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A COMPARATIVE STUDY OF THE EFFECTS OF CLONIDINE AND DEXAMETHASONE WITH BUPIVACAINE IN SUPRACLAVICULAR APPROACH OF BRACHIAL PLEXUS BLOCK.

Anaesthesiology

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ABSTRACT

This study was done to compare the block characteristics and analgesic duration of equal amount (32 ml) of drug i. e 0.5% bupivacaine with either dexamethasone or clonidine for brachial plexus block by supraclavicular approach .

In our randomized prospective double blinded study, we have evaluated the effects on onset and duration of sensory and motor block among 2 groups-Bupivacaine (0.5% 30 ml) with Clonidine (150µg 1ml) and Bupivacine (0.5% 30 ml) with dexamethasone (8mg 2ml) in supraclavicular brachial plexus block named as Group BC and Group BD respectively. In each group volume was diluted upto 32 ml with normal saline.

Dexamethasone and Clonidine both when added to bupivacaine in supraclavicular brachial plexus block enhanced the onset of sensory and motor block compared to control group, but was faster in Clonidine group in comparison to Dexamethasone group. Similarly, the duration of sensory and motor block was significantly prolonged in Clonidine group than Dexamethasone group. The time for rescue analgesia was prolonged in both groups of patients receiving Clonidine and Dexamethasone, but it was more prolonged in patients receiving Clonidine. Clonidine produces some side effects (bradycardia) intraoperatively but that was manageable whereas dexamethasone produces minimal side effects and is relatively safer.

KEYWORDS

Clonidine, Dexamethasone, Bupivacaine In Supraclavicular

INTRODUCTION

There has always been a search for adjuvants to local anaesthetics for peripheral nerve blocks that prolong the duration of analgesia but with minimum adverse effects. Increasing the volume of local anaesthetic may prolong the duration of analgesia, but may also increase the risk of local anaesthetic systemic toxicity. Although continuous catheter based nerve blocks can extend postoperative analgesia, their placement requires additional time, cost and skill. [1] Ropivacaine has a long duration of action, with similar pharmacology to bupivacaine but a wider safety margin. [2-6]

Local anesthetics alone for Supraclavicular brachial plexus block provide good operative conditions but have shorter duration of postoperative analgesia. So various adjuvant like opioids, clonidine, neostigmine, Midazolam, etc. were added to local anesthetics in brachial plexus block to achieve quick, dense and prolonged block, but the results are either inconclusive or associated with side effects.[2]

Steroids have powerful anti-inflammatory as well as analgesic property. They suppress inflammation through inhibition of phospholipase A_2. Local application of methylprednisolone has been found to block transmission in nociceptive C-fibers but not in myelinated A-beta fibers.[3] The effect was reversible, suggesting a direct membrane action of steroids.[3] Corticosteroids also suppress ectopic neuronal discharge.[4]

Perineural injection of glucocorticoid along with local anesthetics is reported to influence the onset and duration of sensory and motor block.[2,5,7]

Dexamethasone is a very potent and highly selective glucocorticoid. Various studies have been done using dexamethasone 8 mg as an adjuvant to local anaesthetics mixture in brachial plexus block resulting in variable effects on onset but prolonged duration of analgesia[1,2,5,6,8-13] and motor block.[1,9,10,13]

In this context the present study has been undertaken to evaluate the effect of dexamethasone 8 mg, used as an adjuvant to 0.5 % ropivacaine in supraclavicular brachial plexus block, on the onset time and duration of sensory as well as motor block. This study was done to compare the block characteristics and analgesic duration of equal amount (32 ml) of drug i. e 0.5% bupivacaine with either dexamethasone or clonidine for brachial plexus block by supraclavicular approach .

MATERIALS AND METHODOLOGY

Our present study was conducted in the department of Anaesthesiology in MGM medical college ,Kishanganj from July 2018 to June 2019. The number of patients required in each group for correctly rejecting the Null hupothesis with a confidence level at 95% and power of the study as 80% is 72 , 36 patients in each group. Sample size was calculated from the sensation of mean sensory block duration as obtained from a previous study. This single blind study was allocate the patients in 2 study groups by computer generated randomization according to following inclusion and exclusion criteria,

INCLUSION CRITERIA –

Patients scheduled for elective forearm surgery.
Patients with ASA physical status I and II.
Age between 18 and 60 years .

