

Original Research Article

# Comparative evaluation of ropivacaine versus dexmedetomidine and ropivacaine in epidural anesthesia in lower limb orthopaedic surgeries

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## Abstract

**Background:** One of the indispensable components of spine surgeries is the relieving of post-operative pain. When used as an adjuvant in regional anaesthesia,  $\alpha_2$  adrenergic agonists have both analgesic and sedative properties. With the addition of alpha agonist to epidural local anesthetics, the degree of pain relief increases because of their analgesic properties and augmentation of local anaesthetic effects. Hence, we comparatively evaluated the effect of ropivacaine versus dexmedetomidine and ropivacaine in epidural anaesthesia in lower limb orthopedic surgeries.

**Materials and methods:** The present study included 200 patients in the age group of 25 to 65 years. The patients who were scheduled to undergo lower limb orthopedic surgeries under epidural anaesthesia were included for the present study. All the patients were randomly divided into two study groups; Group I and group II with 100 patients in each group. Pre-operatively pulse rate, non-invasive systolic and diastolic blood pressure (DBP) and respiratory rate was recorded. Assessment of sensory block was done by observing the loss of sensation to pin prick in the midline. Assessment of the motor block was done by analyzing the modified Bromage score. Assessment of analgesia was done by analyzing VAS score. Post-operative values of the parameters were also recorded after surgery. Adverse effects and complication like hypotension, bradycardia, headache, dry mouth, nausea and

vomiting etc were noted in the first 24 hours after surgery. All the results were analyzed by SPSS software and chi square test was used for assessment of level of significance.

**Results:** Mean age of the patients in group I and II were 40.45 and 41.23 years respectively. No significant results were obtained on comparing the mean age and mean weight of the patients. Majority of the patients in both the groups were males while rest were females. 74 % of the patients in group I belonged to ASA grade 1 while in group II, 69 percent of the patients belonged to ASA grade 2.

**Conclusion:** For shorter surgical procedures, dexmedetomidine may be undesirable as it produces prolonged duration of motor block and sedation.

## Key words

Anesthesia, Dexmedetomidine, Ropivacaine.

## Introduction

One of the indispensable components of spine surgeries is the relieving of post-operative pain. Various methods have been tried for the management of post-operative pain in spine surgeries out of which epidural techniques are becoming most promising [1]. When used as an adjuvant in regional anaesthesia,  $\alpha_2$  adrenergic agonists have both analgesic and sedative properties [2]. Dexmedetomidine is a highly selective  $\alpha_2$  adrenergic agonist with receptor affinity 8 times greater than clonidine [3]. While no head to head comparison of dose equivalence of epidural dexmedetomidine and clonidine has been done, the observation of various studies have stated that the dose of clonidine is 1-2 times higher than dexmedetomidine when used in epidural route [4]. With the addition of alpha agonist to epidural local anesthetics, the degree of pain relief increases because of their analgesic properties and augmentation of local anaesthetic effects [5]. Hence, we comparatively evaluated the effect of ropivacaine versus dexmedetomidine and ropivacaine in epidural anaesthesia in lower limb orthopedic surgeries.

## Materials and methods

The present study was carried in the department of orthopaedics and included 200 patients in the age group of 25 to 65 years. The patients who were scheduled to undergo lower limb orthopaedic surgeries under epidural anaesthesia were included after approval from the institution's ethical and scientific committee.

Patients with history of any systemic disease, any coagulation or neurological disorders, morbid obesity, pregnancy, deformity or previous surgery of spine, anticipated difficulty in regional anaesthesia, allergy to the study drug and unwillingness were excluded from the present study. All the patients were randomly divided into two study groups; Group I and group II with 100 patients in each group. Pre-anaesthetic check up was carried out one day before surgery. Interpretation of visual linear analogue scale (VAS) was explained to determine the level of analgesia in the postoperative period. This was carried out with 10 cm line. The first end mark '0' means 'no pain' and the end marked '10' means 'severe pain'. Pre-operatively pulse rate, non-invasive systolic and diastolic blood pressure (DBP) and respiratory rate was recorded. In the operation room, a good intravenous access was secured and patients were preloaded with 10 ml/kg body weight of Ringer Lactate solution over 15-20 min. Through the inter vertebral disc, Epidural block was performed. Group I consisted of patients who received 20 ml of 0.75% ropivacaine hydrochloride while Group II patients received 20 ml of 0.75% ropivacaine hydrochloride plus dexmedetomidine. Pulse rate, respiratory rate, non-invasive SBP and DBP, SpO<sub>2</sub> and ECG was done and readings were continuously monitored. Pre-operative and intra-operative recording of the readings was done after every 5 minutes of the surgery. Assessment of sensory block was done was observing the loss of sensation to pin prick

in the midline. Assessment of the motor block was done by analyzing the modified Bromage score. Bromage 0: Patient is able to move hip, knee and ankle. Bromage 1: Inability to move the hip but is able to move knee and ankle, Bromage 2: Inability to move hip and knee but can move ankle, Bromage 3: No movement at all and unable to move hip, knee and ankle. Maximum motor block achieved, time required to reach maximum motor block and total duration of motor block (motor recovery to Bromage 0) was noted. All durations were calculated considering the time of epidural injection as zero. Assessment of analgesia was done by analyzing VAS score. Post-operative values of the parameters were also recorded after surgery. Adverse effects and complication like hypotension, bradycardia, headache, dry mouth, nausea and vomiting etc were noted in the first

24 hours after surgery. All the results were analyzed by SPSS software and chi square test was used for assessment of level of significance.

