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Comparative Study of Clonidine and Dexmedetomidine as an Adjuvant to LA for USG Guided Supraclavicular Brachial Plexus Block (SBB)

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Abstract

Background and aims: SBB is the widely used excellent regional anaesthetic technique for upperlimb surgeries. Various LA agents are used for it. They have specific actions regarding time. Various novel adjuvants are used for prolonged sensory and motor blockage. We used 2 alpha agonists clonidine and dexmedetomidine for? Use of ultrasound becamepopular worldwide because we can give block to the site and dose and volume of the drug can be decreased so better blockage achieved with less adverse effects.

Material and Methods: 60 ASA grade I/II adult patients of upperlimb surgery were randomly allocated into 2 groups.

Group C – 20 ml of 0.5% bupivacaine + 1 ug/kg clonidine

Group D –20 ml of 0.5% bupivacaine + 1 ug/kg dexmedetomidine

Results: Onset of sensory and motor blockage noted in each group . duration of sensory and motor blockage in group C 310.52±40.51, 368.22±42.58 min

In group D 505.42±42.38, 560.38±32.48 min

Duration of analgesia group C 340.32±38.49 min

No signicant adverse reactions group D 525.38±45.36 min

Conclusion: Addition of dexmedetomidine prolongs duration of sensory and motor blockage and duration of analgesia as compared to clonidine with 0.5% bupivacaine in SBB.

Keywords: Clonidine; Dexmedetomidine; Supraclavicular Brachial Plexus Block; Ultrasound Guided Supraclavicular Block.

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Introduction

Supraclavicular brachial plexus block is safe, efficient, reliable and accepted regional technique for upper limb surgeries. It is an alternative to GA as stress response to laryngoscopy is prevented. It has virtue of providing safe post operative period which is free from pain, nausea, vomiting and respiratory depression. In SBB, brachial plexus is very much enclosed in sheath of fascia and extends from neck to axilla [1].

Success of block depends on nerve localization needle placement, deposition of LA to right place by

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single injection of LA. [1]. Conventional anatomical landmark method relies on surface anatomy of neck, needle insertion and paresthesia elicitation. Whereas usg guided technique detects perfect location of plexus, variation of anatomy of plexus in relation to surface landmarks, accurate needle placement even in each cord of plexus, visual drug spread can be seen in tissue planes. Usg guided block increases the success rate and reduces injury to surrounding tissues. LA doses required will be less as we are directing giving at the cords, so less LA toxicity and adverse reactions were observed [8].

Bupivacaine produce analgesia by blocking pain signals to dorsal horn, provides muscle relaxation, but it has specific duration of action. To provide better sensorymotor blockage and augment post operative analgesia through single prick , various adjuvants are added to it [6].

Clonidine, an imidazole alpha 2 agonist is studied as adjuvant to various blocks. Dexmedetomidine is also alpha 2 agonist with selectivity to alpha 2 receptor 8 times more than clonidine. The anaesthetic and analgesic requirement get curtailed great extent by dexmedetomidine and clonidine. So we decided to compare efficacy of both with bupivacaine in supraclavicular brachial plexus block.

Material and Methods

In present retrograde observational study after taking written informed consent, 60 adult patients of ASA grade I/II were enrolled in study who are scheduled for upper limb surgery.

Exclusion Criteria

- Patient with history of cardiac, respiratory, hepatic and renal disorders.
- Obstetric patient
- Patient having kno wn allergy to bupivacaine, clonidine or dexmedetomidine
- Patient with coagulation disorders
- Patient with local infection
- Patient refusal

Groups

Patients get randomly allocated groups

Group C 0.5% 20 ml bupivacaine + 1ug/kg clonidine in 1 ml

Group D 0.5% 20 ml bupivacaine + 1ug/kg dexmedetomidine in 1 ml

Patients were NBM atleast for 6 hours. On OT arrival large bore vein cannulated with 18G in non operated arm and RL infusion started. Basic monitors like ECG, NIBP, SpO_2 etc. are applied. Baseline HR, BP, SpO_2 and RR were recorded. Patient was placed in supine position with head turned 45 degrees to contralateral side. Ultrasound machine (sonosite) with linear type probe used. After all aseptic and antiseptic preparation and local infiltration, supraclavicular fossa scanned to locate the subclavian artery, 1st rib, pleura, brachial plexus cluster and then 22G 5cm long needle advanced from lateral to medial in axis of ultrasound beam. Needle advanced towards corner pocket where lower trunk lies (between subclavian artery medially and 1st rib inferiorly and plexus superiorly) Half volume of mixture injected there. Then reposition the needle cranially toward honeycomb appearance neural cluster to inject LA just above and lateral to subclavian artery after negative aspiration. Peroperative hemodynamic vitals were monitored. Onset of sensory and motor blockage, duration of blockage and analgesiawere noted. Postoperative pain assessed by VAS every 60 min. when VAS > 4, analgesic given.

