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Original Research

A comparative study to assess clonidine and dexemedetomidine as adjuvant to IV regional anesthesia

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ABSTRACT:

Background: Nowadays most commonly technique used for short operative procedures on extremities is Intravenous regional anesthesia (IVRA).Numerous methods have been used for improvising of peri-operative analgesia but neither of them proved to be ideal. The aim of present study is the assessment of clonidine and dexmedetomidine as adjuvant to IV regional anesthesia by comparative method. **Materials and methods:** 120 patients were selected for the present study who were planned to undergo elective upper limb orthopedic surgeries. The age of patients ranged between 18-60 years. Patients were randomly divided into two groups of 60 each: Group 1 and Group 2. Study drug used in Group 1 was 0.5% lignocaine (40 ml) + clonidine 1µg/kg and in Group 2 was 0.5% lignocaine (40 ml) + dexmedetomidine 1µg/kg. 40 ml of lignocaine 0.5% was prepared by adding 30 ml normal saline to 10 ml of 2% lignocaine. **Results:** There were significant differences in mean onset and recovery of sensory block between both the groups. In group 1, the sensory block onset time was 6.56 + 1.24 minutes and sensory block recovery time was 5.4 + 1.27 minutes. In group 2, the sensory block onset time was 4.69 + 1.43 minutes and sensory block recovery time was 7.86 + 1.79 minutes. Similarly, significant differences were observed in mean onset and recovery of motor block between both the groups. In group 1, the motor block onset time was 12.46 + 1.89 minutes and motor block recovery time was 7.4 + 0.75 minutes. In group 2, the motor block onset time was 9.2 + 1.98 minutes and motor block recovery time was 10.2 + 1.73 minutes (P<0.001). **Conclusion:** Addition of dexmedetomidine to local anesthetic for IVRA, significantly accelerated onset and prolonged the recovery of sensory as well as motor block in contrast to clonidine.

Key words: Clonidine, Dexmedetomidine, Regional

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INTRODUCTION:

Nowadays most commonly technique used for short operative procedures on extremitiesis Intravenous regional anesthesia (IVRA). IVRA is beneficial as compared to other techniques as it has high indices for reliability, rapid onset of analgesia and good muscular relaxation. The need for application of pneumatic tourniquet throughout the procedure is a drawback to this technique. It limits the time of surgery to the duration during which tourniquet could be safely inflated. Also, post-operative analgesia is absent with this technique.[1] Primary aim of development in this field is to increase the tolerance for tourniquet, advancement in overall quality, post-operative analgesia and decreasing adverse effects related to drugs. Numerous methods have been used for improvising of peri-operative analgesia that include supplementation of narcotics and non-steroidal anti-inflammatory drugs, either systematically or as adjuvants to IVRA but neither of them proved to be ideal.[1, 2] Clonidine, by selectively blocking the Ad and C fibers enhances the peripheral nerve blocks of local anesthetics. Dexmedetomidine, being a strong α 2 receptor agonist, is more selective towards α 2 receptors as compared to clonidine.[2] The aim of present study is the assessment of clonidine and dexmedetomidine as adjuvant to IV regional anesthesia by comparative method.

MATERIALS AND METHODS:

The study was conducted in the department of anesthesiology of our institution. For the study, 120 patients were selected with American Society of Anesthesiologists physical status I and II, undergoing elective upper limb orthopedic surgeries. The age of patients ranged between 18-60 years. The patients were explained about the nature and safety of the procedure and informed consent was obtained.

Patients were randomly divided into two groups of 60 each: Group 1 and Group 2. Study drug used in Group 1 was 0.5% lignocaine (40 ml) + clonidine 1µg/kg and in Group 2 was 0.5% lignocaine (40 ml) + dexmedetomidine 1µg/kg. 40 ml of lignocaine 0.5% was prepared by adding 30 ml normal saline to 10 ml of 2% lignocaine.

When patient was taken into the operating room for the surgery, the study drug was administered by the anesthesiologist who was blinded to the study drug. The assessment of sensory block was done by pinprick with a 22-guage-short-bevelled needle every 30 s. The assessment of motor functions was done by asking the patient to flex and extend the wrist and fingers and when no voluntary movement was possible, motor block was noted as complete. The time elapsed from injection of study drug to sensory block achieved in all dermatomes was labeled as sensory block onset time and the time elapsed from injection of study drug to complete motor block was labeled as motor block onset time. Visual Analogue scale (VAS) was used to assess tourniquet pain scores (0-"no pain" and 10-"worst pain imaginable") and Ramsay sedation score was used for assessment of sedation before tourniquet application and at 5, 10, 15, 20 and 40 min after anesthetic is injected. After 24 h post-operatively, patient satisfaction score was recorded as: 5 for very satisfied, 4 for satisfied, 3 for neutral, 2-dissatisfied and 1-very dissatisfied.

