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ORIGINAL RESEARCH

Assessment of analgesic efficacy of dexmedetomidine as an adjunct to local anesthetics in supraclavicular brachial plexus block

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ABSTRACT

Background: The supraclavicular brachial plexus block may be used for surgical anesthesia alone or in conjunction with general anesthesia. The present study was conducted to assess analgesic efficacy of dexmedetomidine as an adjunct to local anesthetics in supraclavicular brachial plexus block.

Materials & Methods: 70 patients undergoing upper limb and hand surgeries of both genders were divided into 2 groups. Group I received equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline and group II received 1 μg/kg dexmedetomidine along with equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline. Patients were observed for hemodynamic stability, onset and duration of sensory and motor blockade, duration of analgesia, postoperative pain, and adverse effects.

Results: Group I had 20 males and 15 females and group II had 18 males and 17 females. The mean duration of surgery (min) was 82.5 and 88.5, onset of sensory block (min) was 10.2 and 10.0, onset of motor block (min) was 15.4 and 11.3, duration of sensory block (hours) was 11.4 and 15.7, duration of motor block (hours) was 10.6 and 13.9, duration of analgesia (hours) was 12.3 and 17.5 and block performance time (min) was 5.6 and 5.2 in group I and group II respectively. The difference was significant ($P< 0.05$).

Conclusion: The addition of dexmedetomidine to ropivacaine-lidocaine prolonged the duration of supraclavicular brachial plexus block and improved postoperative analgesia.

Key words: Dexmedetomidine, supraclavicular brachial plexus, anesthetic

Introduction

The supraclavicular brachial plexus block may be used for surgical anesthesia alone or in conjunction with general anesthesia for managing perioperative pain in patients undergoing upper extremity surgery.[1] Various adjuvants, including opioids, midazolam, magnesium sulfate, dexamethasone, and neostigmine, have been added to local anesthetics in an attempt to increase the duration of block and postoperative analgesia with the risk of various adverse effects.[2]

Dexmedetomidine (DEX) is a highly selective alpha-2 adrenergic receptor agonist. In previous clinical studies, the administration of intravenous DEX has shown to produce significant opioid sparing effects, as well as a decrease in inhalational anesthetic requirement. Recently, DEX as an local anesthetic adjuvants has been the subject of increasing interest as the potential to prolong blockade duration.[3]Dexmedetomidine is also reportedly safe and effective when administered with long-acting local anesthetics in peripheral nerve blocks. No significant histopathologic abnormalities were reported after intrathecal or perineural administration of dexmedetomidine.it can also be used as a perineural adjuvant to facilitate better anesthesia and analgesia.[4]The hypothesized mechanisms of DEX administration in the peripheral nerve block are as follows: DEX inhibits the function of sodium channels and neuronal potassium current and blocks the hyerpolarization-activated cyclic nucleotide-gated channels, resulting in the enhancement of activity-dependent hyperpolarization and leading to

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the inhibition of substance P release in the nociceptive pathway at the dorsal root neuron.[5]The present study was conducted to assess analgesic efficacy of dexmedetomidine as an adjunct to local anesthetics in supraclavicular brachial plexus block.

Materials & Methods

The present study comprised of 70 patients undergoing upper limb and hand surgeries of both genders. All gave their written consent for the participation in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Group I received equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline and group II received 1 µg/kg dexmedetomidine along with equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline. A total volume of 0.5 mL/kg was administered in ultrasound-guided supraclavicular brachial plexus block in both groups. Patients were observed for hemodynamic stability, onset and duration of sensory and motor blockade, duration of analgesia, postoperative pain, and adverse effects. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Distribution of patients

Groups	Group I	Group II
M:F	20:15	18:17

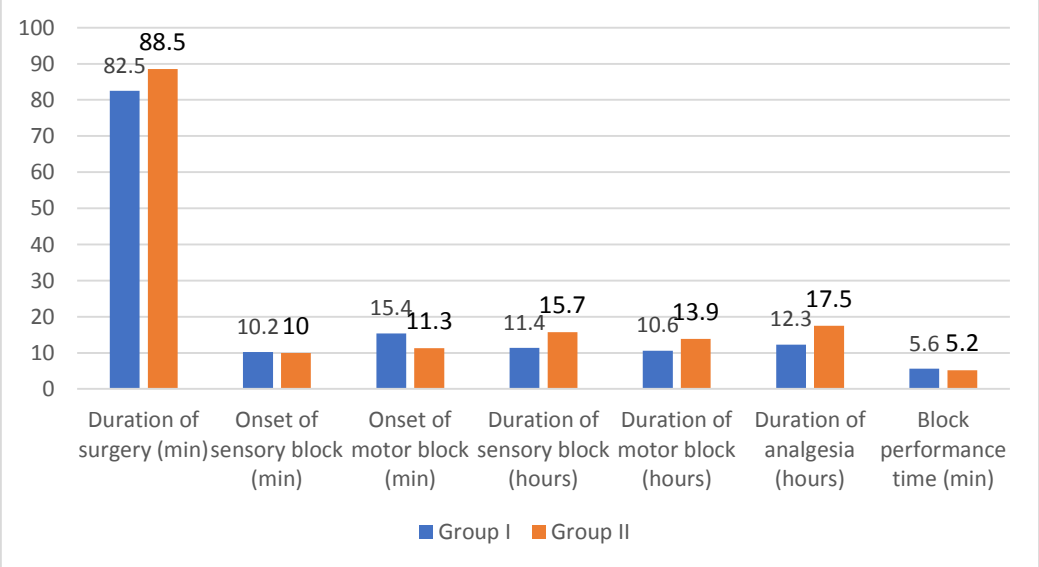
Table I shows that group I had 20 males and 15 females and group II had 18 males and 17 females.

