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Sole intrathecal Inj. Clonidine as an adjuvant for induced hypotension in spine surgery; with Entropy monitoring

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ABSTRACT

Spine surgeries require clear surgical field. Induced hypotension facilitates this. Sympatholytic effect produced by Clonidine makes it an ideal anaesthetic adjuvant to General anaesthesia for induced hypotension. A total of sixty patients of ASA grade I/II of either sex, age 18 to 50 years undergoing elective spine surgeries were studied in two groups. The first group (Group A) received intrathecal, sole Inj. Clonidine without local anaesthetic in the dose of 1ugm/kg; followed by general anaesthesia. The second group (Group B) received general anaesthesia only. Aim of the study was to find out efficacy of sole intrathecal Inj. Clonidine for induced hypotension. From our study, we found that Clonidine group required significantly low dosages of anaesthetics and analgesics as compared with control group. So we conclude that sole intrathecal inj. clonidine is an effective anaesthetic adjuvant for induced hypotension.

KEYWORDS: sole intrathecal inj. clonidine, spine surgeries, induced hypotension, DOA, entropy.

Introduction

Clonidine belongs to the class of α2 agonists having sympatholytic effect and possesses the properties as sedation, analgesia and opioid sparing effect.[1] Spine surgeries are very commonly performed surgeries for Prolapsed inter vertebral disc / spondyolysthesis, and chronic backache syndromes. It requires blood less surgical field which is best provided with induced hypotension. [2] General anaesthesia is considered the choice of anaesthesia. Addition of regional anaesthesia in the form of spinal anaesthesia provides unique advantages over general anaesthesia. Studies have been conducted using intrathecal clonidine doses up to 1 mcg/kg; along with local anaesthetics. [3-5] No study has been conducted to evaluate the effect of sole intrathecal inj. Clonidine as an anesthetic adjuvant for induced hypotension.

Decrease in anaesthetic requirement makes it mandatory to monitor the depth of anaesthesia (DOA) to avoid unwanted awareness under anaesthesia. Hence we included entropy for monitoring DOA, [6] to evaluate efficacy of sole intrathecal inj. Clonidine.

Methods

After obtaining approval from institutional ethics committee. We enrolled sixty nine patients posted for elective lumbar or lower thoracic spine surgeries in 6months duration. Out of which sixty were included for study.

Inclusion criteria:

ASA grade I/II
Age: 18 to 50 years
Gender: both male and female
Surgery: Elective lumbar or lower thoracic spine surgeries for laminectomies, discectomies etc. requiring 1-4 hrs duration.

Exclusion criteria:

ASA grade > II
Age < 18 or > 50 years
Contra-indications to spinal anaesthesia in Group A Prolonged spine surgeries which required more than 4hrs [7-8]
Contra-indications to hypotensive anaesthesia [9]
Patient's refusal

After proper pre anaesthetic check up, written, valid and informed consent was taken from patients posted for elective spine surgeries. The study is designed in a prospective, randomized, double blind manner. Patients selected for the study were randomly allocated into two equal groups of 30 each. Both the groups were demographically comparable.

Preoperatively intravenous line was established in premedication room. All patients were preloaded with balanced salt solution, 20ml/kg. In OR, patient's baseline pulse, blood pressure, Oxygen saturation, respiratory rate, and ECG were recorded.

In a Group A, Spinal anaesthesia was given in a sitting position at selected space (one space below or above the diseased space) with 27 G Quincke's lumbar puncture needle. Inj. Clonidine was loaded in a tuberculin syringe, and was administered in the dose of 1ugm/kg. and additional 0.05ml as a calculated dead space of 27G spinal needle. Afterwards patient was made supine. In a Group B, no spinal anaesthesia was given. All the patients were premedicated with inj. Glycopyrrolate .04ugm/kg , inj. Midazolam .03mg/kg , inj. Ondansetron 0.08mg/kg, inj. Fentanyl 2ugm/kg. Observer was introduced at this point who was unaware of patients study group. At this point entropy and ETCO2 monitoring were introduced and all values were monitored every 5 minutes.

Patients were pre oxygenated for 3 minutes. General anaesthesia was induced after 20mins.of spinal anaesthesia in Group A and 10 minutes after premedication in both the groups with Inj. Propofol 2mg/kg, and inj. Vecuronium 0.1mg/kg;. After adequate relaxation, intubation was performed. Urinary catheter was inserted. Anaesthesia was maintained with oxygen, N2O (40: 60) and Isoflurane. Dial setting of isoflurane was adjusted, so as to maintain mean arterial BP (MAP) of 50-60mmHg; and to maintain entropy between 40-60 in both the groups. Patients were ventilated mechanically with IPPV, in prone position. In both the groups additional doses of inj. Propofol and inj. Fentanyl administered, to maintain MAP and DOA were recorded. For hypotension, (MAP < 60mmHg) inj. Ephedrine in the increments of 6mg and for bradycardia, Inj. Atropine were administered intravenously. At the end of the procedure, muscle paralysis was antagonized with Inj. Neostigmine 0.05mg/kg and inj.Glycopyrrolate0.08mg/kg. Patients were extubated after the extubation criteria were met and shifted to recovery room.

In recovery room, patients were observed for two hours for hypotension, bradycardia, respiratory depression, post operative nausea and vomiting and pain score every 15 minutes and then moved to ward.

Statistics: This is a double blind control study including a control group. We used 2 independent sample t-test for the analysis and SPSS (Statistical package for social sciences) statistical software version 17.