## Results

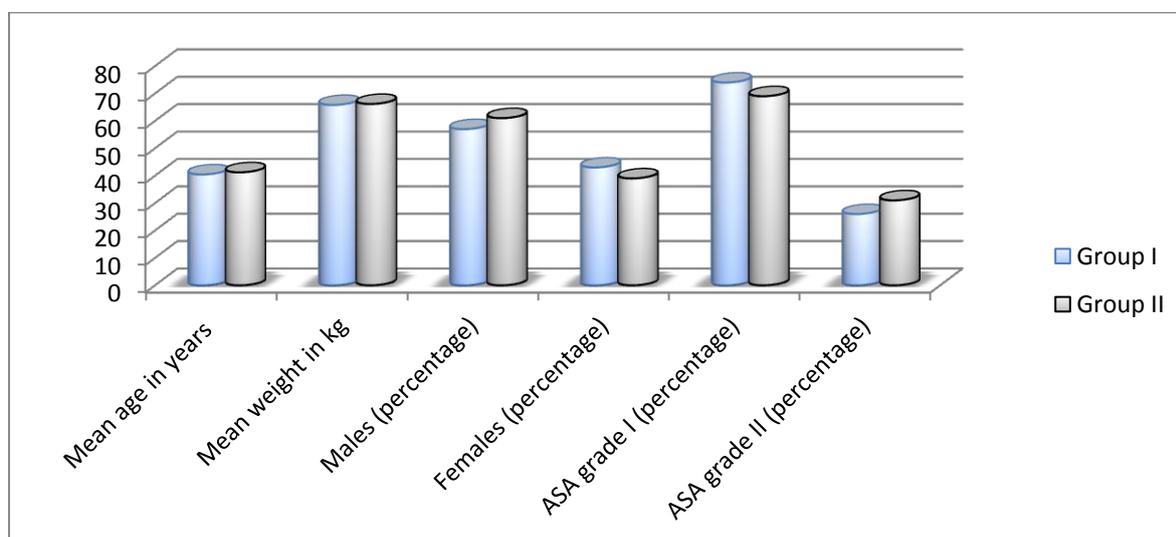
The demographic details of the patients were as per **Table - 1** and **Graph - 1**. Mean age of the patients in group I and II were 40.45 and 41.23 years respectively. No significant results were obtained on comparing the mean age and mean weight of the patients. Majority of the patients in both the groups were males while rest were females. 74 % of the patients in group I belonged to ASA grade 1 while in group II, 69 percent of the patients belonged to ASA grade 2. The mean sedation score of the patients in both the groups was as per **Graph - 2**.

**Table - 1:** p-value for demographic details of the patients.

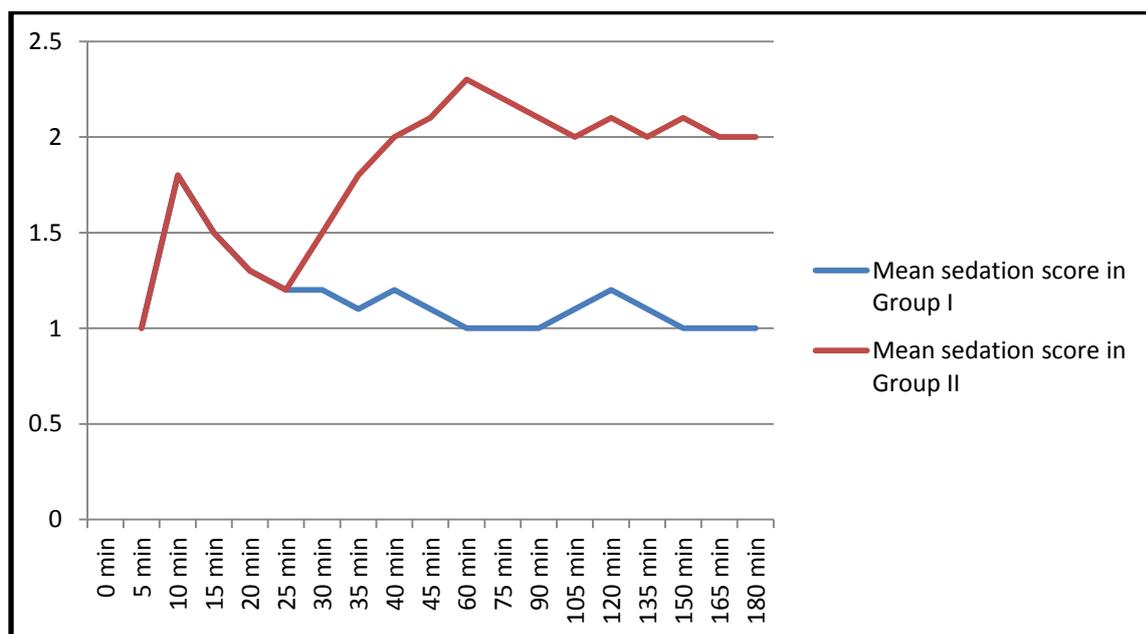
Parameter	Group I	Group II	p-value
Mean age in years	40.45	41.23	0.725
Mean weight in kg	65.82	66.18	0.414
Males (percentage)	57	61	0.315
Females (percentage)	43	39	0.225
ASA grade I (percentage)	74	69	0.842
ASA grade II (percentage)	26	31	0.912

