

Comparative Study of Intrathecal Bupivacaine with Bupivacaine Plus Clonidine in Lower Limb Surgeries

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ABSTRACT

Introduction: Initially adjuvants like clonidine was added to find out whether the addition of clonidine to bupivacaine changes its efficacy and to find out any change in quality of sensory and motor block and also to find out whether the solution was more predictable for block. We investigated and compare the characteristics of spinal block, duration of postoperative analgesia, hemodynamic responses and side effects using intrathecal bupivacaine and its combination with clonidine in patients undergoing lower limb surgeries.

Material and Methods: In a present study, 60 patients of ASA grade I and II, age between 20-60 years were randomly allocated in two groups. Group A received 13.5 mg of hyperbaric 0.5% bupivacaine with 0.5 cc of normal saline and group B received 13.5 mg of hyperbaric 0.5% bupivacaine plus 75µg of clonidine. Blocks were performed after induction of anaesthesia. We studied various parameter of intrathecal block.

Result: Administration of intrathecal clonidine to 0.5% hyperbaric bupivacaine significantly prolonged the duration of motor blockade, time for two segment regression and also prolonged the duration of postoperative analgesia with minimal acceptable side effects as compare to bupivacaine alone. There was no significant change in the cardiovascular response to subarachnoid block.

Conclusion: Intrathecal addition of clonidine significantly prolongs the duration of motor block providing good postoperative analgesia as well as improves the quality of block.

Keywords: Intrathecal, Bupivacaine, Clonidine, Lower Limb Surgeries, Sensory Block, Motor Block, Postoperative Analgesia

INTRODUCTION

Multimodal Techniques are available for Lower abdominal and Lower Limb surgeries. These surgeries can be conducted under local, regional (spinal or epidural), peripheral blocks or general anaesthesia, but neuraxial blockage is more preferred mode of anaesthesia. Since introduction of spinal anaesthesia by "August bier" in 1898, it gains its popularity due to its simplicity, minimum skill implementation, optimal operative condition, lowered risk of aspiration, low intra-operative blood loss, continued analgesia in the post-operative period and minimal postoperative morbidity. So it was frequently used in sub umbilical surgeries like lower extremity orthopaedic, arthroscopic, lower abdominal surgeries¹. The drugs used for spinal subarachnoid block are lignocaine, bupivacaine etc. One disadvantage with spinal anaesthesia using bupivacaine alone is a relatively short

duration of action, which means that early intraoperative need for supplemental intravenous analgesics and even general anaesthesia. In order to maximise quality and duration of anesthesia and postoperative analgesia, a number of adjuvant were added to local anaesthetic².

It was found that addition of clonidine as adjuvant in spinal anesthesia, leads to (a) decrease the time of onset of block, increase its quality and increased duration of action, (b) decrease the amount of bleeding from the surgery field, (c) lower the dose of local anaesthetic, reduce systemic absorption and therefore prevent its side effects³. So we undertook this study with aim to evaluate and compare the changes in characteristics of spinal blockade, postoperative analgesia and vital parameter due to bupivacaine and bupivacaine plus clonidine in lower limb surgeries.

MATERIAL AND METHODS

The present study was conducted in 60 patients of ASA grade I and II, aged between 20-60 years scheduled for lower limb surgeries, after obtaining institutional ethics committee approval and written informed consent from all patients. Patient with systemic diseases and patient having contraindications for spinal anaesthesia were excluded from the study. Sixty selected patients were divided into two equal groups of 30 patients each as a group A and group B. A detailed pre-anaesthetic evaluation including history, thorough physical and clinical examination and all relevant investigations were done for all the patients. Patients were kept 6 hrs fasting for milk and solid prior to the procedure. On operation table, standard monitoring devices NIBP, ECG, Pulse oximeter were applied to the patient and baseline parameters like blood pressure, pulse rate, SPO2, along with respiratory rate were noted. A good IV Line secured and patients were preloaded with 15 ml/kg of crystalloid (Ringer lactate). Equipments and drugs necessary for resuscitation and general anaesthesia administration were kept ready. Subarachnoid block was given under all aseptic precautions in sitting position at L3 – L4 intervertebral space using 25 G Quincke's needle. Study solution administered with opening of needle facing cephalad. Study groups received spinal

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anaesthesia with,

Group A: 13.5mg hyperbaric 0.5% bupivacaine plus 0.5 cc normal saline intrathecally.

