Original Research Article

Comparison of low dose clonidine and dexmed with bupivacaine for brachial plexus block

Santosh Chinchkar[1], Vinayak Sirsath[2*]

[1]Senior Resident, [2]Associate Professor, Department of Anaesthesia, Vilasrao Deshmukh Government Medical College, Latur, Maharashtra, INDIA.
Email: santoshchinchkar88@gmail.com, drvinayak1@gmail.com

Abstract

Background: Regional anaesthesia in the form of brachial plexus block is most common type of peripheral nerve block technique used for upper limb surgeries. **Aims and Objectives:** To study effect of low dose clonidine and dexmed with bupivacaine for brachial plexus block. **Methodology:** Present study entitled 'Comparative study of clonidine and dexmedetomedine as an adjuvant to Bupivacaine in Brachial plexus block by Supraclavicular Approach' was carried at tertiary care Hospital, from January 2016 to October 2017. **Study design:** Hospital based prospective double-blind randomized study. **Sample size:** Two groups of 40 each (Total 80). Group C – i.e. Clonidine group receives 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml clonidine (50µg) Group D – i.e. Dexmedetomidine group receives 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml dexmedetomidine Statistical analysis was done by applying unpaired t- test and chi square test to analyze the data and p value was determined. If 2 tail p value is: $P > 0.05$, it is not significant. $P < 0.05$, it is significant. **Result:** In group C, mean onset time of sensory blockade was (8.95±4.46min) and mean motor blockade was (12±3.31 min),; In group D, mean onset time of sensory blockade was (4.07±1.94min) and mean motor blockade was (8±3.69min), This observed difference was statistically significant ($p<0.0001$). In group C, mean duration of sensory blockade was (299.25±64.05min) and mean motor blockade was(317.75±64.74min). In group D, mean duration of sensory blockade was(497.5±103.22min) and mean motor blockade was (540±105.70Min), This observed difference was statistically significant ($p<0.0001$) **Conclusion:** It can be concluded from our study that faster onset of sensory and motor block is seen with dexmedetomidine as compared to clonidine. Duration of sensory and motor block and duration of postoperative analgesia is significantly prolonged with dexmedetomidine as compared to clonidine.

***Address for Correspondence:**
Dr Vinayak Sirsath, Associate Professor, Department of Anaesthesia, Vilasrao Deshmukh Government Medical College, Latur, Maharashtra, INDIA.
Email: drvinayak1@gmail.com

Received Date: 02/11/2021 Revised Date: 16/12/2021 Accepted Date: 11/01/2022

Access this article online

Quick Response Code:

Website: www.medpulse.in

DOI: https://doi.org/10.26611/10152233

INTRODUCTION

Regional anaesthesia in the form of brachial plexus block is most common type of peripheral nerve block technique used for upper limb surgeries. It produces rapid and reliable anaesthesia for upper extremity surgeries from injection of local anesthetic. It has many advantages as a post operative pain relief; shortening of patients' recovery time, can be preferred in patients with full stomach, avoiding risks and adverse effects of general anaesthesia like post operative nausea and vomiting, atelectasis, hypotension, paralytic ileus, dehydration, deep vein thrombosis.[1] There is better preservation of mental function in elderly, intact pharyngeal and laryngeal reflexes, thus decreasing chances of aspiration, stress response to anesthesia in compromised patients. Peripheral nerve blocks not only provide intraoperative anaesthesia but also extends analgesia in the post-operative period without any systemic sideeffects.[2] hence this technique have become important in clinical practice and now a well accepted concept for comprehensive anaesthetic care. William Steward Halsted in 1884, who first performed the brachial plexus block by exposing the roots, it has undergone many changes and modification to arrive at a better technique.[3] Regional blocks are based on the concept