EXCLUSION CRITERIA –

Patient refusal
Patients undergoing emergency surgery
Allergic to any of study drugs
Inadequate block
Previous neurovascular deficit
Patients with local infection or bleeding disorder
Body mass index > 30 kg / m2
History of drug and alcohol abuse
Patients with severe systemic disorders like diabetes
Stage 2 hypertension , musculoskeletal disorders etc.

Statistical Analysis:

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. p-value ≤ 0.05 was considered for statistically significant.

RESULT AND ANALYSIS

In our group we showed that the BC mean age (mean± s.d.) of patients was 31.5000 ± 9.9298 years with range 18.0000 - 58.0000 years and the median was 29.5000 years. In Group-BD the mean age (mean± s.d.) of patients was 32.4444 ± 10.2356 years with range 18.0000 - 52.0000 years and the median was 31.0000 years. Difference of mean age in two groups was not statistically significant (p=0.6923).

Difference of mean height in two groups was not statistically significant (p=0.7321). Difference of mean weight in two groups was not statistically significant (p=0.3009).

We found association of ASA status in two groups was not statistically significant (p=0.6170). In Group-BC the mean onset time of sensory block (mean± s.d.) of patients was 10.7500 ± 1.2277 min. In Group-BD the mean onset time of sensory block (mean± s.d.) of patients was 9.0000 ± 1.1711 min. Difference of mean onset time of sensory block in two groups was statistically significant (p<0.0001). In Group-BC the mean onset time of motor block (mean± s.d.) of patients was 14.8611 ± 1.3126 min. In Group-BD the mean onset time of motor block (mean± s.d.) of patients was 18.1389 ± 1.5884 min. Difference of mean onset time of motor block in two groups was statistically significant (p<0.0001).

In our study we showed that the Group-BC mean duration of surgery (mean± s.d.) of patients was 123.5556 ± 23.8788 min. In Group-BD the mean duration of surgery (mean± s.d.) of patients was 124.7222 ± 23.9435 min. Difference of mean duration of surgery in two groups was not statistically significant (p=0.8366). In Group-BC the mean duration of sensory block (mean± s.d.) of patients was 646.8056 ± 157.5489 min. In Group-BD the mean duration of sensory block (mean± s.d.) of patients was 468.5000 ± 47.8596 min. Difference of mean duration of sensory block in two groups was statistically significant (p<0.0001). In Group-BC the mean duration of motor block (mean± s.d.) of patients was 577.3611 ± 121.3995 min. In Group-BD the mean duration of motor block (mean± s.d.) of patients was 395.7500 ± 21.0189 min. Difference of mean duration of motor block in two groups was statistically significant (p<0.0001).

We found in Group-BC the mean No of inj# Diclofenac in first 24 hrs (mean± s.d.) of patients was 1.2222 ± .5404. In Group-BD the mean No of inj# Diclofenac in first 24 hrs (mean± s.d.) of patients was 2.1389 ± .3507. Difference of mean No of inj# Diclofenac in first 24 hrs in two groups was statistically significant (p<0.0001). In Group-BC the mean time to first Diclofenac in first req (mean± s.d.) of patients was 14.2261 ± 2.4024. In Group-BD the mean time to first Diclofenac in first req (mean± s.d.) of patients was 9.2072 ± 2.4293. Difference of mean time to first Diclofenac in first req in two groups was statistically significant (p<0.0001). In two groups all patients had complete quality of analgesia. In two groups all patients had no seizure. In two groups all patients had no hypotension. 11 patients had bradycardia in group-BC and that was statistically significant. In two groups all patients had no dysrhythmia. In Group-BC, 15(41.7%) patients had horner's syndrome and in Group-BD, 13(36.1%) had horner's syndrome. Association of horner's syndrome was not statistically significant (p=0.6287). We showed in two groups all patients had no clinically significant Pneumothorax. Our study showed that difference of SBP at 4 hr in two groups was statistically significant (p<0.0001). Difference of SBP at 5 hr in two groups was statistically significant (p<0.0001). Difference of SBP at 6 hr in two groups was statistically significant (p<0.0001). However, we found that SBP, DBP, HR and SPO2 was not statistically significant in two groups at different time interval.

