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Comparison of Clonidine with Dexmedetomidine as an Adjuvant to Local Anesthetic Agent in Supraclavicular Brachial Plexus Block

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Abstract

Introduction: Addition of adjuvant to local anesthetic in supraclavicular brachial plexus block helps in rapid onset, increased duration of block and improved quality of analgesia. We compare clonidine and dexmedetomidine as an adjuvant to bupivacaine in supraclavicular brachial plexus block. *Methods:* Sixty ASA Grade I/II patients undergoing upper limb surgery under supraclavicular brachial plexus block. Two groups of 30 patients each and randomly assigned using computer generated random numbers. The patients were compared for onset as well as duration of sensory and motor blockade, duration of analgesia and hemodynamic side effects.

Group C: Bupivacaine 0.25% (35 cc) + clonidine 1 *µg/kg;*

Group D: Bupivacaine 0.25% (35 cc) + dexmedetomidine 1 *µg/kg*.

Results: The onset of sensory block was shorter in dexmedetomidine group (statistically highly significant) as additive to bupivacaine compared to clonidine. Although no significant difference was seen in onset of motor block, the duration of sensory block and motor block was significantly prolonged in the dexmedetomidine group than in clonidine group. There was significant less rescue analgesia demanded by patients of dexmedetomidine group with no significant difference in block quality in both the groups.

Conclusion: From the present study, it can be concluded that, dexmedetomidine prolongs the duration of sensory and motor block and enhances the quality of block as compared with clonidine when used as an adjuvant to in supraclavicular brachial plexus block.

Keywords: Dexmedetomidine; Clonidine; Bupivacaine; Supraclavicular brachial plexus block.

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Introduction

Upper limb surgeries are preferably done under regional anesthesia. Peripheral nerve blocks not only provide intra-operative anesthesia but also ensure post-operative analgesia without causing any systemic side effects. The need for longer post-operative pain free interval is however not met by local anesthetic alone. Many drugs are used as adjuvant for faster onset, denser block and

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for prolonging the duration of peripheral nerve blockade. There has always been a search for ideal adjuvant in peripheral nerve blocks which prolonged duration of analgesia with lesser adverse effects. As yet, the ideal local anesthetic adjuvant has not been developed. Although the search continues, we decided to compare clonidine with the new *a*2 adrenergic agonist, dexmedetomidine which is eight times more selective towards *a*2 adrenoreceptors as an adjunct with bupivacaine for supraclavicular blocks. Alpha-2-adrenergic agonists were chosen for their sedative, analgesic, antihypertensive and anti-emetic properties along with decreasing requirement of other drugs.

Materials and Methods

After approval by institutional ethical committee and obtaining written informed consent from patients, this prospective randomized study was done in 60 American Society of Anesthesiologist (ASA) Grade I and II patients of either sex aged *18–60 years*, undergoing orthopedic surgeries on the upper limb under supraclavicular brachial plexus block. The selected patients were divided in two groups of 30 patients each and randomly assigned using computer generated random numbers to one of the following groups:

Group C: Bupivacaine 0.25% (35 cc) + clonidine *1 μg/kg*;

Group D: Bupivacaine 0.25% (35 cc) + dexmedetomidine *1 μg/kg*.

Both, patient and investigator performing the study and observing the result were blinded to the test drug by giving serial numbers to the patients and serial numbers were decoded in the end. All the observations were made by the same observer to eliminate subjective error.

Exclusion Criteria

Hypersensitivity to drugs, Patients on adrenoreceptors agonist or antagonist therapy, Bleeding disorders, uncontrolled diabetes mellitus, pregnant women and Pre-existing peripheral neuropathy.

Pre-medication

All patients were pre-medicated with tablet alprazolam *0.5 mg* orally a night before surgery.

Technique of Anesthesia

On arrival in the operation theatre, baseline heart rate, blood pressure and oxygen saturation were recorded. An intravenous line was secured in the unaffected limb and started with crystalloid fluid. All the patients received brachial plexus block through the supraclavicular approach by an experienced anesthesiologist different from the one assessing the patient intra-operatively and post-operatively.

