EFFECT OF DEXMEDETOMIDINE AS AN ADJUVANT WITH LEVOBUPIVACAINE IN AXILLARY BRACHIAL PLEXUS BLOCK

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ABSTRACT

BACKGROUND
The surgeries in the upper limb can be done either by general or regional anaesthesia or by the combination of both. Regional blockade has wide application in providing surgical anaesthesia and analgesia as well as in treating chronic pain syndromes. Regional anaesthesia has several advantages in the postoperative period compared with general anaesthesia including decreased sedation, decreased nausea and vomiting, early discharge from the recovery room and a smooth transition to pain control as the block effects gradually dissipate. The first demonstration of axillary approach to brachial plexus was done by William Halsted in 1884. He injected cocaine under direct vision. The first percutaneous axillary block was done by G. Hirschel in 1911. The axillary approach to brachial plexus blockade provides satisfactory anaesthesia for elbow, forearm and hand surgery. Aims and Objectives- To evaluate the effect of adding dexmedetomidine as an adjuvant with levobupivacaine in axillary brachial plexus block and to evaluate the adverse effect and onset time for sensory and motor blockade during analgesia.

MATERIALS AND METHODS
This prospective, randomised, controlled trial study was conducted in Govt. Mohan Kumaramangalam Medical College, Salem from 2016 - 2017. Ethical committee clearance was duly obtained from the Hospital. For the sake of convenience, it was decided to include 64 subjects in the study with 32 subjects randomised to each of the two study groups. Randomisation of the population is allocated into these defined groups according to computer generated random numbers.

RESULTS
This study shows the addition of Dexmedetomidine to Levobupivacaine in axillary brachial plexus block results in a shorter onset time for sensory and motor blockade. It also prolongs the duration of sensory and motor blockade and also the duration of analgesia. However, dexmedetomidine use may also lead to bradycardia.

CONCLUSION
The addition of 1 mL Dexmedetomidine to 29 mL of 0.5% Levobupivacaine in axillary brachial plexus block results in a shorter onset time for sensory and motor blockade. It also prolongs the duration of sensory motor blockade and also the duration of analgesia in patients between 20 years to 50 years of age undergoing forearm and hand surgeries of both sexes.

KEYWORDS
Axillary Block, Subclavian Artery, Nerve Stimulator.


BACKGROUND
Brachial plexus block was first performed by two famous surgeons- Halsted in 1884 and Crile in 1887. Both surgeons first surgically exposed the brachial plexus before applying cocaine to this neural structure under direct vision. The first percutaneous brachial plexus blocks were reported in 1911 by Hirschel and Kulenkampff. Over the ensuing years a variety of techniques, modifications and advancements have made brachial plexus block one of the regional anaesthetic techniques most frequently used in contemporary anaesthesia practice.

Recent work by Winnie has further elucidated the clinically relevant anatomy of the brachial plexus, which has led to further refinement of the technique and recognition of the role of brachial plexus block in the treatment of sympathetically maintained pain syndromes involving the upper extremity.

The axillary brachial plexus block is typically performed for hand and forearm surgery. This technique of anaesthetising the brachial plexus is considered superior compared to supraclavicular or interscalene blocks. The anaesthesia extends from the mid-arm level down to the hand.

Aim
To evaluate the effect of adding dexmedetomidine as an adjuvant with levobupivacaine in axillary brachial plexus block

Objectives
To evaluate the adverse effect and onset time for sensory and motor blockade during analgesia.
A total of 64 patients were enrolled in this study. There were totally 4 cases of block failure, 2 in the levobupivacaine (L) group and 2 in the levobupivacaine + dexmedetomidine group (LD). They were excluded from the study. The mean age of the L group was 34 ± 7.4 years and the LD group was 37.1 ± 9.2 years. The difference between the two groups are not statistically significant (p > 0.05) [Table 1]. The mean onset time for sensory block in Group LD was 9.94 minutes, which was lower than Group L - 10.97 minutes. This was statistically significant (p < 0.05). The total duration of analgesia in Group LD was 844 minutes, which was higher than Group L - 658 minutes. This was statistically significant (p < 0.05). Four cases in LD group had bradycardia, which required treatment with atropine. Side effects such as nausea, vomiting, hypoxaemia and hypotension were not present in both the groups.

The mean age of the L group was 34 ± 7.4 years and the LD group was 37.1 ± 9.2 years. The difference between the two groups are not statistically significant (p > 0.05).

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
<th>T value</th>
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<td>7.46</td>
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<td>1.461</td>
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<tr>
<td>Group LD</td>
<td>37.16</td>
<td>9.22</td>
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Table 1. Comparison of Age Distribution between the Two Groups

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Group L</td>
<td>17</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Group LD</td>
<td>16</td>
<td>14</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 2. Comparison of Sex Distribution between the Two Groups

Both the Groups L and LD were comparable, but not statistically significant.
The preoperative haemodynamic variables between the two groups were comparable, but not statistically significant.

