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A CLINICAL COMPARATIVE STUDY OF DEXMEDETOMIDINE AND CLONIDINE AS ADJUVANTS TO 0.25% BUPIVACAINE, IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCKADE FOR ADULT UPPER LIMB SURGERIES AT MENAKSHI MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE



Anaesthesiology

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ABSTRACT

BACKGROUND: Recent trend of Modern anesthesia is surgery under RA with least Tracheal manipulation and its effects. However, nerve block using LA provides surgical anesthesia and analgesia for limited period of time. Adjuvants like epinephrine, opioids have been used to prolong the duration of local anesthetic action after regional and peripheral nerve blocks. This study compares the efficacy in providing anesthesia and post-operative analgesia for adult upper-limb surgeries by Supraclavicular Brachial Plexus Blockade with 0.25% Bupivacaine and Dexmedetomidine 30µg and Clonidine 30µg as adjuvants to LA. **METHODOLOGY:** 50 patients of ASA 1 and 2 between 18-60years undergoing upper-limb surgeries under BPB were selected and randomly allocated into 2 groups. Group D received 28mL of 0.25 % Bupivacaine with 30µg Dexmedetomidine (n=25) and Group C received 28ml of 0.25 % Bupivacaine with 30 µg Clonidine (n=25). Total volume to administered was summated around 30ml. Computer software SPSS version-19 (SPSS Inc., Chicago, Illinois, USA) was used for statistical analysis. Student's t-test and Chi-square test were used and P < 0.05 was considered as significant. **RESULTS:** The mean duration of analgesia in Group D 420 ± 58 mins was and in Group C was 260 ± 120mins. Mean time of Onset of sensory block in Group D is 2.68 mins and in group C 3.48 mins. Mean time of Onset of motor block in group C was and in group D was 5.40 and 5.84 mins respectively. Both groups showed stable hemodynamic conditions and no complications were observed in either of the groups. **CONCLUSION:** Perineural administration of Dexmedetomidine 30µg with 0.25%Bupivacaine of total volume 30ml significantly prolongs duration of analgesia in BPB and is remarkably safe method of providing post-operative analgesia with slight hemodynamic variation which were a characteristic feature of that drug.

KEYWORDS

Brachial Plexus Block, Clonidine , Dexmedetomidine, Supraclavicular

INTRODUCTION:

BP block is popular and widely used PNB technique for perioperative anesthesia and analgesia of upper limb surgeries. When employing a landmark technique for regional blockade, poor localization of nerves may result, due to anatomical variation or trauma to the region. and end in failed anesthesia or cause morbidity. Within the upper limb, surface ultrasound can clearly identify neural elements of the plexus also the surrounding structures. Ultrasound guided plexus block gains the advantage of accurate nerve localization, real time visualization of BP, blood vessels, needle placement, local anesthetic spread^[1]. In our practice, we nearly always use a BPB by supraclavicular approach which provides both intraoperative anesthesia and postoperative analgesia, either as an adjuvant to general anesthesia or as the primary anesthetic technique. At the supraclavicular region, the distribution of anesthesia is adequate for shoulder, arm, and forearm surgery. Additionally, the needle insertion is more lateral, which makes puncture of the Subclavian artery and tension pneumothorax less likely. Regional nerve blocks with local anesthetics alone provide good operative conditions but have shorter duration of postoperative analgesia^[2]. 0.5% Bupivacaine is employed frequently as local anesthetic in plexus brachialis block because it has long duration of action from 4 to six hours. Alpha-2 adrenergic receptor agonists are the main target of interest for his or her sedative, analgesic, perioperative sympatholytic and cardiovascular stabilizing effects with reduced anesthetic requirements. Furthermore, various methods of administration, like epidural, intrathecal and peripheral injections, are tried either alone or together with another drug to prolong and intensify the anesthesia^[3]. Dexmedetomidine, a potent α_2 adrenoceptor agonist, is approximately eight times more selective towards the α_2 adrenoceptor than clonidine^[4]. In previous clinical studies, intravenous dexmedetomidine resulted in significant opioid sparing with reference to duration of block and post-operative analgesia^[5]. In humans dexmedetomidine has shown to prolong the duration of block and post-operative analgesia when added to local anesthetic in various regional blocks. The present study was designed to check the hypothesis that dexmedetomidine when added as an adjuvant to local anesthetic in supraclavicular plexus brachialis block enhanced the duration of sensory and MB, duration of analgesia and quality of block as compared with clonidine.^[6]