How to site this article: Santosh Chinchkar, Vinayak Sirsath. Comparison of low dose clonidine and dexmed with bupivacaine for brachial plexus block. *MedPulse International Journal of Anesthesiology.* June 2022; 22(3):72-76. http://medpulse.in/Anesthsiology/index.php

that pain is conveyed by nerve fibers which can be interrupted anywhere along the pathways.[1] Supraclavicular brachial plexus block acts by blocking the middle and lower trunks of brachial plexus (median, radial and ulnar nerve).[4] Supraclavicular brachial plexus block is given in supine position with arm at side, fully adducted at shoulder and extended at elbow and head turned to opposite side, and injection given at a point 1.5-2 cm above cephaloposterior to subclavian arterial pulsation at midclavicle with paresthesia or nerve locator technique. However, the risk of perioperative pulmonary complications renders the supraclavicular approach unsuitable for patients with significant pulmonary disease. Transient phrenic nerve paresis occurs in up to 50%, while pneumothorax develops in 0.5%-6% of patients after supraclavicular block.[6] Local anaesthetics administered as regional nerve blocks provide postoperative pain relief by blocking signal transmission to dorsal horn. Various amide local anaesthetics like Mepivacaine, Prilocaine, Etidocaine and Bupivacaine have been used successfully.[6] α2 adrenoreceptor agonists have been the focus of interest for their sedative, analgesic, and perioperative sympatholytic action, longer duaration of postoperative analgesia and cardiovascular stabilizing effects with reduced anesthetic requirements. There has always been a search for adjuvants to the regional nerve block with drugs that prolong the duration of analgesia but with lesser adverse effects. The search for the ideal additive continues, and led us to try the α2 adrenergic agent, dexmedetomedine and clonidine. Clonidine, an imidazoline, α2adrenoreceptor agonist, has been extensively studied as an adjuvant to local anesthetic in peripheral nerve blocks. Dexmedetomidine is also α2adrenoreceptor agonist and its selectivity to α2 adrenoreceptor is 8 times greater than clonidine.7 Dexmedetomidine was developed by Orion pharma[8] extent by the use of these two adjuvants because of their analgesic properties and augmentation of local anesthetic effects. The present study is undertaken to compare the efficacy of clonidine and dexmedetomidine as an adjunct to bupivacaine in supraclavicular brachial plexus block in upper extremity surgery for onset and duration of sensory as well as motor block in brachial plexus block by supraclavicular approach.

METHODOLOGY

Present study entitled 'Comparative study of clonidine and dexmedetomedine as an adjuvant to Bupivacaine in Brachial plexus block by Supraclavicular Approach' was carried at tertiary care Hospital, from January 2016 to October 2017.

Study design: Hospital based prospective double-blind randomized study.

Sample size: Two groups of 40 each (Total 80).

Sampling method: Block randomization using random number table

Statistical analysis: Student's t-test and chi square test.

METHOD OF COLLECTION OF DATA: Eighty patients of age between 18 to 60 years, of physical status ASA grade I and II undergoing elective upper limb surgeries were included in the study; this study was conducted after obtaining approval from the ethical clearance committee of the college and written informed consent by the patients.

INCLUSION CRITERIA: Patients aged between 18 years to 60 years under physical status ASA grade I and II, scheduled for elective upper limb surgeries after obtaining written informed consent from patient. EXCLUSION CRITERIA

1. Patient's refusal. 2. Known allergy to local anaesthetics. 3. Infection at local site. 4. Patient with ASA III, IV or V. 5. History of Cardiovascular disorders. 6. Bleeding disorders or patient on Anticoagulant therapy. 7. Respiratory compromise. 8. Hepatic failure, renal failure.

Each patient was randomly allocated to one of the two groups of 40 patients each

Group C: i.e. Clonidine group receives 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml clonidine (50μg)

Group D: i.e. Dexmedetomidine group receives 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml dexmedetomedine (50μg) Quality of motor block was assessed at the same intervals (i.e. in skin dermatomes C4-T2 once in every minute for initial 30 minutes and then after every 30 minutes till patient regained normal motor power) and graded according to Modified Lovett's Scoring. Time taken from the completion of injection of study drug till the patient develops motor blockade. (Lovett's Grade 1). Time taken from the completion of injection of study drug till the patient does not feel the pin prick. (visual analogue scale score -0). Statistical analysis was done by applying unpaired t- test and chi square test to analyze the data and p value was determined. If 2 tail p value is: $P > 0.05$, it is not significant. $P < 0.05$, it is significant.

