



Analgesic effects of dexmedetomidine with hyperbaric bupivacaine in spinal anesthesia for patients undergoing Illiazorov surgery

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ABSTRACT

Objective: To examine the efficacy of dexmedetomidine with hyperbaric bupivacaine 0.5% in spinal anesthesia for patients undergoing Illiazorov surgery.

Methodology: This cross-sectional/observational study was conducted at Orthopedics and Spine Centre, Ghurki Trust Teaching Hospital (GTTH) Lahore for two months from 20th August 2018 to 20th October 2018. In this study 52 patients of both genders undergoing lower limb surgeries were included. Patient's ages ranged from 18 to 65 y. Detailed medical history and informed consent was taken from all of the patients. The patients were randomly divided into two groups using a computer generated random number table. Group-I included 26 patients and received inj. dexmedetomidine 10 µg in 0.5 ml of normal saline along with 12.5 mg of 0.5% hyperbaric bupivacaine (2.5 ml), while the Group-II had 26 patients and received only 0.5ml of normal saline with 12.5 mg of 0.5% hyperbaric bupivacaine(2.5ml). Results were noted in both groups as time to achieve T10 sensory blockade and time to first rescue analgesia after spinal anesthesia.

Results: There were 19 (73.08%) male patients and 7 (26.92%) females in Group-I while in Group-II 21 (80.77%) patients were male and 5 (19.23%) were females. We observed the results were similar with respect to the time to reach T10 sensory blockade. But, we observed a significant difference in time to first rescue analgesia after spinal anesthesia. In Group-I, it was 270.35 min while in Group-II, it was 182.25 min.

Conclusion: In this study, we concluded that there was a significant difference in two groups with respect to the time to first rescue analgesia after spinal anesthesia with and without using dexmedetomidine in addition to 0.5% bupivacaine in spinal anesthesia for Illiazorov surgery.

Key words: Dexmedetomidine; Spinal Anesthesia; Sensory Block; Analgesia

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INTRODUCTION

Unless contraindicated, spinal anesthesia is the preferred mode of anesthesia for patients undergoing lower limb surgery at our institution. Used alone for spinal anesthesia, 0.5% hyperbaric bupivacaine

provides short duration of surgical anesthesia and analgesia. And a rescue technique may become necessary in case of prolonged surgery.¹ Over the years many drugs have been used as an adjuvant to spinal anesthesia in order to hasten its onset of action, prolong the duration of action and to provide

adequate postoperative analgesia. These drugs include midazolam, ketamine, fentanyl, clonidine, etc.^{2,3} Use of opioids is associated with its side effects like pruritus, nausea, vomiting, and respiratory depression which can cause patient distress.⁴

Dexmedetomidine, a highly selective α_2 agonist is rapidly emerging as the adjuvant of choice for spinal anesthesia in view of its property to provide analgesia and sedation without respiratory depression and minimal hemodynamic effects.⁵ There are numerous reports of dexmedetomidine use as an adjunct for spinal anesthesia in doses 3 μg , 5 μg , 10 μg and 15 μg .^{1,2,6} The lower doses show little benefit and 15 μg is related with some side effects. There seems to be no clear consensus on the dose of dexmedetomidine to be used as additive to hyperbaric bupivacaine in spinal anesthesia for routine practice. Avoidance of side effects of dexmedetomidine while ensuring a pain free peri-operative period is vital for successful outcome of anesthesia for surgery.^{7,8}

In this study, we examined the efficacy of dexmedetomidine 10 μg with 0.5% bupivacaine in spinal anesthesia for patients undergoing Illiazorov surgery.

METHODOLOGY

After approval from the hospital ethics committee, this cross-sectional/observational study was conducted at Ghurki Trust Teaching Hospital (GTTH) Lahore from 20th August 2018 to 20th October 2018. All adult patients (N = 52), regardless of race, gender or ethnicity, undergoing Illiazorov surgery who met the inclusion criteria were enrolled provided an informed consent could be obtained. In this study 52 patients of both genders undergoing Illiazorov surgery were included. Patient age range was 18-65 y. A detailed medical history and informed consent were obtained from all the patients. Patients using β_2 adrenergic receptor antagonists, calcium channel blockers, angiotensin-converting enzyme inhibitors, and beta blockers were excluded. Also patient with neurological disorders, uncontrolled hypertension, uncontrolled diabetes mellitus, allergy to study drug, coagulation disorders, spine deformities, pregnant patients and height less than 150 cm were excluded from the study.

The patients were randomized into two groups using a computer generated random number table. Group-I (N = 26) received dexmedetomidine 10 μg in 0.5 ml preservative free normal saline along with 12.5 mg of 0.5% hyperbaric bupivacaine (2.5 ml), while the Group-II (N = 26) received 0.5 ml of preservative free normal saline with 12.5 mg of 0.5% hyperbaric bupivacaine (2.5 ml). Total volume injection in the subarachnoid space was constant at 3 ml in all study patients (N = 52).

