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Effects of Clonidine as an Adjuvant to Ropivacaine for Brachial Plexus Block Via Axillary Approach

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Abstract

Brachial plexus block is the most popular technique to deal the upper limb surgeries. Clonidine, the prototype drug of this class is one of the most attractive adjuvants agents. It has analgesic and sedative action and also reduces the anaesthetic requirements without any respiratory depression.Therefore clonidine has been studied in this study to analyze it effects as an adjuvant to ropivacaine for axillary block in upper limb surgeries.After taking an informed and written consent, patients of ASA grade I & II were selected from the population admitted for various surgeries done below elbow mainly from orthopedic and plastic surgery departments, MLB Medical College, Jhansi. A total of 100 patients of either sex were included in the study.It was found that the degree of sedation was more in the clonidine group in the post-operative period but only during the early post-operative hours which needed no intervention. The 24 hour close monitoring of all the patients participated in the study revealed there was no significant increase in the sedation. It was concluded that the addition of 150 Ilg of inj.clonidine to 40ml (0.75%) inj.Ropivacaine, for brachial plexus block via axillary approach prolongs duration of motor block, sensory block and post-operative analgesia, with acceptable sedation and without an increased incidence of side effects.
Keywords: Brachial Plexus, Clonidine, Sensory Block, Sedation, Upper limb.

Introduction

Pain is perfect misery; the worst of all evils and excessive overturns all patients. (Jhon Milton: Paradise Lost).

The word anesthesia (Greek for an “without esthesia” perception) was given by Oliver Holmes in 1846 and since then this word act as coolant against fear of pain of surgery.The ether discovery of Morton, which he called “Lethion” was one of biggest landmark in the field of medical science & it was said to be the beginning of modern anesthesiology and correctly on the epitaph on his grave is engraved “before whom pain was a misery and after whom man has conquered pain”.[1]

Local anesthesia have their history as old as In 1855, Friedrich Gaedcke (1828-1890) became the first to chemically isolate cocaine, the most potent alkaloid of the coca plant. Gaedcke named the compound “erythroxyline”. In 1884 Austrian ophthalmologist Karl Koller (1857-1944) instilled a 2 % solution of cocaine into his own eye and tested its effectiveness as a local anaesthetic by pricking the eye with needles. His findings were presented a few weeks later at annual conference of the Heidelberg Ophthalmologist society.[2,3]

Generally operations on upper limbs are performed under general anesthesia, but due to increasing cost of anaesthetic agents and associated problems of operation theatre pollution, focus has been shifted towards regional anaesthetic technique, Moreover postoperative pain relief is an added advantage when using this technique. Patients undergoing regional anaesthetic procedures by pass the airway instrumentation which is most of the times very unpleasant to the patients.[4]

Brachial plexus block is the most popular technique to deal the upper limb surgeries. There are many approaches followed to achieve the brachial plexus block like supraclavicular approach, infraclavicular approach and inter scalene approach and also the axillary approach. But among all of them, the axillary approach to achieve the brachial plexus blocks the easiest technique.[5,6,7]

Complications associated with axillary approach are relatively lesser as compared with other techniques. Not Only the easy way but at the same time it is also the most consistent method for anaesthesia in surgeries below the elbow joint.

William Halsted (1852-1922) performed the first brachical plexus block. Using a surgical approach in the neck, Halsted applied cocaine to the brachial plexus.[8]

The first percutaneous supraclavicular block was performed in 1911 by German surgeon DiedrichKulenkampff (1880-1967). Just as his older colleague August Bier (1861-19479) had done with spinal anesthesia in 1898,. Georg Hirschel (1875-1963) described approach to the brachial plesus from the axilla.[9,10]

Among all, axillary block block is the mist distal block performed on the brachial plexus (escept for single nerve blocks in the arm of forearm). Because of its distal location the axillary block have negligible risks of the

respiratory compromise secondary to pneumothorax or phrenic nerve blockade. In addition, the peripheral location permits adequate arterial tamponade to be applied if an iinadvertent arterial puncture occurs.[11]

The main air of modern anaesthesia is not only limited to diminish pain during surgery but to maintain this period in convalescence too.

Limited duration of action and requirement of high doses are the two practical difficulties we come across when thinking about optimal post operative analgesia. Here comes the role of adjuvants. These adjuvants when combined with local anaesthesia improve quality of block.

The α-2 rece4ptor agonists are also assuming importance as adjuvant to local anaesthetic drugs. Indeed clonidine, the prototype drug of this class is one of the most attractive adjuvants agents. It has analgesic and sedative action and also reduces the anaesthetic requirements without any respiratory depression.[12]

Therefore clonidine has been studied in this study to analyze it effects as an adjuvant to ropivacaine for axillary block in upper limb surgeries.

Aims and objectives

The aims and objectives of this study were:

1- To study the effect of clonidine when added with ropivacaine for branchial plexus block via axillary approach in terms of-
   a. Onset of block.
   b. Duration of block
   c. Quality of block
2- Postoperative analgesia.
3- Effect on hemodynamic.

