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Efficacy of Clonidine Added To Bupivacaine and Bupivacaine Alone For Supraclavicular Brachial Plexus Block: A Comparative Study

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Abstract: ***Aim:*** *Whether additional anesthetic and analgesic effects are derived from administration of clonidine, an alpha-2 adrenergic agonist to brachial plexus block through supraclavicular approach.*
Place and duration of study: *Anaesthesia Department, Siddhartha Medical College / Government General Hospital, Vijayawada,Krishna District, Andhra Pradesh from Jan'2017 to June'2018.*
Methodology: *The randomization was done by computerized programme and patients were allocated into two groups: Bupivacaine +Clonidine group(n=50) and Bupivacaine group (n=50) in a double-blind fashion. All the patients were premedicated with Intravenous Injection Midazolam 2 mg, 15 minutes before the block.*
Bupivacaine+Clonidine group (n=50) received 40 ml diluted solution containing Bupivacaine 0.25% with 2µg/kg body weight of Clonidine for brachial plexus block.
Bupivacaine group (n=50) received 40 ml of 0.25 % of Bupivacaine for brachial plexus block. The patients mainly included those undergoing orthopedic, plastic and reconstructive surgeries
Results: *It was observed that addition of clonidine to bupivacaine resulted in faster onset of sensory block, longer duration of analgesia (as assessed by visual analogue score), prolongation of the motor block (as assessed by modified bromage Rating Scale), prolongation of the duration of recovery of sensation and no association with any haemodynamic changes (heart rate and blood pressure), sedation or any other adverse effects.*
Conclusion: *These findings suggest that clonidine added to bupivacaine is an attractive option for improving the quality and duration of supraclavicular brachial plexus block in upper limb surgeries..*
Key Words: *brachial plexus, bupivacaine, clonidine.*

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I. Introduction

Peripheral nerve blockade is a well-accepted concept for comprehensive anaesthetic care. From the operation theatre, the role of peripheral nerve blockade has expanded for postoperative pain relief and management of chronic pain. The trend towards regional anaesthesia began in the late 18th century when William Halsted and Richard Hall experimented with cocaine as an anaesthetic for upper and lower limb procedures. Regional anaesthesia of the upper limb is achieved by blocking brachial plexus at varying stages along the course of the trunks, divisions, cords, and terminal branches.

Supraclavicular brachial plexus block is the preferred anaesthesia for upper limb surgeries. Here, the brachial plexus is arranged most compactly at the proximal division or at the trunk level that provides most reliable anaesthesia for upper limb surgeries by anesthetizing the middle and lower plexus over 80% of the times.

It is a valuable tool in the anaesthesiologist's armamentarium. It provides not only anaesthesia but also postoperative pain relief after surgery. At present, there is an interest in performing the blocks with peripheral nerve stimulator as it increases the success rate considerably. Successful peripheral nerve blocks rely on proper techniques of nerve localization, needle placement, and local anaesthetic injection. Blind procedures depend on surface landmarks, needle insertion, and paresthesia. These resulted in multiple needle punctures resulting in procedure-related pain and complications.

After synthesis of Lignocaine 1943 Lofgren systematic study of a whole range of compounds (Lofgren 1948), so laying the foundation for all subsequent studies of local anaesthetic drugs. From these studies have come derivatives of Lignocaine such as Mepivacaine, Prilocaine, Bupivacaine, and Etidocaine.

Local anaesthetic administered as regional nerve blocks are utilized in providing post-operative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn. Certain drugs may be used as adjuncts to local anaesthetics to lower the dose of them and improve analgesic efficacy and reduce the incidence of adverse reactions such as epinephrine, alpha two agonists – clonidine, dexmedetomidine, midazolam, dexamethasone, Tramadol, and fentanyl, etc.,

Several studies have demonstrated analgesic effects of "Clonidine," in local, spinal and epidural anaesthesia when combined with local anaesthetic Bupivacaine. This observation that Clonidine has analgesic effects at the spinal level has stimulated research to examine analgesic effects in the periphery. It has direct local action on the nerve itself and facilitation of local anaesthetic action. Also, Clonidine seems to provide analgesic benefit without adverse effects.

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II. Aims And Objectives

To compare the effects of injection bupivacaine and injection bupivacaine with clonidine as an adjunct, use for the supraclavicular approach to brachial plexus block concerning

- *Onset time of sensory blockade.*
- *Onset time of motor blockade.*
- *Duration of sensory blockade.*
- *Duration of motor blockade.*
- *Duration of analgesia.*
- *Time of rescue analgesia*
- *Untoward side effects*

III. Materials And Methods

100 patients aged between 18 and 60 years of physical status ASA 1 and 2 undergoing orthopedic, plastic, reconstructive surgeries of duration more than 30 minutes were included in the study. The study was conducted at GGH, Vijayawada which was attached to Siddhartha Medical College, Vijayawada. The patients mainly included those undergoing orthopedic, plastic and reconstructive surgeries.

3.1Inclusion criteria

- *Patients between 18 and 60 years, under physical status ASA 1 and ASA 2 scheduled for upper limb surgeries were included after obtaining ethical clearance from the Institution and informed written consent from the patients.*

3.2 Exclusion criteria

- Patients with cardiovascular diseases (Ischemic heart disease, hypertension, valvular heart disease), neuromuscular diseases, thyroid diseases, diabetes mellitus, hepatic or renal failure, pregnant women are excluded from the study

The randomization was done by computerized programme and patients were allocated into two groups: Bupivacaine +Clonidine group(n=50) and Bupivacaine group (n=50) in a double-blind fashion. All the patients were premeditated with Intravenous Injection Midazolam 2 mg, 15 minutes before the block.

Bupivacaine+Clonidine group (n=50) received 40 ml diluted solution containing Bupivacaine 0.25% with 2µg/kg body weight of Clonidine for brachial plexus block.

Bupivacaine group (n=50) received 40 ml of 0.25 % of Bupivacaine for brachial plexus block.

3.3 Procedure:

On the morning of the surgery, anesthesia machine with working laryngoscope, airways, endotracheal tubes, face mask, breathing circuit and emergency drugs tray including 20% Intralipid emulsion was kept ready. After shifting the patient to the operation theatre, noninvasive minimum mandatory monitors were attached and the baseline pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, ECG (lead II) and oxygen saturation were noted down. A wide bore I.V. cannula was secured, and an infusion of Dextrose Normal Saline was started at a rate of 10ml/kg body weight.

Premedication: Inj. Ondansetron 0.1mg/kg IV, Inj.Midazolam 0.01mg/kg IV.

3.4 Procedure:

The patient was made to lie in the supine position; head turned away from the side to be blocked and shoulder depressed. The arm of the side to be blocked was kept adducted.

3.5 PREPARATION OF PARTS:

The neck and the area up to the nipple were cleaned and painted with an antiseptic solution. The painted part was now draped with a holed towel thus maintaining strict aseptic and antiseptic precautions.

3.6 METHOD OF GIVING SUPRACLAVICULAR BLOCK:

The patient was placed in supine position without a pillow, arms at the side and head turned slightly to the opposite side. The arm was kept by the side of the patient so that his fingers were in touch with his knee. The anesthesiologist stood at the head end of the patient. The area was aseptically prepared and draped. The subclavian artery pulsation was felt 1 cm above the midpoint of the clavicle, the tip of the index finger was rested in the supraclavicular fossa directly over the arterial pulsations, and the artery retracted medially.