METHODOLOGY:

After ethical committee approval (ECR/1184/Inst/TN/2019) and

informed consent from patients, A Clinical Comparative study of adjuvants Clonidine 30µg and Dexmedetomidine 30µg with 0.25% Bupivacaine for patients posted for upper limb surgeries by Supraclavicular plexus block under USG guidance. This study was done among two groups of patients belonging to ASA 1 and 2. Both the groups of patients were comparable with regard to age, sex and weight. This study was conducted in the Department of Anesthesiology and Intensive Care Unit in Meenakshi Medical College Hospital and Research Institute, Enathur, Kanchipuram conducted during the period of November 2018 to March 2020. Sample size and Study Group: Total of 50 patients posted for adult upper limb surgery, meeting the inclusion criteria were allotted into two groups by randomization. Group C received 28ml of 0.25 % Bupivacaine with 30 µg Clonidine (n=25). Group D received 28mL of 0.25 % Bupivacaine with 30µg Dexmedetomidine (n=25). Total volume to administered was summated around 30ml. Data were entered in excel sheet for calculation and understanding.

Statistics: Computer software SPSS version-19 (SPSS Inc., Chicago, Illinois, USA) was used for statistical analysis. Student's t-test and Chi-square test were used and P < 0.05 was considered as significant.

Study variables and Measurements- Analgesia was assessed by Visual Analogue Scale^[7] (VAS), Onset of analgesia: The time at which loss of sensation to pin prick over the specified dermatomes taken as the onset of SB. Onset of MB: MB is assessed by Modified Bromage scale^[8]. With Grade 0- being Normal motor function and Grade 2- Complete MB with inability to move fingers. End point of analgesia: The time at which patient complained of pain of quite 50 in VAS. Duration of analgesia: It's the period of time between the onsets of analgesia to the top point of analgesia. Duration of MB: Time period from Upper limb Bromage Score 2 to Bromage Score 1 is considered as duration of MB. Finally, Ramsay Sedation Score was used to assess the level of sedation.

Study procedure: All selected patients were given Tab. Alprazolam 0.25mg, Tab. Omeprazole 20mg and Tab. Ondansetron 4mg on preoperative day at 10:00 pm and at 6 am on the day of surgery. The anesthesia machine was checked. Laryngoscopes with appropriate size blades, Intubation trolley and dealing suction apparatus were kept

ready. All the required drugs were drawn, labeled and kept ready. When the patient reached the pre-anesthesia room, intravenous line was secured using an 18G cannula. IV fluid was started. Patient was shifted to the operation theatre. Standard patient monitors like ECG, pulse oximeter, non-invasive blood pressure were attached. Inj. Midazolam 0.05mg/kg IV given as anxiolytic. The patient was placed in supine position with the head turned opposite to the side to be blocked. The arms were resting along the side of the body. Initial landmarks for performing this block are the clavicle, posterior border of the clavicular head of the sternocleidomastoid and Anterior scalene^[9]. The patient was asked to reach for the ipsilateral knee with the limb to be blocked or by passively pulling the patient's wrist inferiorly. After cleaning the skin with an antiseptic solution, linear probe 5-7MHz was placed in Supraclavicular area midpoint between two ends of clavicle. The probe is placed in transverse-oblique view to visualize subclavian artery (Hypoechoic, Pulsatile, and Round). Postero-lateral to subclavian artery are trunks of BP has grape-like appearance, with several hypoechoic bundles embedded as hyperechoic supporting connective tissue surrounded by epineurium, is found. The needle is inserted using the in-plane technique at the lateral border of the probe^[10]. Once the skin has been pierced, the needle is advanced lateral to medial direction towards the brachial plexus located poster lateral to the SCA. The needle tip is then carefully directed as near to the BP as possible. Once the tip of the needle has been confirmed, the local anesthetic is injected by 'hydro-dissection' technique^[10]. Local anesthetic with adjuvants was injected slowly with intermittent aspiration to rule out intravascular injection. After injection of the intended volume of local anesthetic mixture, patients were evaluated at 2 min intervals for next 30 mins for the development of SB and MB. Assessment of time of onset of analgesia, onset of MB, duration of analgesia, duration of MB, Hemodynamic changes, Sedation and adverse effects were done. The efficacy of postoperative analgesia was assessed using a VAS, this score graded (0 no pain; 100 worst pain possible). Break through pain of more than 50 was managed with Inj. Tramadol 50 mg IV and the time was noted; which was recorded as end point of analgesia. The efficacy of MB was assessed using a modified bromage scale with Grade 0 being able to move hand, flex elbow and Grade 2 being no motor movement. That was the end of the study. The time period between the onset of analgesia to the end point of analgesia is documented as duration of analgesia. Time period between onset of MB to complete reversible of motor function is taken as duration of MB. Adverse effects if any, were noted. Intra-operative patient sedation was assessed using Ramsay Sedation Score.

