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Original Research Article

Clinical Characteristics of Individuals Receiving Intrathecal Bupivacaine with Clonidine or Bupivacaine with Fentanyl Spinal Anaesthesia

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Abstract

Aim: The aim of this study to assess the clinical characteristics of individuals receiving intrathecal bupivacaine with clonidine or bupivacaine with fentanyl spinal anaesthesia.

Methods: A prospective double blind randomized controlled study was conducted in the Department of Anaesthesiology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 1 year. 100 adult patients were randomly divided on an alternative basis into two groups of 50 each. Group **"**A**"**-Bupivacaine plus clonidine group. Group **"**B**"**-Bupivacaine plus fentanyl group. Patients with ASA grade 1 and 2 patients and age group of 18 –70 yrs. Those patients scheduled to undergo elective lower abdominal, lower extremity, gynaecological or urological surgeries under subarachnoid block were included in this study. Patients belonging to group 'A' received 3 ml (15 mg) of hyperbaric bupivacaine 0.5% plus 1 $\mu g.kg^{-1}$ of clonidine. Patients of group 'B' received 3 ml (15 mg) of hyperbaric bupivacaine 0.5% plus (25 µg) of fentanyl. After injection, patient was immediately turned to supine position.

Results: Majority of patients in the both the groups belonged to the group 30 to 40 years. The number of males 42% and females 58%. Majority of female patients in the both the groups belonged to the group 160 to 170 cms and males 171 to 175 cms, Samples were height matched. Most of the patient's 40 percent from gynaecology surgery followed by lower limb surgery 35 percent and Lower Abdominal Surgery 25 percent.

Conclusion: We concluded that the administration of local anaesthetics in combination with opioids intrathecally is an established technique for managing postoperative pain following abdominal, pelvic, thoracic or orthopaedic procedures on lower extremities. Local anaesthetics with opioids demonstrate significant synergy.

Keywords: Spinal Anesthesia, Bupivacaine, Clinical Profile.

Introduction

Local anesthetic like bupivacaine is commonly used in spinal anesthesia, but the duration of spinal anesthesia may be short and limited, and higher doses of rescue analgesics may be required in the postoperative period. This can be avoided by using higher doses of bupivacaine which again can produce cardiac toxicity. Studies have shown that duration of analgesia due to bupivacaine in spinal anesthesia can be prolonged by using adjuvants such as midazolam, opioids, neostigmine, dexmedetomidine, and clonidine[1]. Almost all opioids have been used as adjuvants intrathecally.

Most commonly used opioid in regional anesthesia is fentanyl citrate which is a μ_1- and μ_2-receptor agonist. It is a highly potent drug because of its high lipophilicity. It is preferred as an adjuvant in spinal anesthesia because of its rapid onset and short duration of action with minimal cephalic spread[2,3]. However, pruritus, nausea, vomiting, respiratory depression, and urinary retention are other common side effects for which search for ideal nonopioid adjuvants goes on[4]. Clinical studies have suggested that intrathecal clonidine, an α_2-receptor agonist, prolongs sensory and motor block in spinal anesthesia and provides prolonged postoperative analgesia. Clonidine has beneficial effects such as antiemesis, reduced post spinal shivering, anxiolysis, and sedation, thereby avoiding unwanted opioid-related side effects such as pruritus and respiratory depression.

The technique of subarachnoid block is quite simple and single injection results in ideal operating conditions with complete analgesia, profound muscular relaxation, decreased blood loss and minimal ventilatory disturbances. Further, in a developing area like Bundelkhand, non-availability of highly sophisticated anaesthetic equipment and compressed gases with their prohibitive cost makes spinal anaesthesia one of the major tools in the hands of an anesthesiologist. If we can extend its duration to include the postoperative period it will be unmatched. Reasons to achieve optimal postoperative pain relief than any other surgical patients and they also present with unique challenges. Post cesarean delivery patients are at higher risk for thromboembolic events which may also be precipitated by immobility from inadequate pain control[5] or excessive sedation from opioids. Moreover, these women need to ambulate, to be alert and energetic enough to care for, interact with and breastfeed their newborn. Early breastfeeding is important immediately after childbirth to promote and improve mother bonding and enhances puerperal changes to regain prepregnancy state[6,7]. With these goals in mind, the analgesic of choice requires minimal transfer in breast milk, little or no effect on neonates, minimal maternal side effects and minimal or no interference with caring for the newborn or discharge from hospital. The common modalities are systemic administration of opioids, either by intramuscular injection or i.v. injection, by patient-controlled analgesia or by neuraxial injection of opioids as part of regional anaesthetic for postoperative analgesia in cesarean delivery. Fentanyl is a synthetic primary μ-opioid agonist. Chemically it is N-phenyl-N-(1-phenethyl-4- piperadenyl) and was first synthesized by Dr.Paul Janssen in 1959. In 1960 fentanyl was introduced as an intravenous anaesthetic under the name of sublimaze. In Mid-1990, duragesic patch of fentanyl was introduced into clinical trial. Now fentanyl is given via various routes i.e. transdermal, i.v., i.m., oral, sublingual, buccal, intrathecal, epidural[8].