The supraclavicular block was given using lateral approach.[1] A point was marked *1 cm* above the junction of medial two third and lateral one third of clavicle. Under all a septic precautions an intradermal wheal was raised with 2% lignocaine at the selected point with anesthesiologist standing at the head end, slightly towards the side. A *5 cm* long 22 G needle was inserted through the wheal, directed medially and inward at the angle of around *20 degrees* to the skin, parallel to the clavicle avoiding the external jugular vein till paresthesia was elicited.

Following negative aspiration, *35 ml* of a solution containing local anesthetic combined with clonidine or dexmedetomidine as mentioned above was injected. Sensory block was assessed by the pin prick method. Assessment of sensory block was done at each minute after completion of drug injection in the dermatomal areas corresponding to median nerve, radial nerve, ulnar nerve and musculocutaneous nerve till complete sensory blockade. Sensory onset was considered when there was a dull sensation to pin prick along the distribution of any of the above-mentioned nerves.

Sensory block was graded as:

Grade 0: Sharp pin prick felt;

Grade 1: Analgesia, dull sensation felt;

Grade 2: Anesthesia, no sensation felt.

Assessment of motor block was carried out by the same observer at each minute till complete motor blockade after drug injection. Onset of motor blockade was considered when there was Grade 1 motor blockade. Motor block was determined according to a modified Bromage scale for upper extremities on a 3-point scale.[2]

The block was considered incomplete when any of the segments supplied by median, radial, ulnar and musculocutaneous nerve was not having analgesia even after *30 min* of drug injection. These patients were supplemented with intravenous fentanyl (*1 μg/kg*) and midazolam (*0.02 mg/kg*). When more than one nerve remains unaffected, it was considered a failed block. In this case, general anesthesia was given intra-operatively and patient was excluded from the study.

Patients were monitored for hemodynamic variables such as heart rate, blood pressure and oxygen saturation every *5 min* after the block intra-operatively and every *15 min* post-operatively. Sedation of patients was assessed by the Ramsay Sedation Score.

At the end of the procedure, quality of operative conditions was assessed according to the following numeric scale:

Grade 4: (*Excellent*) No complaint from patient;

Grade 3: (*Good*) Minor complaint with no need for the supplemental analgesics;

Grade 2: (*Moderate*) Complaint that required supplemental analgesia;

Grade 1: (*Unsuccessful*) Patient given general anesthesia.

Duration of surgery was noted. The intra- and post-operative assessment was done by an anesthesiologist who was unaware of the drug used.

Results

Onset of sensory block

The onset of sensory block was shorter when dexmedetomidine was used (statistically highly significant) as additive to bupivacaine compared to clonidine as shows in Table 1.

Onset of motor block

Dexmedetomidine reduced the onset of motor block as compared to clonidine but after comparing statistically, no significant difference was found in both the groups ($p = 0.137$).

Sensory block duration

Duration of sensory block was calculated as the time taken from onset of sensory block to VAS score of more than 5. Total sensory duration was longer in Group D and this difference was statistically significant ($p < 0.05$).

Motor block duration

The duration of motor block was significantly prolonged in the dexmedetomidine group than in clonidine group. Duration of motor block was taken as the time from onset of motor block to when patient recovers the ability to flex elbow and wrist. Total duration of motor block was around *80 min* longer in Group D. Difference in total motor block duration was statistically highly significant ($p = 0.000$).

Rescue analgesia

Patients of dexmedetomidine group had significant prolongation of post-operative analgesia. Their demand of rescue analgesia was also less compared to the clonidine group and these values were found to be statistically significant with p value of < 0.0001. The additional analgesic requirement was significantly reduced by dexmedetomidine.

Block quality

There was no significant difference in block quality in both the study Groups.

Intra-operative vitals

There was decline in mean blood pressure in both the groups but this was in-significant compared to each other. Heart rate also declined in both the groups with significant decline from baseline at *20 mins* and *105 mins*, was seen in clonidine group though no treatment was required in both the groups. Thus neither dexmedetomidine nor clonidine caused exaggerated fall in hemodynamic when added to bupivacaine.