OBSERVATION AND RESULTS:

Table No. 1.1- Cross tabulation of Gender, Age, Weight of Study Group

Study Group		Gender		Total	Pearson Chi-Square	P value
		M	F			
	C	11 44%	14 54%	25 100%	.321	.571
	D	13 52%	12 48%	25 100%		
Total	Count	24	26	50		
Age	Study group	N	Mean	SD	Std. Error Mean	T test
	C	25	45.20	7.858	1.572	-307
	D	25	45.96	9.559	1.912	
	C	25	66.40	9.211	1.842	-.556
	D	25	67.92	10.095	2.019	

Interpretation –

- The above table depicts that the Pearson chi-square value is .321 and the significant value (P value) is .571 which greater than .05, **hence there is no difference in gender on the study group.**
- The mean value of group C is 45.20 and the mean value of group D is 45.96, t-value is -.307, the degree of freedom is 48, and the P value is .760 which is greater than .05, **hence there is no difference in age of the patients among the study group.**
- The mean value of group C is 66.40 and the mean value of group D is 67.92, the t-value is -.556, the degree of freedom is 48, and the P value is .581 which is greater than .05, **hence there is no difference in weight of the patients among the study group.**

Table No. 2.1 - Comparison of onset of Sensory & Motor Block based on group

Study group	N	Mean	Std. Deviation	Std. Error Mean	t-test	df	P value	
SB	C	25	3.48	1.085	.217	2.726	48	.009
	D	25	2.68	.988	.198			
MB	C	25	5.84	1.25	0.25	-1.24	48	0.220
	D	25	5.40	1.24	0.25			

Interpretation-

- The mean value of group C is 3.48 and the mean value of group D is 2.68, t-value is 2.726, the degree of freedom is 48, and the P value is .009 which is less than .05, **hence there is a difference in onset of SB between the study group C and D.**
- The mean value of group C is 5.40 and the mean value of group D is 5.84, t-value is -1.242, the degree of freedom is 48, and the P value is .220 which is greater than .05, hence there is no difference in onset of MB between the study group C and D. However, **Group D has early onset of MB.**

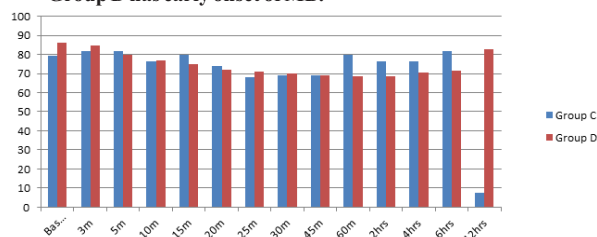


Figure. 1.1 - Comparison of HR based on group at different intervals of time

Interpretation- The mean value for baseline HR of group C is 79.48 and the mean value of group D is 86.04. **Group D shows reduction in heart rate at above mentioned timeframe when compared to Group C.**

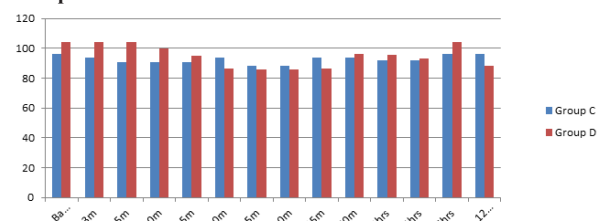


Figure 1.2 Comparison of MAP at different intervals of time.