RESULT

Table 1: Age wise distributions of patients in two groups

Age (Yrs.)	Group C		Group D	
	No.	Percentage (%)	No.	Percentage (%)
18-20	07	17.5	03	7.5
21-30	14	35	12	30
31-40	06	15	08	20
41-50	08	20	08	20
51-60	05	12.5	09	22.5
Total	**40**	**100**	**40**	**100**

Total 80 patients were enrolled in this study divided into two groups of 40 each and all patients were in age group of 18-60 years. Out of 40 patients in group C, 7 patients (17.5%) were in age group of 18-20 years, 14 patients (35%) in 21-30, 6 patients (15%) in 31-40, 8 patients (20%) in 41-50 and 5 patients (12.5%) were there in age group of 51-60. Out of 40 patients in group D, 3 patients (7.5%) were in age group of 18-20 years, 12 patients (30%) in 21-30, 8 patients (20%) in 31-40, 8 patients (20%) in 41-50 and 9 patients (22.5%) were there in age group of 51-60

Table 2: Gender wise distributions of patients in two groups

Gender	No.	%	No.	%
Male	32	80	30	75
Female	8	20	10	25
Total	**40**	**100**	**40**	**100**

Total 80 patients were enrolled in this study divided into two groups of 40 each. Out of 40 patients in group C, 32 patients (80%) were males, 8 patients (20%) females. Out of 40 patients in group D, 30 patients (75%) were males, 10 patients (25%) females.

Table 3: Comparison of Onset Time of Sensory and Motor blockade in Two Groups

Variables	Group C(Mean±SD)in min	Group D(Mean±SD)in min	P Value	NS /S
Onset of Sensory Blockade (OSB)	8.95±4.46	4.07±1.94	0.0001	**S**
Onset of Motor Blockade(OMB)	12±3.31	8±3.69	0.0001	**S**

Table no 3 shows variation of onset of sensory and motor blockade in two study population groups: In group C, mean onset time of sensory blockade was (8.95±4.46min) and mean motor blockade was (12±3.31 min),; In group D, mean onset time of sensory blockade was (4.07±1.94min) and mean motor blockade was (8±3.69min), This observed difference was statistically significant ($p<0.0001$).

Table 4: Comparison of Duration of Sensory and Motor Blockade in Two Groups

Variables	Group C(mean±SD)in min	Group D(mean±SD)in min	P Value	NS/S
Duration ofSensoryBlockade(DOSB)	299.25±64.05	497.5±103.22	0.0001	**S**
Duration of Motor Blockade(DOMB)	317.75±64.74	540±105.70	0.0001	**S**

Table no 4 shows variation of duration of sensory and motor blockade in two study population groups.In group C, mean duration of sensory blockade was (299.25±64.05min) and mean motor blockade was (317.75±64.74min). In group D, mean duration of sensory blockade was (497.5±103.22min) and mean motor blockade was (540±105.70 Min) ,This observed difference was statistically significant ($p<0.0001$)

DISCUSSION

The present study was a prospective, randomized, hospital based, double blind study carried at tertiary care hospital. Eighty patients of age between 18 to 60yrs (ASA I and II) undergoing elective upper limb surgeries were included in the study. Patients were divided into two groups of 40 each (Group C and Group D). Group C was given supraclavicular Brachial plexus block with 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml clonidine (50µg) and Group D with 39 ml Bupivacaine 0.25% (2.5 mg/ml) +1ml dexmedetomidine (50µg). Recently there is a renewed interest on α2 agonists like clonidine and Dexmedetomidine as an adjunct to local anesthetics. The α2 agonists dose dependently enhances local anaesthetic potency and prolongs its duration by combining at the α2receptors at the peripheral level. The other possible mechanisms by which the α2 agonists improve local anaesthetic action include vasoconstriction around the site of injection, thus the absorption of local anaesthetic drug will be delayed, resulting in a prolongation of the local anaesthetic effect. Other mechanisms include release of local enkephalin like substances, decrease in the release of

local inflammatory mediators and increase in the release of anti-inflammatory cytokines. The usages of clonidine in brachial plexus block with various local anaesthetics yield conflicting results. Dexmedetomidine has been found to be an effective and safe adjuvant in many studies on neuraxial and peripheral nerve blocks.