We found that in Group-BD, 23(63.9%) patients had VAS 4 hr 0 and 13(36.1%) patients had VAS 4 hr 1. In Group-BC, 34(94.4%) patients had VAS 4 hr 0 and 2(5.6%) patients had VAS 4 hr 1. Association of VAS 4 hr in two groups was statistically significant (p=0.0014).We found that in Group-BD, 20(55.6%) patients had VAS 8 hr 0 and 16(44.4%) patients had VAS 8 hr1. In Group-BC, 28(77.8%) patients had VAS 8 hr 0 and 8(22.2%) patients had VAS 8 hr 1. Association of VAS 8 hr in two groups was statistically significant (p=0.0455). We found that association of VAS 12 hr in two groups was statistically significant (p=0.0005). Association of VAS 16 hr in two groups was statistically significant (p<0.0001). Association of VAS 24 hr in two groups was statistically significant (p=0.0003).

DISCUSSION

Brachial plexus block is an easy and relatively safe procedure for upper limb surgery. Bupivacaine produces 3-4 hours of block, which is sufficient for most upper limb surgeries but not enough duration for elective postoperative analgesia .Addition of 8 mg of dexamethasone effectively and significantly prolongs the duration of analgesia. The block prolonging effect of dexamethasone is due to its local action and not a systemic one. [14] This effect is mediated via glucocorticoid receptors.

Addition of steroid to local anaesthetics effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action. The mechanism of the analgesia induced by corticosteroids is not fully understood. This effect is suspected to be mediated by their anti-inflammatory or immune-suppressive effects.[17] Corticosteroids may have a local effect on the nerve; the dexamethasone effect may be related to this action. Adverse effects with a single dose of dexamethasone are probably extremely rare and minor in nature and previous studies have demonstrated that short-term (24 hours) use of dexamethasone as safe.[14-18]

In our randomized prospective double blinded study, we have evaluated the effects on onset and duration of sensory and motor block among 2 groups-Bupivacaine (0.5% 30 ml) with Clonidine (150µg 1ml) and Bupivacine (0.5% 30 ml) with dexamethasone (8mg 2ml) in supraclavicular brachial plexus block named as Group BC and Group BD respectively. In each group volume was diluted upto 32 ml with normal saline.

We found that difference of mean age in two groups was not statistically significant (p=0.6923). Sex in two groups was not statistically significant.

We found that Difference of mean height in two groups was not statistically significant (p=0.7321). Difference of mean weight in two groups was not statistically significant (p=0.3009). Association of ASA status in two groups was not statistically significant (p=0.6170).

Choi S et al [19] found that equivalent prolongation with perineural or systemic administration of dexamethasone compared with placebo.

Chatrath V et al [20] found that significant differences were observed in the time for onset of sensory block (5.80 ± 5.12 min in group R and 4.87 ± 1.46 min in group B, P< 0.05); onset of motor block (11.37 ± 2.66 min in group R and 9.60 ± 1.78 min in group B, P< 0.05); duration of sensory and motor block (10.07 ± 0.91 and 9.03 ± 0.89 h in group R and 12.50 ± 1.14 and 10.67 ± 1.18 h in group B respectively, P< 0.01) and duration of analgesia (15.30 ± 1.39 h in group R and 18.07 ± 1.66 h in group B). No significant difference was observed in hemodynamics, sedation, side-effects and complications.

Rakesh Nigam et al [21] found that the groups were compared regarding quality of sensory and motor blockade, duration of post-operative analgesia and intra and postoperative complications. There was a significant increase in duration of motor and sensory block and analgesia in Group BD as compared to Group B patients (P < 0.0001). No significant side effects were noted.

Present study found that the mean onset time of sensory block was higher in Group-BC which was statistically significant (p<0.0001). Difference of mean onset time of motor block was higher in Group-BC which was statistically significant (p<0.0001).

We found that difference of mean duration of surgery in two groups was not statistically significant (p=0.8366). Difference of mean duration of sensory block was higher in Group-BD which was statistically significant (p<0.0001).

Krishna SS et al[22] found that the onset of the sensory and the motor block in bother the groups were similar to each other with no statistical difference, but there was a very high significance in the duration of both sensory and motor block within both the groups. The onset of the sensory and the motor block in bother the groups were similar to each other with no statistical difference, but there was a very high significance in the duration of both sensory and motor block within both the groups.

Alarasan AK et al [23] found that the VAS score was significantly lower in dexamethasone group after 210 min. Present study found that 11 patients had bradycardia in group-BC and that was statistically significant.

Chakraborty S et al [24] found that no clinically significant difference was observed in heart rate, blood pressure, and oxygen saturation. Sedation score was higher in the clonidine group. Addition of a small dose of clonidine to 0.5% bupivacaine significantly prolonged the duration of analgesia without producing any clinically important adverse reactions other than sedation.

