

Intrathecal Hyperbaric Ropivacaine In Patients with Mild and Moderate IHD – Is It Safe? A Case Series

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Abstract: Spinal anaesthesia with hyperbaric Ropivacaine has been conducted for various surgeries including Cesarean section over past two decades. The convenience offered by this drug for delivering safe peri operative outcome in patients with Ischemic Heart Disease (IHD) for conduct of elective surgical procedures is worth considering due to the high burden of patients with IHD in our country, we present a case series of successful management of such cases. In Case 1, the patient underwent knee arthroscopy with stable hemodynamics throughout the surgery, with <10% variation in his vitals. This suggests that spinal anesthesia with hyperbaric Ropivacaine can provide safe perioperative outcomes in IHD patients undergoing elective surgeries. It is also noteworthy that the patient received only one dose of i.v Injection Mephentermine during the surgery, indicating minimal requirement for vasopressor support. In Case 2, the patient underwent haemorrhoidectomy under spinal anesthesia with stable hemodynamics and only two litres of oxygen through Hudson mask. This case highlights the importance of discontinuing dual antiplatelets prior to surgery to minimize bleeding complications. In Case 3, the patient underwent skin grafting for a non-healing ulcer over the dorsum of the right foot under spinal anesthesia with hyperbaric Ropivacaine. The patient maintained stable vitals throughout the surgery, even with the use of a tourniquet around the left thigh to obtain the skin graft. These cases demonstrate the feasibility and safety of spinal anesthesia with hyperbaric Ropivacaine in IHD patients undergoing elective surgeries. However, it is important to note that each patient's individual condition and medical history should be thoroughly evaluated before deciding on the anesthetic technique to be used. Close monitoring and appropriate management of any hemodynamic changes or complications should also be ensured.

Keywords: anaesthesia, ischemic heart disease, spinal, bupivacaine, ropivacaine

1. Introduction

Spinal anaesthesia with hyperbaric Ropivacaine has been conducted for various surgeries including Cesarean section over past two decades. [1-4] While it has been used in various ambulatory surgeries due to its favourable motor blockade profile, lesser consideration on its benefit of causing minimal hemodynamic fluctuations has been noted. The convenience offered by this drug for delivering safe peri operative outcome in patients with Ischemic Heart Disease (IHD) for conduct of elective surgical procedures is worth considering due to the high burden of patients with IHD in our country. Providing anaesthesia care for such patient mandates experience; while, facilities for invasive blood pressure monitoring, central venous access, availability of

ventilator, etc. is probably required depending on patient's condition. The use of hyperbaric ropivacaine in patients with ischemic heart disease (IHD) for neuraxial blockade has been shown to provide a safe perioperative outcome. It is a favourable choice of drug due to its minimal hemodynamic fluctuations, which is especially important for patients with IHD who may be at a higher risk of cardiovascular events during surgery. The conduct of neuraxial blockade with hyperbaric Ropivacaine in IHD patients posted for elective surgery has not been described. Here we present case series of three IHD patients posted for elective surgery which was conducted with 15mg of intrathecal hyperbaric Ropivacaine.

2. Case Series

Case-1

A 65 year old male patient of 163cm height, weighing 68kg was admitted for severe pain over his right knee since two months. He had history of accidental injury on the same area one year ago. As he was planned to undergo knee arthroscopy, routine investigations including screening Echo was done as per our institute protocol. He was noted to have hypokinesia in anterior segment, with mild left ventricular systolic dysfunction (EF - 45%) as shown in Figure 1. Other blood and urine investigations were within normal limits. He was started on Tablet Metoprolol 25g (once daily), and was advised to continue it on the morning of surgery; which was to be performed two days later. Other cardiac medications were planned to be started one day after his surgery as discussed with cardiologist. The angiogram revealed a double vessel disease. On the third day patient was received in pre operative room. He had pulse rate of 60 beats per minute, NIBP 106/65 mm of Hg and SpO₂ of 99% in room air. Patient's consent was obtained under American Society of Anaesthesiologists Class 2, after informing him briefly regarding administration of spinal anesthesia and its effects. On shifting him to operation theatre, routine monitors were attached. Under aseptic precautions, patient was administered 2 ml of 0.75% Hyperbaric Ropivacaine commercially available through NEON brand as ROPIN (0.75%) after positioning him in lateral decubitus at L3-L4 intervertebral space through midline approach using 25- G Quincke's spinal needle over 30 seconds. He was made to lie supine and lack of response to pin prick was noted after 5th minute of intrathecal drug injection using blunted tip 26 gauge hypodermic needle at T₁₀ level in mid axillary line bilaterally. Right knee arthroscopy was performed with patient in supine position without tourniquet over patient's thigh. His hemodynamics was continuously monitored and noted every 5 minutes for first 30 minutes and later every 10 minutes till the end of surgery; which lasted for 90 minutes with 100-200 ml blood loss. Patient had stable hemodynamics with <10% variation in his vitals as shown in Table 1. He received half a litre Normal Saline as intravenous fluid during his surgery. He was administered 6mg i.v Injection Mephentermine only once throughout his surgery.

Case-2

A 58 year old male patient presented with bleeding per rectum since two years was posted to undergo haemorrhoidectomy. He was known case of IHD

diagnosed 5 years ago and was on medical management for it. He gave history of inability to walk beyond 5 minutes and climb stairs due to breathlessness while doing so. His 2D Echo showed LVEF 35% with pulmonary artery pressure of 45mm of Hg. He had stable hemodynamics and his investigations were within normal range. After discontinuation of his dual anti platelets for a week, he underwent haemorrhoidectomy under spinal anaesthesia with 2 ml of 0.75% Hyperbaric Ropivacaine, administered under aseptic precautions in sitting position and supported in the same position for around 30 seconds after intrathecal drug administration. After confirming absence of patient's response to pin prick at T₁₀ dermatome level, surgery was conducted over 60 minutes with lithotomy positioning. Blood loss was < 250-300 ml. He was stable throughout the surgery with two litres oxygen through Hudson mask.

