Int J Biol Med Res. 2014; 5(1): 3862-3864

BioMedSciDirect Publications

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International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original Article

Intra-thecal Fentanyl in Prevention of Intraoperative Shivering

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ARTICLE INFO

Keywords:
Hyperbaric bupivacaine
Intrathecal fentanyl
Intraoperative shivering
Spinal anesthesia.

ABSTRACT

Aims: This randomized double blind study was carried out to investigate effect of intrathecal fentanyl on incidence and severity of intraoperative shivering on patients undergoing lower abdominal surgeries under spinal anesthesia. Method: 120 patients undergoing lower abdominal surgeries under spinal anesthesia were assessed in a randomized fashion. They were divided in to two groups. Each subject received 3.5 ml 0.5% hyperbaric bupivacaine plus 25 µg fentanyl (Group F) or 4 ml 0.5% hyperbaric bupivacaine (Group C). The incidence and severity of shivering along with side effects after addition of fentanyl were observed. Results: The incidence of shivering after spinal anesthesia was 9 of 60 patients, 15% in group F and 24 of 60 patients; in 40% in group C. The difference was statistically significant ($p<0.5$). Only 2 patients of fentanyl group having moderate shivering while 16 patients of control group having moderate shivering. The difference was statistically significant ($p<0.5$). There was no difference in the incidence of side effects between two groups. Conclusion: The addition of 25 µg fentanyl in 3.5 ml of 0.5% hyperbaric bupivacaine Intrathecally can reduce the incidence and severity of shivering after spinal anesthesia without increasing other side effects.

1. Introduction

The thermoregulatory system generally maintains core body temperature within a few tenths of a degree centigrade of normal which is about 37^{0}C in humans. Anesthetic induced inhibition of thermoregulation combined with exposure to cold operating room environment makes most unwarmed patients hypothermic [1]. Shivering like tremor in volunteers given neuraxial anesthesia is always preceded by core hypothermia and vasoconstriction (above the level of the block) [2]

Shivering may induce arterial hypoxemia, lactic acidosis and increased intraocular and intracranial pressure and interference with ECG monitoring, PR, BP etc and is associated with morbid myocardial outcome and increased O_2 consumption up to 200 500 %. Postanesthetic shivering can be treated by skin surface warming. It can also be treated with a variety of drugs including clonidine (75 mg/IV), Ketanserin (1mg/IV) [3], Tramadol [4], Physostigmine (0.04 mg/kg IV) [5], Nefopam (0.15 mg/kg IV) [6].

Customarily, we just treat shivering rather than prevent it. Prevention mainly entails preventing perioperative hypothermia by actively rewarming the patient with the use of forced air warming, warming blankets etc, however less efficient than pharmacological interventions using. This study is undertaken to evaluate the efficacy of intrathecal fentanyl in prevention of shivering in lower abdominal surgeries under spinal anesthesia

2. Material and Methods

The study is designed as a double blind randomized controlled trial with two groups of 60 patients each. Following approval from Institutional ethical committee, ASA I and II patients, aged 18-60 years scheduled for lower abdominal surgeries under spinal anesthesia were included. Patients with contraindication to SA and in whom narcotics were contraindicated were excluded from the study.

The patients were randomly allocated into two study groups according to list of random numbers. Group F received an intrathecal injection of 0.5% heavy Bupivacaine 3.5 ml with 25 µgm Fentanyl. Group C received an intrathecal injection of 0.5% 4 ml heavy Bupivacaine.

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No premedication was given. After preoperative examination and obtaining informed written consent venous access was obtained with 18 G or 20 G I.V. canula, monitors were attached and baseline values of HR, BP, axillary temperature and oxygen saturation recorded. After preoperative examination and obtaining informed written consent venous access was obtained with 18 G or 20 G I.V. canula monitors were attached and baseline values of HR, BP, axillary temperature and oxygen saturation recorded. Preloading was done with ringer lactate at the dose of 15 ml/kg. Ambient temperature was monitored and maintained at 23 ± 1^0C. In sitting position the desired subarachnoid space was identified with 25 G quincke's spinal needle and after ensuring free flow of CSF 4.0 ml of the study solution injected intrathecally. The study solution was prepared by another investigator and its content blinded to the anesthetist who administered it. The following parameters ware recorded immediately after spinal anesthesia thereafter at an interval of 5 min for 60 min; heart rate, blood pressure, respiratory rate, oxygen saturation, grade of shivering, grade of sedation. Sensory level obtained was checked immediately and at 5 min after giving the spinal anesthesia and during operation. The anesthesiologist who was collecting the data blinded to the contents of these study drug. Shivering was given a score of Grade '0' for no shivering; Grade 'I' for mild shivering not distressing to the patient; Grade 'II' for moderate shivering, distressing to the patient; Grade 'III' for severe shivering, distressing to the patient & interfering with monitoring.

Grading of sedation was as follows Grade '0' alert, Grade 'I' awaken to voice, Grade 'II' awaken with gentle tactile stimulation, Grade 'III' awaken with vigorous tactile stimulation, Grade 'IV' un arousable.

The patient was monitored for hypotension, nausea, vomiting and pruritis. Hypotension was described as systolic blood pressure <30% from baseline. Hypotension was treated with fluid and incremental dose of ephedrine 6 mg IV. Vomiting was treated with metaclopramide 10 mg IV. Shivering was treated with tramadol 0.5mg/kg IV. Pruritus was treated with nalbuphine 2.5 mg I.V.