Ribeiro KS et al [25] found that likewise the mean blood pressure measured between the two groups at 20 minutes, 60 minutes, 120 minutes and 180 minutes Post-operatively showed no significance. There was no significant difference in incidence of PONV in both groups with p-value of 0.624. Dexamethasone as an adjuvant to local anaesthetic in brachial plexus blocks significantly, prolongs duration of analgesia in children undergoing upper limb surgeries.

CONCLUSION

Dexamethasone and Clonidine both when added to bupivacaine in supraclavicular brachial plexus block enhanced the onset of sensory and motor block compared to control group, but was faster in Clonidine group in comparison to Dexamethasone group. Similarly, the duration of sensory and motor block was significantly prolonged in Clonidine group than Dexamethasone group. The time for rescue analgesia was prolonged in both groups of patients receiving Clonidine and Dexamethasone, but it was more prolonged in patients receiving Clonidine. Clonidine produces some side effects (bradycardia) intraoperatively but that was manageable whereas dexamethasone produces minimal side effects and is relatively safer. Side effects may be associated with dosage or individual sensitivity.

Table1: Distribution of Mean in all parameters in two groups

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Age	Group-BC	36	31.5000	9.9298	18.0000	58.0000	29.5000	0.6923
	Group-BD	36	32.4444	10.2356	18.0000	52.0000	31.0000	
Height (Cm)	Group-BC	36	161.8056	5.6256	153.0000	172.0000	163.0000	0.7321
	Group-BD	36	162.2500	5.3419	150.0000	170.0000	164.0000	
Weight	Group-BC	36	68.8056	2.8866	66.0000	78.0000	68.0000	0.3009
	Group-BD	36	69.5556	3.2111	66.0000	78.0000	69.0000	
onset time of sensory block (min)	Group-BC	36	10.7500	1.2277	9.0000	12.0000	11.0000	<0.0001
	Group-BD	36	14.3333	1.1711	13.0000	17.0000	14.0000	
onset time of motor block (min)	Group-BC	36	14.8611	1.3126	13.0000	17.0000	14.5000	<0.0001
	Group-BD	36	18.1389	1.5884	15.0000	21.0000	18.0000	
duration of surgery (min)	Group-BC	36	123.5556	23.8788	80.0000	184.0000	124.5000	0.8366
	Group-BD	36	124.7222	23.9435	70.0000	180.0000	124.5000	
duration of sensory block (min)	Group-BC	36	646.8056	157.5489	440.0000	1270.0000	622.5000	<0.0001
	Group-BD	36	468.5000	47.8596	419.0000	602.0000	459.0000	
duration of motor block (min)	Group-BC	36	577.3611	121.3995	400.0000	1040.0000	552.5000	<0.0001
	Group-BD	36	395.7500	21.0189	347.0000	422.0000	404.0000	
No of in Diclofenac in first 24 hrs	Group-BC	36	1.2222	.5404	1.0000	3.0000	1.0000	<0.0001
	Group-BD	36	2.1389	.3507	2.0000	3.0000	2.0000	
Time to first Diclofenac in first req	Group-BC	36	14.2261	2.4024	10.0000	17.4000	14.7500	<0.0001
	Group-BD	36	9.2072	2.4293	5.6000	16.4000	8.9500	

Table2: Distribution of seizure , hypotension , bradycardia , dysrhythmia, Distribution of horner's syndrome and pneumothorax in two Groups.

		Group-BC	Group-BD	p-value
seizure	No	36	36	-
	Row %	50.0	50.0	
	Col %	100.0	100.0	
hypotension	NO	36	36	-
	Row %	50.0	50.0	
	Col %	100.0	100.0	
bradycardia	No	25	36	0.00031
	Row %	41.0	59.0	
	Col %	69.4	100.0	-
	Yes	11	0	
	Row %	100.0	0.0	
	Col %	30.6	0.0	
dysrhythmia	No	36	36	
	Row %	50.0	50.0	
	Col %	100.0	100.0	
horner's syndrome	No	21	23	0.6287
	Row %	47.7	52.3	
	Col %	58.3	63.9	
	Yes	15	13	
	Row %	53.6	46.4	
	Col %	41.7	36.1	
clinically significant pneumothorax	No	36	36	-
	Row %	50.0	50.0	
	Col %	100.0	100.0	

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