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COMPARISON OF DEXMEDETOMIDINE AND CLONIDINE (ALPHA2 AGONIST DRUGS) AS AN ADJUVANT TO LOCAL ANAESTHESIA IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK: A PROSPECTIVE DOUBLE-BLIND STUDY

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ABSTRACT

Objective: Addition of adjuvants to local anaesthetic in supraclavicular brachial plexus Block helps in improving duration of block and analgesia. We compare clonidine and Dexmedetomidine in supraclavicular brachial plexus block. Method: A total of 80 patients aged from 20 to 55 years belonging to ASA I-II scheduled for Upper limb surgery were included and divided into three groups- Group I received 0.5%, normal saline, Group II received 0.5% clonidine and Group III dexmedetomidine. The patients were compared for onset as well as duration of sensory and motor blockade, duration of analgesia and haemodynamic Side effects. **Results:** The mean duration of sensory and motor block as well as analgesia was found to be More (statistically highly significant $p<0.001$) in group III (dexmedetomidine group) having A much longer duration of sensory and motor block as well as analgesia compared to group I and group II (clonidine group). **Conclusion:** Therefore, in present study it was found that addition of clonidine and Dexmedetomidine are effective in supraclavicular brachial plexus block. However, dexmedetomidine is a better alternative to clonidine as adjuvant to obtain early onset and prolong the duration of sensory and motor block and Postoperative analgesia.

Keywords: Dexmedetomidine; Clonidine; Supraclavicular Brachial Plexus Block.

INTRODUCTION

Supraclavicular brachial plexus block is a common regional anaesthetics technique used to provide anesthesia and analgesia for upper extremity surgery at our institution. A-2 adrenoreceptor agonists have been the focus of interest for their sedative, analgesic, and perioperative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements [1]. The perception of pain is a complex phenomenon that is influenced by the emotional state and past experience of the Individual [2]. By the end of the 19th century, the idea was firmly established that acute pain was a distinct sensory modality that was susceptible to interruption through conduction blockade with local anaesthetics. Regional nerve blocks not only eliminate the pain but also facilitate surgery and attenuate the pain which Follows.Many drugs have been used as adjuvants to local anaesthetic agents [3].

To prolong the duration of peripheral nerve blocks. Clonidine, A partial α-adrenoceptor agonist and Dexmedetomidine α2Agonists also has been reported to prolong the duration of Anesthesia and analgesia during such blocks.3,4 The α2α1Selectivity of

Dexmedetomidine is eight times that of clonidine And its high specificity for α2Subtype makes it a much more Effective sedative and analgesic agent [4]. Dexmedetomidine is a new generation highly selective α2-adrenergic receptor (α2-AR) agonist that is associated with sedative and analgesic sparing effects, reduced delirium and agitation, perioperative sympatholytic, cardiovascular stabilizing effects, and preservation of respiratory function Side effects consist of mild to moderate cardiovascular depression, with slight decreases in blood pressure and heart rate. Dexmedetomidine is a useful sedative agent with analgesic properties, hemodynamic stability and ability to recover respiratory function in mechanically ventilated patients facilitating early weaning [5]. Besides being a new modality of sedation and analgesia in ICU patient

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management. Clonidine is an imidazoline compound with the molecular formula.It is the prototype of alpha-2 adrenoceptor agonists that has been extensively studied with an alpha-2: alpha-1 ratio of 200:11.

The drug is licensed for the treatment of hypertension, migraine and menopausal flushing [6]. It is also an analgesic, sedative and anxiolytic. These properties along with its ability to maintain peri-operative haemodynamic stability make clonidine a useful agent in anaesthesia and intensive care [7].

The present study was undertaken to compare the Efficacy and safety of clonidine and Dexmedetomidine in Supraclavicular brachial plexus block and to Assess the sensory and motor blockade in terms of Their onset and duration, duration of pain relief And side effects.

METHODS

An approval by our institution Research and Ethics committee and patient's written informed Consent. A double blinded randomized prospective clinical Study, a total of 80 patients of both sexes of age group 20-55yrs Belonging to ASA grade physical status I and II posted for upper Limb orthopedic surgeries were randomly allotted in 3 groups

Through "slips in a box technique" and supraclavicular brachial Plexus block was given:

Group I (Control) (n=25): + 1ml Normal saline.

