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Original Article

Fentanyl versus dexmedetomidine for epidural analgesia in lower limb orthopedic surgeries

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ABSTRACT:
Background: Epidural anesthesia is the most commonly used technique for inducing surgical anesthesia and postoperative analgesia in lower abdominal and limb surgeries.The present study compared fentanyl and dexmedetomidine for epidural analgesia in lower limb orthopedic surgeries. **Materials & Methods:** 84 patients of American Society of Anaesthesiologist (ASA) physical status I and II who underwent lower limb orthopedic surgery of both genderswere divided into two groups of 42 each. Group I patients received Ropivacaine + Fentanyl (RF) and group II received Ropivacaine + Dexmedetomidine (RD). 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:** The mean duration of surgery (min)was 126.5 in group I and 102.6 in group II. Sensory block at T10 was 9.2 minutes in group I and in group II was 7.2 minutes. The mean time for maximum sensory block level (min) was 16.6 in group I and 13.2 minutes in group II. Complete motor block (min) was 21.1 in group I and 18.4 in group II. The mean dose of mephenteramine requirement was 8.6 mg in group I and 11.5 mg in group II. The difference was significant (P< 0.05). **Conclusion:** Dexmedetomidine is better alternative as an epidural adjuvant as it provides comparable stable hemodynamics as compared to fentanyl.
Key words: Dexmedetomidine, Fentanyl, lower limb

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INTRODUCTION

Epidural anesthesia is the most commonly used technique for inducing surgical anesthesia and postoperative analgesia in lower abdominal and limb surgeries.Postoperative pain management is one of the most important areas of anesthesia.[1] Early postoperative mobilization and rehabilitation with minimally associated pain and discomfort is the most desirable quality that has been needed in modern orthopedic surgery. For achieving this effect, large volumes of local anesthetics were used which also increase the possibilities of local anesthetic toxicity and hemodynamic instability.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.[2]

Dexmedetomidine, a highly selective α2 - adrenoreceptor agonist, has effective analgesic and sedative properties and lacks opioid-related side effects.[3] 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.[4] 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.[5] The present study compared

fentanyl and dexmedetomidine for epidural analgesia in lower limb orthopedic surgeries.

MATERIALS & METHODS

The present study consisted 84 patients of American Society of Anaesthesiologist (ASA) physical status I and II who underwent lower limb orthopedic surgery of both genders. All gave written consent for participation in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into two groups of 42 each. Group I patients received Ropivacaine + Fentanyl (RF)and group II received Ropivacaine + Dexmedetomidine (RD). 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 subjected statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I: Distribution of patients

Groups	Group I (41)	Group II(41)
Method	Ropivacaine + Fentanyl	Ropivacaine + Dexmedetomidine
M:F	21:20	18:23

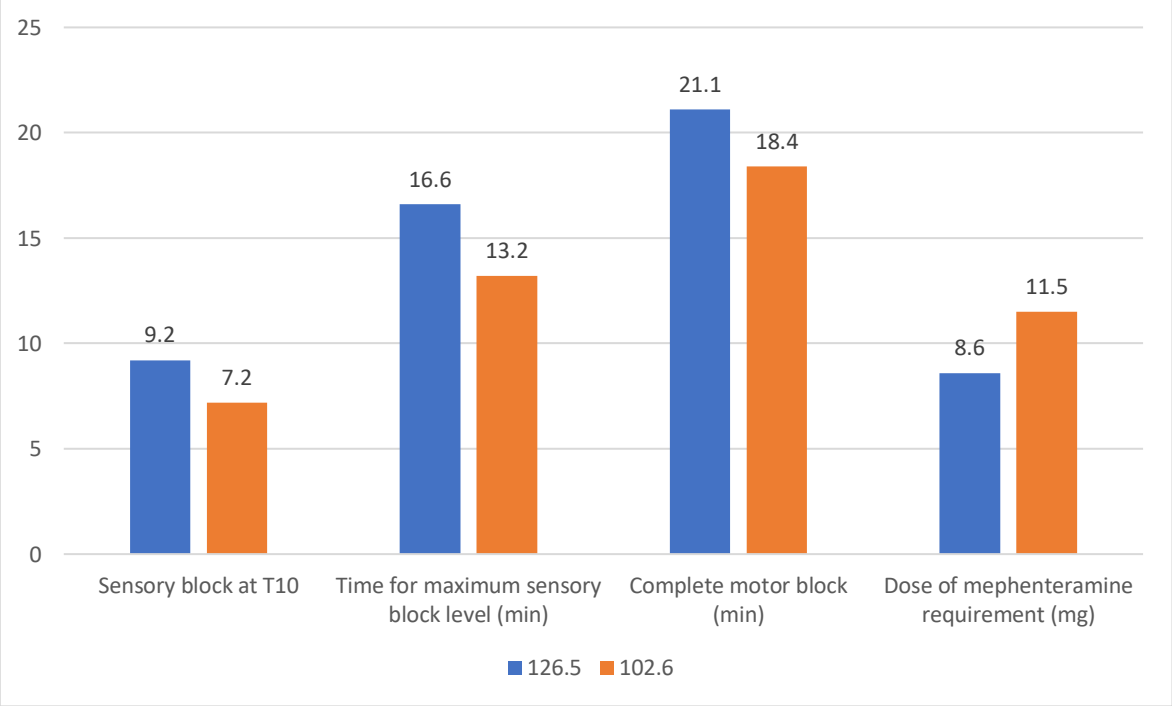
Table I shows that group I had 21 males and 20 females and group II had 18 males and 23 females.

