patients were divided into three groups, Group 1: 8ml of 0.25% Bupivacaine. Group 2: 8 ml of 0.25% Bupivacaine + 1μg/kg of Neostigmine. Group 3: 8ml of 0.25% Bupivacaine + 0.5 μg/kg of Dexmedetomidine **Results:** Visual Analog scores were tested using the same ANOVA test and it showed statistically significant difference of being lower at 2,3,4,5 and 6 hours. **Conclusion:** Addition of the drug neostigmine to bupivacaine epidurally could not produce statistically significant differences in duration and quality of postoperative analgesia, when compared to bupivacaine alone. Epidural dexmedetomidine exhibited excellent synergism with local anaesthetic bupivacaine in view of postoperative analgesia with no increase in adverse effects of individual drugs.

**KEYWORDS :** Epidural; Bupivacaine; Dexmedetomidine; Neostigmine; Mean Arterial Pressure; Postoperative Pain.

## INTRODUCTION:

Role of epidural analgesia is well known. It is very effective in relieving intraoperative or postoperative pain after major upper abdominal, thoracic or orthopedic surgeries. Surgical pain results in stress responses (endocrine, metabolic and inflammatory) not only intraoperatively but also in postoperative period. Reduction in surgical stress responses will lead to a reduced incidence of postoperative organ dysfunction and thereby to an improved outcome. Postoperative epidural analgesia is very safe and effective in relieving postoperative pain after major orthopedic surgery when bupivacaine is used.

Dexmedetomidine is a new addition to the class of 2 agonist which has got numerous beneficial effects when used through epidural route. It acts on both pre- and post-synaptic sympathetic nerve terminal and central nervous system, thereby decreasing the sympathetic outflow and norepinephrine release causing 20 sedative, antianxiety, analgesic, sympatholytic, and hemodynamic effects.

Dexmedetomidine causes a manageable hypotension and bradycardia.Both dexmedetomidine (α2 agonist) and neostigmine are being used as adjunct with bupivacaine to increase duration of regional anesthesia.

### Aim And Objectives:

### Primary Objective:

To compare the duration of postoperative analgesia in neostigmine and dexmedetomidine along with bupivacaine epidurally in lower limb orthopaedic surgeries.

Secondary Objective

1) Postoperative Visual Analog score
2) To evaluate the requirement of systemic rescue analgesics
3) To assess hemodynamic instability in the study groups
4) To watch for the incidence of gastrointestinal complications

## METHODOLOGY:

This study was done among patients undergoing lower limb orthopedic surgeries under in Katuri Medical College & Hospital , chinakondrupadu,Guntur District during the period of AUG 2020 to NOV 2022.

### Study Population:

All Patients undergoing lower limb orthopedic surgeries under in Katuri Medical College & Hospital, chinakondrupadu, Guntur District .

**Study Design:** Randomised Prospective

### Study setting:

Patients undergoing lower limb orthopedic surgeries under in Katuri Medical College & Hospital , chinakondrupadu ,Guntur District.

### Inclusion Criteria:

Patients consenting for lower limb orthopedic surgeries under epidural anaesthesia belonging to

- ASA I,II
- Age group of 18 to 60 yrs
- Body Mass Index between 18.5 - 24.9 Kg/m2

### Exclusion criteria:

- Refusal to epidural anaesthesia.
- ASA III and above physical status
- Allergic to local anaesthetics and adjuvants
- Infection at needle site
- Contraindications to subarachnoid block like bleeding tendencies, gross spinal deformities.

### Sample Size:

Total size of 60 patients

### Study Procedure

Group 1: 8ml of 0.25% Bupivacaine

Group 2: 8 ml of 0.25% Bupivacaine + 1μg/kg of Neostigmine

Group 3: 8ml of 0.25% Bupivacaine + 0.5 μg/kg of Dexmedetomidine

## RESULTS:

All the patients who were randomly divided into three groups were successfully given combined spinal epidural in the first attempt. The hemodynamic profile was measured using HR,SBP and DBP.

The ANOVA p values of heart rates were significantly lower at 1 hour,2 hours,4 hourts and 5 hours. But from the Tukey post

hoc analysis, we could conclude that heart rate in group 3 was lower at 4 and 5 hours with a mean HR at 4 hours77.15/min and 5 hours-84.25/min.

Systolic blood pressure showed a significantly lower at 3,4,5,6 hours by the ANOVA test and from the Tukey post hoc analyses, group 3 had significantly lower SBP with mean SBP at 3,4,5,6 hours of 109.85mmhg, 115.4mmhg, 121.3mmhg, 128.5mmhg respectively.