Group II (n=25): inj. Clonidine

Group III (n=25): + 1ml of inj.dexmedetomidine

Exclusion Criteria:Patients with a history of significant neurological, psychiatric, Neuromuscular, cardiovascular, pulmonary, renal, hepatic Disease, history of alcoholism or drug abuse, pregnancy or Lactating women, patients receiving adrenoceptor agonists or Antagonists therapy or chronic analgesic therapy. Patients with Morbid obesity, diabetes, peripheral vascular disease, suspected Coagulopathy, known allergies.

Basic lab investigation like Complete blood picture, urine (routine and microscopic), blood urea, blood sugar, ECG, x-ray above 40 yrs were done prior to surgery. Relevant specific investigations were also done. Sensitivity test for local anaesthetics was also done.All the patients were thoroughly examined and all patients Undergone pre-anaesthetic check up prior to anesthesia.Preoperative baseline HR (heart rate), BP (blood pressure), RR (respiratory rate), SPO2 and ECG was noted. Patients were Explained about the procedure and technique and informed

RESULTS

100 patients selected initially for upper limb surgeries were assessed for suitability to enroll in the study. Due to non stable and other reasons 20 Subjects were absconded from the study.finally 80 patients were enrolled into the study.

Patients randomly divided into two groups. There was no protocol deviation preoperatively and intraoperatively, except for one patient in group C who had to be given general anaesthesia for inadequate block.Both groups were comparable in terms of age, gender, weight and type of surgeries(P>0.005).The baseline ,demographic parameters, haemodynamic parameters were comparable in both groups. Significantly lower pulse rate was observed at 60, 90 and 120 min, but not less than 60 beats/min, in Group D as compared with Group C (P<0.001).Systolic and diastolic blood pressure were found to be significantly lower than baseline from 30 to 120 min in Group D as compared with Group C (P<0.002). No treatment was required for this fall in blood pressure. The haemodynamic parameters were comparable at the end of 180 min.

Table 1: Demographic parameters of the subjects

Parameters	Group C (Mean±SD)	Group D (Mean±SD)	P value
Age	34.4±3.13	29.4± 5.90	Ns
Weight	28.4± 2.12	42.4±4.3	Ns
Gender	45/ 55	45/60	Ns

Difference between group C and D, were statistically significant p (< 0.009).Table-2 shows intergroup statistical analysis of onset and Duration of motor blockade. Difference between group C and D.

Table 2: Sensory and motor block onset time, block and analgesia durations in both groups

	Group C Mean±SD	Group D Mean±SD	P value
Onset time of sensory block (min)	1.03±1.08	1.33±1.20	0.002
Onset time of motor block (min)	233.97±67.01	323.97±57.31	O.005
Duration of sensory block (min)	203.97±,56.08	242.97±85.01	0.001
Duration of motor block (min)	397±98.09	413.97±87.31	0.009
Duration of analgesia (min)	398.97±93.01	453.97±67.33	0.001

Group C and D were statistically significant (p<0.05).

Time of rescue analgesia was 203.6 ±56.08 min in Group 1 398.975.2±93.02 min in Group II and 453.97± 67.33min in Group III Table-4 shows the in Group I, the Mean±SD VAS score Was remain insignificant up to 3 hrs, thereafter VAS score Significantly increased and remain on higher side throughout the study. Onset of sensory block was faster in Group D than In Group C, while onset of motor block was faster in Group C than in Group D, but the difference was not statistically significant while in Group II and III the mean VAS score was 0 up to 5-6hrs thereafter the VAS score remains lower as compared to Group I throughout the study. Difference between all the groups was statistically significant.

In Group D, 80% of the patients achieved Grade IV quality of block as opposed to 40% in Group C ($P<0.05$). There were a total 17 patients in Group C with Grade II and III block and six patients in Group D Who required sedation or sedation with analgesia. One

Patient in Group C required general anaesthesia as the Block was inadequate.No side-effects (nausea, vomiting, dry mouth) were reported during the first 24 h in the post-operative Period in both the group

DISCUSSION

Alpha-2 agonists are mixed with local anaesthetic agents to extend the duration of spinal, extradural and peripheral nerve blocks. We 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 [8].