Table II: Assessment of parameters

Parameters	Group I	Group II	P value
Duration of surgery (min)	126.5	102.6	0.17
Sensory block at T10 (min)	9.2	7.2	0.02
Time for maximum sensory block level (min)	16.6	13.2	0.05
Complete motor block (min)	21.1	18.4	0.02
Dose of mephenteramine requirement (mg)	8.6	11.5	0.51

Table II, graph I shows that mean duration of surgery (min) was 126.5 in group I and 102.6 in group II. Sensory block at T10 was 9.2 minutes in group I and in group II was 7.2 minutes. The mean time for maximum sensory block level (min) was 16.6 in group I and 13.2 minutes in group II. Complete motor block (min) was 21.1 in group I and 18.4 in group II. The mean dose of mephenteramine requirement was 8.6 mg in group I and 11.5 mg in group II. The difference was significant (P< 0.05).

Graph I: Assessment of parameters



DISCUSSION

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.[6] 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. 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 fentanyl and dexmedetomidinefor epidural analgesia in lower limb orthopedic surgeries.

We found that group I had 21 males and 20 females and group II had 18 males and 23 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 genders 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 patients 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. 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%).

We found that mean duration of surgery (min) was 126.5 in group I and 102.6 in group II. Sensory block at T10 was 9.2 minutes in group I and in group II was 7.2 minutes. The mean time for maximum sensory block level (min) was 16.6 in group I and 13.2 minutes in group II. Complete motor block (min) was 21.1 in group I and 18.4 in group II. The mean dose of mephenteramine requirement was 8.6 mg in group I and 11.5 mg in group II. Paul et al[12]compared the effect of dexmedetomidine and fentanyl as an adjuvant to epidural bupivacaine in lower limb surgeries. Sixty patients belonging to the American Society of Anesthesiologists' Grade I or II who were undergoing lower limb surgery were randomly divided into two groups. Group BD: received epidural study solution of 38 ml of 0.25% bupivacaine hydrochloride + 1 ml of 100 μg dexmedetomidine + 1 ml of normal saline. Group BF: received epidural study solution of 38 ml of 0.25% bupivacaine hydrochloride + 2 ml of 100 μg fentanyl. Onset and maximum level of sensory blockade, time to attain maximum sensory level, time to complete motor blockade, time for two-segment regression, duration of analgesia and motor block, heart rate, and blood pressure were observed. Pain and sedation were assessed by numerical rating scale and Ramsay Sedation Scale, respectively. Data were recorded and statistically analyzed. The onset of sensory blockade and time to attain maximum sensory level in Group BD were earlier than that of Group BF ($P < 0.001$). Duration of analgesia and motor blockade in Group BD were significantly more than that of Group BF ($P < 0.001$). Postoperative visual analog scale was reduced statistically significantly in Group BD

CONCLUSION

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

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