Table 1: Comparison of Onset and Duration of Sensory and Motor Block of two Groups.

	Group C Mean ± SD	Group D Mean ± SD	*p* - value
Onset of motor block (*minutes*)	4.73 ± 1.10	4.33 ± 0.95	0.137
Onset of sensory block (*minutes*)	3.3 ± 0.79	2.13 ± 0.78	0.000*
Total motor block duration (*minutes*)	330.67 ± 37.55	472.00 ± 84.55	0.000*
Total sensory block duration (*minutes*)	290.17 ± 47.82	395.17 ± 63.57	0.000*

(* Highly significant)

Discussion

Brachial plexus block is being practiced safely and effectively for last many years. Continuous research is going on how to improve this most used peripheral nerve blockade anesthetic technique and to expand its use for various surgical procedures.

Nerve blocks performed with long acting local anesthetics are beneficial for prolonging post-operative analgesia, but the duration of block is still not sufficient so as to avoid the post-operative opioid use. Alternatively, perineural catheters can be used to prolong the duration of analgesia, however, the insertion of peripheral nerve catheters is more time consuming, costly, demanding more post-operative care, possibly more painful for the patient and has possible higher complication rates (*e.g.,* infection, dislodgment). Thus, adding adjunct to local anesthestics is a better alternative to perineural catheter insertion. We used same dose of dexmedetomidine and clonidine *i.e., 1 mcg/kg*, so, that both drugs can be compared. We selected dose of *1 µg/kg* as no added benefits were found with doses exceeding *1.5* µg*/kg*.

The result of our study, showed that the onset of sensory block was significantly shorter in Group D as compared to Group C. Our results were not in accordance with Swami *et al.*,[3] who in their study concluded that dexmedetomidine as an adjuvant to bupivacaine has no significant difference in the onset of sensory block in supraclavicular brachial plexus block as compared to clonidine although comparing the same two studying groups. The time for the onset of sensory block was *2.33 ± 1.21 minutes* in the group using bupivacaine and clonidine as compared to *1.77 ± 1.28 minutes* in the group using bupivacaine and dexmedetomidine as an adjuvant. The difference was statistically in-significant with a p - value of 0.083 ($p > 0.05$). In our study, the onset of sensory block was significantly faster in the groups receiving bupivacaine with dexmedetomidine (p - value < 0.05).

While our results were in accordance with the Sebastian *et al.*[4] where onset of sensory block was faster in dexmedetomidine group as compared to clonidine group and the difference in the result was significant with a p – value < 0.05.

Sensory block duration

In our study, mean total duration of sensory block was *290.17 + 47.82 min* in Group C whereas in Group D it was *395.17 + 63.57 min*. Total sensory duration was longer in Group D and this difference was statistically significant ($p < 0.05$). The results of our study were in accordance with Swami *et al.* (2012), who in their study concluded that dexmedetomidine as an adjuvant to bupivacaine has significant difference in the duration of sensory block in supraclavicular brachial plexus block as compared to clonidine. The time for the duration of sensory block was *227.0 ± 48.36 min* in the clonidine group as compared to *413.97 ± 87.31 min* in the group using bupivacaine and dexmeditomidine as an adjuvant. The difference was statistically significant with a p - value of 0.001 ($p < 0.05$). Another study by Sebastian *et al.*[4] of clonidine and dexmedetomidine, as adjuvant to ropivacaine in supraclavicular block, to ropivacaine *29 ml* (0.5%), Group C received clonidine *1 ml* (*50* µg) and Group D received dexmedetomidine *1 ml* (*50* µg). The mean duration of sensory block in Group C was *463.5 ± 40.325 min* and in Group D was *647.67 ± 49.857 min*. The difference was statistically significant ($p < 0.01$). This study was in accordance from the result of our study that the duration of sensory block was faster in group receiving dexmedetomidine with levobupivacaine than the group receiving levobupivacaine alone.