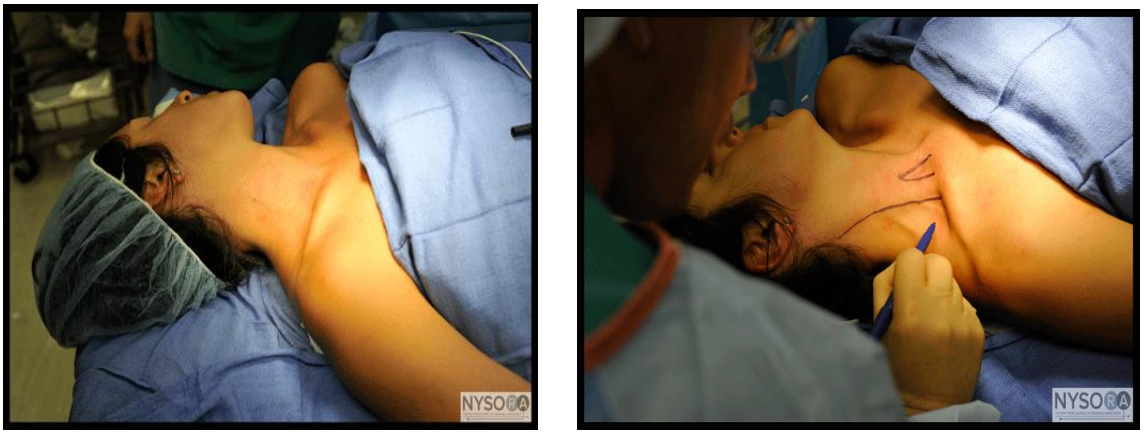


Figure 1a And 1b: Position And Landmarks For Supraclavicular Brachial Block

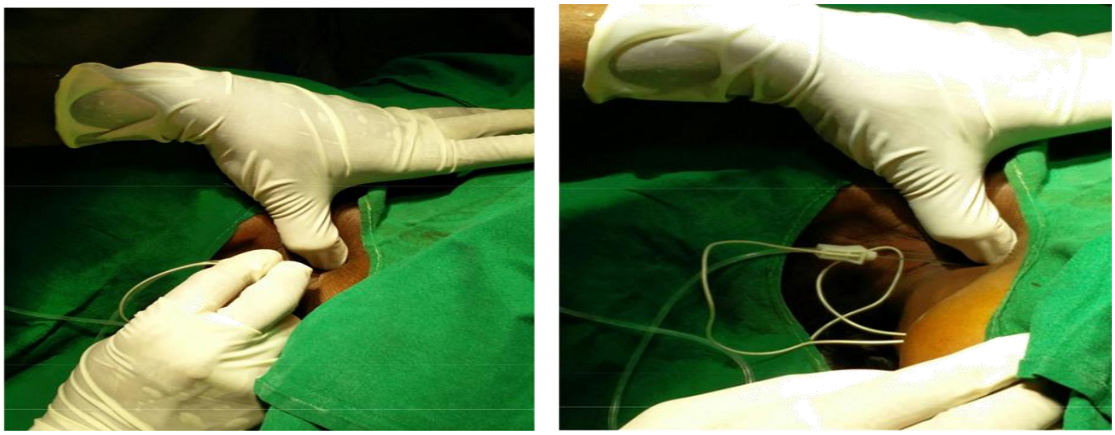


Figure 2 & 3: Technique Of Supraclavicular Brachial Plexus Block With A Peripheral Nerve Stimulator

3.7 Needle Puncture:

Needle puncture: An intradermal wheal was raised just above the palpating finger with a 24G needle. A 2 inch 24G short bevel needle connected to a syringe and nerve locator was inserted through the skin wheal and advanced slowly Backwards (posteriorly), slightly Inward (Medially) and Downward (caudal) [BID] gradually towards the first rib so that the shaft of the needle and syringe are almost parallel to the patient's head. The following setting was used in nerve locator

- Frequency was set at 1 Hz as 2 Hz may cause unpleasant and vigorous muscle twitches.
- The positive electrode connected to ECG lead.
- The negative electrode to a port in the needle.
- Begin at 1.5 mA current strength – a twitch of the fingers was observed for.
- An evident motor twitch of all fingers was taken as end motor response.
- As soon as we observed the twitch, the current strength was decreased to 0.5mA with continued observation of twitch. Even at 0.5 mA current when we got a satisfactory twitch of all fingers, the simulator was turned off, and the drug injected with repeated aspiration for blood and air.
- If the finger twitch disappeared on decreasing the current strength, the needle was repositioned to elicit the twitch response and again the procedure repeated.

After proper point location, negative aspiration test for blood and air was done, and drug mixture was then injected slowly. Care was taken that the needle did not get displaced, so vascular and pleural puncture avoided. Immediately after drug injection, gently massage was done over the point of drug injection for even distribution of the drug.

3.8 The following parameters were observed:

1.**Onset time of sensory blockade**

Sensory block in ulnar nerve, median nerve, radial nerve, the musculocutaneous nerve was assessed by using a 3-point scale: 0 = normal sensation, one = loss of pinprick (analgesia), and two = loss of touch (anaesthesia)

2.Onset time of the motor blockade

Motor block was seen the action of the four nerves on movements of thumb by abduction (radial nerve), adduction (ulnar nerve), opposition (median nerve), and flexion at the elbow joint (musculocutaneous nerve) according to the modified Bromage scale on a 3-point scale:

0: Normal muscle power with full flexion and extension of elbow, wrist, and fingers

1: Decreased motor strength with the ability to move the fingers only

2: Complete motor block with the inability to move the fingers

The onset of motor blockade was considered when there was decreased muscle power. Peak motor block was considered when the patient was unable to move the fingers.

The sensory and motor blocks were assessed every. Time taken for recovery of sensory and motor functions were noted.

3.Duration of sensory blockade

Defined as the time interval from onset of paresthesia to return of normal sensation on all the nerves (score 0).

4.Duration of analgesia.

It is defined as the time between onset of action and onset of pain. (VAS 1)

5.Duration of motor block

Taken as the time interval from complete motor block to complete recovery of the power of muscles of hand and forearm.

During surgery heat rate, noninvasive blood pressure and peripheral oxygen saturation were monitored. Symptoms such as nausea, vomiting, sedation and other adverse effects observed.

6)Time for rescue analgesia:

It is defined as the time after the block at which the patient complained of pain and requested for supplementation of analgesia and VAS score was more than 5.

In the postoperative period, patients were visited first at 30 and 60 minutes, then every 1 hourly till 6 hours then every 2 hourly till 12 hours then at 18 and 24 hours. The postoperative analgesia was assessed using 10 points visual analog scale (VAS) which is the most commonly used method of assessing the intensity of acute pain and its relief.

3.9 SIDE EFFECTS AND COMPLICATIONS:

All the patients were observed for any side effects and complications like hypotension, bradycardia, respiratory depression, nausea, vomiting, allergic reactions, pneumothorax, local hematoma formation and any neurological sequel in the intra and post-operative period.

Bradycardia was defined as the fall in pulse rate of more than 20 % from preoperative value. Similarly, hypotension was defined as fall in systolic blood pressure of more than 20 % from preoperative value.

Respiratory depression was defined as fall in SpO2 less than 90% or respiratory rate less than 10 per minute.

IV. Observation And Results

The 100 patients admitted in our hospital selected for study.

