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Dexemedetomidine and Clonidine as Adjuvant to Local Anaesthetic Agent in Epidural Anaesthesia

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Abstract

Background: Many anesthetic drug combinations have been used in patients to improve regional anaesthesia. This study was planned to compare the analgesic and sedative effects of dexmedetomidine and clonidine as an adjuvant to bupivacaine in patients undergoing lower limb surgeries. *Material and Methods:* This prospective study was conducted in 50 patients of ASA grade I and II, aged between 18-65 years. Patients were randomly allocated to Group BC receiving 30ml of 0.5% bupivacaine + 2 μg/kg of clonidine and group BD receiving 30 ml solution of 0.5% bupivacaine + 1.5 μg/kg of dexmedetomidine. Onset and duration of sensory and motor blocks, duration of analgesia, sedation, and complication if any were recorded. *Results:* Group BD resulted in an earlier onset (8.52±2.36 min) of sensory analgesia at T_{10} as compared to Group BC (9.76±3.44 min). ($p<0.05$) Time to onset of motor block was significantly shorter in group BD (17.42±5.16 min) as compared to group BC (19.76±4.06). ($p<0.05$) Time for rescue analgesia was comparatively shorter in group BC (310.76±23.75 min) as compared to group BD (344.88±28.16). ($p<0.05$) Mean sedation score 3 was significantly higher in group BD (40%) as compared to group BC (16%). ($p<0.0001$) The incidence of dry mouth was higher in both the groups but it was statistically non-significant in both the groups ($p>0.05$). *Conclusion:* Dexmedetomidine was found to be better adjuvant than clonidine with bupivacaine because of better analgesia effect, sedative effect and also hemodynamically stable during the surgical procedures under anaesthesia.

Keywords: Bupivacaine; Clonidine; Dexmedetomidine; Sensory and Motor Block.

Introduction

The anaesthetic techniques in last twenty years have improved and evolved for the management of postoperative pain. Effective pain management is essential for optimal care of surgical patients and patient satisfaction is improved when the anaesthetic technique choosen for the procedure is associated with less post-operative side-effects [1]. Many techniques and drug regimens have been used in patients to improve regional anaesthesia [2,3]. Effective postoperative analgesia prevents increase in catecholamine secretion, decreases incidence of respiratory and cardiovascular complications, avoids catabolic state, causes early return of gastrointestinal motility, results in early ambulation, reduces patient's anxiety, accelerates recovery and reduces hospital stay [4].

Various adjuvants in regional anaesthesia are being used to produce smooth and prolonged post operative analgesia along with good sedation and stable hemodynamic properties [5,6]. These properties are produced by both clonidine and dexmedetomidine which are α-2 adrenergic agonists and commonly used in anaesthetic practice. These drugs inhibit the release of neurotransmitters and help in modulating pain transmission [7,8]. Clonidine is being used since long but Dexmedetomidine is being highly selective α_2 adrenergic agonist with less side effects as compared

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to clonidine so this can be used in low dose [9-11]. They decrease the anesthetic dose because of increase in augmentation of both sensory and motor blockade of local anesthetics. Few studies have demonstrated the effect of these adjuvants with bupivacaine which is a commonly used local anesthetic. This study was planned to compare Dexmedetomidine and Clonidine when used epidurally as an adjuvant to bupivacaine in patients undergoing lower limb surgeries.

Materials and Methods

The present prospective study was conducted in the department of anaesthesiology and critical care at a tertiary care teaching hospital only after getting approval from Institutional ethics committee. Fifty patients of American society of anaesthesiologists (ASA) grade I and II, aged between 18-65 years scheduled for lower limb surgeries were included in the study. The patients with coagulation disorders, blood dyscrasias, psychiatric illness, diabetes, and history of allergy to local anaesthetics were excluded from the study.

Patients were randomly allocated to two treatment groups; bupivacaine + clonidine (BC) and bupivacaine + dexmedetomidine (BD). Written informed consent was taken from all the patients. Patients had continuous ECG, pulse oximetry, blood pressure monitoring. After taking base line parameters patients were administered epidural block with 18 gauge needle and catheter was secured 3-4 cm into epidural space and a test dose of 3 ml of 2% lignocaine hydrochloride solution containing adrenaline 1:200,000 was injected. After 4–6 minutes of administering the test dose, patients in group BC received 30ml of 0.5% bupivacaine + 2 μg/kg of clonidine. Patients in group BD were administered 30 ml solution of 0.5% bupivacaine +1.5 μg/kg of dexmedetomidine.

The bilateral pin-pricking was used to test the sensory level while a modified Bromage scale for motor block. It was measured at 5, 10, 15, 20, 25 and 30 minutes intervals after the epidural administration of the drugs.

Onset of sensory blockade and motor blockade, duration of motor block (mins.), duration of sensory block (mins.) and adverse effects if any were observed and recorded. Ramsay Sedation Score was used to grade sedation which was evaluated in five point likert scale. Sedation scores were recorded just before the initiation of surgery and thereafter every 15 minutes during the surgical procedure.

All vital parameters were checked and recorded every 5 min until 30 min and at 10 min interval, thereafter up to 60 min and then at 15 min interval for next hour and finally at 30 min in the third hour. Hypotension (systolic pressure falling more than 20% mmHg) was treated with inj. mephenteramine 3–6 mg in bolus doses and bradycardia (heart rate <50 beats/min) was treated with 0.3 mg of inj. atropine. The onset of pain was managed by giving 10 ml of 0.25% bupivacaine after operation. Complication if any like anxiety, nausea, vomiting, pruritis, shivering, etc. were also recorded.