Material and methods

This single blind, prospective, randomized, placebo controlled study was conducted in Department of Anaesthesiology and Critical Care Medicine, MLB Medical College, Jhansi (UP).

Following the approval from ethical committee, patients were examined thoroughly and subjected to routine investigations including hemoglobin, TLC, DLC, RBS, Blood urea, serum creatinine and urine examination.

After taking an informed and written consent, patients of ASA grade I & II were selected from the population admitted for various surgeries done below elbow mainly from orthopedic and plastic surgery departments, MLB Medical College, Jhansi. A total of 100 patients of either sex were included in the study.

Patient selection

Inclusion criteria

After taking an informed and written consent, patients of ASA grade I & II were selected from the population admitted for various surgeries done below elbow mainly from orthopedic and plastic surgery departments of MLB Medical college, Jhansi. A total of 100 patients were included in the study, including male and female patients.

Exclusion criteria
1) Patients aged <18yrs. or >60yrs. 2) Patients having body weight <45kg.
3) Patients having peripheral neuropathy or hypersensitivity to local anaesthetic agents.
4) Patients having history of seizures.
5) Patients having bleeding disorders or receiving anti-coagulants.
6) Patients taking beta blockers.

All patients were subjected to a detailed history and clinical examination.

After a thorough preoperative screening, Patients were randomly assigned using "slips in a box technique" to one of the following groups. with each group consisting of 50 patients.

GROUP A: Patients were gIven 40ml Inj.Ropivacaine (0.75%) +lml (150J1gm) Inj.Clonidine
GROUP B: Patients were given 40ml Inj.Ropivacaine (0.75%) + lml of normal saline.

Advice to patient

Patients were fasted for 6-8 hrs and received no medication preoperatively.

Anaesthetic technique:

After shifting to the operation theatre, the monitors were applied and baseline pulse rate, blood pressure, respiratory rate and Sp02 were recorded. IV line was established with 18 Guaze cannula, patients were started infusion of Ringer's lactate solution and unifonn premedication of Inj.Midazolam 0.03mglkg (bodyweight) was given before perfonning the axillary block.

Statistical analvsis:

The data was analysed by SPSS(Statistical Package for Social Sciences) , software. Unpaired t-test was applied for demographic data, hemodynamic parameters, onset and duration of sensory and motor blockade and duration of analgesia. Fisher exact test was applied for assessment of quality of block.

Obserations and results

These patients were selected from patients admitted for surgeries done bellow elbow mainly from orthopaedic and plastic surgery departments, MLB Medical College, Jhansi. A total of 100 patients were included in the study, including male and female patients.

The study groups

On the basis of adjuvant added to Inj. Ropivancaine for auxiliary block, patients were divided into two groups, with each group containing 50 patients.

Group A (n=50)- Patients receiving 1 ml (150 μ.gm) of Inj. Clonidine added to 40 ml of 0.75% Inj. Ropivacaine.

Group B (n=50)- Patients receiving 1ml of Normal Saline added to 40 ml of 0.75% Inj. . Ropivacaine.

The data data obtained were analysed statistically and following observations were made-

TABLE – 1
Distribution of patients according to age

Age (in years)	Group A (n=48)	Group B (n=48)
20-25	8	10
36-30	21	16
31-35	10	13
36-40	5	4
41-45	4	5
MEAN ± S.D.	28.98± 5.86	29.36± 6.50

Table 1 shows age distribution of the patients. Majority of patients in both the groups belonged to 26-30 years of age. There was no significant difference between the mean age of patients in the two groups (p> 0.05)

TABLE – 2
Distribution of Sensory block (in min)

Age (in min)	Group A (in=48)	%	Group B (n=48)	%
450-470	0	-	15	31.25
471-490	0	-	24	50
491-510	0	-	9	18.75
511-530	0	-	0	-
531-550	0	-	0	-
551-570	14	29.16	0	-
571-590	27	56.25	0	-
591-610	7	14.58	0	-

MEAN ± S.D.	557.40± 13.47		457.8± 15.76	

Table 4 shows the distribution of duration of sensory block in the two groups.

Duration of sensory block was statistically significantly longer in group A than in group B (p>0.05).

TABLE – 3

Distribution of analgesia (in min)

Duration (in min))	Group A (n=48)	Group B (n=48)
540-570	0	10
571-600	0	30
601-630	0	8
631-660	0	0
661-690	0	0
691-720	0	0
721-750	3	0
751-780	21	0
781-810	24	0
Mean±SD	754.2±1820	567.6±22.91

Table 5 shows the distribution of duration of analgesia in the two groups.