Table-1: Agewise distribution

Age	Group B+C		Group B	
	Count	%	Count	%
18-20	8	16.0%	10	20.0%
21-30	9	18.0%	10	20.0%
31-40	9	18.0%	6	12.0%
41-50	8	16.0%	15	30.0%
51-60	16	32.0%	9	18.0%
Total	50	100.0%	50	100.0%
P=0.29				

Variable	Group	N	Mean	SD	P-value
Age	Group B+C	50	40.62	15.20	0.29
	Group B	50	37.48	14.62	

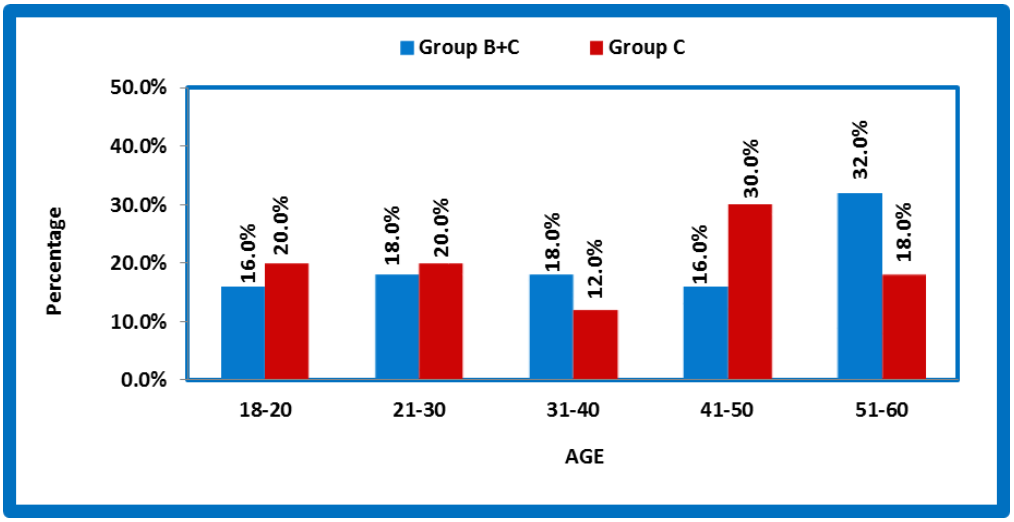


Table-2 : Sex Distribution

Sex	Group B+C		Group B		P-value
	Count	%	Count	%	
Female	16	32.0%	12	24.0%	0.5
Male	34	68.0%	38	76.0%	
Total	50	100.0%	50	100.0%	

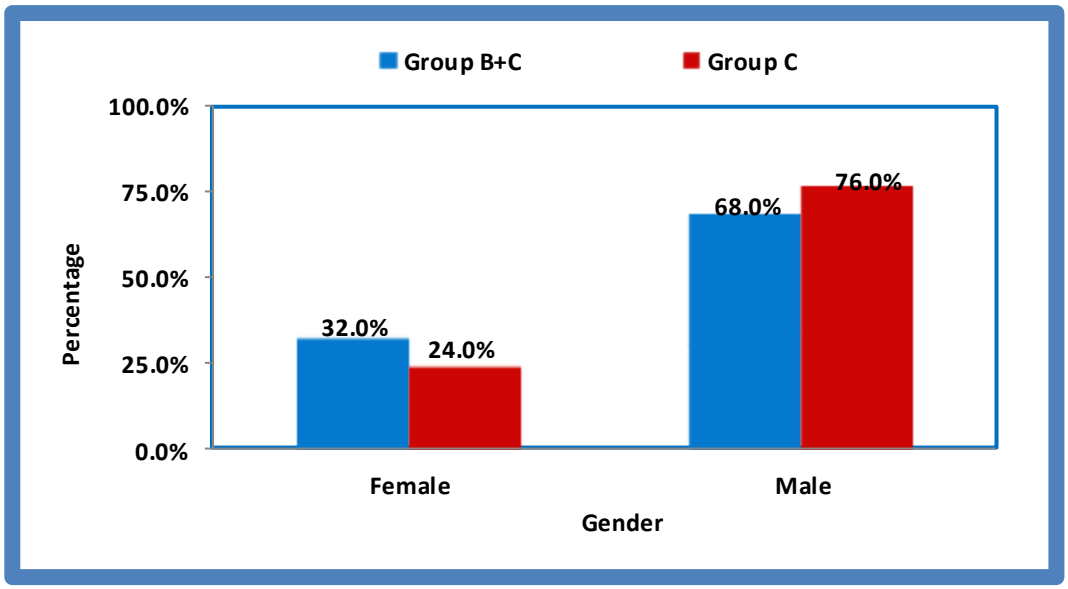


Table-3 : HEIGHT AND WEIGHT

Variable	Group	N	Mean	SD	P-value
Height	Group B+C	50	170.76	8.80	0.98
	Group B	50	170.80	8.77	
Weight	Group B+C	50	68.42	7.90	0.08
	Group B	50	65.68	7.63	

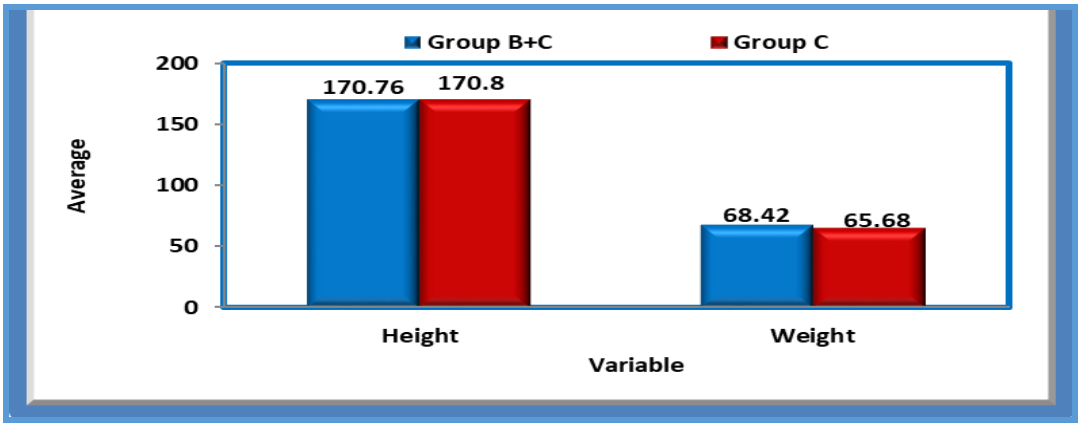


Table-4: ONSET TIME FOR SENSORY BLOCK

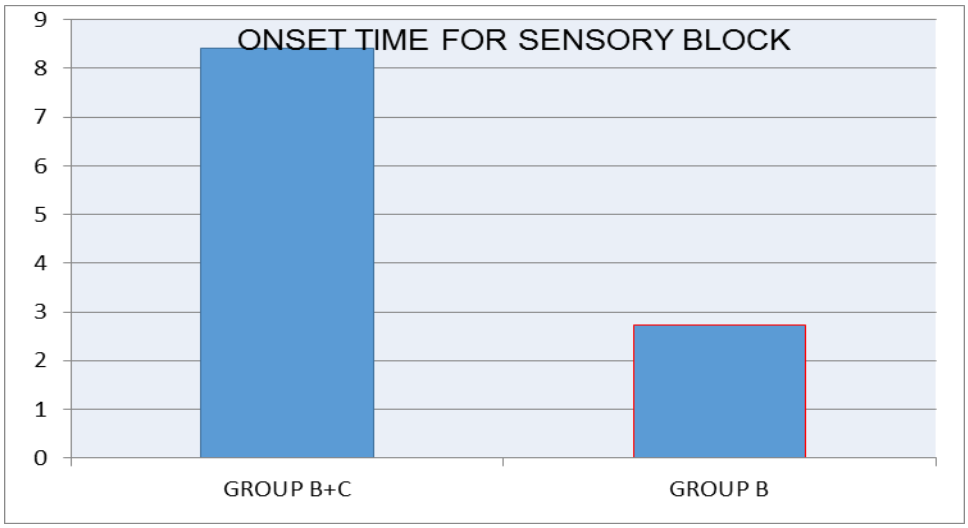
Variable	Group	N	Mean	SD	P-value
	Group B+C	50	8.42	2.46	**<0.001**
	Group B	50	17.14	2.74	

