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# Original Research

## Dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries

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***ABSTRACT:***
**Background:** Epidural anesthesia is the most commonly used technique for providing not only peri-operative surgical anesthesia but post-op analgesia in lower abdominal and limb surgeries. The present study compared dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries. **Materials & Methods:** 72 patients of American Society of Anaesthesiologist (ASA) physical status I and II who underwent lower limb orthopedic surgery of both genders were randomly divided into two groups. Group I received Ropivacaine + Dexmedetomidine (RD) and group II received Ropivacaine + Fentanyl (RF). Hemodynamic parameters was recorded. **Results:** The mean duration of surgery (min) was 104.2 in group I and 126.4 in group II. Sensory block at T10 was 7.2 minutes and in group II was 9.0 minutes, time for maximum sensory block level (min) was 13.6 in group I and 16.2 minutes in group II. Complete motor block (min) was 18.1 in group I and 22.4 in group II and dose of mephenteramine requirement (mg) was 11.6 in group I and 8.5 in group II. **Conclusion:** Dexmedetomidine is better alternative to fentanyl as an epidural adjuvant as it provides comparable stable hemodynamics.
**Key words:** Dexmedetomidine, Epidural adjuvant, Fentanyl

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### INTRODUCTION

Epidural anesthesia is the most commonly used technique for providing not only peri-operative surgical anesthesia but post-op analgesia in lower abdominal and limb surgeries.[1] Early postoperative mobilization and rehabilitation with minimally associated pain and discomfort is the most desirable feature in modern orthopaedic surgery. 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 haemodynamic consequences.[2] The new amide local anaesthetic Ropivacaine has minimal cardio-vascular and central nervous system toxicity as well as a lesser propensity of motor block during post-operative epidural analgesia.[3]

Dexmedetomidine, a highly selective α2 - adrenoreceptor agonist, has effective analgesic and sedative properties and lacks opioid-related side effects.[4] The effects of a dexmedetomidine–bupivacaine mixture in thoracic epidural are mainly studied in patients undergoing thoracic surgery with one-lung ventilation in respect of the intraoperative awareness and analgesic benefits. Dexmedetomidine is a new addition to the class of alpha-2 agonist which has got numerous beneficial effects when used through epidural route.[5] It acts on both pre and post synaptic sympathetic nerve terminal and central nervous system thereby decreasing the sympathetic outflow and nor-epinephrine release causing sedative, anti-anxiety, analgesic, sympatholytic and haemodynamic effects.[6] The present study compared dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries.

## MATERIALS & METHODS

The present study comprised 72 patients of American Society of Anaesthesiologist (ASA) physical status I and II who underwent lower limb orthopedic surgery of both genders. Consent from all patients was obtained.

Data such as name, age, gender etc. was recorded. Patients were randomly divided into two groups. Group I received Ropivacaine + Dexmedetomidine (RD) and group II received Ropivacaine + Fentanyl (RF). Inj. Ropivacaine, 15 ml of 0.75%, was administered epidurally in both the groups. Parameters such as time to onset of analgesia at T10, maximum sensory analgesic level, time to complete motor blockade, time to two segmental dermatomal regressions, and time to first rescue analgesic was recorded. Results were assessed statistically.

## RESULTS

**Table I Distribution of patients**

| Groups | Group I | Group II |
|---|---|---|
| Method | Ropivacaine + Dexmedetomidine | Ropivacaine + Fentanyl |
| M:F | 10:26 | 12:24 |

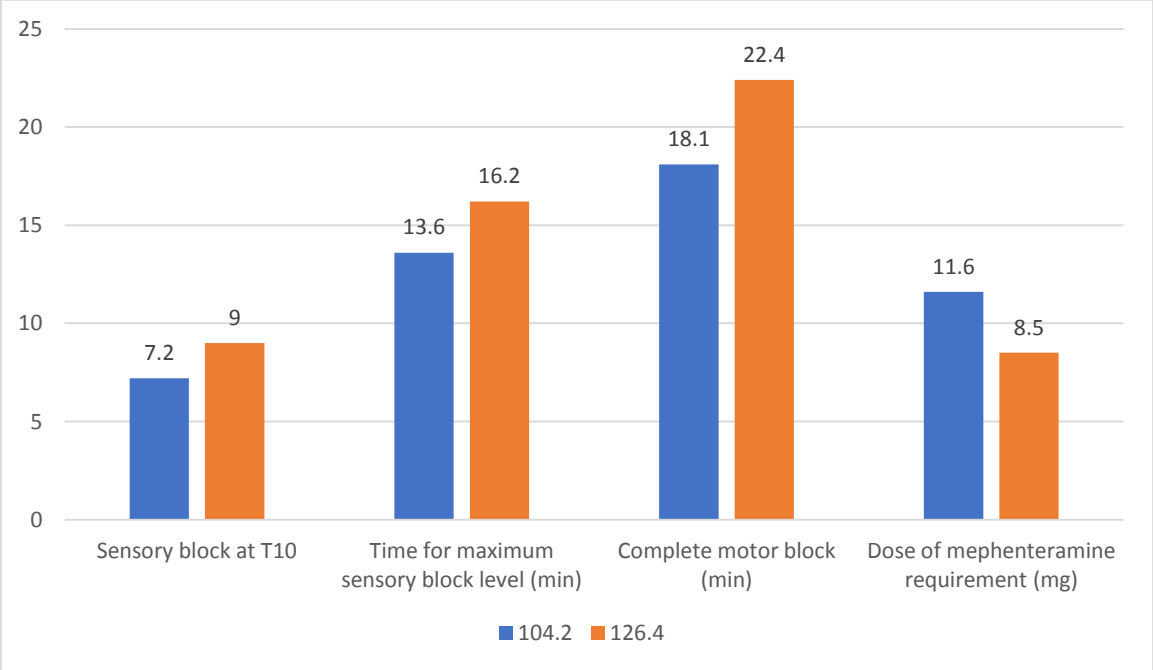
Table I shows that group I had 10 males and 26 females and group II had 12 males and 24 females.

