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## Comparison of dexmedetomidine and clonidine as the adjuvants with hyperbaric bupivacaine in subarachnoid block for lower limb orthopaedic surgeries

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### Abstract

**Aim:** To compare dexmedetomidine versus clonidine as the adjuvants with hyperbaric bupivacaine in subarachnoid block for lower limb orthopedic surgeries.

**Material and method:** The present study included 160 patients undergoing lower limb orthopedic surgery under subarachnoid block at Department of anaesthesia, Mahatma Gandhi Missions Institute of Health Sciences, Navi Mumbai, Maharashtra. Randomization was a statistical procedure by which the participants have been allocated into 2 different groups i.e. Group C (Clonidine group) and Group D (Dexmedetomidine group). Time of onset of motor block was assessed using Bromage scale. Analgesia duration was observed and recorded following pain scoring system- Visual analogue score (VAS).

**Results:** It was observed that there was statistically significant difference between the total duration of sensory and motor block of the patient in the both groups. The difference in VAS scores were found to be statistically significant among two groups ( $p < 0.05$ ) at 2 hr, 2.5 hr and 3 hr.

**Conclusion:** We concluded that dexmedetomidine  $5\mu\text{g}$  is the preferred drug, when prolongation of spinal anaesthesia is desired in lower limb orthopedics surgeries.

**Keywords:** Dexmedetomidine, Clonidine, Spinal Anaesthesia

### Introduction

International Association for the Study of Pain (IASP) [1] widely used definition states "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Post-operative pain management remains a challenge in anaesthesia. Effective postoperative pain management leads to earlier mobilization, fewer pulmonary and cardiac complications, a reduced risk of deep vein thrombosis, faster recovery with less likelihood of the development of neuropathic pain, and reduced cost of care.

Lower limb surgeries may be performed under regional (spinal or epidural) or general anaesthesia. Spinal block is still the first choice because of its rapid onset, superior blockade, lower risk of infection, lesser failure rates, and cost-effectiveness but has the drawbacks of shorter duration of block and less post-operative analgesia [2].

Bupivacaine is commonly used local anaesthetic drug to achieve the sub arachnoid block. Adjuvants are a different pharmacological class of drugs, which are used to lower the dose requirements, to enhance and prolong analgesia and to reduce the dose dependent side effects. Initially opioids were the standard choice as spinal adjuvant. But since there were many side effects, there is an active search for an alternative ideal adjuvant which is devoid of these side effects and complications [3].

Both clonidine and dexmedetomidine belong to the same group,  $\alpha_2$  agonist. They cause sedation and analgesia, in that dexmedetomidine produces more analgesia and sedation because of its high selectivity to  $\alpha_2A$  receptor compared to clonidine [3]. This study has been done to compare dexmedetomidine versus clonidine as the adjuvants with hyperbaric bupivacaine in subarachnoid block for lower limb orthopedic surgeries.

## Material and method

The present study included 160 patients undergoing lower limb orthopedic surgery under subarachnoid block at Department of anaesthesia, Mahatma Gandhi Missions Institute of Health Sciences, Navi Mumbai, Maharashtra from 2015 to 2017. The study has been conducted after approval of ethics committee and research review board of the institution. Informed written consent was obtained from all patients. Randomization was a statistical procedure by which the participants have been allocated into 2 different groups. A total of 160 sealed envelopes (80 per group) were made, each envelop mentioning a particular study group. One of my colleagues asked the patient to pick up an envelop from the box. Patient has been allocated to group mentioned on the envelop. The study was conducted in following two groups of patients. Each group comprised of 80 patients.

Group C: Clonidine group (n=80) 3ml of 0.5% hyperbaric Bupivacaine + 0.5ml (50mcg) of clonidine (1:0.5 dilution) (total volume 3.5ml)

Group D: Dexmedetomidine group (n=80) 3 ml of 0.5% hyperbaric bupivacaine +1ml (5mcg) of dexmedetomidine (0.5:5 dilution) (total volume 3.5 ml)

**Inclusion criteria:** Patients aged 20-60 years, having height >145 cm, body weight 40-80 kg and ASA grade I-II.

**Exclusion criteria:** All contraindications to spinal block, chronic history of headache and backache, spinal deformity or infection at the local site, allergic to drug, failed spinal block.

After taking informed and written consent and confirming overnight fasting, patient taken on the operation table, monitors connected and baseline vitals like BP, pulse rate, saturation (spo<sub>2</sub>) and respiratory rate were recorded. 18G intravenous cannula was inserted at the upper limb, lactated Ringer's solution was administered as a bolus of 10ml/kg before performing subarachnoid block. The vitals just before lumbar puncture were noted. Under all aseptic precaution, spinal anesthesia was performed at L3-L4 interspace (L4-L5 in case of failure) with the patient in sitting position by using a 25 Gauge Quincke needle. After ensuring free flow of CSF, the anesthetic solution, was administered as 0.1ml/second. The intrathecal drug's composition depended upon the group to which patient

belonged. The direction of the needle aperture was cranial during the injection. Monitoring was done using continuous electrocardiography (lead II & V5), non-invasive blood pressure and continuous pulse oximetry and patients were given 4.0 L/min of oxygen by venti-mask. Intraoperative fluid management was done according to the blood loss and hemodynamic parameters.

