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RESEARCH ARTICLE

COMPARITIVE STUDY TO KNOW THE EFFICACY OF DEXMEDETOMIDINE AND CLONIDINE AS AN ADJUVANT TO LOCAL ANESTHESIA IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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ABSTRACT

Aim of study: To compare efficacy of Clonidine and Dexmedetomidine as an adjuvant to local an aesthetic agent in supraclavicular brachial plexus block with respect to onset and duration of sensory and motor block, potency and duration of analgesia. **Methodology:** Total of 100 patients were studied Patients of either sex was randomly allocated into Group C and Group D. **Group C** –. Received Bupivacaine 0.25% (35 ml) + inj Clonidine 1 mcg / kg. **Group D--**. received Bupivacaine 0.25% (35 ml) + injDexmedetomidine 1 mcg/kg Sensory block was assessed by the pin prick method. Assessment of motor block was carried out each minute till complete motor blockade after the drug injection. Patients were assessed for duration of analgesia as per a numeric rating scale of 0 to 10. **Results:** The mean time for onset of sensory block in group D was 9.17±1.26 mins and that observed in group C was 11.07±2.14 mins. Mean duration of sensory block in group D was 690 ± 87.41min and in group C was 470 ± 55 min. The mean time for onset of motor block in group D was 12.63 ± 2.18 min and 15.17±1.77 min in group C. The mean duration of motor block in D group was 353.17 ± 41.24min and in group C was 270.51 ± 51.61min. The duration of analgesia was 448.40 ± 91.97 min in D group and 309.20±37.30 min in C group. Both Dexmedetomidine and Clonidine when used in the mentioned doses above does not produce haemodynamic instability and respiratory depression. **Conclusion:** From our study, the use of α-2 agonists, Dexmedetomidine (1 mcg/kg) and Clonidine (1 mcg/kg) as adjuvants to local anaesthetic solution (0.25% Bupivacaine) in supraclavicular brachial plexus block for upper limb surgeries, we conclude that faster onset of sensory and motor block is seen with Dexmedetomidine as compared to Clonidine. Duration of sensory and motor block and postoperative analgesia is significantly prolonged with Dexmedetomidine as compared to Clonidine. Haemodynamic parameters, side effects and sedation scores are comparable between the two groups.

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INTRODUCTION

"For all the happiness mankind can gain is not in pleasure but in rest from pain"- John Dryden. Pain is an inevitable consequence of surgery. Surgical intervention to reduce human suffering is associated with pain and distress to patients. Severe postoperative pain may have physiological consequences increasing the stress response to surgery, seen as a cascade of endocrine-metabolic and inflammatory events that ultimately may contribute to organ dysfunction, morbidity, increased hospital stay and mortality. Pain relief after surgery can be achieved by various regional an aesthetic techniques. Upper limb surgeries are mostly performed under peripheral blocks such as the brachial plexus block. The brachial plexus block is one among the most popular regional nerve blocks performed for upper limb surgeries. Brachial plexus block provides a useful alternative to general anesthesia for upper limb surgeries.

They achieve near ideal operating condition by producing complete muscular relaxation, maintaining stable intraoperative hemodynamics and the associated sympathetic block. The sympathetic block decreases post-operative pain, vasospasm and edema. Supraclavicular approach for brachial plexus block is most commonly suitable for upper limb surgeries. The acceptance of regional anesthesia techniques has been limited by two major factors inherent inthelocalanaestheticagentsavailablefortheblockadenamelyslow onsettime, short duration of action and limited duration of postoperative analgesia. Different adjuncts have been tried to fill the lacunae created by the local anaesthetics. Alpha-2 adrenergic receptor agonists have been the focus of interest for their sedative, analgesic, peri operative sympatholytic and cardiovascular stabilizing effects with reduced anaesthetic requirements. They are mixed with local anaesthetic agents to extend the duration of spinal, extradural and peripheral nerve blocks.