Group B: 13.5 mg hyperbaric 0.5% bupivacaine plus clonidine 75µg intrathecally.

Then patients were placed in the supine position. The time of injection of drug was noted. Onset of sensory block (by pin prick sensation), onset of motor block (by modified Bromage scale) were noted in all patients. The parameters observed were quality of sensory and motor block, two segment regressions time, total duration of motor block, haemodynamic responses like PR, BP, RR and SpO₂ were monitored and recorded throughout the procedure. Also the duration of post operative analgesia, Intensity of postoperative pain at rest and on movement was measured by visual analog scale, time for first dose of analgesic and perioperative complications as hypotension, nausea, dryness of mouth, sedation and respiratory depression were recorded. In our study hypotension was defined as a decrease in blood pressure by 20% from preoperative value.

STATISTICAL ANALYSIS

All the observations were recorded and student's t test was applied to test statistical significance between the means of the groups. The chi square test was used to find dependencies between the two groups. Data are presented as mean \pm SD. $P < 0.05$ was considered statistically significant and $P < 0.001$ was considered highly significant.

RESULTS

A total of 60 patients who underwent lower limb surgeries were enrolled for the study and were randomly allocated into 2 groups of 30 patients each. The demographic profiles of the patients were comparable between two groups and difference was statistically not significant, (Table 1).

There was increase in the duration of motor blockade in patients receiving clonidine with bupivacaine intrathecally (205 mins) as compared to bupivacaine alone (154 mins) and difference was statistical significant, $P < 0.05$. Also the time for two segment regression in clonidine group was 204 minutes on comparison with 126 minutes for control group, which was statistically highly significant ($P < 0.01$). The duration of post operative analgesia in clonidine group was 512 minutes which was higher than that in control group 220 minutes ($P < 0.01$), thus decreasing the need for post operative analgesic requirement. The results regarding characteristics of subarachnoid blockade and duration of analgesia were depicted in Table 2.

The figure 1 show changes in pulse rate at different time intervals in both the groups. When comparing to groups we found decrease in pulse rate in clonidine group as compare to control group.

There was potential hypotension observed in clonidine group especially after 45 minutes of intrathecal administration. This fall in blood pressure was not more than 15% of preoperative values far less than acceptable 20% limit, (figure 2).

Very few side effects were observed in the study (Table 3).

Variables	Group A (control)	Group B (Clonidine)
Age (years)	34.48 \pm 4.42	34.88 \pm 4.20
Weight (kg)	56.50 \pm 5.31	57.68 \pm 4.80
Height (cms)	158.40 \pm 3.80	157.57 \pm 3.60

Table-1: Demographic data and duration of surgery

Characteristics (minutes)	Group A	Group B
Time of two segment regression	126 \pm 4.06	204 \pm 3.88
Duration of motor blockade	154 \pm 3.08	205 \pm 3.78
Duration of analgesia	220 \pm 4.05	512 \pm 4.08

Table-2: Summary of results of spinal blockade and duration of analgesia

Complications	Group A	Group B
Nausea	4	3
Dryness of mouth	3	13
Sedation	0	24
Respiratory depression	0	0

