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Original Research Article

COMPARATIVE STUDY OF INTRAVENOUS BUTORPHANOL VERSUS INTRAVENOUS CLONIDINE FOR PREVENTION OF INTRAOPERATIVE SHIVERING UNDER SPINAL ANAESTHESIA

[1]Dr Sajidhusain. B. Nadaf, [2]Dr.Pavan Dhulkhed, [3]Dr Anusha Katti, [4]Dr Gudli S.V.

[1]Assistant Professor, Dept. of Anaesthesiology, BIMS, Belagavi.
[2]Associate Professor, Dept. of Anaesthesiology, SDM College of Medical Sciences & Hospital, Dharwad, Karnataka
[3]Senior Resident, Dept. of Anaesthesiology, BIMS, Belagavi
[4]Professor & HOD, Dept. of Anaesthesiology, BIMS, Belagavi.

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Corresponding Author: Dr Sajidhusain. B. Nadaf

Abstract

Background: Shivering is a common problem during the perioperative period, in surgeries done under regional anesthesia. Shivering is a potentially serious complication, resulting in increased metabolic rate; increased oxygen consumption along with raised carbon dioxide production; ventilation and cardiac output; adverse postoperative outcomes, such as wound infection; increased surgical bleeding; and morbid cardiac events.[4,5] Present study aimed to compare the efficacy of butorphanol versus clonidine for control of shivering in patients undergoing surgeries under spinal anaesthesia.

Material and Methods: Present study was conducted patients aged between 18-60 years, of either sex, ASA physical status I/II, scheduled for elective lower abdominal surgeries under subarachnoid block. 60 Patients were randomly allocated using a computer generated table of random numbers. Group B (n= 30) received intravenous bolus butorphanol 1 mg while group C (n= 30) received an intravenous bolus of 150 µg (1 mL) clonidine.

Results: In present study, 60 patients were randomly allocated into group B (n= 30, received butorphanol) & group C (n= 30, received clonidine). Age (years), weight (Kg), BMI(Kg/m^2), Gender (Male/Female), ASA grade, duration of surgery (min) & baseline axillary temperature were comparable between both groups & no statistically significant difference was noted among them. In butorphanol group an earlier onset of sensory as well as motor block & prolonged duration of sensory as well as motor block was noted as compared to clonidine group & difference was statistically significant. In present study, higher incidence of shivering was noted in clonidine group as compared to butorphanol group & difference

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was statistically significant. Side effects, such as hypotension, nausea & vomiting were more in clonidine group as compared to butorphanol group & difference was statistically significant. Bradycardia was noted in both groups in 3 patients.

Conclusion: Intravenous butorphanol is a safe and effective for prevention of shivering as well as had early onset & prolonged duration of sensory/motor block.

Keywords: intraoperative shivering, spinal anesthesia, tramadol, clonidine

Introduction

Shivering is a common problem during the perioperative period, in surgeries done under regional anesthesia. Shivering may be defined as an involuntary, repetitive activity in the skeletal muscle commonly occurs as a thermoregulatory response to hypothermia.[1] Prolonged impairment of thermoregulatory autonomic control under anesthesia along with the cold environment of operating rooms and cold infusion fluids, contributes to a fall in core body temperature, and hence shivering. [2,3]

Shivering is a potentially serious complication, resulting in increased metabolic rate; increased oxygen consumption (up to 100-600%) along with raised carbon dioxide (CO2) production; ventilation and cardiac output; adverse postoperative outcomes, such as wound infection; increased surgical bleeding; and morbid cardiac events.[4,5]

Non-pharmacological methods using equipment to maintain normal temperature of the body are effective but expensive and lack practicality, while the pharmacological methods using drugs like pethidine, tramadol, clonidine, doxapram, katenserin, nefopam, etc., are simple, cost-effective and easy to implement.[6] Present study aimed to compare the efficacy of butorphanol versus clonidine for control of shivering in patients undergoing surgeries under spinal anaesthesia and to evaluate any other relevant observation, if they arise.

Material and Methods

Present study was conducted in department of Anaesthesiology, Belagavi Institute of Medical Sciences, Belagavi, Karnataka. Study design was comparative, clinical, interventional study. Study period was from January 2022 to Feb 2022 (45 days). Study was approved by institutional ethical committee.