Duration of total analgesia was significantly prolonged among the clonidine group patients, than the control group patients. When the duration was 754.2±18.20 mins for the clonidine group, it was 567.6±2291 mins for the control group patients, which is statistically highly significant. (p>0.001)

TABLE – 4
Distribution of motor block

Time (in min)	Group A	Group B
540-570	-	10
571-600	-	30
601-630	-	8
631-660	7	0
661-690	28	0
691-720	12	0
Mean±SD	655.5.2±20.28	548.1±19.66

Table 7 shows distribution of duration of motor block in the two group. In the majority of patients, the duration of motor block was between 661-690 min in group A and 540-57 min in group B.

Duration of the motor block was 655.5±20.28 mins for group A, where it was 548.1±19.66 for the group B.

It is observed that clonidine prolongs the motor block significantly when added to ropivacaine for brachial plexus block (p>0.05)

TABLE – 5
Mean systolic blood pressure at different time intervals

Time (in min)	Group A (Mean±S.D.	Group B (Mean±S.D.)
Basal	114.48±7.20	117.04±7.06
5	114.48±6.93	117.20±6.70
10	114.28±7.33	117.04±7.00
15	114.52±7.16	117.28±6.85
20	114.28±5.79	117.04±5.40
30	113.52±5.56	116.32±5.15
60	112.04±5.91	114.84±5.58
90	112.96±5.74	115.76±5.12
120	112.76±5.42	115.48±5.16

Table 8 shows the mean systolic pressure at different time interval in the two groups.

There was no appreciable drop in Systolic pressure seen in both the groups and the maximum drop in systolic pressure with reference to the basal value occurs around 60 minutes in both the groups.

TABLE – 6

Change in mean pulse rate (per min) at different time intervals

Time (in min)	Group A (Mean±S.D.	Group B (Mean±S.D.)
Basal	74.28±6.31	76.32±4.92
5	75.54±6.11	76.68±4.69
10	73.76±4.77	75.24±3.89
15	74.88±4.48	75.84±3.54
20	73.28±3.83	74.88±3.13
30	73.76±7.49	75.04±5.52
60	73.80±5.67	75.04±4.43
90	75.20±5.37	75.68±4.61
120	74.68±6.24	75.00±4.73

Table shows the change in mean pulse rate in the two groups at different time intervals.

The maximum decrease in mean pulse rate against the basal value was seen around 20 mins in both the groups, as the time somewhat coincides with the onset time of sensory bloc, we can explain the decrease in the pulse rate on the basis of pain relief.

Conclusion

The present study was conducted to compare the effects of clonidine as an adjuvant to ropivacaine. The onset time and duration of both sensory and motor blockade, duration of analgesia and as well as any unwanted adverse effects like hypotension, bradycardia and excessive sedation were noted.

Patients were divided into 2 groups

Group-A: Patients received inj. clonidine as adjuvant to InJ. Ropivacaine,
Group-B: Patients received normal saline added to InJ. Ropivacaine.

On the basis of the observations and their careful analysis, following conclusions have been drawn:

1) The onset of sensory block was showing no significant difference between the two groups.

-The sensory onset time is 20.9± 2.78mms for radial nerve In clonidine group where it is 21.8± 3.12 mins in the control group,

-Likewise it is 19.12 ± 2.48mins for median nerve in clonidine group and 19.38 ± 2.38mins in the control group,

-For ulnar nerve it was 18.48±1.52 mins in the clonidine group patients and 18.88±1.45mins in the control group patients.

Even though clonidine group showing an early onset, the difference is very narrow to establish a statistical significance ($p>0.05$).

2) Clonidine group patients experienced a statistically significant prolonged duration of the sensory block of 557.40+13.47 mins, than the control group patients who had 457.8+15.76 mms. ($p<0.001$).

3) Duration of analgesia was significantly longer in clonidine group than in control group ($p<0.05$).

4) Onset time for motor block was 20.56+3.78 mins for the clonidine group patients where it was 19.48+3.84 mins for the control group. Even though it seems the clonidine group lags behind, the statistical analysis fails to establish a significance between the difference.($p>0.05$).

5) Duration of the motor block was 655.5+20.28 mins for the clonidine group, when it was 548.1+19.66 mins for the control group. Which can be taken as clonidine prolongs the motor block significantly when added to

ropivacaine for brachial plexus block.($p<0.05$)

6) Changes in the hemodynamic parameters like pulse rate, systolic and diastolic blood pressures, and mean arterial pressure between the clonidine and control groups was statistically insignificant ($p>O.05$).

7) Even though few cases in both the groups experienced hypotension, bradycardia and nausea the degree of the incidence and problem was not severe. And statistically speaking the incidence and extent of adverse effects was insignificant. ($p>O.05$).

8) The degree of sedation was more in the clonidine group in the post operative period but only during the early post-operative hours which needed no intervention. The 24 hour close monitoring of all the patients participated in the study revealed there was no significant increase in the sedation .($p>0.05$)

So to conclude

"The addition of 150 Ilg of inj.clonidine to 40ml (0.75%) inj.Ropivacaine, for brachial plexus block via axillary approach prolongs duration of motor block, sensory block and post operative analgesia, with acceptable sedation and without an increased incidence of side effects, and any change in the onset times of sensory and motor blocks".

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