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COMPARISON OF DEXMEDETOMIDINE AND CLONIDINE AS AN ADJUVANT TO LOCAL ANAESTHESIA (BUPIVACAINE) IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Anaesthesiology

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ABSTRACT

BACKGROUND: The study was done to compare the efficacy of injection dexmedetomidine versus injection clonidine as an adjuvant to bupivacaine in supraclavicular brachial plexus block in adult patients.

MATERIALS AND METHODS: 60 adult patients of ASA grade I/II, posted for various elective upper limb surgeries were divided into two groups Group C and Group D.Group C patients received Inj. Bupivacaine 0.5% 20 ml + Inj. Clonidine 1µg/kg and Group D patients received Inj. Bupivacaine 0.5% 20 ml + Inj. Dexmedetomedine 1µg/kg, in supraclavicular brachial plexus block. Onset and recovery time of sensory and motor block, duration of analgesia,hemodynamic variables ,sedation and complications were studied.

RESULTS: Mean onset time of sensory block and motor block in Group D was significantly lower than Group C. Mean duration of sensory block and motor block was longer in Group D as compared to Group C. Mean duration of analgesia was significantly longer in Group D.There were no any significant incidents of any complications.

CONCLUSION: Dexmedetomidine prolongs the duration of sensory and motor block, duration of analgesia, shortens the onset time for sensory and motor block as compared to clonidine when used as an adjuvant to local anaesthetic (bupivacaine) in supraclavicular brachial plexus block.

KEYWORDS

Dexmedetomidine,clonidine,bupivacaine,supraclavicular brachial plexus block

INTRODUCTION

Peripheral nerve blocks are ideally suited for limb surgeries because of the peripheral location of the surgical site and the potential to block pain pathways at multiple levels. Peripheral nerve blocks not only provide intraoperative anaesthesia but also extend analgesia in the post-operative period without any systemic side effects.They are safe, economical, minimally invasive, avoid polypharmacy, provide early ambulation and prolonged pain relief. They avoid airway manipulation and unwanted effects of anaesthetic drugs used during general anaesthesia.

Upper limb surgeries are mostly performed under peripheral blocks such as the brachial plexus block. There are various techniques for blocking the nerves of the brachial plexus which are classified by the level at which the needle or catheter is inserted for injecting the local anaesthetic.

Brachial plexus block via supraclavicular approach gives the most effective result for the upper extremity and is carried out at the level of the trunk of the brachial plexus. The plexus is blocked where it is most compact ,resulting in a homogenous spread of the anaesthetic drug throughout the plexus with a fast onset and complete block. Various drugs like opioids, α2 adrenergic agonist, neostigmine, adrenaline etc are used as an adjuvant to local anaesthetics to enhance the analgesic effect and to maximise the duration of the blockade.

Clonidine is a selective α2 adrenergic agonist with some α1agonistic activity .When added to a local anaesthetic it prolonges the duration of the block and prolongs the time of post operative analgesia.[1] Numerous studies have been carried out to study the effects of clonidine as an adjuvant to lignocaine, bupivacaine, ropivacaine or mepivacaine.(1,2)

Dexmedetomidine is a highly selective and specific α2 adrenoreceptor agonist. The α2:α1 selectivity of dexmedetomidine is eight times that of clonidine and its high specificity for α2 subtype makes it more effective as a sedative and analgesic agent. Dexmedetomidine has also shown to prolong the duration of sensory and motor block and the duration of postoperative analgesia when added to local anaesthetics in various regional blocks.[3]

This study was conducted to compare and evaluate the effects of addition of clonidine and dexmedetomidine with bupivacaine in supraclavicular brachial plexus block for upper limb surgeries in terms of block characteristics, analgesia and sedation.

MATERIALS AND METHODS

This comparative observational study was conducted at V.S.Hospital after the approval of Institutional Review Board.

The study was carried out in 60 adult patients of ASA grade I/II divided into two groups:Group C patients received Inj. Bupivacaine 0.5% 20 ml + Inj. Clonidine 1µg/kg and Group D received Inj. Bupivacaine 0.5% 20 ml + Inj. Dexmedetomedine 1µg/kg in supraclavicular brachial plexus block in various elective upper limb surgeries. The patients were randomly allocated in the two groups; each group contained 30 patients. Patient refusal,infection at local site, hypersensitivity to local anaesthetics,coagulation disorders, existing neurological disorder were excluded from the study.