The concurrent injection of alpha 2 adrenergic agonist drugs has been suggested to improve the nerve block characteristic of local anesthetic solutions. The search for the ideal additive continues, and led us to try the α2 adrenergic agent, Dexmedetomidine and Clonidine. Our study is designed to compare Clonidine and Dexmedetomidine, used as an adjunct to Bupivacaine in supraclavicular brachial plexus block for upper limb surgeries, in terms of efficacy in onset, duration, potency of sensory, motor block, sedation score and analgesia.

MATERIALANDMETHODS

This study was carried out in the Department of Anaesthesiology, B.LD.E.U's Shri B.M. Patil Medical College, Hospital and Research Centre, VIJAYAPUR. Study was conducted from December 2015 to August 2017.

Total of 100 patients were studied Patients of either sex was randomly allocated into Group C and Group D.

Group C: Received Bupivacaine 0.25% (35 ml) + inj Clonidine 1 mcg / kg.

Group D: Received Bupivacaine 0.25% (35 ml) + inj Dexmedetomidine 1 mcg/kg

Inclusion Criteria

Patients with

- ASA I and II physical status.
- Patient with age group of 18 to 60yrs

Patient's undergoing elective upper limb surgeries

Exclusion criteria

- ASA III and ASA IV
- Patient with known Hypersensitive to study drugs
- Patient's refusal
- Patient's with heart block
- Local cutaneous infections at the site of injection
- Patients with coagulopathy or on anticoagulants
- Patients with central and peripheral neuropathy
- Pregnant and lactating patients
- Patients with heart blocks

For the procedure

A portable tray covered with sterile towels containing

- Sterile syringes - one 20ml and one 10ml.
- Hypodermic needles of 5 cm length, 22 G.
- Bowl containing povidone iodine and spirit.
- Sponge holding forceps.
- Towels and towel clips.
- Sterile gauze pieces.

For emergency resuscitation:

- The anesthesia machine, emergency oxygen source (E type cylinders), pipeline O2 supply, working laryngoscopes, appropriate size endotracheal tubes and connectors.
- Working suction apparatus with suction catheter.
- Oropharyngeal airways.
- Intravenous fluids.
- Drugs: Thiopentone, Succinylcholine, Hydrocortisone, Atropine, Adrenaline, Aminophylline, Mephenteramine, Calcium gluconate and Sodium bicarbonate.

Monitors: Pulse oximeter, ECG & NIBP monitor

MATERIALS AND METHODS

- On the arrival in the operation room, baseline heart rate, blood pressure and oxygen saturation were recorded. An IV line was be secured with 18 G cannula in the unaffected limb and Ringer's lactate was started.
- All the patients received supraclavicular brachial plexus block using Sonosite M Turbo ultrasound machine.
- Following negative aspiration, 35mL of a solution containing local anaesthetic combined with Clonidine or Dexmdetomidine as mentioned were injected. A 3min massage was performed to facilitate an even drug distribution.
- Sensory block was assessed by the pin prick method.

Assessment of sensory block was done at each minute after completion of drug injection in the dermatomal areas corresponding to median nerve, radial nerve, ulnar nerve and musculo-cutaneous nerve till complete sensory blockade. Sensory onset was considered when there was dull sensation to pin prick along the distribution of any of the above mentioned nerves. Complete sensory block was considered when there was complete loss of sensation to pin prick.

- Sensory block was graded as –

Grade 0- sharp pin felt

Grade 1- analgesia, dull sensation felt
Grade 2- anaesthesia, no sensation felt

- Assessment of motor block was carried out each minute till complete motor blockade after the drug injection. Onset of motor blockade was considered when there was Grade 1 motor blockade. Peak motor block was considered when there was Grade 2 motor blockade.
- Motor block was determined according to modified Bromage scale for upper extremities on 3 point scale.

Grade 0- Normal motor function with full flexion extension of elbow wrist fingers.

Grade 1- Decrease motor strength with ability to move the fingers only.

Grade 2- Complete motor block with inability to move the fingers.