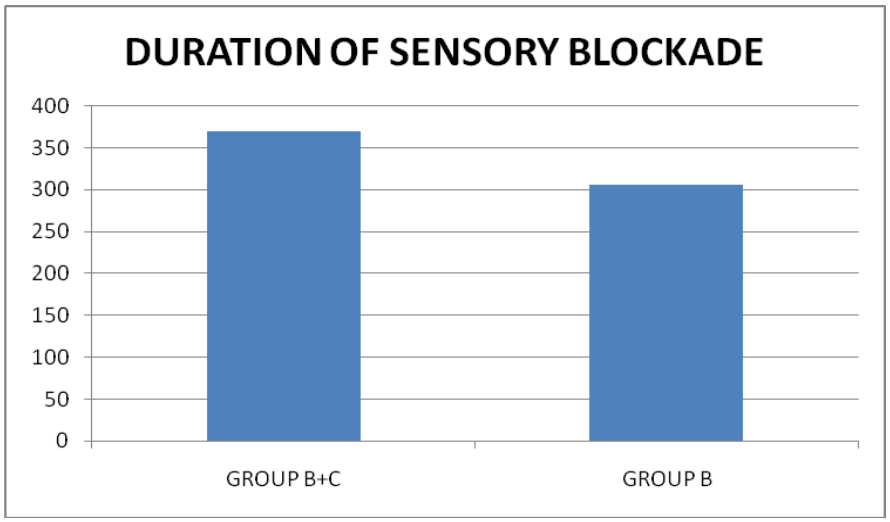
Table 5: ONSET TIME FOR MOTOR BLOCKADE

Variable	Group	N	Mean	SD	P-value
MOT	Group B+C	50	18.12	3.56	**<0.001**
	Group B	50	25.68	3.54	

Table- 6: DURATION OF SENSORY BLOCKADE

Variable	Group	N	Mean	SD	P-value
DOSB	Group B+C	50	369.40	27.80	**<0.001**
	Group B	50	306.60	17.57	





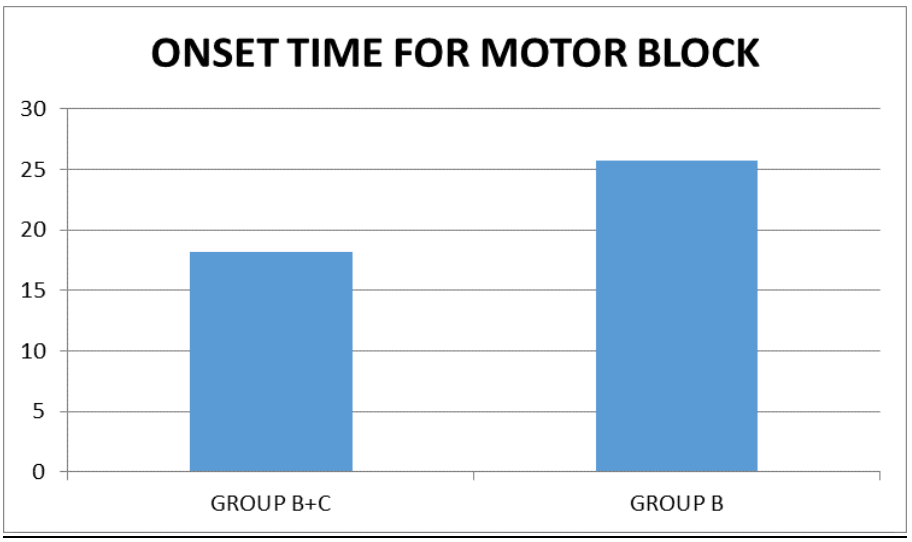


Table -7: DURATION OF MOTOR BLOCKADE

Variable	Group	N	Mean	SD	P-value
DOMB	Group B+C	50	407.60	25.84	**<0.001**
	Group B	50	359.20	19.15	

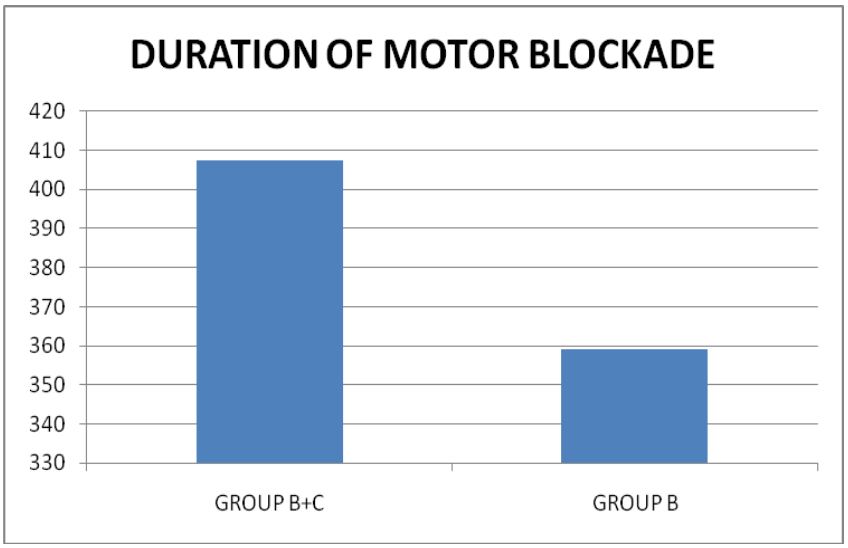


Table – 8: DURATION OF ANALGESIA

Variable	Group	N	Mean	SD	P-value
DOA	Group B+C	50	447.70	43.04	**<0.001**
	Group B	50	382.20	17.41	
Total		**145**			

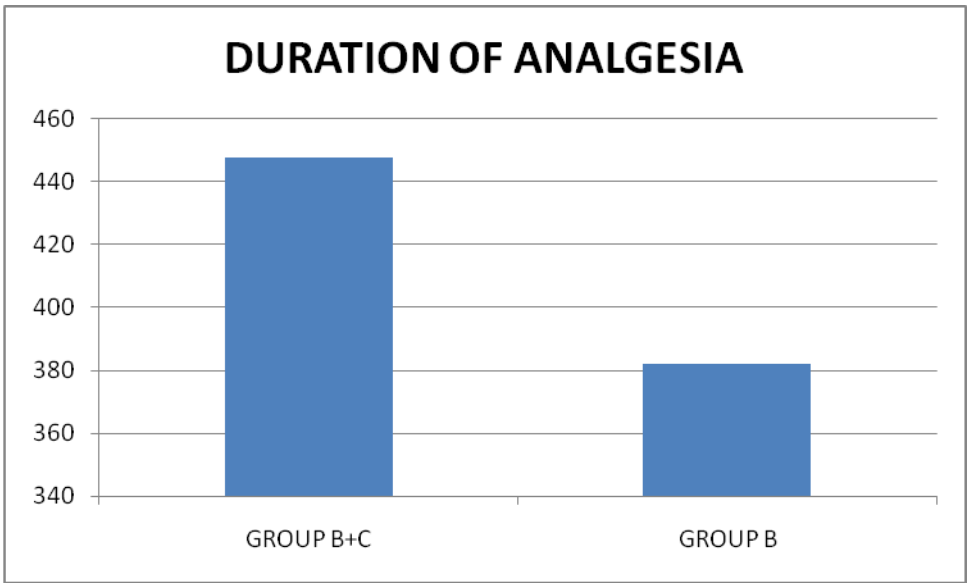
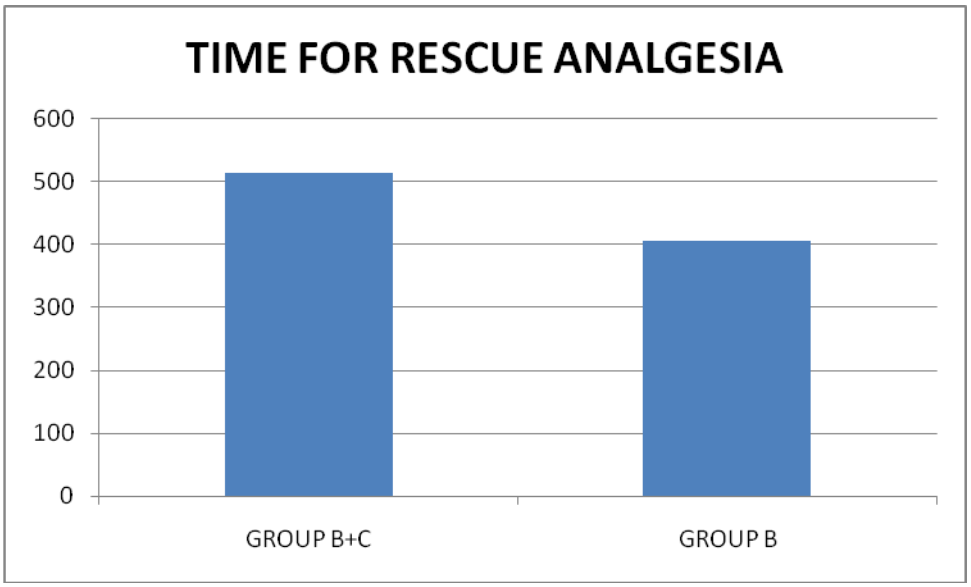