During a preanesthetic visit, the patients were explained about the type of the procedure, its advantages and risks. An informed, written consent was taken. A thorough general and systemic examination was conducted and all the routine investigations were reviewed. All the patients were kept nil orally for eight hours before the surgery. In the operation theatre, after securing an intravenous cannula, Lactated Ringer's solution was commenced. After establishing standard monitoring, baseline parameters such as the heart rate, blood pressure, electrocardiogram and oxygen saturation were recorded.

Under all aseptic precautions the block was performed with the patient in supine position with his/her head turned to the contralateral side and with the ipsilateral arm adducted gently by an assistant and the shoulder slightly pulled down. The ultrasound probe (linear) was put in the supraclavicular fossa, parallel to the middle third of clavicle, in the sagittal plane, to visualise the brachial plexus as a bunch of grapes like cluster of 5-6 hypoechoic circles located lateral and superior to the subclavian artery between the anterior and middle scalene muscles at the lower cervical region. A 23 gauge, 1.5 inches, block needle was inserted in the in-plane technique. Upon visualising its path to the desired location the local anaesthetic mixture was injected according to the allocated group C or D. The predetermined volume of drug solution was administered after negative aspiration around the brachial plexus.

Block assessment was done every minute till the complete effect was achieved.Sensory block was assessed by pin prick test in areas innervated by nerves of brachial plexus.

Assessment of sensory block by 3 point scale

3 point scale	
0	Normal sensation
1	Loss of sensation of pin prick (analgesia)
2	Loss of sensation of touch (anaesthesia)

Onset of sensory block was taken as the time from injection of LA to blunted sensation to pin-prick. The duration of sensory block was taken as the time from onset to time of complain of pain.

Motor block was assessed by Hallmen scale.

Hallmen Scale[14]	
SCALE	
1	Normal muscle function.
2	Slight weakness in function.
3	Very weak muscular function.
4	Complete loss of muscle action.

Onset of motor blockade was defined as the interval between time of injection of drug to time of development of motor weakness in the blocked limb. Duration of motor blockade was defined as the interval between the onset of motor blockade to the time patient first experiences movement of the blocked limb.Duration of analgesia was defined as the time interval from the end of local anaesthetic injection to the need for first rescue analgesic.

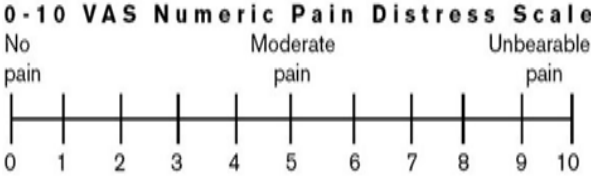
Sedation was assessed by Ramsay sedation score.

Score	Observation
1	Anxious, agitated or restless
2	Cooperative, oriented and tranquil
3	Responsive to commands
4	Asleep, but with brisk response to light glabellar tap or loud auditory stimulus
5	Asleep, sluggish response to glabellar tap or loud auditory stimulus
6	Asleep, no response

The heart rate, blood pressure, ECG, and oxygen saturation (SpO2) were noted at baseline, thereafter every 5 minutes for the initial 15 minutes, then every 30 minutes till the end of the surgery, then every hourly up to 4 hours and then every 2 hourly up to 12 hours in the post operative period.

When the heart rate declined to less than 60 beats per min, it was labelled as Bradycardia. Fall of more than 20% in systolic and/or diastolic blood pressure was recorded as hypotension.

Post operative pain was assessed using 10 point Visual Analogue Score –VAS.



Patients were explained about this scoring system and asked to mark a vertical mark on the following scale which reflected the intensity of pain, which they experienced at that time.'

Patients were observed for complications like horner's syndrome, pneumothorax, hypotension, bradycardia, respiratory depression, nausea and vomiting.

Inj. diclofenac sodium 1.5mg/kg IV was administered when VAS ≥ 4 or on patient's demand and time for rescue analgesia was noted.

STATISTICS

Results were statistically analyzed by unpaired t-test with $p<0.05$ considered statistically significant. Data were presented as mean value and mean+SD.

RESULTS

Mean onset of sensory block was 7.15±0.65 min in group C and 3.05±0.36 min in group D.