All the study patients were monitored with non-invasive blood pressure, electrocardiography and pulse oximetry and received ringer's lactate bolus of 15 ml/kg over 15 min before the spinal anesthesia. The spinal was performed in sitting position. With standard aseptic technique, gown gloves and mask were used by operator and skin was prepared with chlorhexidine 2% and draped. The lumbar puncture was performed with a 25 gauge Quincke spinal needle via median approach at L3-L4 intervertebral space. Successful intrathecal placement of spinal needle was confirmed by aspiration of cerebrospinal fluid and the study drug was injected over 10 second and the patients were placed supine after the injection.

The sensory blockade was tested, with blunt pin prick along midclavicular line, every two min after the injection of drug until the highest level of block was achieved.

Results were noted in both groups as time to achieve T10 sensory blockade and time to first rescue analgesia after completion of surgery. All the statistical data was analyzed by SPSS 17.0. A p-value < 0.05 was considered significant.

RESULTS

In Group-I, who received 10 μg of dexmedetomidine in 0.5 ml normal saline along with 2.5 ml of hyperbaric bupivacaine (0.5%), there were 19 (73.08%) men patients and 7 (26.92%) women with mean height was 156.23 \pm 3.45 cm. In Group-II (control group) who received 2.5 ml hyperbaric bupivacaine (0.5%) with 0.5 ml normal saline, (n = 26) 21 (80.77%) patients were men and 5 (19.23%) were women and mean height was 157.47 \pm 4.11 cm (see Table 1)

The observed results were statistically similar with respect to the time to achieve T10 sensory blockade. On the other hand a statistically significant difference in time to first rescue analgesia after completion of surgery. In Group-I, it was 270.35 min while in Group-II, it was 182.25 min (see Table 2). No side effects were observed in both groups.

DISCUSSION

It is well known that dexmedetomidine prolongs the duration of sensory and motor block without systemic effects seen with intravenous use. This motor block enhancing effect is by its effect on intrathecal α_2 receptors. And the sensory block is enhanced by its effect on dorsal horn nuclei. The narcotic sparing effect seen with systemic use of dexmedetomidine is due to its effect at α_2 located in locus ceruleus.

In our study we observed that 10 μg of dexmedetomidine in 0.5 ml was safe and effective with 0.5% hyperbaric bupivacaine and shows 100% results with respect to

Table 1: Demographical details of patients in both groups

Gender	Group I (n=26)	Group II (n=26)	p-value
Male	19 (73.08%)	21 (80.77%)	p > 0.05*
Females	7 (26.92%)	5 (19.23%)	p > 0.05*
Mean height (cm)	156.23 ± 3.45	157.47 ± 4.11	p > 0.05*

Table 2: Observations of dexmedetomidine at different parameters

Variable	Group I (n=26)	Group II (n=26)	p-value
Time to highest sensory block T10 (min)	3.20 ± 0.46	3.30 ± 0.47	p > 0.05*
Time to first rescue analgesia (min)	270.35 ± 19.66	182.25 ± 18.71	p < 0.05**

P > 0.05 for time to highest sensory block T10, and p < 0.05 for time to first rescue analgesia

movement of legs and feet with no side effects. We also observed that the duration of intraoperative and post-operative analgesia was significantly longer with 10 µg dose of dexmedetomidine. These results show similarity to some other studies in which results show dexmedetomidine with 0.5% hyperbaric bupivacaine was very beneficial and effective with no side effects.⁹⁻¹²

In this study, 52 patients were randomized into two groups, 26 patients in each group. In Group-I, patients received 10 µg of dexmedetomidine (n = 26) 19 (73.08%) were male patients and 7 (26.92%) were females and mean height was 156.23 ± 3.45 cm. In Group-II without dexmedetomidine included (n = 26) 21 (80.77%) patients were male and 5 (19.23%) were females and mean height was noted as 157.47 ± 4.11 cm. A study conducted by Arati et al.¹¹ regarding examining the efficacy of dexmedetomidine in spinal anesthesia with hyperbaric bupivacaine reported the male patients population higher as compared to female with ratio 21:9 and 16:14.

In our study, we observed two parameters in both groups. Time to highest sensory block t10 and time to first rescue analgesia. Between the two groups we observed the results were similar with respect to

time to reach highest sensory t10 blockade. These results shows no major difference to a study conducted by Zhang et al.¹³ in which they reported time to rescue analgesia was 208.37 min in patients who received 3 µg of dexmedetomidine and 274.42 min in patients who received 5 µg of dexmedetomidine.

While exploring new avenues of dexmedetomidine in their study, Grewal et al. mentioned the prospect of using dexmedetomidine as an additive in spinal analgesia taking into advantage its highly selective agonistic action for intrathecal α_2 receptors which have antinociceptive actions for both somatic and visceral pain.¹⁴

No neurological deficits have been reported till date in studies on both humans and animals during intrathecal/epidural use.¹⁴

CONCLUSION

Based upon the results of this study, we conclude that the addition of dexmedetomidine to bupivacaine in spinal anesthesia significantly improves the duration of sensory block and surgical analgesia with no added side effects.

More clinical studies may be needed to validate the efficacy and safety of intrathecal administration of dexmedetomidine as an adjuvant to local anesthetics for different types of surgeries.

Conflict of interest: None declared by the authors.

Authors' contribution:

AR: Concept, conduction of the study work and manuscript editing.

SS: Manuscript editing.

KQ, AN, KH, NA: Data collection and conduction of the study work.

7. LA: Discussion writing

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