Materials and methods

A prospective double blind randomized controlled study was conducted in the Department of Anaesthesiology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 1 year, after taking the approval of the protocol

review committee and institutional ethics committee. After taking informed consent detailed history was taken from the patient or the relatives. The technique, risks, benefits, results and associated complications of the procedure were discussed with all patients.

100 adult patients were randomly divided on an alternative basis into two groups of 50 each. Group **"**A**"**-Bupivacaine plus clonidine group. Group **"**B**"**-Bupivacaine plus fentanyl group. Patients with ASA grade 1 and 2 patients and age group of 18 –70 yrs. Those patients scheduled to undergo elective lower abdominal, lower extremity, gynaecological or urological surgeries under subarachnoid block were included in this study.

In the preoperative room, intravenous line was secured and the patients were preloaded with 15 ml / kg Ringer's lactate, 30 minutes prior to spinal anaesthesia.

In each case, spinal anaesthesia was performed under strict aseptic precautions by inserting 25-gauge Quincke's spinal needle into subarachnoid space at L2-3 or L3-4 interspace with patient in lateral position and the study solution was injected over 15-20 secconds.

Patients belonging to group 'A' received 3 ml (15 mg) of hyperbaric bupivacaine 0.5% plus 1 $\mu g.kg^{-1}$ of clonidine. Patients of group 'B' received 3 ml (15 mg) of hyperbaric bupivacaine 0.5% plus (25 µg) of fentanyl. After injection, patient was immediately turned to supine position.

Standard monitoring was carried out in the form of pulse oximetry, ECG and non-invasive arterial blood pressure monitoring. Pulse rate, respiratory rate, arterial blood pressure and oxygen saturation were recorded every 3mins for first 10 mins, every 5 mins for next half an hour and then every 10 mins intra operatively. Bolus doses of inj mephenteramine 6 mg i.v. were given to maintain arterial blood pressure within 20% of baseline and inj atropine 0.6 mg i.v. was given when the patient developed bradycardia (PR< 50 beats/min). No other sedative or analgesic was given in the study period. Sensory block was assessed by pin pricks in mid clavicular line bilaterally using 25 guage hypodermic needle. The onset of sensory block was considered as the time taken from intrathecal injection to the highest level of the sensory block. The duration of sensory block was taken from the time of intrathecal injection to regression of the level of sensory block to L1 dermatome. Duration of motor block was recorded from onset time to time when the patient was able to lift the extended leg.

Modified Bromage Scale

- Grade 0 - Full flexion of knees and feet.
- Grade 1 - Just able to flex knees, full flexion of feet.
- Grade 2 - Unable to flex knees, but some flexion of feet possible.
- Grade 3 - Unable to move legs or feet.

The duration of complete analgesia was taken from the time of intrathecal drug administration to the first report of pain

The duration of effective analgesia was taken from the time of intrathecal drug administration to the time of first supplementation with rescue analgesic. Injection diclofenac sodium 1.0 mg / kg intramuscular was the rescue analgesic given if VAS was found to be 5 or more.

Sedation scores were assessed every 15 minutes both intra and post operatively using a four-point score described by Chernik et al.

Grade 0 – patient wide awake.
Grade 1 – patient is sleeping comfortably but responding to verbal commands.
Grade 2 – deep sleep but arousable.
Grade 3 – deep sleep, unarousable.

Post operatively, monitoring of vital signs, VAS scores and sedation scores was continued every 30 minutes until the time of regression of sensory block to L1 dermatome. The incidence of hypotension (arterial blood pressure < 20% of baseline),

bradycardia (heart rate <50beats/min), pruritus, nausea, vomiting and urinary retention were monitored in the recovery room and then shifted to the ward.