Mean onset of motor block was 10.04±0.45 min in group C and 6.07±0.46 min in group D.

The mean duration of sensory block was found to be 545.03±12.21 min in group C and 663.60±13.41 min in group D. Mean duration of motor block was 507.83±11.38 min in group C and 624.36±10.98 min in group D.

Mean pulse rate was seen to decrease in both the groups but statistically significant decrease was noted in Group D at 30, 60, 90, 120 min. Mean systolic and diastolic blood pressures were significantly lower than baseline in both the groups but statistically significant decrease was noted in group D at 30, 60, 90 min. RSS score was comparable throughout the study period with no decline in spo2.

Mean duration of analgesia according to a VAS score ≥4 was 605.03±9.88 min in group C and 724.16±10.57 min in group D and was found to be statistically longer in group D as compared to group C.

Table 1: Demographic Data:

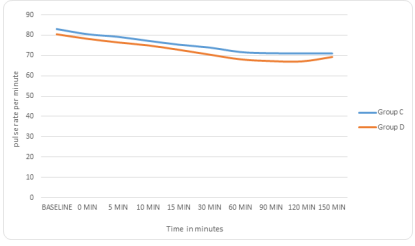
	Group C	Group D	Inference
Sex(M/F)	16/14	17/13	NS
Age(Years)	36.96±9.97	34.50±10.03	NS
Weight(kg)	69.30±11.98	66.26±7.79	NS
Duration of surgery(Min)	92.33±32.76	90.50±21.96	NS

Table 2: Onset of anaesthesia

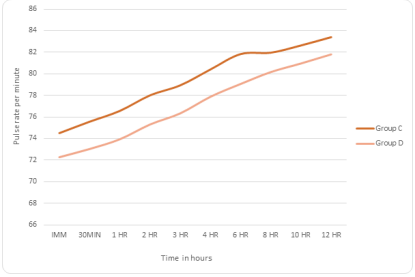
Onset	Group C	Group D	P value	Inference
Mean Sensory (min) block	7.15±0.65	3.05±0.36	<0.05	S
Mean Motor (min) block	10.04±0.45	6.07±0.46	<0.05	S

Table 3: Duration of Anaesthesia:

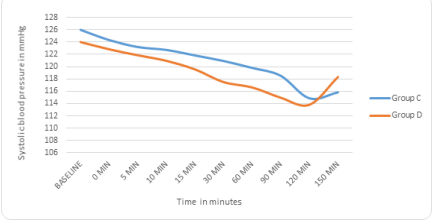
	Group C	Group D	P value
Mean duration of sensory block(min)	545.03±12.21	663.60±13.41	<0.05
Mean duration of motor block(min)	507.83±11.38	624.36±10.98	<0.05



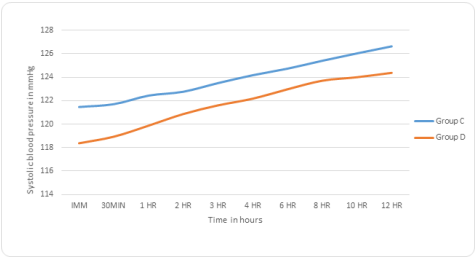
Graph: 1: Changes in heart rate intraoperatively (beats per minute)



Graph 2: Changes in Heart Rate Postoperatively (in beats per minute)



Graph 3: Systolic Blood Pressure (mmHg)



Graph 4: Diastolic Blood Pressure (in mmHg)

Table 4: RSS score

TIME	GROUP C	GROUP D	P VALUE
0 MIN	1	1	≥0.05
5 MIN	2	2	≥0.05
10 MIN	2	2	≥0.05
15 MIN	2	2	≥0.05
30 MIN	2	2	≥0.05
60 MIN	2	2	≥0.05
90 MIN	2	2	≥0.05
120 MIN	2	2	≥0.05
150 MIN	2	2	≥0.05
Postoperative period			
IMMEDIATE	2	2	≥0.05
30MIN	2	2	≥0.05
1 HR	2	2	≥0.05
2 HR	2	2	≥0.05
3 HR	2	2	≥0.05
4 HR	1	1	≥0.05
6 HR	1	1	≥0.05
8 HR	1	1	≥0.05
10 HR	1	1	≥0.05
12 HR	1	1	≥0.05

RSS score was comparable throughout the study period. No decline is spO2 was noted.

