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Assessment of different dexmedetomidine doses on the duration of spinal anaesthesia

Dr. RN Das[1], Dr. Alok Ranjan[2], Dr. DK Mishra[3]

[1, 2] Assistant Professor, Department of Anaesthesia, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India

[3] Professor and HOD, Department of Anaesthesia, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India

Abstract
Dexmedetomidine is most often used in the intensive care setting for light to moderate sedation. It is not recommended for long-term deep sedation. A unique feature of dexmedetomidine is that it has analgesic properties in addition to its role as a hypnotic, but is opioid sparing; thus, it is not associated with significant respiratory depression.

The study is conducted in Anugrah Narayan Magadh Medical College and Hospital in Surgery department. The approval of ethical committee had been taken along with the consent from the patients were also taken. Total 40 patients having are group of 20-60 year were enrolled in to the study.

From the present study we conclude that, effect of 6µg Dexmedetomidine Dosage on Duration of Spinal Anaesthesia hydrochloride added to local anaesthetic in subarachnoid block has proved to be a better adjuvant in prolonging the sensory and motor blockade intra-operatively and duration of effective post-operative analgesia compared to 2 µg, without signifcant adverse effects.

Keywords: spinal anaesthesia, dexmedetomidine, intrathecal adjuvant, etc.

Introduction

Spinal anaesthesia (or spinal anesthesia), also called spinal block, subarachnoid block, intradural block and intrathecal block [1], is a form of regional anaesthesia involving the injection of a local anaesthetic into the subarachnoid space, generally through a fine needle, usually 9 cm (3.5 in) long. For obese patients longer needles are available (12.7 cm / 5 inches).

Spinal anaesthesia is a commonly used technique, either on its own or in combination with sedation or general anaesthesia. Examples of uses include:

- Orthopaedic surgery on the pelvis, hip, femur, knee, tibia, and ankle, including arthroplasty and joint replacement
- Vascular surgery on the legs
- Endovascular aortic aneurysm repair
- Hernia (inguinal or epigastric)
- Haemorrhoidectomy
- Nephrectomy and cystectomy in combination with general anaesthesia
- Transurethral resection of the prostate and transurethral resection of bladder tumours
- Hysterectomy in different techniques used
- Caesarean sections

Spinal anaesthesia is the technique of choice for Caesarean section as it avoids a general anaesthetic and the risk of failed intubation (which is approximately 1 in 250 in pregnant women). It also means the mother is conscious and the partner is able to be present at the birth of the child. The post operative analgesia from intrathecal opioids in addition to non-steroidal anti-inflammatory drugs is also good.

If surgery allows, spinal anaesthesia is very useful in patients with severe respiratory disease such as COPD as it avoids intubation and ventilation. It may also be useful in patients where anatomical abnormalities may make tracheal intubation very difficult.

Regardless of the anaesthetic agent (drug) used, the desired effect is to block the transmission of afferent nerve signals from peripheral nociceptors. Sensory signals from the site are blocked, thereby eliminating pain. The degree of neuronal blockade depends on the amount and concentration of local anaesthetic used and the properties of the axon. Thin unmyelinated C-fibres associated with pain are blocked first, while thick, heavily myelinated A-alpha motor neurons are blocked moderately. Heavily myelinated, small preganglionic sympathetic fibers are blocked first. The desired result is total numbness of the area. A pressure sensation is permissible and often occurs due to incomplete blockade of the thicker A-beta mechanoreceptors. This allows surgical procedures to be performed with no painful sensation to the person undergoing the procedure.

Some sedation is sometimes provided to help the patient relax and pass the time during the procedure, but with a successful spinal anaesthetic the surgery can be performed with the patient wide awake.

Dexmedetomidine, is an anxiety reducing, sedative, and pain medication. Dexmedetomidine is notable for its ability to provide sedation without risk of respiratory depression (unlike other commonly used sedatives such as propofol, fentanyl, and midazolam) and can provide cooperative or semi-arousable sedation.

Similar to clonidine, it is an agonist of α2-adrenergic receptors in certain parts of the brain. Dexmedetomidine hydrochloride is also used in veterinary medicine for dogs and cats. It was developed by Orion Pharma [1].

Dexmedetomidine is most often used in the intensive care setting for light to moderate sedation. It is not recommended for long-term deep sedation. A unique feature of

dexmedetomidine is that it has analgesic properties in addition to its role as a hypnotic, but is opioid sparing; thus, it is not associated with significant respiratory depression (unlike propofol).

Many studies suggest dexmedetomidine for sedation in mechanically ventilated adults may reduce time to extubation and ICU stay [2]. People on dexmedetomidine can be rousable and cooperative, a benefit in some procedures.