Results :

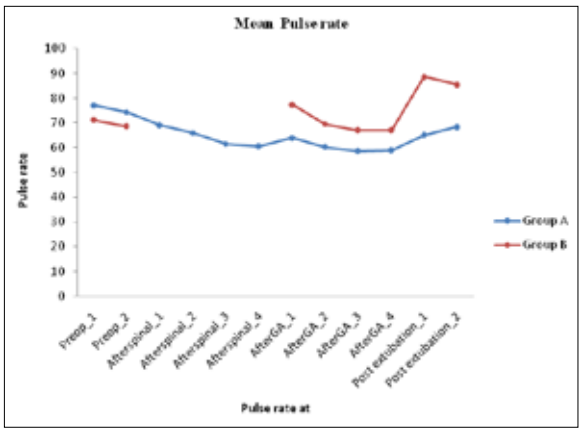
We found in group A; 29 out of 30 patients (96%) maintained stable MAP, and Heart rate throughout the surgical procedure. Also in group A; entropy value was maintained within the range of 40-60 without much changes in dial settings of Isoflurane. Concentration of Isoflurane needed was also low, (0.2-0.6%) While in group B; frequent adjustments of isoflurane concentration were made to maintain induced hypotension with significantly higher dial settings than group 1(0.8-1.5) as shown in Table 1; which was statistically significant. (p<0.001)

Table 1

	Number of patients	Isoflurane MAC (Mean ± SD)	p-value
Group A	30	0.79 ± 0.15	< 0.001
Group B	30	1.91 ± 0.16	

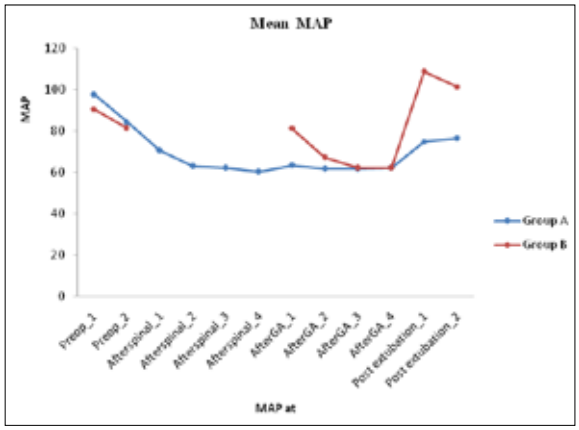
In Group A, no added analgesia was required during the procedure. In spite of low concentration of isoflurane, MAP, HR and Entropy were stable; which is suggestive of adequate

DOA
Graph No.1 Here



Graph No. 1

Graph No. 2 Here
Graph No. 2



In Group B, additional analgesia was required in 26 (86%) patients after 2 hrs during the procedure in the form of Inj. Fentanyl. 2 patients required additional inj. Propofol and 2 more required additional Inj. Betaloc to control MAP and pulse rate. While coming out of relaxant; MAP, HR and Entropy values also increased which means that patient was responding to surgical stimulus.

One patient in Group A, developed sustained hypotension for almost 8 hrs post operatively, while others attained their baseline MAP and HR within 30-45 minutes post extubation without any incidence of rebound hypertension. In Group B, almost all the patients attained their baseline MAP and HR as soon as isoflurane was switched off. There was no significant difference in post operative VAS in both the groups.

Discussion: Clonidine belongs to the class of α2 agonists having sympatholytic effect and possesses the properties as sedation, analgesia and opioid sparing effect. [1] The exact mechanism of action of spinally administered clonidine is unknown, but is presumed to involve inhibition of afferent nerve cell firing at the level of the dorsal horn. [1,3,4]

Stimulation of adrenoceptors in the vasomotor center or medulla spinalis is regarded as the major mechanism in the hypotensive effect. [11] Clonidine acts by inhibiting nor epinephrine release from pre synaptic terminals; resulting in sympatholytic effect produced by clonidine. [12-14] It produces sedation and analgesia by its action on spinal cord and locus ceruleus. [1,12-14] and also due to decrease catecholamine release in brain. Intrathecal clonidine suppresses tumor necrosis factor (TNF) in plasma during the peri operative period which is presumed to result in analgesia. [15] Various agents are used to provide induced hypotension; [16-17] like Nitroglycerine, sodium nitroprusside, magnesium sulphate, Fentanyl etc. by intravenous route. But drug toxicity, tachyphylaxis and constant titration of infusion rates and rebound hypertension are the limiting factors. This has led to provide induced hypotension for précised time and also it requires additional doses of analgesics and inhalational anaesthetics.

Clonidine decreases the requirement of additional anaesthetic drugs. Hence monitoring of DOA to avoid awareness under anaesthesia is must. We monitored DOA using entropy. There are two entropy parameters: fast reacting response entropy (RE) and more steady and robust state entropy (SE). Activation of RE to painful stimulus may be interpreted as a sign of inadequate analgesia. SE is designed to monitor the depth of hypnosis. [18-19] In our study we aimed at keeping both the entropy values between 40-60 to ensure adequate depth of anaesthesia as well as nociception. We observed that with the use of clonidine we can taper down on anaesthetics as well as opioids while avoiding awareness and rendering the patients pain free.

Maintaining stable haemodynamics throughout the surgical procedure is a characteristic of a balanced anaeshtesia. Achieving this with minimal resources, with simplicity is also an art. It also keeps anaesthesiologist free to perform other tasks like monitoring, documentation, administering fluids and additional dosages of drugs etc.

Conclusion: In our study we observed that clonidine provides good surgical field throughout the surgical procedure and also reduces the requirement of analgesics and inhalational anaesthetics still maintaining adequate depth of anaesthesia. It also maintains stable haemodynamics and provides smooth recovery. Thus provides a simple, steady and cost effective mode of providing induced hypotension. Since requirement of inhalational agents is reduced; such options should be encouraged to reduce green house effect and being eco friendly.

We therefore recommend that sole intrathecal inj. clonidine can be used for induced hypotension as an anaesthetic adjuvant.

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