Inclusion criteria

- Patients aged between 18-60 years, of either sex, ASA physical status I/II, scheduled for elective lower abdominal surgeries under subarachnoid block,

Exclusion criteria

- Patients with history of severe cardiac or pulmonary disease, uncontrolled hypertension, morbid obesity, neurologic or psychological disease, hepatic or renal dysfunction, thyroid disease or metabolic disorders,
- Patients requiring intraoperative blood transfusion, acute infections or fever.
- Patients with deranged coagulation profile, deformity of spinal column, infection at the site of lumbar puncture,

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- Patients with known hypersensitivity to study drugs,
- Patients had refusal to the technique, uncooperative patient, patients not willing to participate

Study was explained & written informed consent was taken for participation. Clinical details were collected & anaesthetic evaluation done, After anaesthetic fitness, patients satisfying study criteria were finalized. All enrolled patients were admitted prior to day of operation and received tablet alprazolam 0.5 mg orally, night before surgery. After arrival in the operation theatre, monitoring for heart rate, electrocardiogram, pulse-oximetry, non-invasive arterial blood pressure and axillary temperature were commenced and noted.

60 Patients were randomly allocated using a computer generated table of random numbers. Group B (n= 30) received intravenous bolus butorphanol 1 mg while group C (n= 30) received an intravenous bolus of 150 μg (1 mL) clonidine.

Under all aseptic precautions, in supine position with 10^0 Trendelenburg tilt, subarachnoid block was given at L2-L3 or L3-L4 intervertebral space with 3.5 ml of 0.5% hyperbaric bupivacaine (17.5 mg). All patients were given midazolam 2 mg, followed by study drug solution according to group allocation and supplemental oxygen was given at rate of 4 mL/min via face mask.

The sensory and motor block characteristics were assessed till required surgical anaesthesia was achieved. The hemodynamic parameters of were monitored at 5 minute intervals till end of surgery and then in recovery room.

Intraoperatively shivering was recorded at 5-minute interval up to 60 minutes of surgery, using a scale validated by Wrench.

Grade 0: No shivering,

Grade 1: Piloerection but no visible muscular activity,

Grade 2: Visible muscular activity confined to one muscle group,

Grade 3: Visible muscular activity in more than one muscle group but not generalized,

Grade 4: Gross muscular activity (Shivering) involving the whole body.

The prophylaxis for shivering was regarded as ineffective if the patient exhibits grade-3 shivering any time during the study. Patients, who developed grade 3 or more of shivering were treated with tramadol (50 mg intravenously) with ondansetron 4 mg.

The subarachnoid block characteristics, onset & duration of sensory /motor block, hemodynamic parameters (systemic arterial pressure, heart rate, ECG,SpO_2), shivering with its onset time and grade, time of disappearance, level of sedation and any other intraoperative adverse events were recorded.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

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Results

In present study, 60 patients were randomly allocated into group B (n= 30, received butorphanol) & group C (n= 30, received clonidine). Age (years), weight (Kg), BMI(Kg/m^2), Gender (Male/Female) & ASA grade were comparable between both groups & no statistically significant difference was noted among them. Similarly, duration of surgery (min) & baseline axillary temperature were comparable between both groups & no statistically significant difference was noted among them.

Table: 1 General characteristics

General characteristics	Group B (n=30)	Group C (n=30)	P-value
Age (years)	43.9 ± 10.5	43.2 ± 10.9	0.91
Weight (Kg)	66.3 ± 8.2	65.9 ± 7.7	0.72
BMI (Kg/m2)	23.6 ± 2.1	24.1 ± 2.9	0.90
Gender (M/F)	17/13	18/12	0.81
ASA I/II	25/5	24/6	0.72
Duration of surgery (min)	92.1 ± 33.7	94.1 ± 34.2	0.73
Baseline axillary temperature (^{0}C)	36.4 ± 0.5	36.5 ± 0.4	0,61

In butorphanol group an earlier onset of sensory as well as motor block & prolonged duration of sensory as well as motor block was noted as compared to clonidine group & difference was statistically significant.