All the data was expressed in mean±SD or in percentage. Data was analyzed using suitable statistical tests like 'Analysis of variance and chi-square test'. A p value of less than 0.05 was considered significant.

Results

Both dexmedetomidine and clonidine groups were comparable demographically and mean duration of surgery was also comparable in both the groups and statistically non-significant ($p > 0.05$). (Table 1)

Group BD resulted in an earlier onset (8.52±2.36 min) of sensory analgesia at T_{10} as compared to Group BC (9.76±3.44 min). The p value in both the group was < 0.05 i.e. statistically significant. Group BD also helped in achieving the maximum sensory anaesthetic level in a shorter period (13.26±3.96 min) as compared to Group BC (15.76±4.86 min). The p value in both the group was<0.05 i.e. statistically significant. Time to onset of motor block was significantly shorter in group BD (17.42±5.16 min) as compared to group BC (19.76±4.06). The p value

Table 1: The demographic characterstics of patients of both the groups

Demographic characteristics	Group BD (n = 25)	Group BC (n = 25)
Age (years)	35.38 ± 8.64	33.06 ± 6.36
Sex (M/F)	20/5	20/5
ASA (I/II)	21/4	20/5
Duration of surgery (mins.)	84.34 ± 14.58	83.78 ± 13.68

*P value > 0.05 for all parameters (non-significant)

in both the group was<0.05 i.e. statistically significant (Table 2).

Time to two segmental dermatomal regression was found significantly more in group BD (135.36±8.22 min) as compared to group BC (128.08±7.54) (P < 0.05). As a result the time for rescue analgesia was comparatively shorter in group BC (310.76 ± 23.75 min) as compared to group BD (344.88±28.16) (P < 0.05) (Table 2).

Mean sedation score 3 was significantly higher in group BD (40%) as compared to group BC (16%). The p value in both the group was < 0.0001 i.e. highly significant (Table 3).

Respiratory rate, heart rate and systolic and diastolic blood pressure in both the groups were found non-significant at all intervals. (P>0.05) The incidence side effects like nausea, vomiting, headache, shivering and dizziness were comparable in both the groups and statistically non-significant (Table 4).

Discussion

Good pain relief and early mobilization are possible during epidural analgesia when it is given with an adjuvant drugs [3]. Because of respiratory depression, higher cost and also postoperative nausea and vomiting, opioids are being less used with local anesthetic for postoperative pain relief [8]. Alfa 2 agonists like clonidine have been used successfully to achieve faster onset of action of local anaesthetics, rapid onset of sensory and motor blockade, prolonged duration of analgesia during post-operative period, stable hemodynamically in regional anaesthesia [12-14]. But the introduction of dexmedetomidine has further increased the scope of α-2 agonists in regional anaesthesia [15].

In present study demographic characteristics of both groups of patients were comparable. Both the groups in present study have not only faster onset of sensory block, prolonged duration of analgesia but also provides a good sedation as compared to

Table 2: Comparison of both sensory and motor block characteristics in both the groups

Block characteristics (Time in minutes)	Group BD (n = 25)	Group BC (n = 25)
Onset of sensory block	8.52 ± 2.36	9.76 ± 3.44
Onset of motor block	11.54±42	12.96±76
Time to maximum sensory block level	13.26± 3.96	15.76 ± 4.86
Time for complete motor block (mins.)	17.42± 5.16	19.76 ± 4.06
Time to two segmental regression	135.36 ± 8.22	128.08 ± 7.54
Time to sensory regression at S1	314.64 ± 42.36	295.72 ± 34.52
Time to first rescue analgesia	344.88 ± 28.16	310.76 ± 23.76
Duration of motor block	326.34±27.54	296.42±26.52
Duration of sensory block	338.74±24.64	301.22±24.42

*p<0.05 for all parameters (significant)

Table 3: Sedation scores in both the groups

Sedation scores during surgery	Group BD (n = 25) N (%)	Group BC (n = 25) N (%)	P value
1	4 (16)	9** (36)	<0.0001
2	11 (44)	12 (48)	>0.05
3	10** (40)	4 (16)	<0.0001
4	0	0	-
5	0	0	-

Table 4: Incidence of complications in both the groups

Adverse effects	Group BD (n = 25) N (%)	Group BC (n = 25) N (%)
Dry mouth	7(28)	6 (24)
Nausea/vomitting	5 (20)	6 (24)
Shivering	1 (4)	1 (4)
Headache	1 (4)	2 (8)
Dizziness	2 (8)	1 (4)

established data with bupivacaine alone [16,17]. But dexmedetomidine group in present study was found significantly more effective as compared to clonidine group for these characteristics and also for duration of sensory and motor block, prolonged post-operative analgesia and a lesser amount of total bupivacaine used post-operatively. Similar results have been shown by other studies in which dexmedetomidine was used as adjuvant [3,18,19].

In present study dexmedetomidine has produced significantly profound sedation as compared to clonidine group. Overall, the sedation scores were highly significant statistically with administration of dexmedetomidine. Similar results were found in other study which has used ropivacaine as local anesthetic [18].

Blood pressure and heart rate were found stable throughout the study period. It can be concluded that both drugs are hemodynamically stable. Similar results were shown in other studies [5,7,18,20]. Both the dexmedetomidine and clonidine groups were having higher incidence of dry mouth in the post-operative period which was non-significant on comparison. One study has also shown a higher incidence of nausea and dry mouth during the postoperative period. Profound deep sedation or respiratory depression was not found in any of the patient in either group which is common with opioids. Similar results were found in other studies [5,18].

Conclusion

Dexmedetomidine was found to be better adjuvant than clonidine with bupivacaine because of better analgesia effect, sedative effect and also hemodynamically stable during the surgical procedures under anaesthesia.

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