Results

Table 1: Age distribution of patients

Age	Gender		Total
	Female	Male	
Below 20	6	9	15
20-30	11	18	29
30-40	26	11	37
40-50	13	3	16
Above 50	2	1	3
Total	58	42	100

Majority of patients in the both the groups belonged to the group 30to 40 years.

Table 2: Gender distribution of patients

Gender	Number of patients	Percentage
Male	42	42
Female	58	58
Total	100	100

The number of males 42% and females 58%.

Table 3: Height distribution of male and female

Height (cms)	Female	Male	Total
160-165	27	7	33
166-170	26	5	31
171-175	5	20	25
>176	0	10	10
Total	58	42	100

Majority of female patients in the both the groups belonged to the group 160 to 170 cms and males 171 to 175 cms, Samples were height matched.

Table 4: Type of surgery

Type of surgery	Frequency=100	Percent
Gynaecology	40	40
Lower Abdominal Surgery	25	25
Lower Limb Surgery	35	35

Most of the patients 40 percent from gynaecology surgery followed by lower limb surgery 35percent and Lower Abdominal Surgery 25 percent.

Discussion

Clonidine is an α_2-agonist which block the conduction of Aδ and C fibers, thereby prolongs the action of local anesthetics. When used intrathecally, it activates the postsynaptic α_2-receptors in substantia gelatinosa of spinal cord and produces analgesia. Clonidine, a selective partial agonist for α2 adrenoreceptors known to increase both sensory and motor block of local anaesthetics, after intrathecal administration exerts its analgesic effects through activation of post synaptic α2 receptors in substantia gelatinosa of spinal cord[9]. Fentanyl and bupivacaine co-administration has a synergistic inhibitory action on the Aδ and C- fiber conduction

causing improved perioperative analgesia[10].

The use of neuraxial opioids have increased dramatically over the last few years. They improve the quality of intraoperative analgesia produced by local anaesthetics, by binding directly with spinal opiate receptors and prolong the duration of postoperative analgesia. Opioids administered in the subarachnoid space appear to act principally on μ-receptor in the substantia geletinosa of the dorsal horn of spinal cord by suppressing excitatory neuropeptide release from cfibers[11]. The combination of local anaesthetic and opioids, allow for a reduction in doses of both classes of drugs, thus lessening the side effects attributable to each. Fentanyl, a lipophilic opioid has rapid onset of action following intrathecal administration, provides better intraoperative analgesia and is a safer alternative than morphine for management of early post operative pain as it does not migrate to fourth ventricle in sufficient concentration to cause delayed respiratory depression when administered intrathecally[12].

The first neuraxial block was performed 8 months after the demonstration in Heidelberg of the local anaesthetic properties of cocaine. James Leonard Corning (1855-1923), a neurologist in New York City on October 12, 1885 injected a total of 120 mg of cocaine between the T11 and T12 spinous process in a 45 year old man and obtained loss of sensation of the legs and perineum. He concluded that this proved action of cocaine on spinal cord and suggested its use in certain cases of spinal spasticity and for operations on the genito-urinary system[13].

On August 15, 1898, August Bier and August Hildebrandt, surgeons at Kiel University, Germany used the Quincke method of entering the intrathecal space and injected between 5mg and 15 mg of cocaine to produce spinal anaesthesia in six cases for operations on lower part of the body. They also reported the results of spinal anaesthesia given to each other in what has become one of the classic clinical papers in the medical literature[14].

The scientific study of spinal anaesthesia began within a few years after its introduction. Investigations were undertaken by Arthur E Barker (1850-1916) to determine the factors involved in spread of local anaesthetics within the subarachnoid space. His emphasis on gravity as an essential determinant of local anaesthetic spread remains an important facet of spinal anaesthesia technique today[15].

Post spinal headache was an annoying problem for the first practitioners and their patients. However, study by Leroy Vandam and Robert Dripps confirmed Bier's original suggestion that CSF leakage through the dural rent was the causative factor. The use of small diameter spinal needles has decreased the incidence of post spinal headache. An innovative treatment of headache after dural puncture, epidural blood patch, was suggested by James B Gormley in 1960 and further described by Anthony J Digiovanni and Burdett S Dunbar in 1970[16,17].

Conclusion

The present study concluded that the administration of local anaesthetics in combination with opioids intrathecally is an established technique for managing postoperative pain following abdominal, pelvic, thoracic or orthopaedic procedures on lower extremities. Local anaesthetics with opioids demonstrate significant synergy.

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