This block was incomplete when any of the segments supplied by median, radial, ulnar and musculo cutaneous nerve did not

have analgesia even after 30 minutes of drug injection,. These patients were supplemented with IV Fentanyl (1-2µg/kg) and Midazolam (0.02 mg/kg). When more than one nerve remained unaffected it was considered a failed block in this case general anaesthesia was given. Patients were monitored for hemodynamic variables heart rate, blood pressure and oxygen saturation every 30min after the block intra operatively and every 60 mins post operatively. The sedation on patient was assessed by Ramsay sedation score. At the end of the procedure, quality of blockade was assessed according to numerical score.

Quality of blockade

Grade 4-Excellent, no complaints from patient

Grade 3-Good, minor complaints with no need for analgesics.

Grade 2-Moderate complaint that require supplemental analgesia

Grade 1-Unsuccessful, patient given general anaesthesia.

Patients were assessed for duration of analgesia as per a numeric rating scale of 0 to 10.The numeric rating scale was recorded post operatively every 60 min till the score of 5.The rescue analgesia was given in the form of inj. Diclofenac sodium(1.5mg/kg) intramuscularly at the Numeric Rating Scale of 5 and the time of administration was noted. All patients were observed for any side effects like nausea, vomiting, dryness of mouth and complications like pneumothorax, haemotoma, local anaesthetic toxicity and post block neuropathy in the intra and postoperative periods. The duration of sensory block is defined as the time interval between the end of local anaesthetic administration and the complete resolution of anaesthesia on all nerves. The duration of motor block is defined as the time interval between the end of local of anaesthetic administration and the recovery of complete motor function of the hand and the forearm.

RESULTS

Interpretation: As shown in above tables and graphs demographic criteria like age, sex, weight are comparable in both groups. And there was no statistically significant difference between two groups (P>0.05).

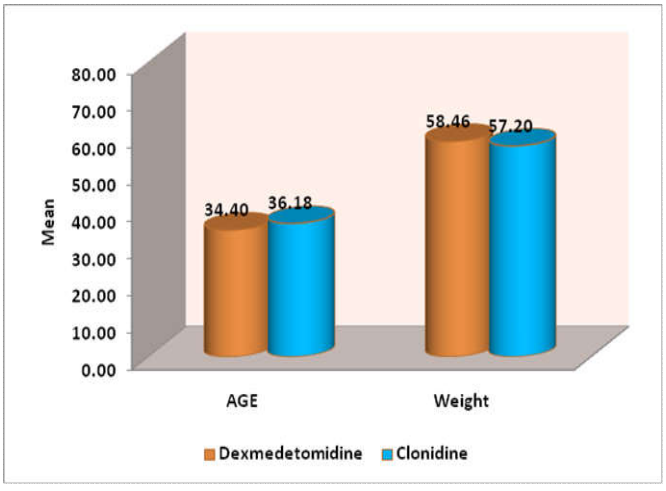

Figure no.1. Mean Age and Weight of cases between study groups

Table. 1 Table: Distribution of sex between study groups

Sex	Dexmedetomidine		Clonidine		Total	p value
	N	%	N	%		
Male	40	58.8	33	48.5	68	0.115
Female	10	31.3	17	53.1	32	
Total	50	50.0	50	50.0	100	