The statistical significance of the data was assessed using software SPSS for windows. Statistically significance was determined at $P<0.05$.

RESULTS

In the present study, there were significant differences in mean onset and recovery of sensory block between both the groups. In group 1, the sensory block onset time was 6.56 + 1.24 minutes and sensory block recovery time was 5.4 + 1.27 minutes. In group 2, the sensory block onset time was 4.69 + 1.43 minutes and sensory block recovery time was 7.86 + 1.79 minutes ($P<0.001$) (Table 1).

Similarly, significant differences were observed in mean onset and recovery of motor block between both the groups. In group 1, the motor block onset time was 12.46 + 1.89 minutes and motor block recovery time was 7.4 + 0.75 minutes. In group 2, the motor block onset time was 9.2 + 1.98 minutes and motor block recovery time was 10.2 + 1.73 minutes ($P<0.001$) (Table 1). On the basis of time for request of first dose of analgesic, the mean duration of analgesia was 604 + 537 minutes in Group 1 and 1287 + 489 in Group 2 ($P<0.001$).

Table 1: Comparison of Group 1 and Group 2

	Group 1	Group 2	P value
Sensory block onset time (min)	6.56 + 1.24	4.69 + 1.43	< 0.001
Sensory block recovery time (min)	5.4 + 1.27	7.86 + 1.79	<0.001
Motor block onset time (min)	12.46 + 1.89	9.2 + 1.98	<0.001
Motor block recovery time (min)	7.4 + 0.75	10.2 + 1.73	<0.001
Duration of analgesia (min) (mean)	604 +537	1287 +489	<0.001

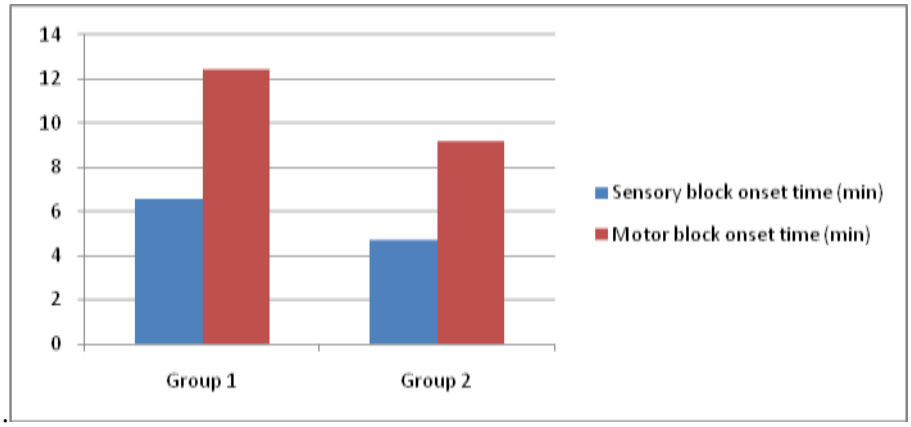

Figure 1: Comparison of onset of sensory and motor block

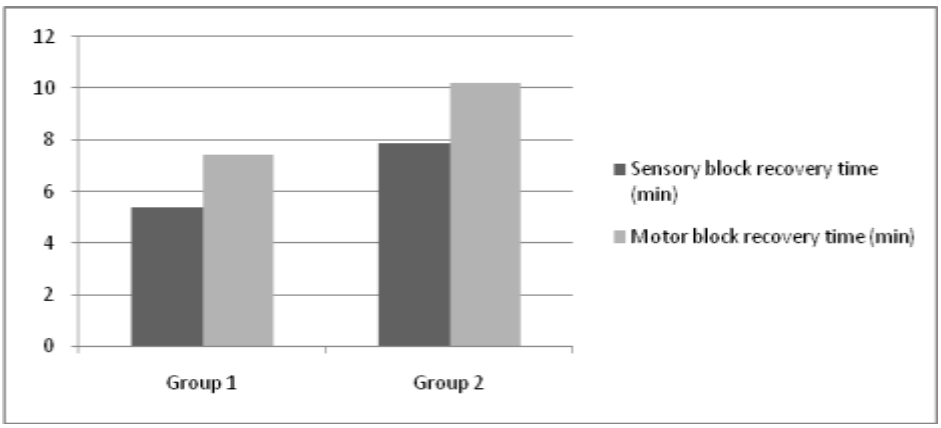

Figure 2: Comparison of recovery of sensory and motor block

DISCUSSION:

Intra venous regional anesthesia (IVRA) is a method of injecting local anesthetic solution into venous circulation of same limb and simultaneously applying tourniquet to limb to occlude the circulation to the limb. The time of surgery is limited because tourniquet can be applied safely for a limited time only. Dull and aching pain sensation described as tourniquet pain is a common drawback. Another limitation to this technique is the absence of post-operative analgesia. Various scholars have tried different agents as additives to local anesthetics for IVRA for example non-steroidal anti-inflammatory drugs, opioids, muscle relaxants, neostigmine and magnesium; but none of them have proved to be satisfactorily.[3, 4]

α 2 agonists have been widely studied regarding pharmacological properties which are beneficial to its addition to regional anesthesia.[5, 6] It has been reported that duration of both sensory and motor blockade induced by local anesthetics is prolonged by addition of Dexmedetomidine to the anesthetic, irrespective of the route of administration because it is 8-10 times more selective toward α2 adrenergic receptors and 3.5 times more lipophilic than clonidine.[7, 8, 9]

In a study conducted by Gupta et al. two different doses of dexmedetomidine were supplemented as an additive to local anesthetics. It was concluded that quality of anesthesia and post-operative analgesia are improved with addition of dexmedetomidine 1 µg/kg to lignocaine in contrast to 0.5 µg/kg of dexmedetomidine.[10]

In the present study, we used used 1 µg/kg dexmedetomidine and compared it with 1 µg/kg clonidine. In case of dexmedetomidine, we observed significant shortening of onset of sensory and motor block and prolonged recovery as compared to clonidine. The time for request of first dose of analgesic, the mean duration of analgesia was significantly longer in dexmedetomidine group. These results can be credited to more selective action of dexmedetomidine on α2 adrenergic receptors and its lipophilic nature as compared to clonidine.[7]

Esmaoglu et al. evaluated the effect of adding dexmedetomidine to levobupivacaine for axillary brachial plexus blockade. The primary endpoints were the onset and duration of sensory and motor block and duration of analgesia. Sixty patients scheduled for elective forearm and hand surgery were divided into 2 equal groups in a randomized, double-blind fashion. They concluded that Dexmedetomidine added to levobupivacaine for axillary brachial plexus block shortens the onset time and prolongs the duration of the block and the duration of postoperative analgesia.[11]

In the present study, the time for demand of rescue analgesic as a measure of post-operative analgesia was recorded. The duration of post-operative analgesia was significantly increased with dexmedetomidine as an adjuvant as compared to clonidine. Most of the patients who received dexmedetomidine did not demand analgesic or complain of pain for 24 h post-operatively. α2 adrenergic receptors located at nerve endings may have a role in the analgesic effect of the drugs by preventing norepinephrine release. The effect is more pronounced with dexmedetomidine as it is more selective and a complete agonist at these receptors.[7]

Swami S et al. compared clonidine and dexmedetomidine as an adjuvant to local anaesthetic agent in supraclavicular brachial plexus block with respect to onset and duration of sensory and motor block and duration of analgesia. Sixty ASA I and II patients scheduled for elective upper limb surgeries under supraclavicular brachial plexus block were divided into two equal groups in a randomized, double-blinded fashion. There was no statistically significant difference in onset of sensory and motor block between the two groups. The duration of analgesia (time to requirement of rescue analgesia) in group D was 456±97 min, while in group C, it was 289±62 min. Statistically, this difference was significant (P=0.001). The number of patients achieving grade IV quality (excellent) of block was higher in group D (80%) as compared with group C (40%) (P<0.05). They concluded that Dexmedetomidine when added to local anesthetic in supraclavicular brachial plexus block enhanced the duration of sensory and motor block and also the duration of analgesia. The time for rescue analgesia was prolonged in patients receiving

dexmedetomidine. It also enhanced the quality of block as compared with clonidine.[12]

CONCLUSION:

Addition of dexmedetomidine to local anesthetic for IVRA, significantly accelerated onset and prolonged the recovery of sensory as well as motor block in contrast to clonidine. Dexmedetomidine had better quality of block, post-operative analgesia duration and patient satisfaction.

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