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Original Article

Subarachnoid Fentanyl as Adjuvant to Hyperbaric Bupivacaine Prevents Perioperative Shivering Among Parturient Undergoing LUCS Under Spinal Anaesthesia- A Prospective Study

Tapas Kumar Das[1], Mohib Ullah[2], Shyamal Chandra Banik[3], Mitu Das[4]

[1]Associate Professor (cc), Department of Anaesthesiology, Dhaka National Medical College and Hospital, [2]Registrar, Department of Anaesthesiology, Dhaka National Medical College and Hospital, [3]Assistant Professor, Department of Physiology, Dhaka National Medical College, [4]Medical Officer, Department of Medicine, Islami Bank Hospital, Dhaka.

Abstract:

Background: Post Spinal Anaesthesia Shivering (PSAS) is one of the most common problems during spinal anaesthesia. Shivering is being treated with some drugs.

Objective: To evaluate the efficacy of intrathecal fentanyl in prevention of shivering in patients undergoing LUCS under spinal anaesthesia.

Methodology: This prospective study was done among 60 patients of ASA I and II divided into two groups of 30 each. Group A was given a combination of 10 mg (2 mL) of hyperbaric 5% bupivacaine with 25 µg (0.5mL) fentanyl intrathecally and group B was given only 10 mg (2 mL) of hyperbaric 5% bupivacaine. Shivering was observed in both groups for 3 hours.

Results: Among the 30 patient of group A only 3 patients (10%) developed shivering whereas among the 30 patient of group B only 18 patients (60%) developed shivering. So the incidence of shivering in Group A was significantly lower than Group B.

Conclusion: Intrathecal fentanyl is effective in decreasing the frequency of perioperative shivering in parturient undergoing LUCS under spinal anaesthesia.

Key Words: Intrathecal fentanyl, LUCS, Shivering, Spinal anaesthesia

Introduction:

Spinal anaesthesia is a popular & preferred technique for caesarean section due to its safety profile. Although it is linked with some adverse effects such as hypotension, bradycardia, nausea & vomiting.[1,2] Among them shivering is one of the common complication in spinal anaesthesia and its incidence is around 56.7%.[3] Shivering increases oxygen consumption, lactic acidosis, carbon dioxide production and cardiac workload.[4] It is an unpleasant experience which leads to patient discomfort and interfere with electrocardiography and pulse oximetry monitoring.[5,6] Prevention has always been preferred over cure. Different drugs have been used for prevention of shivering e.g, intrathecal dexmedetomidine, intrathecal meperidine, intravenous Tramadol etc. but all of them have some adverse effect on mother and baby.[7,4] Fentanyl, a synthetic opioid analgesic, is very popular for its rapid onset and shorter duration of action following intrathecal administration.[8,9] Intrathecal administration of 10-40 µg Fentanyl along with Bupivacaine has been found to be very effective in minimizing shivering during and after cesarean section without increasing serious adverse effects.[9-13]

The aim of our study was to evaluate the effect of intrathecal fentanyl (25 µg) as adjuvant to hyperbaric Bupivacaine on incidence of perioperative shivering during spinal anesthesia for cesarean section. The severity of shivering and side effects of fentanyl (nausea, vomiting, itching and hypotension) were also investigated.

Methods:

This prospective randomized clinical trial was performed in Dhaka National Medical College Hospital, Dhaka from June 2022 to December 2022. This clinical trial was approved by the institutional ethics committee. Informed written consent was taken

from 60 healthy women based on American Society of Anesthesiologists classification system (ASA Physical status I and II) scheduled for elective term cesarean section under spinal anesthesia. Patient with contraindication to spinal anesthesia (coagulopathy, infection in the spinal site, patient refuse, and increased intracranial pressure), previous history of allergic reaction to the local anesthetics, fentanyl and pethidine were excluded. This 60 parturient were randomly divided in two groups, A (bupivacaine + fentanyl) & B (only bupivacaine) group, each having 30 patients.

Patients were monitored by pulse oximetry and noninvasive blood pressure every three minutes, and venous access was obtained in the upper limb with a 20G catheter. Patients were preloaded with 500 mL intravenous Ringer's lactate at room temperature immediately before the spinal anesthesia. Axillary temperature of patients were measured by digital thermometer with the arm held close to the body. The ambient temperature was maintained at 22-24°C. Spinal anesthesia was performed in sitting position at L3-L4 with a 25G Quincke (B.Braun Germany) spinal needle. A combination of 10 mg (2 mL) of hyperbaric 5% Bupivacaine with 25 µg (0.5mL) fentanyl was administered intrathecally in group A and only 10 mg (2 mL) of hyperbaric 5% Bupivacaine was administered intrathecally in group B. Subsequently, patients were placed in the supine position with lateral deviation of the uterus to the left using a wedge under the right hip. Supplemental oxygen was given via a nasal cannula at the rate of 3 lit/min during the operation. After blockade, hydration with 10 mL/kg/hr of Ringer lactate was maintained. Sensory analgesia was evaluated by pinprick before the start of surgery. After birth, 1 g of Ceftriaxone and 10 units of oxytocin in 500 ml of Ringer lactate were administered by infusion.