Table II: Assessment of parameters

Parameters	Group I	Group II	P value
Duration of surgery (min)	82.5	88.5	0.12
Onset of sensory block (min)	10.2	10.0	0.83
Onset of motor block (min)	15.4	11.3	0.05
Duration of sensory block (hours)	11.4	15.7	0.02
Duration ofmotor block (hours)	10.6	13.9	0.04
Duration of analgesia (hours)	12.3	17.5	0.01
Block performance time (min)	5.6	5.2	0.17

Table II, graph I shows that mean duration of surgery (min) was 82.5 and 88.5, onset of sensory block (min) was 10.2 and 10.0, onset of motor block (min) was 15.4 and 11.3, duration of sensory block (hours) was 11.4 and 15.7, duration of motor block (hours) was 10.6 and 13.9, duration of analgesia (hours) was 12.3 and 17.5 and block performance time (min) was 5.6 and 5.2 in group I and group II respectively. The difference was significant (P< 0.05).

Graph I: Assessment of parameters



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Discussion

The efficacy of α2-adrenoceptor agonists has been established in a variety of regional anesthesia techniques.[6] Clonidine, when added to lidocaine, prolonged the duration of anesthesia and analgesia after brachial plexus block, although the results with long-acting local anesthetics have been somewhat less impressive.[7]Dexmedetomidine is a selective α2-adrenoceptor agonist and is approximately 8 times more potent than clonidine.[8]The present study was conducted to assess analgesic efficacy of dexmedetomidine as an adjunct to local anesthetics in supraclavicular brachial plexus block.

We found that group I had 20 males and 15 females and group II had 18 males and 17 females. Erdivanli et al[9] also echoed the above results and showed no pathohistological changes of nerve system after the intrathecal administration. Fritsch et al[10]showed no neurological sequelae after administration of DEX and ropivacaine for BPB at postoperative 7 day and 28 days. Though the safety of preneural administration of DEX is encouraging, information concerning delayed neurological effects is still lacking.

We found that the mean duration of surgery (min) was 82.5 and 88.5, onset of sensory block (min) was 10.2 and 10.0, onset of motor block (min) was 15.4 and 11.3, duration of sensory block (hours) was 11.4 and 15.7, duration of motor block (hours) was 10.6 and 13.9, duration of analgesia (hours) was 12.3 and 17.5 and block performance time (min) was 5.6 and 5.2 in group I and group II respectively. Brummett et al[11]showed the neurotoxicity of DEX when the dosage of perineural DEX up to 40 μg/kg in rat and it might even attenuate the acute perineural inflammation induced by bupivacaine.

Bharti et al[12] in their study sixty adult patients undergoing upper limb and hand surgeries were randomly allocated into 2 groups. The control group received equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline, whereas the dexmedetomidine (dexmed) group received 1 μg/kg dexmedetomidine along with equal volumes of 0.75% ropivacaine and 2% lidocaine with adrenaline. The onset time of motor blockade was shortened and the duration of sensory, as well as motor, block was significantly prolonged in the dexmed group ($P < 0.0001$). The duration of postoperative analgesia was also longer in the dexmed group compared with the control group, 12 hours and 17 hours in control and dexmed group, respectively. The requirement for rescue analgesic during the 24-hour postoperative period was less in the dexmed group ($P < 0.0001$). Postoperative pain scores were comparable among groups except at 8 and 10 hours, when pain scores were lower in the dexmed group. Patients receiving dexmedetomidine were more sedated for 2 hours than the control group patients ($P < 0.0001$). No episode of bradycardia, hypotension, respiratory depression, or dizziness was reported.

Ping et al[13]assessed the efficacy and safety of DEX as local anesthetic adjuvants on BPB.Sensory block duration, motor block duration, onset time of sensory and motor block, time to first analgesic request, the common adverse effects were analyzed.Eighteen trails (1014 patients) were included with 515 patients receiving perineural DEX. The addition of DEX prolonged the duration of sensory block, motor block and analgesia. Perineural DEX also increased the risk of bradycardia, hypotension and somnolence. There was a lack of evidence that perineural DEX increased the risk of other adverse events.

The limitation the study is small sample size.

Conclusion

Authors found that the addition of dexmedetomidine to ropivacaine-lidocaine prolonged the duration of supraclavicular brachial plexus block and improved postoperative analgesia.

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