Table- 9: TIME FOR RESCUE ANALGESIA

Variable	Group	N	Mean	SD	P-value
TORA	Group B+C	50	514.80	45.50	**<0.001**
	Group B	50	406.20	16.15	



10: SYSTOLIC BLOOD PRESSURE

SBP	Group B+C			Group B			P-value
	n	Mean	SD	n	Mean	SD	
at 0min	50	126.20	9.45	50	125.80	9.28	.831
at 15min	50	125.80	9.28	50	123.60	10.38	0.476
at 30min	50	110.60	10.38	50	110.80	9.66	.921
at 45min	50	110.80	9.66	50	112.60	9.44	.348
at 60min	50	112.60	9.44	50	113.80	7.53	.484
at 90min	50	113.80	7.53	50	114.60	7.88	.605

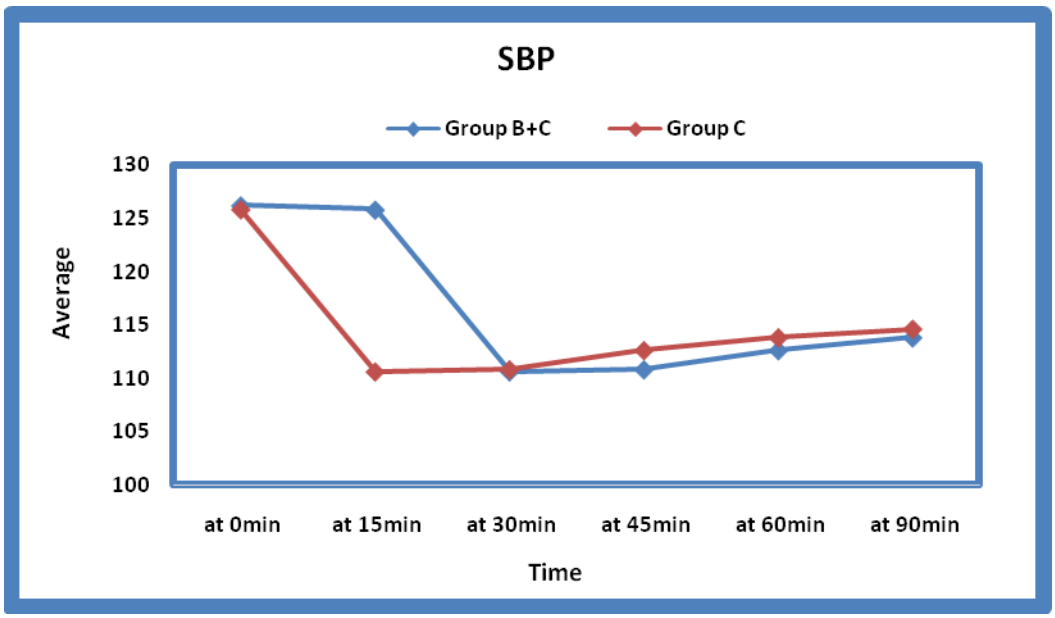


Table-1: DIASTOLIC BLOOD PRESSURE

DBP	Group B+C			Group B			P-value
	n	Mean	SD	n	Mean	SD	
/ 0min	50	78.20	6.91	50	78.80	7.18	.671
at 15min	50	78.80	7.18	50	77.80	6.74	0.476
at 30min	50	75.08	6.74	50	75.22	6.48	.916
at 45min	50	75.22	6.48	50	75.80	5.38	.627
at 60min	50	75.80	5.38	50	76.60	5.19	.451
at 90min	50	76.60	5.19	50	76.40	4.85	.843

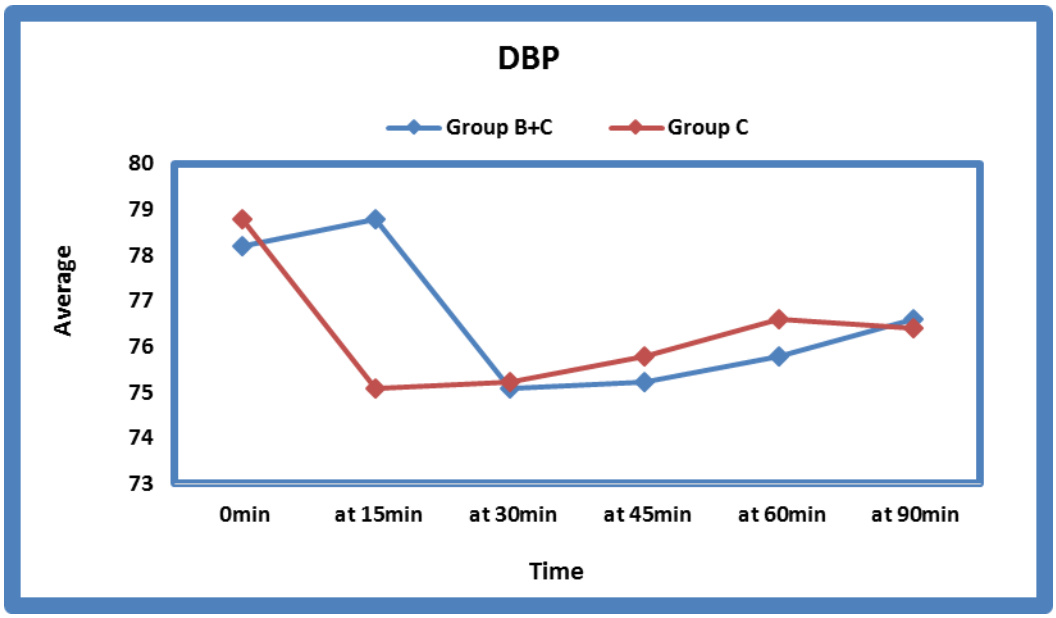
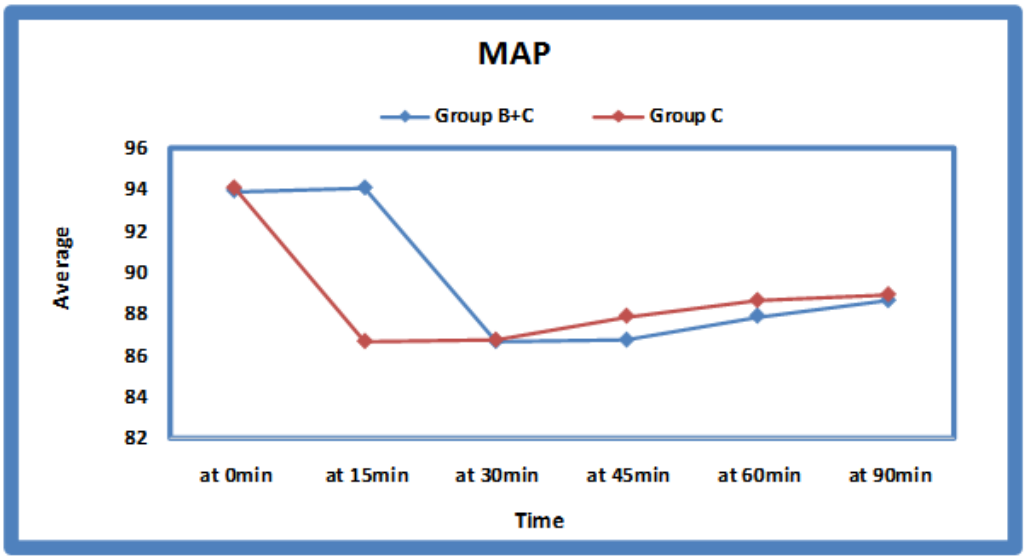
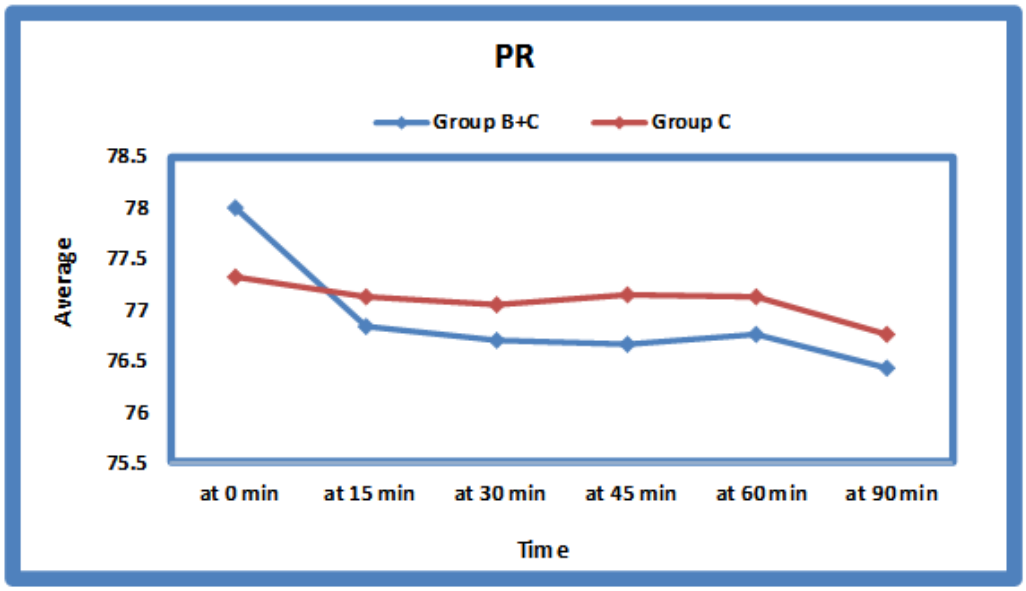