Sensory Blockage

Grade 0 – sharp pin felt

Grade 1 – analgesia, dull sensation felt

Grade 2 – anaesthesia, no sensation

Motor blockage: modified bromage scale for upper limb on 3 point scale

Grade 0- normal motor function with full flexion and extension of elbow, wrist and fingers

Grade 1- decreased motor strength with ability to move fingers only

Grade 2 – complete motor block with inability to move fingers

Observations and Results

Quality of block was assessed by numeric scale

Grade 4 (excellent) - no complain from patient

Grade 3 (good) - minor complain with no need to supplement

Grade 2 (moderate) – complaints require to supplement analgesia

Grade 1 (unsuccessful) – patient given GA

Table 1: Demographics

	Group C	Group D	Plain
Age (yrs)	32.72 +/- 12.06	31.82 +/- 14.78	NS
Weight (kg)	58.4 +/- 4.31	54.3 +/- 8.11	NS
Gender (M/F)	22/8	19/11	NS
Types of surgeries	19	13	-
# olecranon	4	8	-
# lower end humerus	7	9	-
# radius ulna	30	30	-

Table 2: Sensory motor characteristics of blockage

Parameters (min)	Group C	Group D	Plain
Onset of sensory block	2.33 +/- 1.21	1.77 +/- 1.28	0.083
Onset of motor block	3.57 +/- 2.18	4.58 +/- 2.48	0.163
Duration of sensory block	310.52 +/- 40.51	505.42 +/- 42.38	<0.05
Duration of motor block	368.22 +/- 42.58	560.38 +/- 32.48	<0.05
Duration of analgesia	340.32 +/- 38.49	525.38 +/- 45.36	<0.05

Table 3: Quality of block

Grade	Group C	Group D	P
I	1 (3.3%)		NS
II	8 (26.7%)	2(6.7)	
III	9 (30)	4(13.3)	
IV	12 (40)	24(80)	

All patients observed for adverse effects as nausea, vomiting, dryness of mouth, haematoma, LA toxicity, pneumothorax etc. post block neuropathy was assessed in peroperative, immediate postoperative and late postoperative period. Duration of sensory block, time between end of LA injection to complete resolution of anesthesia in all nerves was assessed. Duration of motor block, time between end of LA injection to recovery of complete motor function of arm, hand and forearm was assessed.

Statistical Analysis

It is done by SPSS software, Unpaired T test for Demographics, onset of sensory & motor blockage, haemodynamics parameters, Fischer extract test for quality of block. $p<0.05$ is significant, $p<0.001$ is highly significant.

Discussion

Ultrasound guided peripheral nerve blockages are getting popular worldwide. USG is like a boon for anesthesiologists as it increases ability to see brachial plexus, cords, subclavian artery, first rib and pleura [1-7]. Procedure time can be curtailed as compared to anatomical landmark guided or peripheral nerve stimulator guided supraclavicular brachial plexus block. With the help of USG guidance positioning, repositioning of needle performed under direct vision and in real time, as compared to blind redirection and repositioning in pns method [4].

In present study we have taken clonidine 1 ug/kg and dexmedetomidine 1 ug/kg as adjuvant to bupivacaine in usg guided supraclavicular brachial plexus block. Results show that onset of sensory and motor blockage after SBB with both adjuvants is similar $p< 0.05$. while duration of sensory and motor blockage is better with dexmedetomidine. Also with dexmedetomidine, better quality of analgesia is achieved. Several animal studies investigated that alpha 2 agonists provide better analgesia when added to LA. Yoshitomi et al. [12] that addition of dexmedetomidine or clonidine enhance LA was mediated through alpha 2 agonists. Brummett et al found that dexmedetomidine added to ropivacaine prolongs duration of analgesia. In human studies it was found that both are safe and effective in various neuraxial and regional anesthesia. Abosedira [14] compared both alpha 2 agonists in Bier's block and found dexmedetomidine superior in quality of anesthesia, tourniquet tolerance and analgesia. Memis et al. and Esmaglu et al. found improved quality of anesthesia and tourniquet tolerance with dexmedetomidine.

Baswa et al. [15] used both as adjuvants in epidural anesthesia and found dexmedetomidine superior.

El- hennery et al. [11] found both adjuvants equal in pediatric caudal anesthesia. Dose of one study was selected according to study of Abosedira [14], who used both in Bier's block.

Mechanism by which both agent work assumed to be effect by decreased release of Noradrenaline and cause receptor independent inhibition of compound action potential. Centrally alpha 2 adrenoreceptor agonists produce sedation and analgesia by inhibition of substance P release in nociceptive pathway at level of dorsal horn neuron and activation of alpha 2 adrenoreceptor in locus cereuleus.

So, In nutshell both Dexmedetomidiine and clonidine are good adjuvant to local anaesthetic agent, but Dexmedetomidiine provide superior quality of block.

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