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Original Research Article

Comparison of Efficacy of Clonidine & Fentanyl as Adjuvants to Local Anaesthetic in Ultrasound Guided Supraclavicular Brachial Plexus Block for Upper Limb Surgeries

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Conflict of interest: Nil

Abstract

Introduction: Regional Blocks Produced With Adjuncts Added To Local Anesthetics Are Of Higher Quality. The Aim Of Present Study Is To Compare The Efficacy Of Clonidine & Fentanyl As Adjuvants To Local Anesthetic In Ultrasound Guided Supraclavicular Brachial Plexus Block For Upper Limb Surgeries.

Methods: The Present Comparative Study Was Done At A Tertiary Care Centre Among Patients Admitted To Hospital For Upper Limb Surgeries During One Year Duration Period Of Study. Total 50 Subjects Were Selected By Random Sampling & Were Divided Into Two Groups Of 25 Patients In Each Group Named As Group C & Group F. Version 25.0 Of The Statistical Product For Social Sciences (SPSS) Was Used To Analyse The Data.

Results: When Sensory And Motor Block Data Were Examined Between The Two Groups, It Was Discovered That Group F Experienced Faster Onset And Completion Of Sensory & Motor Block Than Group C. When Comparing Group C To Group F, The Length Of The Sensory & Motor Block Was Longer In Group C. Group C Has Experienced Analgesia For A Longer Duration Of Time Than Group F.

Conclusion: When Used As An Adjuvant, Fentanyl Has An Advantage Over Clonidine In That It Causes Sensory & Motor Block To Occur More Quickly Whereas Sensory & Motor Block With Clonidine Lasts Longer.

Keywords: Clonidine, Fentanyl, Local Anesthetics, Supraclavicular Brachial Plexus Block.

Introduction

A common and extensively used regional nerve block procedure for perioperative anesthesia during upper limb surgery is the supraclavicular brachial plexus block. It avoids the side effects of the anesthetics used during general anesthesia, the strain of the laryngoscopy and the need for tracheal intubation. This method is very helpful for patients who have different types of cardio-respiratory problems. [1]

Local anesthetics provide four to eight hours of analgesia. The main problem with upper limb blocks is that they don't provide very long postoperative analgesia, which makes them ineffective for patients who need postoperative analgesia. [2, 3] Therefore, adding an adjuvant to lengthen the supraclavicular brachial plexus block and reduce the amount of local anesthetics is a safer and better strategy to prolong analgesia. [4–7] Adjuvants include morphine, tramadol, magnesium sulfate, epinephrine, dexamethasone, ketamine, neostigmine, fentanyl, & clonidine. [8]

Short-acting opioids like fentanyl are frequently added to local anesthetic as an adjuvant to extend the duration of sensory & motor blockage and to provide analgesia following surgery. [9] Clonidine is an alpha 2 adrenergic agonist that has gained popularity because of its centrally mediated activity, which also helps to extend the duration of nerve block. [10] Increase in the duration of motor & sensory block was observed on the addition of clonidine & fentanyl with local anesthetics in various clinical trials. [11,12]

While supraclavicular blocks guided by ultrasonography are commonly utilized in upper

limb surgery, there is a paucity of information contrasting the effectiveness of local anesthetics with fentanyl or clonidine in research or clinical settings.

Hence the present study was done to compare the efficacy of Clonidine & Fentanyl as adjuvants to local anesthetic in Ultrasound guided Supraclavicular brachial plexus block for Upper limb surgeries.

Material & Methods

The current comparative study was conducted over the course of a year among patients admitted to the hospital for upper limb surgeries at a tertiary care institution. Before the study started, the institutional ethical committee granted its approval. Patients were informed about the entire treatment before providing their informed consent.

A total of fifty people were chosen at random and split into two groups, Group C & Group F, each with twenty-five patients. Patients were chosen based on the inclusion & exclusion criteria listed below:

Inclusion criteria

1. Patients having ASA status as 1 & 2.
2. Patients between the age group of 18 - 55 yrs.
3. Patients having body weight between 50 - 80kgs.

Exclusion criteria

1. Patients having cardiovascular, respiratory & neurological disorders.
2. Patients having allergy to study drugs.
3. Patients having coagulation abnormalities.
4. Patients on anticoagulant drugs.