Table – 12: MEAN ARTERIAL BLOOD PRESSURE.

MAP	Group B+C			Group B			P-value
	n	Mean	SD	n	Mean	SD	
at 0min	50	93.98	6.07	50	94.12	6.36	0.91
at 15min	50	94.12	6.36	50	93.68	6.74	0.47
at 30min	50	86.68	6.74	50	86.74	5.94	.962
at 45min	50	86.74	5.94	50	87.90	4.86	.288
at 60min	50	87.90	4.86	50	88.66	4.65	.426
` at 90min	50	88.66	4.65	50	88.94	4.87	.769


MAP
Group B+C
Group C
Average
96
94
92
90
88
86
84
82
at 0min
at 15min
at 30min
at 45min
at 60min
at 90min
Time


PR
Group B+C
Group C
Average
78.5
78
77.5
77
76.5
76
75.5
at 0 min
at 15 min
at 30 min
at 45 min
at 60 min
at 90 min
Time

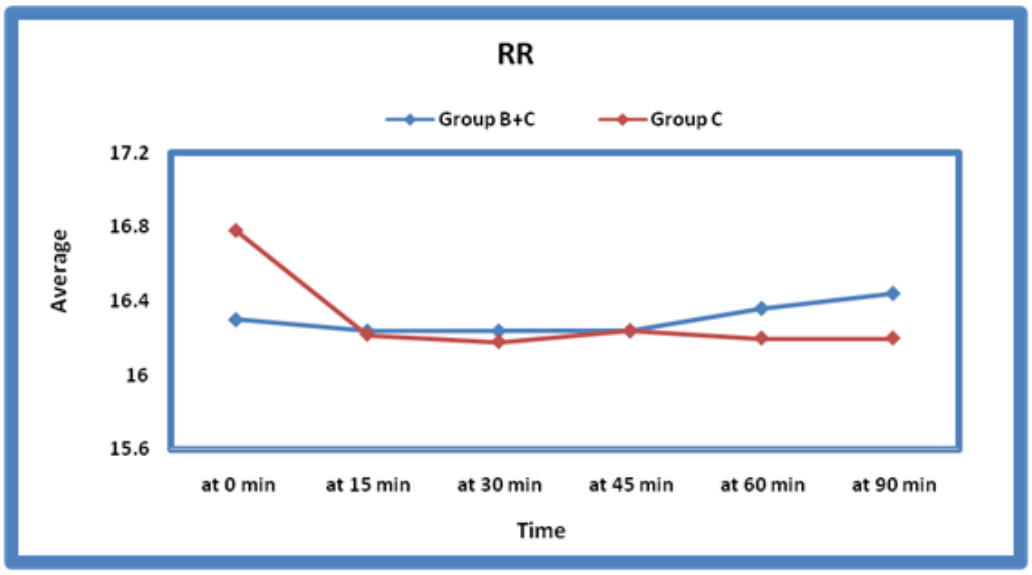

RR
Group B+C
Group C
Average
17.2
16.8
16.4
16
15.6
at 0 min
at 15 min
at 30 min
at 45 min
at 60 min
at 90 min
Time

Table 10: HEART RATE

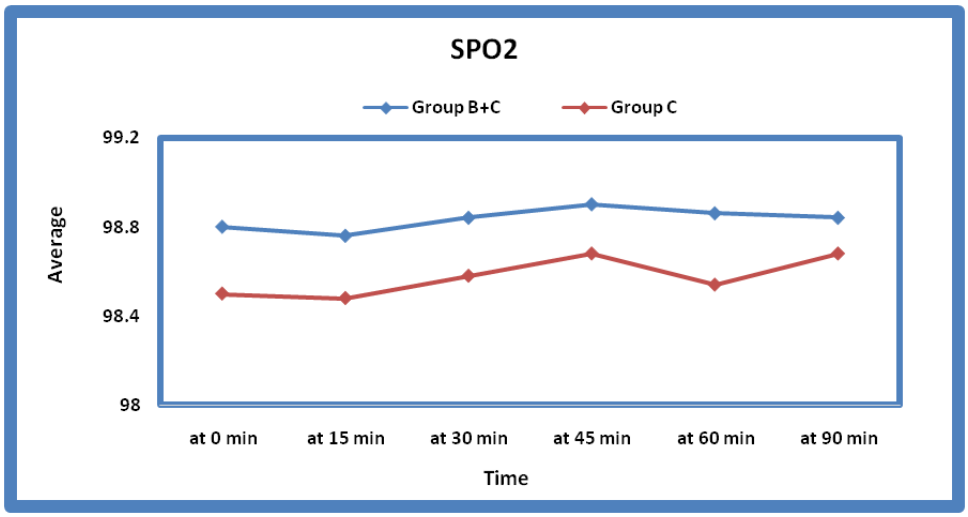
PR	Group B+C			Group B			P-value
	n	Mean	SD	n	Mean	SD	
at 0 min	50	78.00	2.58	50	77.32	1.24	.10
at 15 min	50	76.84	1.48	50	77.12	1.27	.31
at 30 min	50	76.70	1.39	50	77.04	1.28	.21
at 45 min	50	76.66	1.36	50	77.14	1.34	.08
at 60 min	50	76.76	1.39	50	77.12	1.26	.18
at 90 min	50	76.42	2.37	50	76.76	1.74	.42

Table 11: RESPIRATORY RATE

RR	Group B+C			Group B			P-value
	N	Mean	SD	N	Mean	SD	
at 0 min	50	16.30	0.46	50	16.78	1.20	0.09
at 15 min	50	16.24	0.43	50	16.22	0.51	.83
at 30 min	50	16.24	0.43	50	16.18	0.52	.53
at 45 min	50	16.24	0.48	50	16.24	0.52	1.00
at 60 min	50	16.36	0.63	50	16.20	0.45	.15
at 90 min	50	16.44	0.73	50	16.20	0.40	.05