The level of sensory block was tested by pin prick bilaterally at mid clavicular line which was done every two minute till the T10 and T8 dermatomal level was achieved and then after every 5 minutes till the highest dermatomal level was reached. Time of onset of motor block was assessed using Bromage scale. Onset of motor block was taken as the time taken to achieve Bromage score 0 from the time of subarachnoid injection. Side effects were recorded too.

Analgesia duration was observed and recorded following pain scoring system- Visual analogue score (VAS).

## Statistical analysis

It was performed with the SPSS, version 24 for Windows statistical software package (SPSS inc., Chicago, IL, USA). The Categorical data was presented as numbers (percent) and were compared among groups using Chi square test. The quantitative data was presented as mean and standard deviation and were compared by t-test. Probability was considered to be significant if less than 0.05.

## Results

The mean age among group C and D was 38.86±13.61 and 36.68±11.40 years respectively. Male was the dominant category among both the groups. There was no significant difference among group C and D w.r.t. ASA grade, weight and height. The mean duration of surgery among group C and D was 85.44±18.03 and 85.75±14.48 minutes respectively.

It was observed that there was statistically significant difference between the mean duration of onset of sensory block between the two groups. But there was no statistically significant difference in mean onset of motor block of the patient in the both groups ( $p < 0.05$ ). It was observed that there was statistically significant difference between the total duration of sensory and motor block of the patient in the both groups ( $p < 0.05$ ) as shown in table 1.

**Table 1:** Mean onset and duration of sensory and motor block (minutes)

Variables	Group C		Group D		P value
	Mean	SD	Mean	SD	
Onset of sensory block (Minutes)	3.53	1.08	2.94	0.93	0.0003
Onset of Motor block (Minutes)	6.18	1.11	6.23	1.28	0.792
Duration of Sensory Block	279.54	18.11	317.98	26.81	0.001
Duration of Motor Block	185.4	14.00	192.61	22.15	0.014
Duration of Analgesia (Minutes)	253.85	17.48	267.31	32.80	0.001

After administration of drug the heart rate, systolic blood pressure, diastolic blood pressure and MAP was not

significantly different among the two groups at all time intervals.

**Table 2:** VAS score at different time interval

Time	Group C		Group D		P value
	Mean	SD	Mean	SD	
0.5 hr	0.30	0.72	0.28	0.69	0.823
1 hr	0.38	0.79	0.35	0.76	0.838
1.5 hr	1.65	0.90	1.60	0.94	0.731
2 hr	2.27	0.66	2.00	0.00	<0.001
2.5 hr	3.09	0.37	2.03	0.16	<0.001
3 hr	4.00	0.00	2.10	0.44	<0.001

Table 2 shows VAS of the two groups at different time intervals. The difference in VAS scores were found to be statistically significant among two groups ( $p < 0.05$ ) at 2hr, 2.5 hr and 3 hr.

It was observed that there was not statistically significant difference between the no. of complication such as hypotension, bradycardia, nausea, and vomiting of the patient in the both groups ( $p > 0.05$ ).

### Discussion

In lower limb surgeries sensory block up to T10 is considered favourable to abolish the discomfort of surgery. It is important to limit the cephalad spread to lessen haemodynamic changes. So the study was performed to compare the effects of dexmedetomidine (5µg) versus clonidine (50µg) with 0.5% hyperbaric Bupivacaine in spinal anaesthesia for lower limb orthopedic surgeries.

In our study, group D has faster onset of sensory block as compared to group C. Ganesh M *et al.* [4], Chandra PG *et al.* [5] observed similar results.

There was no statistically significant difference in onset of motor block in group C and group D in this study. Anandani DN *et al.* [6], Vidhi Mahendru *et al.* [7] concluded their study with the same results.

In our study, duration of sensory block was calculated by the time of regression of sensory block to S1 dermatome i.e.  $279.54 \pm 18.11$  and  $317.98 \pm 26.81$  minutes in group C and D respectively with statistically significant difference ( $p < 0.01$ ). Jahnabee Sarma *et al.* [8] observed that duration of sensory block was prolonged in dexmedetomidine containing group as compared to clonidine group. Rampal Singh *et al.* [9] also concluded in their study that the regression time of sensory block to S1 dermatome was significantly higher in dexmedetomidine group as compared clonidine group. Our result coincides with the above mentioned studies in terms of mean time duration of sensory block.

In this study, the mean duration of analgesia was prolonged in Group D as compared to Group C with statistically highly significant. Jahnabee Sarma *et al.* [8], Ganesh M *et al.* [4] concluded that difference in mean time for rescue analgesia between two groups was statistically significant. The longer time for rescue analgesia was seen in dexmedetomidine group as compared to clonidine group.

In the present study, side effects were not significant probably because we used a small dose of intrathecal dexmedetomidine and clonidine with local anesthetics which was in accordance with the findings of Anandani DN *et al.* [6].

### Conclusion

Due to the absence of significant adverse effects, we conclude that, dexmedetomidine 5µg is the preferred drug, in terms of effect versus side effects, when prolongation of

spinal anaesthesia is desired in lower limb orthopedics surgeries.

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