ASA: American Society of Anaesthesiologist

**Graph - 1:** Demographic details of the patients.



**Graph - 2:** Mean sedation score of the patients in both the groups.



## Discussion

In lower abdominal and limb surgeries the most commonly used technique is Epidural anesthesia it provide not only peri-operative surgical anesthesia but also in post-operative analgesia. The most desirable feature in modern orthopaedic surgery is early postoperative mobilization and rehabilitation with minimally associated pain and discomfort [6-9]. Many a time for achieving desired peri-operative anaesthetic effect, invariably large volumes of local anaesthetics are used, thereby increasing the possibilities of local anaesthetic toxicity and deleterious hemodynamic consequences. The Ropivacaine is new amide local anaesthetic which has minimal toxicity on cardio-vascular and central nervous system as well as a lesser propensity of motor block during post-operative epidural analgesia [10, 11]. Opioids like fentanyl have been used traditionally as an adjunct for epidural administration in combination with a lower dose of local anaesthetic to achieve the desired anaesthetic effect [12]. Hence, we comparatively evaluated the effect of ropivacaine versus dexmedetomidine and ropivacaine in epidural anaesthesia in lower limb orthopedic surgeries.

In present study demographic profile was compared and did not show any significant differences. But the difference was found to be statistically non – significant ( $P > 0.05$ ). The result show that supplementation of epidural Ropivacaine with Dexmedetomidine significantly prolongs the duration of sensory and motor block with improved quality of postoperative analgesia as compared to Ropivacaine alone. Time of onset of sensory block to T10 dermatome in Group II was found to be little earlier than Group I. These results were in concordance with the results of Salgado, et al. [13]. In the present study, there was significantly delayed requirement of rescue analgesia and also reduced 24 h analgesic requirement with Dexmedetomidine added to Ropivacaine, which supports the analgesic efficacy of Dexmedetomidine as an epidural adjuvant. Similarly, significantly improved analgesic efficacy was seen by Salgado, et al. [13]. Bajwa, et al. compared the comparing the hemodynamic, sedative, and analgesia potentiating effects of epidurally administered fentanyl and dexmedetomidine when combined with ropivacaine. They analyzed a total of one hundred patients of both gender aged 21-56 years, American Society of Anaesthesiologist

(ASA) physical status I and II who underwent lower limb orthopedic surgery. From the results, they concluded that Dexmedetomidine seems to be a better alternative to fentanyl as an epidural adjuvant as it provides comparable stable hemodynamics, early onset, and establishment of sensory anesthesia, prolonged post-op analgesia, lower consumption of post-op LA for epidural analgesia, and much better sedation levels [14]. Saravana Babu, et al. evaluated the efficacy of epidural route and to compare the efficacy and clinical profile of dexmedetomidine and clonidine as an adjuvant to ropivacaine, in epidural analgesia with special emphasis on their quality of analgesia and the ability to provide the smooth post-operative course. They assessed total 60 subjects, 33 were men and 27 were women between the age of 18 and 65 years of American Society of Anaesthesiologists (ASA) I/II class who underwent spine surgeries. From the results, they concluded that Dexmedetomidine is a better neuraxial adjuvant compared with clonidine for providing early onset and prolonged post-operative analgesia and stable cardiorespiratory parameters [15]. Arunkumar, et al. compared the effect of clonidine and dexmedetomidine when used as an adjuvant to epidural ropivacaine in lower abdominal and lower limb surgeries. From the results, they concluded that Dexmedetomidine at doses of 1 µg/kg is an effective adjuvant to ropivacaine for epidural anaesthesia [16].

## Conclusion

From the above results, it can be concluded that for shorter surgical procedures, Dexmedetomidine may be undesirable as it produces prolonged duration of motor block and sedation. However, further research in this field of anaesthesia is recommended.

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