All data are statistically analyzed with SPSS version 10 and MS Office Excel 2007. Data were expresses as mean ± SD and number (percentile) for all determination a 'p' value < 0.05 was considered significant.

Results

The two groups were comparable with respect to age, weight; height and baseline of blood pressure, Pulse Rate, Oxygen saturation, Respiratory rate, body temperature and intraoperative fluid are shown in Table No. 01. After giving spinal anesthesia maximum height of block (i.e. T6) was same in both the groups.

The incidence and severity of shivering after spinal anesthesia are shown in Table No. 02. The group' F' had significantly less shivering than group 'C' (p value <0.05). The nine patients had shivering in group 'F 'while in group 'C' 24 patients had shivering; thus incidence of shivering in group 'C' is significantly higher than Group 'F'(p = 0.0022). The severity of shivering was also significantly reduced after addition of fentanyl.

The incidence of the side effects such as hypotension, nausea, vomiting and sedation were same in both groups and are shown in Table no. 03.

Table No. 01: Demographic data and Baseline parameters are expressed in mean ± SD

Parameters	Group 'F'	Group 'C'
Age (yrs)	38 ± 11	36 ± 10
Weight (kg)	50 ± 9	51 ± 5
Height (cm)	158 ± 12	154 ± 11
BP (mmHg)	127/83	131/86
PR/min	83 ± 16	90 ± 17
SP O_2 (%)	97.4 ± 1.15	97.4 ± 1.4
RR/min	14 ± 1	14 ± 2
Body temperature (^{0}C)	36.78 ± 0.43	36.73 ± 0.35
IV Fluid (ml)	1510 ± 204.77	1473 ± 144.8

Table No.02: Incidence and severity of shivering

Shivering	Group 'F' (n=60)	Group 'C' (n=60)	p value
Incidence	09 (15%)	24 (40%)	p=0.0022
Mild Shivering	07 (11.66%)	08 (13.33%)	p=0.7825
Moderate Shivering	02 (3.33%)	16 (26.66%)	p=0.0003
Severe Shivering	0	0	

p value <0.05 is significant

Table No. 03: Side effects

Side effects	Group 'F' (n=60)	Group 'C' (n=60)	p value
Hypotension	18 (30%)	22 (36.6%)	p=0.4386
Nausea	02 (3.33%)	01 (1.6%)	p=0.5587
Vomiting	02 (3.33%)	02 (3.33%)	p= 1
Pruritus	01 (1.6 %)	01 (1.6%)	p= 1
Sedation (Gr. I)	14 (23.33%)	10 (16.6%)	p=0.3613

p value <0.05 is significant

Discussion

The spinal anesthesia is preferred for lower abdominal surgeries as it is simple, easy to perform, economical produces rapid onset of anesthesia and complete muscle relaxation. However 40% to 70% of patients undergoing regional anesthesia develop shivering, though it is also found to occur after general anesthesia [2,7].

The mechanism which leads to shivering after regional anesthesia is not very clear, but the probable mechanism which lead to shivering are:

1. The sympathetic blockage after regional anesthesia leads to peripheral vasodilatation, increased heat loss resulting in to core hypothermia [9].

2. The spinal anesthesia decreases the thresholds triggering vascoconstriction and shivering by about 0.6 ^{0}C[10,11].

3. A cold operating room or the rapid infusion of crystalloid solutions at room temperature [12].

4. The direct effects of cold anesthetic solution upon thermo-sensitive structure with in the spinal cord [13].

Several non-pharmacological and pharmacological measures are used to prevent shivering. Non-pharmacological measures include force air warming device, warming lights, blankets, warm IV fluids and using anesthetic drugs at body temperature [14, 15]. The present study was designed to standardize these possible confounding factors while reflecting the usual practice in our Institution. Operating room temperature was constantly held at 23^{0}C. Intravenous fluids and all drugs were administrated at room temperature and double layer blanket was used to cover the upper part of the body during the operation and whole body parts after the operation.

Pharmacological measures for treatment of shivering include mepridine, tramadol, clonidine, ketanserine, physostigmine & nefopam etc.

In the present study, we evaluate the efficacy of intrathecal fentanyl in prevention of shivering in lower abdominal surgeries under spinal anesthesia. The fentanyl is a phenylpiperidine derivative & μ receptor agonist. Intrathecally administrated fentanyl has its analgesic action both in the spinal cord & systemic [16]. The spinal cord makes a major contribution to afferent thermal input and also involve in the integration of thermal input [17].

In the present study both incidence and severity of shivering is reduced, which may be due to effect of fentanyl on thermoregulator and could affect afferent thermal inputs at the spinal cord. Anchalee Techanivate et al found that the incidence of intraoperative shivering decreased when fentanyl (20μgm) was added to intrathecal bupivacaine [18] without increasing the side effects such as Itching, nausea, vomiting, hypotension, bradycardia and urinary retention.

In the present study also addition of fentanyl (25μmg) to intrathecal bupivacaine was not increase the incidence of shivering in caesarean section [19]. In another study authors compared intrathecal fentanyl and intravenous fentanyl for prevention of intraoperative shivering [20]. They found that intrathecal fentanyl was better in reducing shivering with less sedation.

Our study also concluded that there was no significant difference in degree of sedation in both groups.

Conclusions

We concluded that addition of fentanyl to intrathecal Bupivacaine is very advantageous as it reduces the incidence and severity of shivering without increasing side effects

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