Case-3

A 60 year old female with non-healing ulcer of 10 x 15cm over dorsum of right foot since 3 months was posted for SSG. She was a known case of IHD diagnosed 2 years ago and was on medical management. While her routine investigations were normal, 2D Echo showed LVEF 45%. Her preoperative vitals were heart rate 68 beats per minute, NIBP 110/60 mm of Hg and SpO₂ 100% on room air. She underwent surgery under spinal anesthesia with 2ml of 0.75% Hyperbaric Ropivacaine administered with aseptic precautions in sitting position. Surgeons used tourniquet around her left thigh inflated to 250 mm of Hg for 40 minutes to obtain skin graft. Just before tourniquet deflation 250ml Normal Saline i.v fluid was given. She maintained stable vitals throughout her surgery. (Figure 2)



Figure 2: 60 year old patient undergoing SSG- 30 minutes after spinal anaesthesia with 15mg Hyperbaric Ropivacaine showing stable hemodynamics comparable to her baseline.

3. Discussion

Ropivacaine has been developed as a pure $-S$ enantiomer of its parent chiral molecule Propivacaine, with lesser lipid solubility compared to Bupivacaine due to pharmaceutical advancements targeted to reduce the cardio toxicity and neuro toxicity of Bupivacaine [5]. Since it is less lipophilic than bupivacaine, it is also less likely to penetrate large myelinated motor fibres. Therefore, it has selective action on the pain transmitting $A\delta$ and C nerves rather than $A\beta$ fibres, which are involved in motor function. Hence greater differentiation in sensory- motor blockade is observed in spinal anaesthesia with hyperbaric Ropivacaine. [5] Fettes et al have demonstrated reliable onset of sensory blockade, adequate maximum dermatome blockade level and spinal anaesthesia duration at T₁₀ dermatome with Hyperbaric Ropivacaine. They have concluded that it can be routinely used in short duration, infra umbilical outpatient surgeries. [6] Wildsmith et al have demonstrated that spinal anaesthesia with 15mg Hyperbaric Ropivacaine provides lesser incidence of significant hypotension. [7] Thereby, intervention with intravenous vasopressor and/or inotropic support is also reduced. As per Laplace's law, the wall stress (σ) is the product of pressure (P) and radius (R) divided by wall thickness (h); $\sigma = P \times R/2h$. Wall stress and heart rate are probably the two most relevant indices that accounts for changes in myocardial oxygen demand. [8] While, Frank-Starling mechanism may remain intact even in a failing heart, the end diastolic volume will stretch the cardiac muscle fibres, leading to increase in the force of contraction; hence surely myocardial oxygen demand will increase. This will render the patient vulnerable to develop ischemic changes during and even after the surgery. Here, as Marey's law states heart rate is inversely proportional to arterial blood pressure, provided other factors remain constant, the possibility of myocardial ischemia in such IHD patients could be reduced by intrathecal hyperbaric Ropivacaine. Hypotension and tachycardia occurs routinely in spinal anaesthesia with hyperbaric Bupivacaine, hence i.v fluids and/or vasopressor and inotrope support is used. This not only requires more intensive patient monitoring, but also increases the likelihood of precipitation of adverse events like pulmonary edema, stroke, etc. Also, the side effects of intrathecal opioid adjuvants commonly used for reducing the dosage of local anaesthetics administered in spinal anaesthesia- like delayed onset of respiratory depression, paralytic ileus, urinary retention, nausea, vomiting, itching, etc is to be noted. This is due to the fact that occurrence

of any such events will also make patients unsuitable for discharge, as they are not home-ready. [9] Along with contraindications for spinal anaesthesia, various patient and surgical factors such as unstable hemodynamics of patient, major surgery beyond two hours with massive anticipated/ unanticipated blood loss, etc will mandate calculated volume resuscitation with central venous pressure and invasive arterial pressure monitoring. Here other modalities for providing surgical anaesthesia might be relevant. Besides this, the availability of Hyperbaric Ropivacaine, its cost and its prompt storage at 25°C should also be considered. Here in all three cases, spinal anaesthesia with commercially available 15 mg hyperbaric Ropivacaine provided adequate surgical anaesthesia with minimal fluctuations in patient's hemodynamics during surgery and after it. Patients had minimal blood loss of around 300ml. Intravenous fluids for resuscitation, vasopressor and inotropic support was required in none of these patients peri operatively and they were discharged as per routine institution policy. There are a lot of techniques and anaesthesia methods described for the management of such cases keeping in mind the cardiac grid. [10,11] Main limitation of this case series was that it was conducted in small population of three mild and moderate IHD patients with stable pre operative hemodynamics posted for elective surgery. It was not compared with other groups respect to dosage of intrathecal hyperbaric Ropivacaine and adjuvants.

4. Conclusion

We suggest that Intrathecal hyperbaric Ropivacaine can be considered for providing surgical anaesthesia in elective surgeries in patients with mild and moderate IHD having stable hemodynamics. Other contraindications for spinal anaesthesia, anticipated surgical blood loss and availability of intrathecal hyperbaric ropivacaine stored at appropriate temperature should be considered. The suggestion needs controlled trials with larger sample size.

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