Table-12: SPO_2

SPO2	Group B+C			Group B			P-value
	n	Mean	SD	n	Mean	SD	
at 0 min	50	98.80	0.86	50	98.50	0.81	.076
at 15 min	50	98.76	0.80	50	98.48	0.99	.124
at 30 min	50	98.84	0.87	50	98.58	0.91	.145
at 45 min	50	98.90	0.81	50	98.68	0.91	.207
at 60 min	50	98.86	0.86	50	98.54	0.89	.069
at 90 min	50	98.84	0.87	50	98.68	0.79	.338



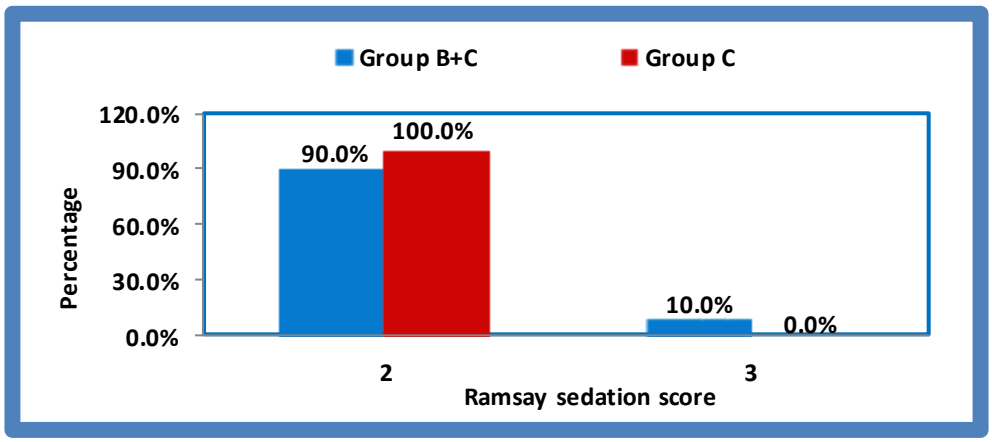


Table 13: RAMSAY SEDATION SCORE

Ramsay sedation score	Group B+C		Group B		P-value
	Count	%	Count	%	
2	45	90.0%	50	100.0%	0.06
3	5	10.0%	0	0.0%	
Total	50	100.0%	50	100.0%	

V. Discussion

Supraclavicular brachial plexus block is an effective, time-tested regional anesthetic technique for surgeries of upper extremities. It is not only an excellent alternative, but also offers several perioperative advantages over general anaesthesia like reduced stress response,less blood loss, provides superior surgical conditions, provides optimal postoperative analgesia and reduces the incidence of postoperative nausea and vomiting, providing early ambulation and reduced length of hospital stay, leading to satisfactory patient acceptance and improved clinical outcomes.

5.1 Selection of study drugs:

To improve block characteristics and prolong the duration of postoperative analgesia, many adjuvants are added to local anesthetics in peripheral nerve blocks. Various studies have shown that addition of nonopiate adjuvants like clonidine, dexmedetomidine (alpha two agonists) and opioids like morphine, fentanyl, butorphanol (opioids) to the local anesthetic mixture in peripheral nerve blocks prolonged the duration of analgesia, but the results have been inconclusive.

The mechanism of action of clonidine on peripheral nerve has been mentioned in basic studies but has failed to be translated clinically.

Mostly accepted theories for the mechanism of action are alpha two mediated vasoconstriction, centrally mediated analgesia through action on locus ceruleus, and spinal component through action on substantial gelatinosa.

However, recent studies state that the peripheral effects of clonidine are not due to its action on alpha two receptors but through inhibition of hyperpolarization-activated cation current (I_h)[41]

This function is typically useful to restore the resting membrane potential of a hyperpolarized nerve to make the nerve susceptible to the next action potential.

The inhibition of I_h current caused by clonidine is more profound on C fibers (pain) than on A alpha (motor) fibers making the effects of the drug more sensory-specific. The present study was conducted in General Hospital, attached to Siddhartha Medical College, Vijayawada. 100 ASA I and II patients undergoing elective upper limb surgery lasting more than 30 minutes were included in the study. Patients were divided into two groups of 50 each (Bupivacaine+clonidinegroup &Bupivacaine group). Group B+ C received brachial plexus block with 40 ml of 0.25% Bupivacaine and 2µg /kg body weight Clonidine. Group B received brachial plexus block with 40 ml 0f 0.25% Bupivacaine. Parameters observed include the onset of sensory blockade, the onset of motor block, duration of sensory blockade, duration of motor blockade, duration of analgesia, time for rescue analgesia and any untoward side effects.

5.2 Demographic Data:

In the present study, the subjects were predominantly below 50 yrs of age. The mean age group in group B+C was 40yrs, and that of group B was 37 yrs.

According to Susmitha Chakraborthy and Jayanthi et al[24].,2010 the mean age in clonidine + bupivacaine group was 41.65 years, and bupivacaine group was 41.70yrs

According to Kulkarni A et al[25]., 2012, the mean age was 43.56±5.34 years in the study group and 43.02±6.75 years in the control group.

In a study conducted by Dr.Yennawar et al[26], 2017, the mean age group of the study group was 30years and in that of the control group was 29.6 years.

In a study conducted by Kumkum Gupta et al[27]., 2018, the mean age in the study group was 36.4 ±12.4 years and in the control group was 37.3± 9.3 years.

In the present study the males were 68% in group B+C and 76 % in group B. There was a male preponderance.

The male preponderance in the study and control groups was also seen in the following studies

Susmitha Chakraborty et al[24]., 2010,

Kulkarni et al[25].,2012,

Dr. Yennawar et al[26]., 2017,

Dr. Kumkum Gupta et al[28].,2018.

5.3 BLOCK PARAMETERS

Onset Time Of Sensory Block :

In the present study, the mean onset time for sensory blockade was 8.42 ± 2.46 minutes in group Clonidine plus bupivacaine whereas it is 17.14 ± 2.14 minutes in group Bupivacaine alone.

These results are in concurrence with

The comparative study conducted by Susmita Chakraborty, Jayanta Chakrabarti and Sabyasachi das[24] ., 2010, titled Effect of clonidine as an adjuvant in bupivacaine-induced supraclavicular brachial plexus block: A randomized control trial, showed that the onset time in Clonidine group was 10.6 ± 1.36 min and that of bupivacaine alone was 18.1 ± 1.36 min. These results are similar to this study.

Dr.Kulakarni A[25], Tarkase A S, and Chaudari SA conducted a study in 2012, which showed the onset time of a sensory block in clonidine group were 10.4±0.48 minutes and in bupivacaine group was 17.3±1.73 minutes which is also in concordance with the present study.

In a study conducted by Ilango Ganesan[28], Vasantha Geetha R and Arunachalam R, 2016, there was the earlier onset of sensory block in clonidine group with mean time being 8.40 ± 0.82 minutes when compared to 12.00 ± 1.97 minutes in bupivacaine group. These results are also in concordance with our present study.

Prashant Sirohiya[29], Kiwi Mantan, H. Rehman, Meera Kumari, Vishal Devra, Raghvendra Singh, 2016, also conducted a similar study which concluded earlier onset of sensory blockade in clonidine group. i.e., clonidine group has a mean onset of the sensory block of 4.97 ± 2.19 minutes, and bupivacaine group has a sensory block onset time of 11.67 ± 4.13 minutes. This also supports our present study.

Onset Of Motor Blockade:

In the present study, the onset time of motor blockade (taken as point 1 on modified Bromage scale for upper limb), in group clonidine plus bupivacaine was 18.12 ± 3.56 minutes when compared to 25.68± 3.54 minutes in bupivacaine only group. This indicates there is the earlier onset of motor blockade upon addition of clonidine to bupivacaine in supraclavicular brachial plexus block.