Onset time of sensory blockade: In our study, we observed that onset time of the sensory blockade was earlier in Dexmedetomedine (Group D) having a mean value of 4.07±1.94minutes in comparison with Clonidine (Group C) having a mean value of c which is statistically significant (p value <0.0001).

In 2015 Preeti More, Basavaraja, Vandana Laheri.[11] conducted a study and concluded that the onset of sensory block in group D was (9.17±1.26) mins and that observed in group C was (11.07±2.15) mins. This difference was statistically significant (p<0.05) is significant. Onset of sensory block was faster in Dexmedetomedine group than Clonidine group

In 2016, Rajaclimax Kirubahar, Bose Sundari, Vijay Kanna,

Kanakasabai Murugadoss[12] conducted a comparative study of clonidine and dexmedetomedine as an adjuvant to bupivacaine in supraclavicular brachial plexus block, and concluded that the mean time for onset of sensory block in Group D was 4.7 minutes which was lower than Group C 8.47 minutes. This was statistically significant (p<0.001)

Onset time of motor blockade In our study, we observed that onset time of the motor blockade was earlier in Dexmedetomedine (Group D) having a mean value of 8±3.69 minutes in comparison with Clonidine (Group C) having a mean value of 12±3.31minutes which is statistically significant (p value <0.0001).

In 2012, Swami, Sarita S. Keniya, Varshali M.*et al.* [9] studied and concluded that onset of motor block was faster in Group C than in Group D, but the difference was not statistically significant.(p= 0.162) These above observations were consistent with our study results.

Duration of sensory blockade In our study, duration of sensory blockade was 497.5±103.22 minutes with Dexmedetomidine group and 299.25±64.05 minutes with Clonidine group. The duration of sensory block was longer in Dexmedetomidine group as compared to Clonidine group which is statistically significant (p value <0.0001).

In 2012, Swami, Sarita S. Keniya, Varshali M.*et al.*[9] studied and concluded that Duration of sensory block was 227.00±48.36 min in Group C as compared with 413.97±87.31 min in Group D. Statistically significant longer duration of sensory block was observed in Group D. (p = 0.001) These above observations were consistent with our study results.

In 2014 , Saurabh Singh, Major General H. S. Nanda.[10] conducted a study and found that both clonidine and dexmedetomidine when added to Bupivacaine for supraclavicular brachial plexus block significantly prolonged

duration of sensory and motor block which ruled out the need for any supplementation intra operatively, duration of sensory blockade was 611.25 ± 32.89 minutes with Dexmedetomidine group and 267.38 ± 20.90 minutes with Clonidine group which was statistically significant.(p=0.00) These above observations were consistent with our study results.

Duration of motor blockade In our study, duration of motor blockade was 540±105.70 minutes with Dexmedetomidine group and 317.75±64.74 minutes with Clonidine group. The duration of motor blockade was prolonged in Dexmedetomidine group compared with Clonidine group which is statistically significant (p value = 0.0001).

In 2012, Swami, Sarita S. Keniya, Varshali M.*et al.* [9] studied and Concluded that The duration of motor block was 292.67±59.13 min in Group C as compared with 472.24±90.06 min in Group D. Duration of motor block was significantly longer in Group D (P=0.001). These above observations were consistent with our study results.