The mean onset time for sensory block in Group LD was 9.94 minutes, which was lower than Group L - 10.97 minutes. This was statistically significant (p < 0.05).

The mean onset time for motor block in Group LD was 10.61 minutes, which was lower than Group L - 11.75 minutes. This was statistically significant (p < 0.05).

The mean time for total duration of sensory block in Group LD was 720 minutes, which was higher than Group L - 602 minutes. This was statistically significant (p < 0.05).

The mean time for total duration of motor block in Group LD was 604 minutes, which was higher than Group L - 491 minutes. This was statistically significant (p < 0.05).

The total duration of Analgesia in Group LD was 844 minutes, which was higher than in Group L - 658 minutes. This was statistically significant (p < 0.05).

DISCUSSION

In our study, we found that addition of dexmedetomidine to levobupivacaine in axillary brachial plexus block shortens the onset time for sensory and motor block. It also extends the duration of sensory and motor block and also duration of analgesia. Also patients experience lower postoperative VAS scores in the 8H, 12H and 16H. Our study had similar findings with the study by Esmaeghli et al, but in their study they used levobupivacaine 0.5% 40 mL (10 mL for each nerve) along with 100 mcg of dexmedetomidine in axillary block. We used only 7.5 mL for each nerve and also we found that the onset time for sensory and motor block was a bit longer. Duration of sensory and motor block and total duration of analgesia was a bit shorter in our study when compared to their study. This may be due to the less volume of drug (30 mL) we used in our study. Our study also shared similar findings with the study by Kaygusuz et al. They used 40 mL (10 mL for each nerve) of 0.5% levobupivacaine along with 1 mcg/kg of dexmedetomidine in axillary block. We used 30 mL 0.5% levobupivacaine with 100 mcg of dexmedetomidine (7.5 mL for each nerve). We found that the onset time for sensory and motor block was a bit longer, duration of sensory and motor block and total duration of analgesia was a bit shorter in our study.
study when compared to their study. This may be due to the less volumes of drug (30 mL) we used in our study. In their study no cases of bradycardia were reported, but we had 4 cases of bradycardia which required treatment with atropine. This may be due to higher dose (100 mcg) of dexmedetomidine we used in our study. The alpha-2 agonists may dose dependently enhance local anaesthetic potency and prolong its duration by combining at the alpha-2 receptors at peripheral level. The other possible mechanism by which the alpha-2 agonists improve local anaesthetic action include; 1) Vasoconstriction around the site of injection, leading to a delay in the absorption of the local anaesthetic and thus a prolongation of the local anaesthetic effect; 2) A direct action on peripheral nerve activity. Clonidine has been found to inhibit peripheral nerve activity directly; 3) Release of local enkephalin like substances; 4) A decrease in the release of local inflammatory mediators; 5) Increase in the release of anti-inflammatory cytokines. Clonidine and Dexmedetomidine are the currently available alpha-2 receptor agonists. The usage of clonidine in brachial plexus block with various local anesthetics yield conflicting results. It was found that clonidine prolongs the motor blockade with mepivacaine and bupivacaine, but not with ropivacaine. The reason for this effect may be because that ropivacaine itself had an intrinsic vasoconstrictor effect and addition of clonidine to ropivacaine did not increase this vasoconstriction effect. Dexmedetomidine was found to be a safe and effective adjuvant in many studies on neuraxial and peripheral nerve blocks. In a study by Abosedira et al clonidine or dexmedetomidine were added to lidocaine in Bier’s block and it was found that dexmedetomidine improved the quality of anaesthesia and analgesia better than that of clonidine. In a study by Kol et al, dexmedetomidine and lornoxicam were added to prilocaine in Bier block. They reported that addition of dexmedetomidine had shortened the sensory block onset time and prolonged the sensory block recovery time more than lornoxicam. In 2 other studies by Memis D et al and Esmaoglu et al, dexmedetomidine-lidocaine mixture was used in Bier block and was found to improve the quality of anaesthesia and reduce postoperative analgesic requirement. Bajwa et al evaluated the effects of dexmedetomidine and clonidine in epidural anaesthesia. They found that dexmedetomidine is a better neuraxial adjuvant than clonidine to provide an early onset of sensory analgesia and also prolonged postoperative analgesia.

CONCLUSION

The addition of Dexmedetomidine (100 mcg) to LevoBupivacaine (0.5%) in axillary brachial plexus block results in a shorter onset time for sensory and motor blockade. It also prolongs the duration of sensory and motor blockade and also the duration of analgesia.

REFERENCES