To determine the incidence of shivering, the scale proposed by Crossley and Mahajan was used.[14] 0 = no shivering; 1 = One or more of the following: piloerection, peripheral vasoconstriction, peripheral cyanosis with no other cause, but no muscular activity; 2 = visible muscular activity confined to one muscle group; 3 = visible muscular activity in more than one muscle. Perioperative side effects such as hypotension (SBP <30% from baseline or <80 mmHg), bradycardia (HR <60 bpm), oxygen desaturation (SpO2 <90%), respiratory depression (RR <12 bpm) and hypothermia (temperature <35°C) and itching were recorded and treated accordingly. Observation of both groups was done for 3 hours.

Results:

Sixty parturient were involved in this study. There were no significant differences in age, BMI, NPO time, surgical time, perioperative IV fluid, height of sensory block or body temperature between the two groups prior to anesthesia. The total incidence of shivering in Group A was significantly lower than Group B (3 of 30 patients, 10% in group A and 18 of 30 patient, 60% in group B). Almost all shivering patients started shivering in the first hour after spinal anesthesia. During the operation, there was a little bit difference in the incidence of Bradycardia or vomiting between the two groups but 5 patients of group A develop pruritus. Hypotension develops in only 6 patients of group A and 12 patients of group B. None developed respiratory depression.

Table-I: Demographic characteristics of patients among groups

	Group- A (Bupivacaine+Fentanyl) (n= 30)	Group-B (Only Bupivacaine) (n= 30)
Age (years)	26.4± 6.3	25.7±5.7
Weight (kg)	65.3± 10.5	66.2 ± 11. 0
Gestational age (weeks)	39.2 ± 1.1	39.3 ± 1.0
ASA I/II	26/4	25/5
Duration of surgery (min)	52.5 ± 15.1	51.3 ± 14.9
Perioperative IV fluid (ml)	1550 ± 272	1600 ± 220

Table-II: Frequency of Shivering

Shivering	Group- A (Bupivacaine + Fentanyl) (n= 30)		Group-B (Only Bupivacaine) (n= 30)	
	number	%	number	%
Present	3	10	18	60
Absent	27	90	12	40

Table-III: Comparison of side effects among groups

	Group- A (Bupivacaine+ Fentanyl) (n= 30) Number	Group-B (Only Bupivacaine) (n= 30) Number
Bradycardia	2	3
Hypotension	6	12
Nausea and Vomiting	3	5
Respiratory depression	0	0
Pruritis	5	0

Discussion:

The actual mechanism of shivering under spinal anesthesia is not clear. The factors that decrease the core temperature such as sympathetic blockage which results in peripheral vasodilatation, increased cutaneous blood flow, and subsequently increased heat loss via the skin[15], decreased operating room temperature, rapid IV infusion[16], the direct effects of cold anesthetic solutions upon thermo sensitive structures within the spinal cord.[17] Shivering increases metabolic heat production. In addition to heat rising, there is marked increase in oxygen consumptions and carbon dioxide production with potential risk of complications in patient with cardiovascular or pulmonary impairment.[18] Many pharmacological agents have been used for the prevention and treatment of shivering. Intrathecal dexmedetomidine, meperidine and intravenous drugs including magnesium sulfate, clonidine, opioids, physostigmine, ondansetron and ketanserin has been suggested for treatment of shivering.[19]

Fentanyl is a highly ionized, lipophilic μ receptor agonist that provide faster onset of action (5-10 minutes) but, with shorter duration of action (4-6 hours). When it is administered intrathecally, the unionized component is rapidly transferred into the spinal cord and affect afferent thermal inputs at the spinal cord and reduction of shivering occurs.[20] Our study results also manifested that the addition of 25μg fentanyl to hyperbaric bupivacaine for spinal anesthesia in patients undergoing cesarean section, reduces the incidence and severity of perioperative shivering. It is shown that fentanyl can reduce the intensity and severity of shivering up to 3 h after spinal anesthesia.

Our result is similar to the results presented by Sadegh A et al.[20] & Techanivate et al.[21] They performed their study on 80 & 60 patients respectively and found that frequency of shivering was significantly less in fentanyl group.

Chow et al.[22] demonstrated that addition of even 1.25 μg fentanyl reduces the incidence of shivering in TURP under spinal anaesthesia.

Though Safavi M et al.[23] demonstrated that there is no significant difference between intrathecal fentanyl and intrathecal meperidine for reducing shivering, but their study used 20 μg fentanyl added to 3 ml of bupivacaine 0.5%.

The incidence of pruritis with the administration of opioid into the subarachnoid space was not uncommon. In our study 5 patients of group A developed pruritus. Similar investigations were also found by other researchers.[24,12] On the contrary, some studies had shown non-signified pruritis who received less than 25 μg of intrathecal fentanyl.[25,26] One of the possible mechanism might be that none of these studies have measured pruritis as the main outcome.

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Conclusion

From this study we can conclude that intrathecal administration of fentanyl is very useful to reduce the frequency of shivering among parturient undergoing LUCS under spinal anaesthesia, without increasing any side effect.

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