Table-3: Showing complications observed in two groups

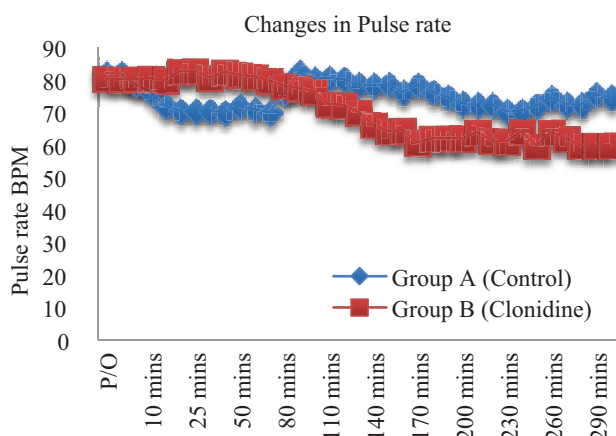


Figure-1: Comparison of changes in pulse rate in both the groups

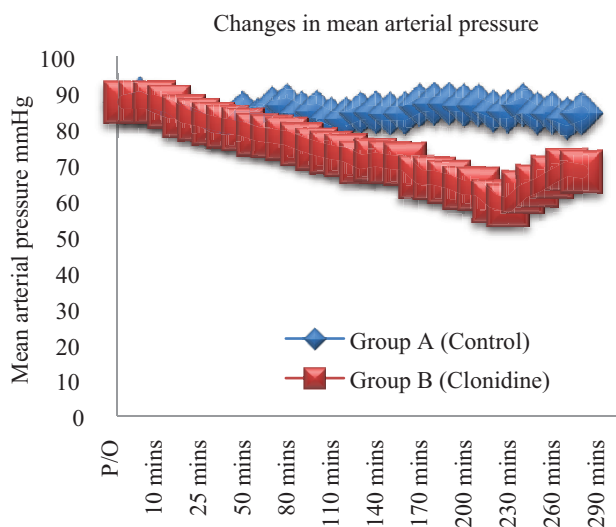


Figure-2: Comparison of changes in mean arterial pressure in both the groups

13 patients belonging to the clonidine group had dryness of mouth where as only 3 patients from control group. 24 patients from the clonidine groups were sedated (sedation

score 1-2), none from the bupivacaine group, thus decreasing the sedative requirement using clonidine as an adjuvant to bupivacaine

DISCUSSION

Local anaesthetics are the commonest agent used for the spinal anaesthesia, but their relatively short duration of action may lead to early analgesic intervention in the postoperative period^{4,5}. Bupivacaine is one of the local anaesthetic given routinely for infra-umbilical and lower limb surgeries. It provides with sensory and motor blockade for patient's well being and surgeons work and also provides some pain relief in initial postoperative period. But the duration of analgesia is not lengthy enough to relieve pain for extended period in postoperative setting after wearing off of the local anaesthetic effect. Inadequate block intraoperatively as well as inadequate pain relief in postoperative period increases morbidity. Adequate pain relief decreases fear, anxiety, reduces morbidity and thus must be included in anesthesia planning before induction of anesthesia. A number of adjuvant to local anaesthetics has been used intrathecally to prolong the intraoperative as well as post operative analgesia. Clonidine, a α_2 adrenergic agonist, has shown clinically useful drug profile due to its sympatholytic, hypnotic, sedative, anxiolytic, analgesic and anesthetic sparing effects without respiratory depression^{6,7}. However it is known to increase both sensory and motor blocks of local anaesthetics by 30-50%. Several other investigators have studied the effect of intrathecal clonidine.

In our study, the cases were randomly allotted in respective groups, physical parameters like age, height and weight in all 2 groups was comparable and statistically not significant. The addition of clonidine to bupivacaine have little, insignificant change in terms of onset and quality of sensory and motor block, time to reach, maximum level of sensory block and time to reach maximum sensory block level. While the addition of clonidine to bupivacaine intrathecally prolongs duration of sensory and motor block and time for two segment regression. In clonidine group much longer analgesia times (512 ± 4.08 minutes) were obtained with minimal haemodynamic alterations. Our findings were in consonance with the studies by B.S.Sethi et al⁸ and L Niemi⁹. In the study of L Niemi $\mu\text{g.kg}^{-1}$ of clonidine was added to 15mg of 0.5% bupivacaine administered intrathecally in patients undergoing knee arthroscopy⁹.

In terms of vital parameters, when we compared pulse rate changes at various time interval between two groups it shows decrease in pulse rate in clonidine group as compare to control group. There was potential hypotension observed in clonidine group especially after 45 minutes of intrathecal administration. This fall in blood pressure was not more than 15% of preoperative values far less than acceptable 20% limit. The study done by B.S.Sethi et al⁸, showed a decrease in mean heart rate from 45 minutes until the end of 6 hours, was greater in clonidine group than in the control group ($p < 0.001$). Negri et al¹⁰ found the addition of 105 mcg clonidine to hyperbaric bupivacaine was exerting minimal

influence on hemodynamic parameters. Furthermore Racle et al¹¹ found that intrathecal clonidine (105 mcg) in patients resulted in a decrease in systolic blood pressure of only 15% from resting values. Also Filos et al¹² reported significant decrease in arterial blood pressure after administration of 150 μg of clonidine, but heart rate was unaffected in their study performed on caesarean section patients soon after general anaesthesia¹².