Interpretation- The mean value for baseline of group C is 96.40 and the mean value of group D is 104.18. There is difference in Mean Arterial pressure between two groups at the time interval except 60m, and 4hrs because the significant value (P value) of those time intervals are .168 and .208, respectively, which is greater than .05. The P value for other time intervals are less than .05. **Group D showed reduced MAP at above mentioned timeframe when compared to Group C.**

Table No. 3.1- Comparison of Duration of Sensory & Motor Block

	Study group	N	Mean ± SD	df	p-value
Duration of SB	C	25	260±37	48	.000
	D	25	420±58		<0.05
Duration of MB	C	25	320±39	48	.000
	D	25	491±43		<0.05

Interpretation-

- The mean value of group C is 260mins and the mean value of group D is 420mins, the degree of freedom is 48, and the P value is .000 which is less than .05, hence there is difference in duration of SB between the study group C and D. **Result- Group D has longer duration of Analgesia.**
- The mean value of group C is 320mins and the mean value of group D is 491mins, the degree of freedom is 48, and the P value is .000 which is less than .05, hence there is difference in duration of MB between the study group C and D. **Result- Group D has longer duration of MB.**

DISCUSSION:

On October 16, 1846 is a day no anesthesiologist will forget.

"Gentlemen it's no humbug"⁽¹¹⁾ were the word came out during William T. G. Morton's first public demonstration of Ether anesthesia. Diedrich Kulenkampff, in Germany, performed the first percutaneous supraclavicular approach on him apparently and published his work and technique to the world on 1928⁽¹²⁾. As Medicine has advanced so does the technique's and drugs. There are different approach for BP block however Supraclavicular block remains every anesthesiologist bread and butter. Large volume of administration, dense block which is adequate for all types of upper limb surgeries are the reason for its peculiarity when compared to others. Numerous studies have been done with wide range of adjuvants with LA in BP block and showed satisfactory result. However, this study on comparing an α_2 -agonist Clonidine 30 μ g and Dexmedetomidine 30 μ g as adjuvants with 0.25% Bupivacaine have an relatively fast onset of SB, adequate post-operative analgesia with no significant adverse effects noted related to adjuvants or LA. Only patients in the age group of 18-60 years belonging to ASA 1 and ASA 2 were included in the study. Other than the test drugs no other analgesics were administered either preoperatively or intraoperative to avoid additive effects. Patient characteristics such as age, gender and baseline parameters like heart rate, blood pressure, oxygen saturation, respiratory rate were recorded. Onset and duration of SB and MB were recorded at specified time intervals along with hemodynamic changes starting from time of injection of LA. Our study revealed that there was a significant difference in onset of SB in group C and group D. The mean onset of SB in group C is 3.48 ± 1.085 min and in group D, it was 2.68 ± 0.988 min with p values = 0.009 (p<0.05) and it is considered as significant. Mean onset of MB in group C is 5.84 ± 1.258 min and in group D, it is 5.40 ± 1.248 min p value=0.220 (p>0.05). Mean duration of analgesia between two groups were 260 ± 37 min and 420 ± 58 min in Group C and D respectively. MB was prolonged in Group D with mean 491 ± 43 min whereas in Group C it was 320 ± 39 min with p value<0.05, it implies the values were significant. A Systematic Review and Meta-analysis by El-Boghdadly, Kariem MBBS, FRCA; Brull, Richard MD, FRCPC; Sehmbi, Herman MD; Abdallah, Faraj W. MD: Perineural found that Dexmedetomidine is more effective than Clonidine when added to Local Anesthetic for Supraclavicular Brachial Plexus Block⁽¹³⁾. Which is again the end result of my study. As with Hemodynamic stability, Group D showed drop in intra-operative MAP compared with Group C. This was very much proved in other article done by Sandiyaagarwal, et al⁽¹⁴⁾ where Dexmedetomidine 100 μ g was used. There were no reported cases of complications like Pneumothorax, Horner's syndrome, respiratory distress secondary to diaphragmatic paresis.⁽¹⁵⁾

CONCLUSION:

This study demonstrates that Dexmedetomidine 25 μ g significantly prolongs the duration of analgesia resulting from a single-shot Supraclavicular BP Block with Bupivacaine 0.25% for upper limb surgeries. Dexmedetomidine also improved the quality of pain relief. Both groups showed stable hemodynamic conditions and no complications were observed in either of the groups. In addition, the longer analgesic duration was accompanied by a lower consumption of postoperative opioids. Thus, it can be concluded that Dexmedetomidine is a good adjuvant in Supraclavicular BP block.

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