Compared with other sedatives, some studies suggest dexmedetomidine may be associated with less delirium. However, this finding is not consistent across multiple studies. At the very least, when aggregating many study results together, usage of dexmedetomidine appears to be associated with less neurocognitive dysfunction compared to other sedatives. Whether this observation has a beneficial psychological impact is unclear. From an economic perspective, dexmedetomidine is associated with lower ICU costs largely due to a shorter time to extubation [3].

This study was undertaken with an aim to investigate and compare the effect of different doses of Dexmedetomidine through the intrathecal route from 1.5 µg to 5 µg in combination with levobupivacaine 0.5%.

Methodology

The study is conducted in Anugrah Narayan Magadh Medical College and Hospital in Surgery department. The approval of ethical committee had been taken along with the consent from the patients were also taken. Total 40 patients having are group of 20-60 year were enrolled in to the study.

Table 1: Following is the group of patients and the dose administered

Group	Dexmedetomidine	Levobupivacaine
Control Group:	No	3 mL (15 mg) of 0.5% levobupivacaine
Group I:	2 µg	3 mL (15 mg) of 0.5% levobupivacaine
Group II:	4 µg	3 mL (15 mg) of 0.5% levobupivacaine
Group III:	6 µg	3 mL (15 mg) of 0.5% levobupivacaine

Inclusion criteria

- Age group 18-60 years
- ASA grade I and grade II
- Elective abdominal and lower limb surgeries

Exclusion criteria

- Patients belonging to ASA grade III, IV and V
- Patient refusal
- Liver and renal dysfunction
- Patients with cardiac dysarrhythmias
- Patients using adrenergic receptor blockers and / or calcium channel blockers
- Weight >120 kg or height < 150 cm
- Patients with contraindications for spinal anaesthesia
- Allergy to drugs

In the O.T., appropriate equipment for airway management and emergency drugs were kept ready. The horizontal position of the operating table was checked and patient shifted to the table. 18G i.v. cannula was inserted and the patient was preloaded with 500ml of Lactated Ringer's solution. NIBP, SpO2, ECG leads were connected to the patient. Preoperative baseline systolic and diastolic BP, PR, SpO2 and RR were recorded. Under strict aseptic precautions, a midline lumbar puncture was performed using a 25G Quincke needle in sitting position. The patient was then immediately placed in supine position. The time for intrathecal injection was considered as 0 and the following parameters were observed – sensory blockade, motor blockade, duration of analgesia and sedation [4].

Results & discussion

The data from the two study groups were collected and presented as below. Total 40 patient's data is presented in the study. The age group of the enrolled study group patients is ranging fromage 20 to 60 years.

Table 2: Age distribution of the Patients

Group	Age	Sex male: female	Duration of Surgery mins
Control Group:	30-46	8:2	92 ± 15
Group I:	35-49	7:3	99 ± 10
Group II:	33-51	9:1	110 ± 16
Group III:	26-55	6:4	95 ± 14

Table 3: Haemodynamic Parameters

Parameter	Control Group	Group I	Group II	Group III
onset of the sensory block (min)	1.3 ± 0.5	2.6 ± 1.3	3.2 ± 1.8	3.0 ± 2.3
Duration of the sensory block (min)	180 ± 50	230 ± 40	290 ± 25	340 ± 30
Duration of analgesia	120 ± 20	260 ± 56	320 ± 73	390 ± 79
Duration of motor block	190 ± 20	242 ± 36	276 ± 28	321 ± 24

Dexmedetomidine a second generation α2 receptor specific, pharmacologically active d- isomer of medetomidine was first synthesized in the late 1980s [5]. Intrathecal dexmedetomidine when combined with spinal bupivacaine prolongs the sensory block by depressing the release of C fibres transmitters and by hyperpolarization of post synaptic dorsal horn neurons [6]. Motor block prolongation by α2 adrenoceptors agonists may result from binding these agonists to motor neuron sin the dorsal horn of the spinal cord [7-8]. Intrathecal α2receptor agonists have been found to have ant inociceptive action for both somatic and visceral pain.

Tis study shows signifcant prolongation of the duration of spinal blockade by intrathecal administration of dexmedetomidine as an adjunct to hyperbaric bupivacaine for patients undergoing abdominal and lower extremity surgeries and is dose dependent.

This study has limitations in the form of the type of surgery as we did not restrict to a single type of surgery which may have an influence on the results. Moreover, adding Dexmedetomidine will not increase the sensory block duration alone, but also, will increase the duration of the motor block duration which considered as a limitation to the drug itself (not to the study) and may lead to prolonged recovery or hospital stay.

Conclusion

From the present study we conclude that, effect of 6µg

Dexmedetomidine Dosage on Duration of Spinal Anaesthesia hydrochloride added to local anaesthetic in subarachnoid block has proved to be a better adjuvant in prolonging the sensory and motor blockade intra-operatively and duration of effective post-operative analgesia compared to2 μg, without signifcant adverse effects.

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