



Anaesthesiology

TO STUDY AND ASSESS THE EFFECTS OF INTRATHECAL HYPERBARIC ROPIVACAINE (0.5%) WITH CLONIDINE VERSUS HYPERBARIC ROPIVACAINE (0.5%) WITH FENTANYL IN LOWER ABDOMINAL AND LOWER LIMB SURGERIES : A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT Objectives: This study was designed to compare Hyperbaric Ropivacaine (0.5%) with clonidine versus Hyperbaric Ropivacaine (0.5%) with Fentanyl for spinal anaesthesia in Elective lower abdominal and lower limb surgeries. The study assesses and compares the onset, level and regression of sensory and motor block, intraoperative and postoperative analgesic effects, haemodynamic stability and side effects if any after giving 0.5% Hyperbaric Ropivacaine (22.5mg) with clonidine (30mcg) Vs 0.5% Hyperbaric Ropivacaine (22.5mg), Fentanyl (25mcg) in lower abdominal and lower abdominal surgeries. Methodology: 60 patients receives one of the two study drugs: Group A will receive intrathecal Hyperbaric Ropivacaine 0.5% 3ml(22.5mg) + Clonidine 0.2ml (30mcg), Group B will receive intrathecal Hyperbaric Ropivacaine 0.5% 3ml(22.5mg) + Fentanyl 0.5ml(25mcg). Assessment of sensory block, duration of sensory block, quality of motor block, duration of motor block, vital parameters, VAS score, side effects like pruritis, nausea and vomiting are assessed. Results: There is no statistically significant difference seen between age, HR, SP02, SBP, DBP, onset of motor block, Onset of sensory block, VAS score. Duration of analgesia is more in Group A than Group B and the p value is <0.001 which is statistically significant. Conclusion: On comparing ropivacaine + clonidine and ropivacaine +fentanyl, group A (ropivacaine + clonidine) group has higher duration of analgesia than group B (ropivacaine + fentanyl)

KEYWORDS : Hyperbaric Ropivacaine 0.5%, Clonidine, Fentanyl

INTRODUCTION

Spinal anesthesia is commonly used for lower limb procedures, providing both quick and deep anesthesia.¹ Spinal anesthesia is administered solely in the lumbar region, specifically the mid to lower lumbar levels, to avoid spinal cord damage and to prevent intrathecally injected drugs from causing activity in the higher thoracic and cervical areas.²

Ropivacaine, an amide local anesthetic which is frequently used as a spinal anesthetic. Hyperbaric ropivacaine, produced by adding glucose to ropivacaine, has been utilized for spinal anesthetic in lower limb procedures. It has a more rapid onset, a higher success rate for analgesia, and a faster recovery from the sensory block than conventional ropivacaine.³

Fentanyl (which can also be spelled fentanil) is a potent synthetic opioid similar to morphine but produces analgesia to a greater extent.⁴ Ropivacaine combined with fentanyl 3.0 µg/ml and epinephrine 0.5 µg/ml at an initial epidural-PCA infusion rate of 10 ml/h provided excellent post-cesarean section analgesia with minimal side-effects and without compromising ambulation abilities.⁵

Clonidine, an α -2 adrenergic agonist, provides nonopioid analgesia and is often used as an adjuvant in regional anesthesia. The addition of Clonidine to Ropivacaine has been demonstrated to extend the sensory block by a few hours while increasing the incidence of motor blocks.⁶

The study assesses and compares the onset, level and regression of sensory and motor block, intraoperative and postoperative analgesic effects, haemodynamic stability and side effects if any after giving 0.5% Hyperbaric Ropivacaine (22.5mg) with clonidine (30mcg) Vs 0.5% Hyperbaric Ropivacaine (22.5mg), Fentanyl (25mcg) in lower abdominal and lower abdominal surgeries. Most of the studies have been done using hyperbaric Ropivacaine 0.5%.

Objectives

- To compare the onset level and regression of sensory and motor block.
- To compare intraoperative and postoperative analgesic effect, haemodynamic stability, side effects if any between intrathecal Hyperbaric Ropivacaine (0.5%) with clonidine versus Hyperbaric Ropivacaine (0.5%) with fentanyl in lower abdominal and lower limb surgeries.