Ultrasound guided in plane technique was used. Group C was given 15ml 0.5% Bupivacaine + 15ml 2% Lignocaine with adrenaline 1:2,00,000 + Clonidine 1mcg/kg while Group F was given 15ml 0.5% Bupivacaine + 15ml 2% Lignocaine with adrenaline 1:2,00,000 + Fentanyl 1mcg/kg. Monitoring of SPO2, HR, MAP, ECG, & RR was done. Sensory & motor block were assessed at 5, 10, 15, 20 & 30 min after block & at 0, 2, 4, 6, 8 &10 hours after surgery. Sensory block was assessed by loss of pinprick sensation in the dermatomes supplied by brachial plexus & motor block assessed by Bromage 0-3 scale. Sedation was checked at 5,10,15,20 & 30 min of block & 2 hours of surgery by Ramsay sedation score –

Definition	Score
Patient is anxious and agitated or restless or both	1
Patient is cooperative, oriented, and calm	2
Patient responds to commands only	3
Patient exhibits brisk response to light glabellar tap or loud auditory stimulus	4
Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus	5
Patient exhibits no response	6

Data was entered into an MS Excel master chart. Version 25.0 of the Statistical Product for Social Sciences (SPSS) was used to analyze the data. Qualitative variables were expressed as numbers (percentages), while continuous data were shown as mean ± SD. The independent t-test was used to compare data that was normally distributed. The student t-test & the chi-square test were used as needed. To assess the degree of significance, the p-value was calculated. P values < 0.05 were considered significant, & P values < 0.001 were considered highly significant.

Results

Two groups were compared on the basis of age, gender, & weight & ASA physical status as shown in table 1. No statistically significant difference was seen between the two groups with respect to all parameters (p>0.05).

Table 1: Showing comparison of demographic parameters among two groups

Variable	Group C	Group F	P value
Age (years)	44.68±10.32	43.32±11.65	0.783
Male	10 (40)	8 (32)	0.484
Female	15 (60)	17 (68)	
Weight (kg)	64.38±8.7	63.25±9.10	0.972
ASA I	16 (64)	14 (56)	0.468
ASA II	9 (36)	11 (44)	

When sensory & motor block data were examined between the two groups, it was discovered that group F experienced faster onset and completion of sensory & motor block than group C. Group C experienced a longer duration of sensory & motor block than group F as shown in table 2.

Table 2: Showing Comparison of sensory & motor block parameters between the two groups (in minutes)

Nerve block	Group C	Group F	P value
Sensory block			
Time of onset	7.11±0.87	4.68±0.25	0.001
Time of completion	21.90±1.5	18.32±0.96	0.001
Total duration	526.34±20.34	445.12±19.76	0.001
Motor block			
Time of onset	8.87±0.96	6.43±0.65	0.001
Time of completion	27.21±1.25	24.13±1.26	0.001
Total duration	469.1±21.24	394.13±19.23	0.001

Comparison of mean SPO2, HR, MAP, RR among two groups during the procedure was done & it was found that none of the results were significant (p>0.05) as shown in table 3.

Table 3: Showing comparison of mean SPO2, HR, MAP, RR among two groups during the procedure

Variable	Group C	Group F	P value
SpO2	95.36±4.6	94.56±4.7	0.284
HR (minutes)	76.34±6.4	80.32±8.7	0.086
MAP (mm of Hg)	87.33±13.2	86.43±12.5	0.807
RR (minutes)	17.34±4.9	18.35±6.2	0.525

Comparison of duration of analgesia between the two groups was done on a 0-10point VAS scale and value > 4 was considered as need for providing rescue analgesia. It was found that group C had a longer duration of the period of analgesia in comparison with group F with significant results as shown in table 4.

Table 4: Showing comparison of duration of analgesia between the two groups (in minutes)

Variable	Group C	Group F	P value
Duration of analgesia	543.43± 20.16	460.45± 21.06	0.001

Comparison of sedation during the block and after surgery was done and it was found that results of the two groups were comparable and showed non-significant results as shown in table 5.