In 2014 , Saurabh Singh, Major General H. S. Nanda.[10] conducted a study and found that both clonidine and dexmedetomidine when added to Bupivacaine for supraclavicular brachial plexus block significantly prolonged duration of sensory and motor block which ruled out the need for any supplementation intra operatively. duration of motor blockade was 566.62 ±37.286minutes with Dexmedetomidine group and 228.75 ± 18.213minutes with Clonidine group which was statistically significant.(p=0.00) These above observations were consistent with our study results

In 2016 Archana Tripathi, Khushboo Sharma, Mukesh Somvanshi, Rajib Lochan Samal[13] carried out a study and concluded that, exmedetomidine had longer duration of both motor and sensory blocks

CONCLUSION

It can be concluded from our study that faster onset of sensory and motor block is seen with dexmedetomidine as compared to clonidine. Duration of sensory and motor block and duration of postoperative analgesia is significantly prolonged with dexmedetomidine as compared to clonidine.

REFERENCES

1. Sathyan N, Hedge H, Padmanabha S, Anish KA. Brachial Plexus Block, a comparison of Nerve locator versus Paresthesia Technique. IOSR-JDMS, Feb 2014; 13(1):06-10.

2. Damien B, Murhy, Collin JL, Cartney, Vincent WS. Novel analgesic adjuvants for brachial plexus block: A systemic review. Anesth Analg 2000; 90:1122-8
3. Marhofer P, Griffiths W. H. Nerve location in regional anaesthesia: finding what lies beneath the skin. Br J Anaesth, 2011; 106(1): 3–5.
4. Wedel DJ, Horlocker TT. Miller's anesthesia.7th ed. Philadelphia: Churchill Livingstone. 2010. Chapter 52, Nerve Blocks; p.1639-1672.
5. Schroeder LE, Horlocker TT, Schroeder DR. The efficacy of axillary block for surgical procedures about the elbow. Anesth Analg, 1996; 83:747-51.
6. Babu Narendra MC, Sreeraghu GM, Sreeharsha S, Chandra DP, Dhingra U. A comparative study of Bupivacaine 0.5% and ropivacaine 0.5%, for supraclavicular brachial plexus block (perivascular approach).Journal of Evolution of Medical and Dental Sciences. 2014; 3, (43), 2011; 10722-10732.
7. Raimo V, Juha M, Veijo S, Leena N, Virtanen R. Characterisation of selectivity, specificity and potency of medetomidine as a2 adrenoceptor agonist. Eur J Pharmacol 1988;150:9-14.
8. http://orion.fi/en/Research-and-developement/Achievements/
9. Swami SS, Keniya VM, Ladi SD, Rao R. Comparison of dexmedetomedine and clonidine (a2 agonist drugs) as an adjuvant to local anaesthesia in supraclavicular brachial plexus block: A randomised double-blind prospective study. Indian J Anaesth 2012;56:243-9.
10. Saurabh Singh, Major General H. S. Nanda. "A Comparitive Study of Clonidine and Dexme detomidine as Adjuvant to 0.25% Bupivacaine in Supraclavicular Brachial Plexus Block for Duration of Action and Haemodynamic Changes". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 49, October 02; Page: 11648-11655, DOI: 10.14260/jemds/2014/3530
11. More preeti , Basavaraja,Laheri vandana. A comparison of dexmedetomedine and clonidine as an adjuvant to local anaesthesia in supraclavicular brachial plexus block for upper limb surgeries. The Journal of Medical Research 2015; 1(5): 142-147
12. Kirubahar R, Bose S, Kanna V, Murugadoss K. Comparison of clonidine and dexmedetomedine as an adjuvant to bupivacaine in supraclavicular brachial plexus block for upper limb orthopedic procedures. Int J Res Med Sci 2016;4:1172-6.
13. Tripathi A, Sharma K, Somvanshi M, Samal RL. A comparative study of clonidine and dexmedetomedine as an adjunct to bupivacaine in supraclavicular brachial plexus block. J Anaesthesiol Clin Pharmacol 2016;32:344-8.

Source of Support: None Declared
Conflict of Interest: None Declared