Inclusion Criteria: Age group 18-60yrs, ASA grade I or II, Both sexes, Posted for elective lower abdominal and lower limb surgeries.

Exclusion Criteria: Previous history of allergy to anaesthetic medication, Any contraindications to spinal anaesthesia, Patients with pre-existing neurological disease, ASA III and IV, Resting heart rate of less than 60/min, Patients on hypnotics, sedatives and other CNS depressant drugs, Patients with coagulopathies, infection at the local site of injection, Patients refusal

Method

This is a prospective comparative study including 60 patients, of ASA grade I and II, in the age group of 20-60 years, posted for elective surgeries under spinal anaesthesia procedures in Bapuji Hospital, Chigateri General Hospital and WCH, attached to J.J.M. Medical College, Davangere within 2 years (March 2023– June 2024)

Preanaesthetic check-up will be done with a detailed history, general physical examination and systemic examination. Airway assessment and spinal column examination are done and preoperative routine investigations like complete Haemogram, Random Blood Sugar, Renal function test, ECG, HIV, HBsAg and others (if required) shall be done. Weight and height of the patients will also be recorded.

Preoperatively

Patients written informed consent will be taken. Nil per oral status will be confirmed. Procedure of subarachnoid will be explained to the patient. They will be premedicated with Tab. Alprazolam 0.5 mg and Tab. Ranitidine 150 mg orally the night before the surgery. Patient will be shifted onto the OT table and intravenous access is established on the forearm with 18 or 20 G IV cannula and Lactated Ringers Solution 8-10 ml/kg infused intravenously before the block.

Procedure

The monitors Pulse Oximeter, NIBP and ECG are applied to the patient on arrival to the operation theatre. Maintenance of IV fluid continued. Following baseline parameters will be recorded. Pulse rate, Respiratory rate, Blood pressure, Oxygen saturation, ECG

Patient placed in sitting or lateral position and under aseptic precautions patients back painted and draped. Lumbar puncture will be done by 23G Quincke Babcock needle at L3-L4 intervertebral space. Clear and free flow of CSF will be confirmed.

Patients receives one of the two study drugs

- Group A will receive intrathecal Hyperbaric Ropivacaine 0.5% 3ml(22.5mg)+Clonidine 0.2ml (30mcg)
- Group B will receive intrathecal Hyperbaric Ropivacaine 0.5% 3ml (22.5mg)+ Fentanyl 0.5ml(25mcg).

After spinal anesthesia, patient is made to lie in supine position. Oxygen at 4 L/min with a face mask is administered to all the patients during the surgery. After intrathecal drug administration, the following parameters are noted in the patients:

Assessment of sensory blockade (Onset of sensory block and Duration of sensory block) will be noted , Assessment of motor blockade (Onset of motor block, Quality of motor block assessed by Modified Bromage Scale, Duration of motor block) will be noted.

Vital Parameters

Patients will be continuously monitored using non invasive blood pressure, pulse oximeter, ECG. Heart rate, blood pressure, SpO2 and respiratory rate will be monitored every 3 minutes for the first 15 minute, every 10 minutes for the next 30 minutes, every 15 minutes for the rest of the surgery. Hypotension, taken as fall in 20% - 25% blood pressure from baseline reading, will be treated with intermittent IV bolus of Ephedrine 6mg. For anxiolysis Intraoperative IV midazolam 1-2 mg can be used as an adjuvant. Bradycardia, taken heart rate less than 60 beats per minute with symptoms will be treated with IV atropine 0.6mg.

Postoperatively, vital parameters will be monitored for every 15 minutes in the 1st hour, every 30 minutes for the 2nd hour, hourly for the 3rd, 4th, 5th, 6th hour and at the 12th and 24th hour.

Assessment of analgesia (Duration of analgesia) and Pain assessment: will be done through VISUAL ANALOGUE SCALE.

Rescue analgesia with injection Diclofenac 75mg intravenous infusion will be given for patients complaining of pain, clinically correlating with VAS score of more than 3.