Table 5: VAS score:

Time	Group C	Group D
IMMEDIATE	1	1
30MIN	1	1
1 HR	1.67±0.48	1.16±0.37
2 HR	1.87±0.35	1.20±0.40
3 HR	1.93±0.25	1.77±0.43
4 HR	2	2
6 HR	2.13±0.35	2.23±0.43
8 HR	2.57±0.5	2.63±0.49
10 HR	4.13±0.35	3
12 HR	14.10±0.30	

Table 6: Time to rescue analgesia

	Group C	Group D	P value
Mean time of 1st rescue analgesic (min)	605.03±9.88	724.16±10.57	<0.05

DISCUSSION

Blocking of the brachial plexus at the supraclavicular level has an advantage due to the compact arrangement of the trunks.This provides complete regional anaesthesia for surgeries on the distal arm,forearm and hand.(4)

α2 agonists have been used peripherally as adjuvants for their properties of prolonging duration of anaesthesia and analgesia, along with providing sedation We have compared the effects of clonidine and dexedetomidine as adjuvants to our study for block characteristics, post-operative analgesia and sedation.

No significant differences were seen in male-female ratio, weight and age of patients and mean duration of surgery between two groups.

We found a statistically significant difference in the onset of sensory and motor blockade between both the groups. Onset of sensory and motor blockade was faster in group D as compared to group C.

Sarita Swami et al(5) carried out a comparative study of adding dexmedetomidine and clonidine as an adjunct to bupivacaine in supraclavicular brachial plexus block and concluded that the 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..

Karthik G. S et al(6) has shown that dexmedetomidine levobupivacaine group have a faster onset of sensory and motor blockade when compared to clonidine levobupivacaine group.

The findings of these studies are comparable to ours.

In our study, the mean duration of sensory block was found to be 545.03±12.21 min in group C and 663.60±13.41 min in group D. Mean duration of motor block was 507.83±11.38 min in group C and 624.36±10.98 min in group D.

Similarly in Archana Tripathi et al's(7) comparative study of adding clonidine and dexmedetomidine as an adjunct to bupivacaine in supraclavicular brachial plexus block,concluded that dexmedetomidine prolonged the duration of sensory and motor block as compared to clonidine.

Furthermore,Khade A et al 2013(8) studied the effect of adding dexmedetomidine to bupivacaine in supraclavicular brachial plexus block. His results showed prolongation of duration of anaesthesia in dexmedetomidine-bupivacaine group.

Usha K Chaudhary et al (2017(9) did a comparative study of the effects of adding dexmedetomidine and clonidine as an adjunct to bupivacaine in ultrasound guided supraclavicular brachial plexus block and concluded that dexmedetomidine increases the duration of sensorimotor blockade as compared to clonidine which is similar to our study.

Mean pulse rate was seen to decrease in both the groups but statistically significant decrease was noted in Group D at 30, 60, 90, 120 min. Mean systolic and diastolic blood pressures were significantly lower than baseline in both the groups but statistically significant decrease was noted in group D at 30, 60, 90 min

Our study findings were comparable and similar to a study carried out by Sarita S et al's(5) in 2012,She observed significantly lower pulse rate at 60, 90, 120 min, but not less than 60beats/min in dexmedeto midine- bupivacaine group as compared with the group containing clonidine. Systolic and diastolic blood pressure were found to be significantly lower than baseline from 30 to 120 min in the group containing dexmedetomidine as compared with the group containing clonidine.This effect can be attributed to the sedation and relief of anxiety caused by dexmedetomidine.

Karthic G et al(6) study in 2015 conducted their study of adding dexmedetomidine and clonidine as adjuvants to levobupivacaine in supraclavicular brachial plexus block and observed heart rate to decrease from baseline in both his study groups but did not fall below 60 beats/min.

The mean duration of analgesia was statistically more in group d which is similar to many studies.

For instance, Sarita S et al in 2012;(5) compared dexmedetomidine and clonidine to local anaesthetic in supraclavicular brachial plexus block and found a longer duration of analgesia in terms of delayed requirement of first rescue analgesic with dexmedetomidine bupivacaine group.