Several animal studies have investigated the analgesic effects of α-2 adrenoreceptor agonists as an adjuvant to local anaesthetic agents [9]. That addition of clonidine or dexmedetomidine to lignocaine enhances local analgesic effect. They postulated that improved analgesic effect of clonidine and dexmedetomidine was mediated through α-2 adrenoreceptors. In another animal study, dexmedetomidine has been shown to increase the duration of bupivacaine anesthesia and analgesia of sciatic nerve block in rats [10]. In two different sciatic nerve rat models, found that dexmedetomidine significantly prolonged the duration of analgesia. Age is one of the determinants of sensory and motorblock with peripheral nerve block. Brachial plexus block is suitable to patients of all age groups as shown by et al in their study on brachial block comprising patients of age ranging from 2.6 to 90 years [11]. However in our study, we included patients of age group 18 to 65 years. Difficulty in obtaining cooperation for regional blocks has made regional anaesthesia an uncommon sole anaesthetic technique in children. The base line and preoperative vital parameters were comparable in the two groups (as $p>0.05$). Monitoring of vital parameters was done for 180 minutes. The differences in the two groups were statistically insignificant at all measured intervals. All the monitored hemodynamic parameters remain stable throughout surgery[12]. A study compared the dexmedetomidine and clonidine in epidural anesthesia and concluded that dexmedetomidine is a better neuraxial adjuvant compared with clonidine for providing an early onset of sensory analgesia and prolonged postoperative analgesia. However, El-Hennawy et al.[13] found no difference in duration of analgesia between either dexmedetomidine or clonidine when added to bupivacaine during pediatric caudal anesthesia.

In an another study, perineural dexmedetomidine for sciatic nerve block in rats prolonged the duration of analgesia by blocking the hyperpolarisation-activated cation. This effect was reversed by a hyperpolarisation-activated cation channel enhancer but not by an a2 adrenoreceptor antagonist. This shows that the analgesic effect of peripheral perineural dexmedetomidine was caused by enhancement of the hyperpolarisation-activated cation current, which prevents the nerve from returning from a hyperpolarized state to resting membrane potential for subsequent firing.

Singelyn et al. Reported that a minimum dose of Clonidine (0.5 µg/kg) added to mepivacaine prolongs The duration of anaesthesia and analgesia after brachial Plexus block. No added benefits were found with Doses exceeding 1.5 µg/kg. The enhancing effect of a Small dose of clonidine on lignocaine may be because Of the evoked inhibition of C-fiber action potential. Therefore, we decided to use clonidine at a dose of 1 µg/kg in our study [16].

Some studies reported the incidence of bradycardia and hypotension with α-2 adrenoreceptor agonists. The results of our study showed stable perioperative hemodynamics, also drowsiness, which often associated with the use of clonidine, was not noted in our patients. No other side effects were noted in any of the patients in the present study. Numbers of analgesic doses given within 24 hours were comparable. The duration of sensory block was taken when the patient again started feeling dull pain (VAS score of 1). The difference in the two groups was found to be statistically highly significant with group B having longer duration of sensory block. Similarly the difference in the two groups was statistically highly significant with group B having longer duration of motor block. This is in accordance with study done also concluded that addition of dexmedetomidine significantly prolonged the duration of sensory and motor block as compared to clonidine[16]. Also found that sensory and motor blockade were prolonged by addition of dexmedetomidine as compared to clonidine. The duration was measured from the time of giving the block till first rescue analgesic was required. The difference in the groups was statistically highly significant ($p<0.0001$) with group B having a much longer duration of analgesia. Similar results were obtained by studies.

The major limitations of our study are that we did not Use ultrasound-guided blocks because of unavailability at the time of our study; this could have helped us To lower dosages and volumes of local anaesthetic. In spite of an intensive search of the published Literature, we were unable to identify an ideal scale for assessment of quality of block achieved. While the Higher cost of dexmedetomidine can be suggested as a reason for preference for clonidine, the increased Requirement of supplementary analgesia and sedation with clonidine may balance this. We admit that further Studies to determine the cost-effectiveness of the drug Are necessary.From this study, we would like to suggest that Dexmedetomidine can be safely used with local Anaesthetic in peripheral nerve blocks; however, Further trials to determine the exact dose and effect of Neurotoxicity on the human nerve are required.

CONCLUSION

To conclude, we would like to state that Dexmedetomidine prolongs the duration of sensory and motor block and enhances the quality of block as Compared with clonidine From this study we concluded that dexmedetomidine was safely used with local anaesthetics and have longer duration of sensory and motor blockade with less haemodynamic effects as clonidine group.

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