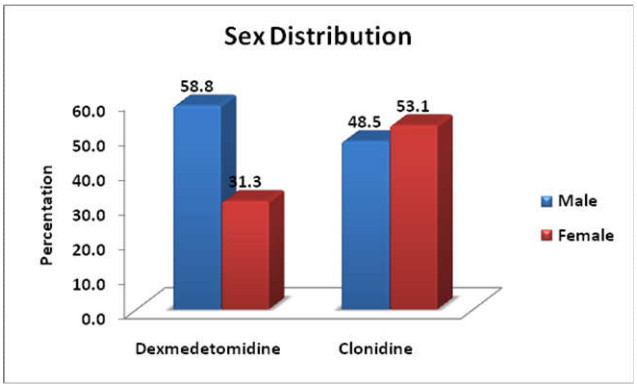

Figure 2. Distribution of sex between study groups

Interpretation: As shown above the graph onset of sensory block in group C in min 10.88 ± 1.98 and group D onset time is 8.66 ± 1.24 min. This difference was statistically significant. (P<0.05 is significant). As shown above the graph onset of Motor block in minutes in group C is 14.94 ± 1.97 min and group D onset time is 11.88 ± 2.77 min. This difference was statistically significant P<0.05 is significant. The duration of sensory block in minutes in group C is 440.68 ± 78.79 min and group D is 692.20 ± 93.07min. This difference was statistically significant. P<0.05 is significant. Duration of Motor Block in minuts in group C is 258.46 ± 45.65min and duration of Motor Block in group D is 351.50 ± 42.41min. This difference was statistically significant. P<0.05 is significant. Duration of analgesia in minutes in group C 309.20 ± 37.30 min and duration of analgesia in group D is 448.40 ± 91.97 min. This difference was statistically significant. P<0.05 is significant. Out of 100 patients group C showed 31% excellent block and group D showed 61.8% excellent block and In group C showed 75% Good block and group C showed 25% good block so there is significant P < 0.05 so Group D showed most of them excellent block compared to group C. The base line pulse rate in group C 76.44 ± 6.31 and group D 77.18 ±7.20. There was fall in Pulse rate compare to base line from 0 minute to 60 minutes which was continue up to 2 hours in group D and Lowest pulse rate was 71.36±8.21 and in group C the lowest pulse rate was 70.70.±6.23 However this fall in pulse rate was within physiological range. Non of the patients developed bradycardia (pulse rate below 50). There was no ±statistical significant difference in pulse rate between two groups intra operatively and post operatively. There was statistically significant decrease in mean systolic blood pressure as compare to baseline from 15 minutes to 2 hours after giving the block in group C. lowest systolic blood pressure was 117.10±9.60 at 15 minutes. group Dlowest blood pressure119.16±12.19 However this fall in systolic blood pressure was with in physiological range. The base line systolic blood pressure in group D was 125.12 ± 10.18 and group C 122.92 ± 9.05. There was no statistical significant difference in mean systolic blood pressure between the two groups. However this fall in systolic blood pressure was with in physiological range.

Table 2. Comparison of Mean Parameters of sensory and motor block and duration of analgesia between study groups

Variables	Dexmedetomidine		Clonidine		p value
	Mean	SD	Mean	SD	
Sensory block onset time in min	8.66	1.24	10.88	1.98	<0.001*
Motar block onset time in min	11.88	2.77	14.94	1.97	<0.001*
Duration of sensory block in min	692.20	93.07	440.68	78.79	<0.001*
Duration of motar block in min	351.50	42.41	258.46	45.65	<0.001*
Duration of analgesia	448.40	91.97	309.20	37.30	<0.001*

Note: *significant at 5% level of significant (p<0.05)

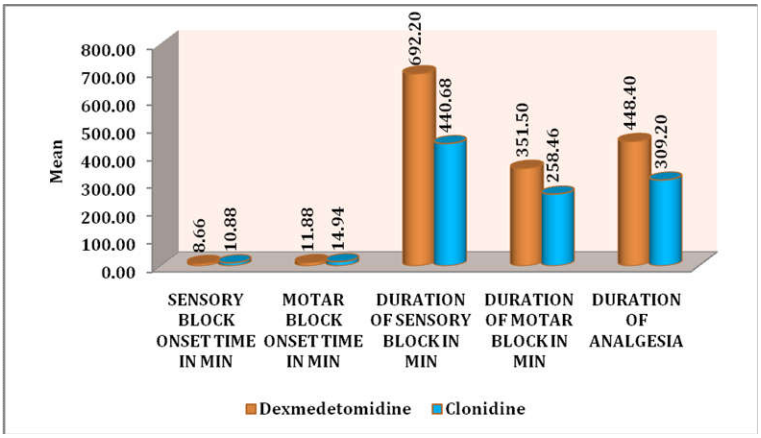

Figure 3. Comparison of Mean Parameters of sensory and motor block and duration of analgesia between study groups