Table 2: Spinal anaesthesia characteristics

Spinal anaesthesia characteristics	Group B (n=30)	Group C (n=30)	P value
Onset of Sensory block (min)	4.99 ± 2.01	6.31 ± 2.56	0.007
Onset of motor block (min)	7.35 ± 2.75	8.52 ± 3.11	0.009
Duration of motor block (min)	232.1 ± 32.34	201.86 ± 41.78	0.004
Duration of sensory block (min)	278.51 ± 38.93	224.36 ± 31.32	0.009
Perioperative Shivering grade			
Grade III	3 (10%)	7 (23%)	0.009
Grade IV	1 (3%)	2 (7%)	0.042

In present study, higher incidence of shivering was noted in clonidine group as compared to butorphanol group & difference was statistically significant. Side effects, such as hypotension, nausea & vomiting werer more in clonidine group as compared to butorphanol group & difference was statistically significant. Bradycardia was noted in both groups in 3 patients.

Table 3: Incidence of side effects

Side effects	Group B	Group C	P- value
Hypotension	3 (10%)	5 (17%)	0.031
Bradycardia	3 (10%)	3 (10%)	-
Nausea and vomiting	1 (3%)	2 (7%)	0.48

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Discussion

Neuraxial anesthesia is the most commonly employed for lower abdominal, perineum and lower limb surgery. It has the advantages of easy administration technique, less adverse effects, cost-effectiveness and the patient remaining conscious throughout the procedure, compared with general anesthesia. One of the most common complications after neuraxial anesthesia is perioperative shivering with reported incidences in the range of 36% to 85%.[3]

Spinal anesthesia is known to decrease the vasoconstriction and shivering thresholds. There is core to periphery redistribution of heat due to spinal-induced vasodilatation and shivering is preceded by core hypothermia and vasoconstriction above the level of block.[8,9]

Shivering under anesthesia may have serious consequences to patient. It can cause increase oxygen consumption, increase carbon dioxide production and hence lactic acidosis. It can cause tachycardia and hypertension.[10,11] Thus patient with cardiac disease or patients with low cardio pulmonary reserve, shivering may be detrimental. Shivering also contribute to increased wound pain, delayed healing, and delay discharge from post-anesthetic care unit.[11,12]

Butorphanol Tartrate is a centrally acting opioid analgesic with potent antishivering property mediated through κ (kappa) and μ (mu) receptors agonistic modulation.[13] Clonidine is an alpha-2 adrenoreceptor agonist, with antihypertensive, sedative, analgesic and antishivering properties. Clonidine exerts its antishivering effect by decreasing the release of nor adrenaline from the axonal terminals in the hypothalamus.[14]

In study by Pranav Bansal,[11] butorphanol was more effective than clonidine in suppressing shivering. Butorphanol and clonidine completely controlled rigors in 83% and 53% of cases, respectively, and incompletely suppressed rigors in 16% and 46% of cases, respectively. Time taken to terminate rigors was significantly higher for clonidine (3.3 ± 0.9 minutes) than for butorphanol (2.1 ± 1.0 minutes, P , 0.001).

In study by Jyotsna PB,[15] time required for control of shivering was more with Clonidine (331.33 ± 70.65 seconds) as compared to Butorphanol (81.17 ± 37.38 seconds). The incidence of recurrence was significantly more with Clonidine as compared to Butorphanol (P< 0.001). The percentage of side effects such as hypotension and bradycardia was significantly higher with Clonidine as compared to Butorphanol. Similar findings were noted in present study as well as by Nandukumar S.[16]

Astha Palan also noted that butorphanol is better than Clonidine for control of shivering which occurs intra-operatively under spinal anaesthesia. The advantages of Butorphanol are faster control with lower incidence of recurrence of shivering and lower incidence of side effects such as hypotension and bradycardia.[17] Fluid warmers, ambient O.R temperature,

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space blankets, surgical drapes, and active circulating water mattress are also useful to control perioperative shivering.[18]

Conclusion

Intravenous butorphanol is a safe and effective for prevention of shivering as well as early onset & prolonged duration of sensory/motor block was noted. Therefore, intravenous butorphanol is an better alternative for intravenous clonidine for prevention of intraoperative shivering in surgeries under spinal anaesthesia.

Conflict of Interest: None to declare
Source of funding: Nil

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