In our study, incidence of sedation as assessed by sedation score which was higher in the clonidine group (24 patients) than in the control group after injection which was statistically significant ($p < 0.001$). Sedation is a well known side effect of clonidine and notwithstanding the fact that patients who received clonidine were more sedated than those in the control group; no significant respiratory depression was seen in our study. Dryness of mouth, a typical side effect of clonidine¹³ was also reported by more patients in the clonidine group but was not worrisome. Clonidine is a good adjunct to an anesthetist's armory of drugs and its use intrathecally as an additive to bupivacaine does extend the duration of spinal anesthesia significantly. Further it also provides excellent post operative analgesia and can be combined with other modalities for providing better pain relief in immediate post operative period. In addition to above, clonidine also provides sedation thus helping to relieve anxiety related with surgery.

CONCLUSION

The present study demonstrated that addition of clonidine to 0.5% hyperbaric bupivacaine in the dose of 75 μg significantly prolongs the duration of motor blockade, improves the quality of block and increases the duration of analgesia as compared to bupivacaine alone. These outcomes not only decreases the dose of bupivacaine required but also the need of sedatives and other analgesics with minimum acceptable side effects.

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REFERENCES

1. Gentili M and Bonnet F. Spinal clonidine produces less urinary retention than spinal morphine. *British Journal of anaesthesia*. 1996;76:872-873.
2. Bajwa SJS, Kaur J, Singh G et al. Dexmedetomidine and clonidine in epidural anaesthesia. *Indian J Anesth* 2011;55:116-121.
3. Barsagade WS, Tirpude NG and Yelne TS. Evaluation of addition of clonidine and dexmedetomidine to intrathecal hyperbaric bupivacaine for lower limb, sub umbilical surgeries. *Research Chronicle in health sciences* 2015;1:234-240.
4. David LB. Spinal, epidural and caudal anesthesia. In: Miller RD, editor. *Miller's Anesthesia*, 6th ed, vol.2. Philadelphia: Churchill Livingstone; 2005. p.1653-

- 1683.
5. Local anesthetics. In: Collins VJ, editor, Principle of Anesthesiology. 3rd ed, Vol.2, Philadelphia: Lea and Febiger; 1993. p.1232-1281.
6. Tryba M, Gehling M. Clonidine: A potent analgesic adjuvant. *Curr Opin Anaesthesiol*. 2002;15:511–517.
7. Jamadarkhana S, Gopal S. Clonidine in adults as a sedative agent in the intensive care unit. *J Anaesthesiol Clin Pharmacol*. 2010;26:439–445.
8. Sethi BS, Samuel M, Sreevastava D. Efficacy of analgesic effect of low dose intrathecal clonidine as adjuvant to bupivacaine. *Indian Journal of Anaesthesia* 2007;51:415-419.
9. Niemi L. Effect of intrathecal clonidine on duration of bupivacaine spinal anaesthesia, haemodynamics and postoperative analgesia in patients undergoing knee arthroscopy. *Acta Anaesthesiol Scand* 1994;38:7243-7248.
10. De Negri P, Salvatore R, Visconti C, De Vivo P, Mastronardi P. Spinal anaesthesia with clonidine and bupivacaine in young humans: interactions and effects on cardiovascular system. *Minerva Anesthesiology*. 1997;63:119-125.
11. Racle JP, Benkhadra A, Poy JY, Gleizal B. Prolongation of isobaric bupivacaine spinal anaesthesia with epinephrine and clonidine for hip surgery in elderly. *Anesth Analg* 1987;66:442-446.
12. Filos KS et al. Haemodynamic and analgesic profile after intrathecal clonidine in humans. A dose response study. *Anesthesiology*. 1994;81:591-601.
13. Gordh T Jr. Epidural clonidine for treatment of postoperative pain after thoracotomy. A double blind placebo-controlled study. *Acta Anaesthesiol Scand*. 1988;32:702-709.

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