Table 3. Distribution of Quality of Block between study groups

QUALITY OF BLOCK	Dexmedetomidine		Clonidine		Total	p value
	N	%	N	%		
Excellent	42	61.8	26	38.2	68	<0.001*
Good	8	25.0	24	75.0	32	
Total	50	50.0	50	50.0	100	

Note: *significant at 5% level of significant (p<0.05)

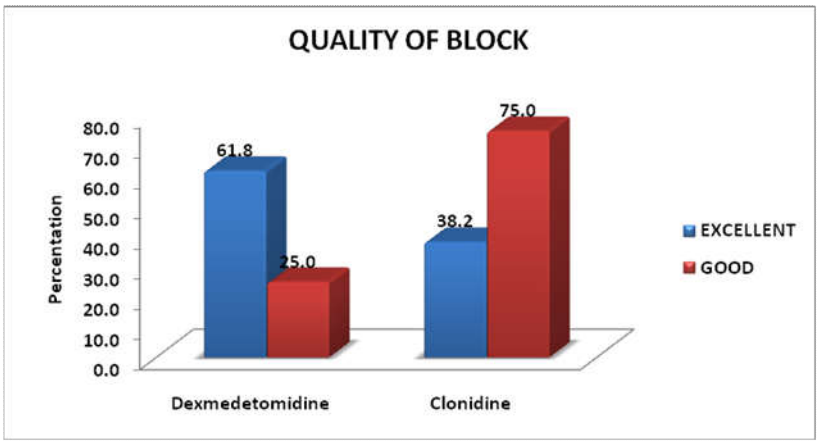

Figure 4. Distribution of Quality of Block between study groups

Table 4. Comparison of Mean Pulse Rate between study groups

pulse rate	Dexmedetomidine		Clonidine		p value
	Mean	SD	Mean	SD	
0 Min	77.18	7.20	76.44	6.31	0.167
5 Min	75.96	6.93	75.52	5.47	0.525
15 Min	73.72	7.78	71.72	6.08	0.155
30 Min	71.36	8.21	70.70	6.83	0.663
60 Min	71.58	8.66	70.64	7.01	0.552
2 Hr	72.06	8.89	70.70	7.02	0.398
6 Hrs	73.10	7.55	71.28	6.48	0.199
12 Hrs	73.58	6.50	72.06	5.73	0.092
24 Hrs	74.54	5.99	73.08	5.99	0.095

Note: *significant at 5% level of significant (p>0.05)