**Table II Assessment of parameters**

| Parameters | Group I | Group II | P value |
|---|---|---|---|
| Duration of surgery (min) | 104.2 | 126.4 | 0.17 |
| Sensory block at T10 (minb) | 7.2 | 9.0 | 0.04 |
| Time for maximum sensory block level (min) | 13.6 | 16.2 | 0.03 |
| Complete motor block (min) | 18.1 | 22.4 | 0.01 |
| Dose of mephenteramine requirement (mg) | 11.6 | 8.5 | 0.51 |

Table II, graph I shows that mean duration of surgery (min) was 104.2 in group I and 126.4 in group II. Sensory block at T10 was 7.2 minutes and in group II was 9.0 minutes, time for maximum sensory block level (min) was 13.6 in group I and 16.2 minutes in group II. Complete motor block (min) was 18.1 in group I and 22.4 in group II and dose of mephenteramine requirement (mg) was 11.6 in group I and 8.5 in group II. The difference was significant (P< 0.05).

**Graph I Assessment of parameters**




## DISCUSSION

The analgesic effect of dexmedetomidine is mediated by its action at the brain, brainstem, spinal cord and peripheral tissues.[7] Dexmedetomidine causes hyperpolarisation of nerve tissues by altering transmembrane action potential and ion conductance at the brainstem locus ceruleus.[8] In the spinal cord, the analgesic effect is related to the activation of the descending medullospinal noradrenergic pathway or to the reduction of spinal sympathetic outflow at

presynaptic ganglionic sites.[9] Epidural opioids have their major site of action on pre- and post-synaptic receptors in the substantia gelatinosa of the dorsal horn, producing selective block of nociceptive pathways.[10] The present study compared dexmedetomidine and fentanyl for epidural analgesia in lower limb orthopedic surgeries.

In present study, group I had 10 males and 26 females and group II had 12 males and 24 females. Bajwa et al[11] compared the hemodynamic, sedative, and analgesia potentiating effects of epidurally administered fentanyl and dexmedetomidine when combined with ropivacaine. 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 were enrolled into the present study. Patients were randomly divided into two groups: Ropivacaine + Dexmedetomidine (RD) and Ropivacaine + Fentanyl (RF), comprising 50 patie nts each. Inj. Ropivacaine, 15 ml of 0.75%, was administered epidurally in both the groups with addition of 1 μg/kg of dexmedetomidine in RD group and 1 μg/kg of fentanyl in RF group. Besides cardio-respiratory parameters and sedation scores, various block characteristics were also observed which included time to onset of analgesia at T10, maximum sensory analgesic level, time to complete motor blockade, time to two segmental dermatomal regressions, and time to first rescue analgesic. The demographic profile of patients was comparable in both the groups. Onset of sensory analgesia at T10 (7.12±2.44 vs 9.14±2.94) and establishment of complete motor blockade (18.16±4.52 vs 22.98±4.78) was significantly earlier in the RD group. Postoperative analgesia was prolonged significantly in the RD group (366.62±24.42) and consequently low dose consumption of local anaesthetic LA (76.82±14.28 vs 104.35±18.96) during epidural top-ups postoperatively. Sedation scores were much better in the RD group and highly significant on statistical comparison ($P$<0.001). Incidence of nausea and vomiting was significantly high in the RF group (26% and 12%), while incidence of dry mouth was significantly higher in the RD group (14%) ($P$<0.05).

We found that mean duration of surgery (min) was 104.2 in group I and 126.4 in group II. Sensory block at T10 was 7.2 minutes and in group II was 9.0 minutes, time for maximum sensory block level (min) was 13.6 in group I and 16.2 minutes in group II. Complete motor block (min) was 18.1 in group I and 22.4 in group II and dose of mephenteramine requirement (mg) was 11.6 in group I and 8.5 in group II. Bharti et al[12] assessed the analgesic efficacy of dexmedetomidine as compared with fentanyl as an adjunct to local anaesthetic in thoracic epidural for upper abdominal surgeries. Forty adult patients of American Society of Anesthesiologists grade I–II undergoing upper abdominal surgery were randomly allocated into two groups to receive 50 μg fentanyl or 50 μg dexmedetomidine as an adjunct to 10 ml 0.125% bupivacaine via thoracic epidural. Anaesthesia was induced with morphine, propofol and vecuronium and maintained by isoflurane with 60% nitrous oxide in oxygen. In the postoperative period patient-controlled analgesic pumps were used to deliver similar types of mixtures via the epidural catheter. Patients were evaluated for rescue analgesic requirements, haemodynamic stability, postoperative pain, sedation and any adverse events. Results: The groups were comparable regarding intraoperative analgesic requirements, recovery times and postoperative pain scores. The total consumption of rescue analgesia was significantly less in the dexmedetomidine group as compared with the fentanyl group ($p = 0.049$). Two patients in the fentanyl group had vomiting and one had pruritus. None of the patients had bradycardia, hypotension, excessive sedation or respiratory depression. Patients receiving epidural dexmedetomidine were more satisfied with the technique than those receiving fentanyl ($p < 0.001$).

## CONCLUSION

Authors found that dexmedetomidine is better alternative to fentanyl as an epidural adjuvant as it provides comparable stable hemodynamics.

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