Usha K Chaudhary et al (2017)(9) in their study observed a pain free period maximum in dexmedetomidine group followed by clonidine group and control group containing only bupivacaine.

The peripheral neural blockade of dexmedetomidine is due to its binding to α2A-adrenoreceptor .It shortens the onset time of both sensory and motor block, prolonges the duration of block and the duration of postoperative analgesia because peripheral α2 agonist produce analgesia by reducing release of norepinephrine leading to α2 receptor independent inhibitory effect on nerve fibre action potential.(10)

Throughout the study, sedation level was assessed by Ramsay Sedation Scale score. RSS score was comparable throughout the study period but was not associated with any decrease in SpO2.

Karthic G S et al in 2015(6) conducted a double blind prospective randomized clinically controlled study to evaluate the efficacy of adding dexmedetomidine and clonidine as adjuvants to levobupivacaine in supraclavicular brachial plexus block. They observed that none of the patients in both the study groups required additional sedation.

Main side effects associated with the use of clonidine and dexmedeto midine are sedation, bradycardia and hypotension. In our study, we did not observe any significant Hypotension or Bradycardia.

Complications which may occur due to the technique of supraclavicular brachial plexus block are Horner's syndrome, blood aspiration and pneumothorax. No such complications were noted in this study.

CONCLUSION:

Brachial plexus block provides a useful alternative to general anaesthesia for upper limb surgeries by providing complete muscle relaxation along with maintaining stable intraoperative hemodynamics and the associated sympathetic block. The sympathetic block decreases postoperative pain and oedema.

To conclude, dexmedetomidine prolongs the duration of sensory, motor block and duration of analgesia, shortens the onset time for sensory and motor block as compared to clonidine when used as an adjuvant to local anaesthetic (bupivacaine) in supraclavicular brachial plexus block. The significantly prolonged duration of analgesia obviates the need for any additional analgesic. The added advantage of conscious sedation, hemodynamic stability and minimal side effects make it a potential adjuvant for nerve blocks.

REFERENCES:

1) Bernard JM,Macarie P.Doserange effects of clonidine added to lignocaine for brachial plexus block.Anaesthesiology.1997; 87:277-84.
2) Erlacher W MD, Christoph Schuschnig MD, Herbert Koining MD, Peter Marhofer et al. Clonidine as adjuvant for mepivacaine, ropivacaine and bupivacaine in axillary, perivascular brachial plexus block; Canadian journal of anaesthesia Feb 2001; 522-4.
3) Sandhya Agrawal, Ritu Agrawal, Praveen Gupta: Dexmedetomidine prolongs the effect of bupivacaine in supraclavicular brachial plexus block journal of anaesthesiology clinical pharmacology 2014; 30-1:36-40.
4)) Visual analogue score: :wiley online library
5)) Swami SS, Kenya VM, Ladi SD, Rao R. Comparison of dexmedetomidine and clonidine as an adjuvant to local anaesthesia in supraclavicular brachial plexus block: randomized double blind prospective study. Indian J Anaesth.2012;56: 243-249
6) Karthik GS, Sudheer R, Sahajananda H, Rangalakshmi, Roshan Kumar. Dexmedetomidine and clonidine as adjuvants to levobupivacaine in supraclavicular brachial plexus block: A comparative randomised prospective controlled study.JEMDS.2015; 4:3207-3220.
7) Archana T, Sharma K, Somvanshi M, Rajib Lochan samal. A comparative study of clonidine and dexmedetomidine as an adjunct to bupivacaine in supraclavicular brachial plexus block.JOACP.2016; 32:344-348.
8) Khade A et al: dexmedetomidine as an adjuvant to bupivacaine in supraclavicular brachial plexus block in NJIRM 2013; 4(6)nov dec.
9) Usha K. Chaudhary, Amruth Danesh, Monika Mahajan, Sudarshan Kumar, Versha Verma, Bhanu Awasthi. Comparison of effects of dexmedetomidine and clonidine as adjuvant to bupivacaine 0.25% in ultrasound guided supraclavicular brachial plexus block. International Journal of Research in Medical Sciences, 2017 ;5(10); 4512-4518.
10) Manpreet Kaur, P.M. Singh: Current role of dexmedetomidine in clinical anaesthesia and intensive care. Anaesthesia essay and research 2012; July 28, IP: 121.246.83.44.