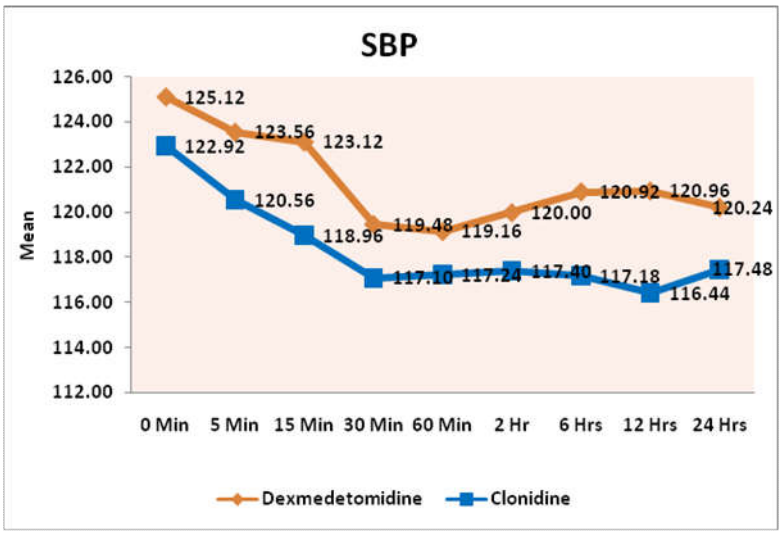

Figure 5. Comparison of Mean Systolic Blood Pressure between study groups

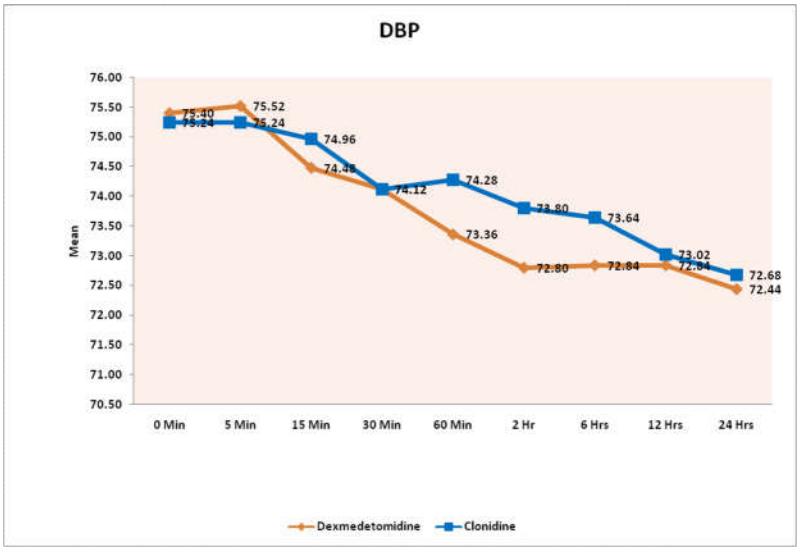

Figure 6. Comparison of Mean DBP between study groups

Table 5. Comparison of Mean Pain Intensity between study groups

Pain intensity	Dexmedetomidine		Clonidine		p value
	Mean	SD	Mean	SD	
0 Min	9.90	0.36	9.88	0.44	0.804
5 Min	6.58	1.81	8.78	0.58	<0.001*
15 Min	3.90	1.16	6.58	1.43	<0.001*
30 Min	2.48	1.18	4.08	1.55	<0.001*
60 Min	1.76	0.82	2.68	1.19	<0.001*
2 Hr	1.40	0.78	1.68	0.77	0.074
6 Hrs	1.32	0.68	1.38	0.49	0.615
12 Hrs	1.14	0.35	1.64	0.94	0.001*
24 Hrs	1.14	0.35	1.74	1.19	0.001*

The base line diastolic blood pressure in group C is 75.24 $\pm$ 7.35and group D 75.40 $\pm$ 6.62.There was no statistically significant difference in mean diastolic blood pressure as compare to base line. The base line Pain intensity showed in group C is 9.88 + 0.44 and in group D 9.90 + 036 and there was significant difference in two groups $p < 0.05$. group D showed better in pain intensity compare to group

DISCUSSION

Brachial plexus block provides adequate anesthesia and post operative analgesia for all the upper limb procedures.

By giving peripheral nerve blocks, the patient remains conscious without any depression of the protective airway reflexes and it provides operative condition similar to or better than general anesthesia, with good muscle relaxation, good surgical field. Various studies have shown that addition of several adjuvancts like Neostigmine, Opioids, Dexamethasone Hyaluronidas Tramadol, Midazolam and α_2 agonist like Clonidine Dexmedetomidine in local anaesthetic solution in peripheral nerve blocks prolonged the duration of analgesia, but the results have been inconclusive because of associated side effects or doubtful efficacy. In our study the onset of sensory block in group C was 10.88 ± 1.98 mins and that