Table 5: Showing comparison of sedation during the block & after surgery

Time interval	Group C	Group F	P value
5 minute	1.05±0.5	1.01±0.1	0.691
10 minute	1.23±0.23	1.09±0.3	0.171
15 minute	1.74±0.77	1.34±0.7	0.060
20 minute	2.62±0.23	2.29±0.9	0.082
30 minute	4.01±0.24	3.67±0.9	0.074
Immediately after surgery	1.43±0.43	1.41±0.45	0.873
2 hours after surgery	3.23±0.46	3.05±0.57	0.225

Discussion

An inevitable part of the recovery after surgery is pain. While pain serves a teleological purpose by alerting patients to possible harm, it also negatively impacts the body's neurological, cardiovascular, gastrointestinal, & respiratory systems. [13] Therefore, a successful pain management program following surgery is crucial to the patient's best outcome.

Peripheral nerve blocks are being used in postoperative & chronic pain management in addition to the operating room. Rapid onset, thick anesthesia, & postoperative analgesia are typical characteristics of peripheral nerve block. Numerous research studies have revealed that the duration of local anesthetics in a supraclavicular brachial plexus block is extended by the use of different adjuncts. Fentanyl & clonidine are two chemicals that have been used independently in a number of trials to extend analgesia. [14,15] In their investigation, Tejwant Rajkhowa et al [16] found that when Fentanyl was combined with Ropivacaine, the duration of sensory & motor blockage was substantially longer than with Ropivacaine alone. Similarly, Nama Nagarjuna Chakravarthy et al's study on Clonidine [15] found that when Clonidine is combined with Bupivacaine, the block's duration is extended relative to Bupivacaine alone. Hence the present study was done to compare the efficacy of Clonidine & Fentanyl while given as an adjuvant with local anesthetics. We used Ultrasound guided technique as it increases the rate of success of the block together with reducing complications such as pneumothorax & arterial puncture. [17]

The age, gender, weight, & ASA physical status of the two groups were compared in our study, & the findings were not statistically significant. When comparing group F to group C, there was a faster start and finish of the sensory and motor block. When comparing group C to group F, the length of

the sensory & motor block was longer in group C. Our investigation aligns with the findings of Jafa et al., who discovered that the supraclavicular brachial plexus block induced a reduction in both the block onset time (10.2 ± 1.15 min) & total block time (21.8 ± 4.6 min) upon the addition of 75 µg fentanyl. [18] According to Moharari et al., the administration of 1.5% lidocaine solution along with 75µg fentanyl sped up the onset of sensory & motor blockade during interscalene block. [19] In this investigation, fentanyl may have accelerated the start of sensory and motor blockage by blocking nerve conduction in the spinal roots, according to theories about potential processes. This suggests that because of axonal transport or diffusion into the epidural & subarachnoid areas, the effects of opioids injected into the perineural sheath may be more central. According to Ahmed's study, the clonidine group had sensory block for 558 ± 66.4 min & motor block for 574.3 ± 40.9 min, respectively, longer than the fentanyl group, which had sensory block for 364.5 ± 33.3 min & motor block for 388.2 ± 34.8 min. [20]

In our study, Group C experienced analgesia for a longer period of time than Group F, with statistically significant outcomes. These outcomes were similar to a research by DiptiMundhada, et al. [21] that included 70 patients between the ages of 18 & 60 who were split into two groups of 35 patients each at random. 25 milliliters of 0.5% Bupivacaine plus 1µg of clonidine per kilogram of body weight were given to Group C, while 25 milliliters of 0.5% Bupivacaine plus 1µg of fentanyl per kilogram. For the clonidine & fentanyl groups, the mean duration of analgesia was 13 hours 13 minutes ± 52 minutes & 11 hours 37 minutes ± 1 hour 7 minutes, respectively. The hemodynamic parameters in our study were similar between the two groups ($P > 0.05$) as seen in the research conducted by DiptiMundhada et al. [21] The clonidine group showed a higher sedation score than the fentanyl group, although there was no significant difference between the two groups ($P>0.05$). Our findings are consistent with a research by Shah Alam et al, which also found no discernible difference in the prevalence of sedation between the clonidine-bupivacaine group (40%) and the fentanyl-bupivacaine group (33%). [22]

We did not observe bradycardia or hypotension with alpha 2adrenoreceptor agonists as observed in some previous studies. [17] This could be due to use of ultrasound guided technique in our study.

Conclusion

Our research found that when used as adjuvants to local anesthetics in supraclavicular brachial plexus block for upper limb surgery, both clonidine & fentanyl lengthen the duration of sensory & motor block as well as the duration of analgesia without producing appreciable side effects. Fentanyl has an advantage over clonidine in that it initiates sensory and motor block faster but clonidine provides longer duration of postoperative analgesia.

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