The comparative study conducted by Susmita Chakraborty[24], Jayanta Chakrabarti and Sabyasachi,2010, das showed earlier onset of motor block in clonidine plus bupivacaine group, i.e., 10.±1.36 minutes when compared to 18.1 ±minutes in bupivacaine only group similar to our present study.

Dr.S D Yennawar[26] and Dr.Anand P satkar, 2016, conducted a study which showed the onset time of the motor block in clonidine plus bupivacaine group was 8.3 minutes when compared to 16.8 minutes in that of bupivacaine alone group.

According to Prashant Sirohiya[29], Kiwi Mantan, H. Rehman, Meera Kumari, Vishal Devra, Raghvendra Singh,2016, the onset time of a motor block in clonidine plus bupivacaine group was 6.03 ±3.89 minutes when compared to 22.23±2.83 minutes in that of bupivacaine alone group.

However, Daniel M. Popping[23],2009, had results which disagree with the present study, as a time for onset of motor block, quantified by using the Bromage scale. In the control group mean onset time of motor block was 18.3 minutes and Clonidine had no significant impact on onset time.

Duration Of Sensory Blockade:

In the present study the sensory blockade duration in group clonidine plus bupivacaine was 369.89 ± 17.80 minutes and in that of group bupivacaine alone is 306.60 ± 17.57 minutes

Susmita Chakraborty[24], Jayanta Chakrabarti and Sabyasachi,2010, das the duration of sensory block in group clonidine plus bupivacaine was more when compared to bupivacaine alone. That is in study group 279 ± 29.98 minutes the duration of sensory block was and in control group duration of block was 116.0 ± 17.16 minutes.

Prashant Sirohiya[29], Kiwi Mantan, H. Rehman, Meera Kumari, Vishal Devra, Raghvendra Singh the duration of sensory block in the study group was 474 minutes, and that of the control group was 285.5 minutes. these results were similar to our study

Gabriella Iohom, 2005,in his study found that the duration of sensory block was longer in Clonidine group compared with placebo 275 ± 75 versus 163 ±57; *P*= 0.04, these observations were similar to the present study.

According to Ilango Ganesan, Vasantha Geetha R and Arunachalan R 2016, the duration of sensory block in study group is446 ± 13.91 minutes when compared to 328.95±34.13 minutes in the control group.

Duration Of Analgesia:

In the present study, the duration of analgesia is 447.70 ±43.04 minutes in group clonidine plus bupivacaine which is more than in that of group bupivacaine alone that is 382.20± 17.41 minutes.

This prolongation of analgesic effect by using clonidine as an adjunct to brachial plexus block via supraclavicular approach is also noted in several studies.

Susmita Chakraborty, Jayanta Chakrabarti, and Sabyasachi das,2010, study stated that the duration of analgesia in the study group was 415.4±38.18 minutes which was more than the duration of analgesia observed in control group which was 194.2± 28.74 minutes. The results of this study are comparable to the present study.

In the paper written by Dr.Kulakarni A, Tarkase A S and Chaudari SA,2012, stated that the duration of analgesia in the study group was 386±38 minutes when compared to 198 ±28 minutes in the control group. These results are also by our present study.

Dr.S D Yennawar and Dr.Anand P Satkar,2017, conducted a similar study in which they found that the duration of analgesia in the study group was 822 minutes. The duration of analgesia in the control group was 300 minutes. The actual duration of analgesia was more in this study when compared to our present study. But this study also stated that addition of clonidine prolonged the duration of analgesia when added as an adjunct to bupivacaine for brachial plexus block through the supraclavicular approach

Prashant Sirohiya, Kiwi Mantan, H. Rehman, Meera Kumari, Vishal Devra, Raghvendra Singh,2016, the duration of analgesia in the study group was 331.0±98.04 minutes, and in the control group was 550.17±182.50 minutes. Their observations were similar to the present study.

Duration Of Motor Blockade:

The motor blockade was assessed by a modified Bromage scale for the upper limb. In the present study, The duration of the motor blockade was noted as the time taken form the onset of motor block (point 1) till complete recovery of muscle power (point 0). In clonidine plus bupivacaine group, it was 407.60±25.84 minutes and 359.20 ± 19.15 minutes in bupivacaine only group. The present study showed that the addition of clonidine to supraclavicular brachial plexus block increased the duration of motor blockade.

In a study conducted by Susmita Chakraborty, Jayanta Chakrabarti and Sabyasachi das,2010, the duration of motor block in study group 330.4±31.48 minutes and control group were 144.8±17.31minutes. These results are comparable with the present study.

According to Sirohiya P, Mantan K, Rehman H, Kumari M, Devra V, and Singh R, 2016, the duration of motor block was 515.3±17.66 minutes in the study group and 307.50±10.21 minutes in control group. The results were similar to the present study.

According to Ilango Ganesan et al.2016, the duration of motor block in the study group was 396.30±14.92 minutes and in the control group was 299±23.22 minutes. These results are similar to the present study.

Dr.S D Yennavar and Dr. Anand P satkar,2017, conducted a similar study in which the duration of the motor blockade in the study group was 350 minutes and in the control group was 160 minutes. These results were similar to results obtained in our present study.

Time For Rescue Analgesia:

It is taken as the time from onset of block till the patient complains of unbearable p in and requests for analgesic or VAS score > 5.

Patients were given injection tramadol 100 mg diluted in 10 ml NS, intravenously.The time for rescue analgesia in our study was 514.80±45.50 minutes in clonidine plus bupivacaine group, and it was 406.20±16.15 minutes in bupivacaine only group. This showed that addition of 2 mcg per kg of clonidine to bupivacaine not only the prolonged duration of analgesia but also increased the time required for a rescue analgesic administration and also the number of rescue analgesic administrations in first 24hours of the postoperative period.

According to Bernard et al[17]. in their study Clonidine reduced the use of supplementary intravenous anesthetic agents for surgery and produced dose-dependent prolongation of analgesia, It reached a mean of 770 min (range, 190-1440 min) for the largest dose 300µ for the patient to request for analgesic, which matches well with our study.

According to Murphy et al., Clonidine provided an analgesic effect that lasted as long as 492 minutes which is twice the duration of placebo group 260 minutes. The present study observations concur well with the study conducted by Eledjam et al. in the supraclavicular block with Clonidine using the dose of 150 µg and 40 ml Bupivacaine of 0.25 %. The analgesia produced with the addition of Clonidine was longer and the time for rescue analgesia was 994.2 ± 34.2 minutes compared to control group 728.3 ± 35.8 minutes.

During the present study, it was noticed systolic, diastolic as well as mean arterial blood pressure was decreased but none of the patients had hypotension (defined by the decrease in blood pressure by 20 %). And maintained the hemodynamic parameters well within the normal range. The hemodynamic effects were similar to study conducted by Susmita Chakraborty et al., 2012, P. Sirohiya et al.,2016, Eisenach JC et al[7], Culebras X et al. [19], and Dr. Yennawar et al., 2017.

In the present study, pulse rate decreased by six beats, but none of the patients had clinical bradycardia (decrease in basal pulse rate by 20 %). Which is similar to study conducted by Susmita Chakraborty et al., 2010, P.Sirohiya et al.,2016, Eisenach JC [7] et al., Culebras X et al[19], and Dr. Yennawar et al., 2017.

Also in the present study, there was no excessive sedation in either of groups, and Ramsay Sedation score[5] was 2 in both the groups.

VI. Conclusion

The addition of Clonidine to Bupivacaine solution for brachial plexus block can modify the action of the local anesthetic solution by its local action. The dosage 2µ/kg body weight used in the study significantly increased the duration of analgesia and muscle relaxation. There were no clinically significant side effects noticed. Hence it is concluded that Clonidine can form a useful adjuvant for Bupivacaine when used for brachial plexus block. Further studies with double blinding randomization, which was not done in the present study, may help much more to establish this fact

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