observed in group D was (8.66 ± 1.24) mins. This difference was statistically significant (p<0.05 is significant) which states group D has faster sensory onset time compared to group Kirubahar *et al.,* showed that the onset for sensory block in group D was 4.7±0.59 min and group C was 8.47+_1.04 min which was statistically significant(p<0.001). Swami S S*et al.,* showed that the onset of sensory block in group C was 2.33±1.21 mins and group D was 1.77±1.28 min which states onset of sensory block was faster in group D when compared to group C. The mean time for onset of motor block in our study in group C was (14.94 ± 1.97) min and (11.88 ± 2.77) min in D group. The difference was found to be statistically significant. Kirubahar *et al.,* showed that onset of motor block in group C was 13.1±1.42min and group D was 9.63±0.89min which was statistically significant (P<0.001). Swami S S *et al*., showed onset of motor block in group D was 4.65±2.46 min and group C was 3.87±1.78 min showed group D onset time was faster compared to group C. The mean duration of sensory block in group C was 440 ± 78.79 min and in group D was 692.20 ± 93.07 mins. This difference was statistically significant (p<0.05) duration of sensory block significantly prolonged in Dexmedetomidine group as compared to Clonidine group. Kirubahar *et al.,* showed that duration of sensory block in group C 319.1±32.74 min and group D 537.8±32.67min which is statistically significant(P<0.001).

Swami *et al*., showed that duration of sensory of sensory block in group D was 413.97±87.31min and group C was 227.00±48.36min which is stastically significant. The mean duration of motor bock in C group was 258.46 ± 45.65 min and in group D was 351.50 ± 42.41 min. This difference was statistically significant. Kirubahur Ret *al.*, showed that duration of motor block in group C 319.1±32.74 min and group D 537.8±32.67 min which is statistically significant(P<0.001). Swami *et al.,* showed that duration motor block in group D was 472.24±90.06min and group C was 292.67±59 min which is stastically significant. In our study showed that the duration of motor block significantly prolonged in Dexmedetomidine group as compared to Clonidine group. Rachana *et al*., studied about Dexmedetomidine with Bupivacine in brachial plexus block by supraclavicular approach they concluded that Dexmedetomidine provided longer duration of motor and sensory block and duration of analgesia. The time to first rescue analgesia was (309.20 ± 37.30) min in C group and (448.40 ± 91.97) min in D group. This difference was statistically as well as clinically significant Kirubahur R *et al.,* showed that duration of analgesia in group C was 375.23±32.6 min and group D 666.27±32.54 min which is statistically significant(P<0.001). Swami S S*et al.,* showed that duration of analgesia in group D was 456.21+_97.99 min and group C was 289.67+_62.50 min which was stastically significant. In our study both Dexmedetomidine and Clonidine have been found to have favourable effect on brachial plexus block characteristics though significant prolongation of postoperative analgesia is seen with Dexmedetomidine than Clonidine and Pain intensity in group D was better when compared to group C. As our study showed group D shows 61.8% excellent block compared to group C which is 38.2% without any supplementry sedation. As shown in the above study conducted by Swami S S*et al.,* group D showed 80% excellent block compared to group C 40% which was statistically significant. Singh *et al*., compared the effects of Clonidine (150 mcg) added to Bupivacaine with Bupivacaine alone on supraclavicular brachial plexus block.

No side-effects were observed in both the Clonidine and the control group throughout the study period. Swami *et al.,* compared Clonidine (1mcg/kg) (group C) and Dexmedetomidine (1mcg/kg) (group D) as an adjuvant to local anaesthetic agent in supraclavicular brachial plexus block. No side-effects (nausea, vomiting, dry mouth) were reported during the first 24 h in the post-operative period in both the groups. In our study no patient developed any serious complications due to block procedure (pneumothorax, large hematoma, horners syndrome, prolonged nerve palsy) in both groups. Of those observed (sedation, nausea, vomiting, pruritis, blurring of vision) their incidence was similar to that reported previously. As shown in the above graph heart rate, blood pressure and oxygen saturation are within physiological limits and patient is hemodynamically stable and not much of variability.

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Conflict of interest: No

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