Motor block duration

In our study, mean total duration of motor block (in min) was 330.67 ± 37.55 in Group C and 472.00 ± 84.55 in Group D. Total duration of motor block was around *80 min* longer in Group D. Our result was in accordance with Swami *et al.*,[3] in their study also concluded that dexmedetomidine as an adjuvant to bupivacaine has significant difference in the duration of motor block in supraclavicular brachial plexus block as compared to clonidine. Our results were also in accordance with Sebastian *et al.*[4] who compared two alpha-2 agonists clonidine and dexmedetomidine, as adjuvant to ropivacaine in supraclavicular block. The mean analgesia time in Group C was *510.83 ± 42.306 min* and in Group D was *720.83 ± 44.16 min*. The difference was statistically significant ($p < 0.01$).

Duration of analgesia

In our study, as shows in Table 2 the mean value of duration of analgesia in Group C was *274.33 ± 59.535 minutes* whereas the mean value in Group D was *460.50 ± 42.215 minutes*. On applying *t*-test, the values were found to be statistically highly significant with p - value of 0.00. These findings suggest that perineural dexmedetomidine significantly increases the duration of analgesia and hence adds to the patient's comfort.

Table 2: Comparison of Duration of Analgesia and Rescue Analgesia of two Groups

	Group	Mean ± SD	*p* - value
Duration of analgesia (*minutes*)	C	274.33 ± 37.94	0.0001
	D	460.50 ± 81.05	
Rescue analgesia (no of diclofenac inj)	C	1.90 ± 0.583	0.0008
	D	1.44 ± 0.455	

(Statistically significant with p value of < 0.0001)

Swami *et al.*[3] in her study using dexmedetomidine as an adjuvant to bupivacaine has significant difference in the duration of analgesia as compared to clonidine in supraclavicular brachial plexus block. Their results were similar and comparable to our study results both showing significantly longer analgesic period in case of dexmeditomidine group.

Hemodynamic parameters

In this study, there was no significant change in the hemodynamic parameters from the baseline and this was consistent with the observation seen in various studies.[5,6]

There were no side effects like sedation, dry mouth, dizziness, arrhythmias and local anesthetic toxicity in both the groups. Only one patient from each of the two groups had episode of nausea and vomiting which was self limiting and no treatment was required. While 2 patients from Group C had episodes of bradycardia without significant hypotension and no intervention was done. These patients were monitored for next 24 hrs and remained hemodynamically stable.

Conclusion

From the present study, it can be concluded that, dexmedetomidine prolongs the duration of sensory and motor block and enhances the quality of block as compared with clonidine when used as an adjuvant to bupivacaine in supraclavicular brachial plexus block. The major limitations of our study are that we did not use ultrasound-guided blocks because of unavailability at the time of our study which could have helped us to lower dosages and volumes of local anesthetic.

References

1. Sahu DK, Sahu A. Lateral approach for supraclavicular brachial plexus block. Indian J Anesth. 2010;54:215–58.
2. El-Tahawy M, Shaaban AR, Ahmad A. Comparison between dexmedetomidine and magnesium sulfate as adjuvants for intravenous regional anesthesia. Ain-Shams J Anesthesiol. 2015;8:129–33.
3. Swami SS, Keniya VM, Ladi SD, *et al.* Comparison of dexmedetomidine and clonidine (*a*2 agonist drugs) as an adjuvant to local an anesthesia in supraclavicular brachial plexus block: A randomised double-blind prospective study. Indian J Anesth. 2012 May;56(3):243–49.
4. Sebastian D, Ravi M, Dinesh K, *et al.* Comparison of dexmedetomidine and clonidine as adjuvant to ropivacaine in supraclavicular brachial plexus nerve blocks. 2015 Mar;14(3 Ver. V):91–97.
5. El Saied AH, Steyn MP, Ansermino JM. Clonidine prolongs the effect of ropivacaine foraxillary brachial plexus blockade. Can J Anesth. 2000 Oct; 47(10):962–67.
6. Casati A, Magistris L, Beccaria P, *et al.* Improving post-operative analgesia after axillary brachial plexus anesthesia with 0.75% ropivacaine. A double-blind evaluation of adding clonidine. Minerva Anestesiol. 2001 May;67(5):407–12.