Using ANOVA test,Diastolic blood pressure over time was found to be significantly lower at 1,2 and 4 hours. But by Tukeys post hoc analysis,conclusive results of which group among the three sample groups is significant could not be arrived.

Visual Analog scores were tested using the same ANOVA test and it showed statistically significant difference of being lower at 2,3,4,5 and 6 hours. By the Tukey post hoc analysis we could conclude that group 3 had significantly reduced VAS score than group 1 and 2 with mean VAS of 1.0,1.0,1.15,1.45, 1.95 at 2,3,4,5 and 6 hours respectively.

**Fig 8: TREND OF VAS OVER TIME**

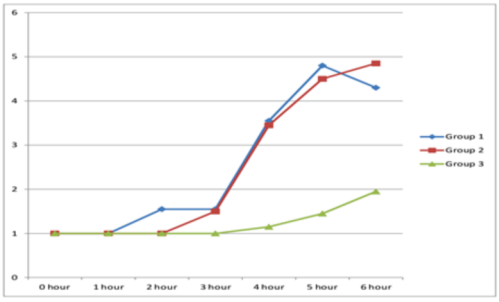
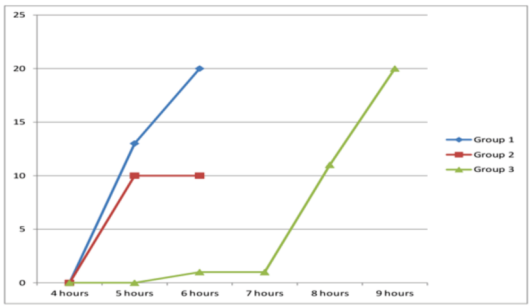



**Fig 10: TREND OF RESCUE ANALGESIA OVER TIME**




Sedation Scores showed statistically significant difference of being higher at 1,2,3,4,5 and 6 hours by the ANOVA tests. The Tukey post hoc analyses showed that SS of group 3 was significantly higher than groups 1 and 2 with mean SS scores of 2.85,2.80,2.45,1.75,1.75,1.35 at 1,2,3,4,5 and 6 hours respectively.

Time for rescue analgesia was significantly prolonged in group 3 over groups 1 and 2 by the ANOVA test. The time for rescue analgesia was more than 6 hours in group 3.

## DISCUSSION:

This study compares the effect of addition of dexme detomidine and neostigmine to epidural bupivacaine for postoperative analgesia. The combination of dexme detomidne and neostigmine to epidural bupivacaine in low doses provided better and longer duration of postoperative analgesia in orthopedic patients.7 The motor blockade was not significantly prolonged by the drugs.

As a neuraxial adjuvant, alpha 2 agonists can activate antinociceptive mechanisms, the main site of action being the spinal dorsal horn.8 Dexmedetomidine is found to act on the presynaptic and postsynaptic nerve terminals leading to reduced norepinephrine release, eventually leading to analgesia, sedation and anxiolysis. There was found to be no significant neurological deficits in animal and human studies conducted so far8. Most studies using dexmedetomidine as epidural adjuvant, have used 1$\mu$g per kg body weight.9,10. The dose of dexmedetomidine used in our study is 0.5$\mu$g per kg body weight.

Neostigmine has been used in various studies for studying its synergistic action with opioids for postoperative pain relief14,15,16.. The dose of neostigmine used in 70 our study(1$\mu$g/kg) was used by sharma et al7. Similar other study done by Zhong et al19 have used neostigmine have used doses upto 300$\mu$g overall intraoperatively to study its analgesic effect. Studies have shown that neostigmine reduces the overall requirement of rescue analgesics over a 24 hour period15.

Visual analog score: Among the three groups, we found that Group 3 with Dexmedetomidine as its adjuvant had a significantly longer period of postoperative analgesia. In our study, we arrived at a conclusion of dexmedetomidine group showing a significant sedative property when administered epidurally.

Hemodynamic profile-patients in Group I and II exhibited stable HR and BP than Group III patients. Neuraxial neostigmine increases sympathetic outflow, thus counteracts the hypotension caused by bupivacaine and bradycardia. Dexmedetomidine epidurally causes sympatholysis, thereby decreasing HR and BP in a dose-dependent manner, documented in a systematic review and meta analysis by Wu et al

## CONCLUSION

Addition of the drug neostigmine to bupivacaine epidurally could not produce statistically significant differences in duration and quality of postoperative analgesia, when compared to bupivacaine alone. Epidural dexmedetomidine exhibited excellent synergism with local anaesthetic bupivacaine in view of postoperative analgesia with no increase in adverse effects of individual drugs.

### Ethics approval and consent to participate:

Approval was taken from Katuri Medical College and Hospital's Ethics Committee and written informed patients consents were also taken.

### Conflict of interest

None

### Source of funding

Self

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