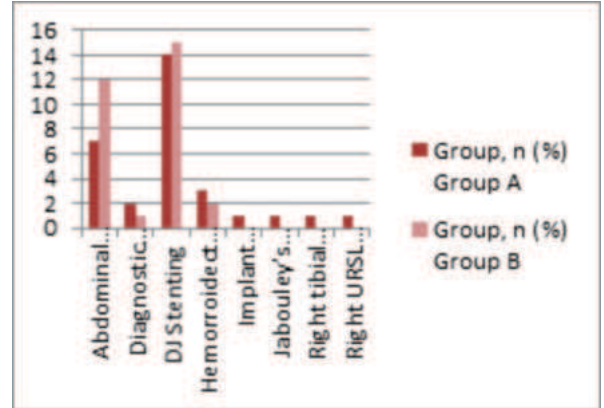
Side Effects: Pruritis , Nausea and vomiting will be noted for 24 hours.

RESULTS

In the present study, a total of 60 patients were selected and divided into 2 groups group A (n=30) and group B (n=30). Regarding the demographic data, on comparing the two studied groups, there were no significant differences between the two studied groups regarding age, gender HR, SPO2, SBP and DBP. Mean between the 2 groups 5.6 irt age, 0.233 wrt HR, 0.267 irt SP02, 0.300 WRT SBP, -3.00 irt DBP and p values are 0.269, 0.920, 0.101, 0.897, 0.062 respectively indicating there is no statistically significant difference seen between Age, HR, SP02, SBP, DBP.

Table 1 : Distribution Of Patients According To Diagnosis Within 2 Groups

Diagnosis	Group, n (%)		Chi square value	P value
	Group A (n=30)	Group B (n=30)		
Left lateral Meniscus tear	1 (3.3)	0	NA	NA
Left ureteric calculus	6 (20)	8 (26.7)		
External + Internal Hemorrhoids	2 (6.7)	0		
Internal Hemorrhoids	1 (3.3)	2 (6.7)		
Left tibial # with implant in situ	1 (3.3)	0		
P2L2 willing for tubectomy	5 (16.7)	8 (26.7)		
P3L3 willing for tubectomy	2 (6.7)	4 (13.3)		
Right lateral meniscus tear	1 (3.3)	1 (3.3)		
Right sided Hydrocoele	1 (3.3)	0		
Right tibial IMIL insitu	1 (3.3)	0		
Right Ureteric calculus	9 (30)	7 (23.3)		



Graph 1 : Distribution Of Patients According To Procedure Within 2 Groups.

In the present study, there is statistically significant difference between Group A and Group B. Duration of analgesia is more in Group A than Group B and the p value is <0.001 which is statistically significant.

Table 2: Comparison of Duration of Analgesia in 2 Groups

Analgesia	Group A	Group B	Mean difference	P value
N	30	30	1.517	<0.001
Mean ± SD	7.40 ± 0.548	5.88 ± 0.751		
Median	7	6.5		
Q1 : Q3	7, 8	5, 6.5		
Min : Max	6.5, 8	5, 7		

In the present study, there is no statistical significance in onset of motor block between 2 groups, median of Group A and Group B is 89 sec and mean difference between 2 groups is -0.233 whereas p value is 0.473

In the present study, on comparison of VAS values, median in Group A and Group B is 4, mean +/- SD of Group A is 3.73 ± 0.450 and Group B is 3.70 ± 0.466 bringing the mean difference between 2 groups to 0.033 and p value is 0.779.

DISCUSSION

Spinal anesthesia is simple to perform, requires minimal medicine, works rapidly, provides consistent surgical anesthesia, and efficiently relaxes muscles. Adjuvants, such as α2 agonists and opioids, can enhance the effectiveness of local anesthesia.

Ropivacaine, an amide local anesthetic with a high pKa and low lipid solubility, has become popular as an intrathecal agent. It may be an appropriate long-acting local anesthetic alternative due to its low cardiotoxicity.⁸

Hyperbaric ropivacaine produces more predictable and consistent sensory and motor blockage, with a faster onset than a plain solution.⁸ The addition of glucose to isobaric ropivacaine causes the drugs to become hyperbaric, which has been shown to improve the speed of onset, block reliability, duration of block, and speed of recovery.⁹

Adding 30 µg of fentanyl and 15 µg of clonidine extended the sensory block. The addition of fentanyl (30 µg) and clonidine (15 µg) significantly prolonged sensory blockade when provided with 15 mg ropivacaine. The addition of glucose (6.66%) induced hyperbaric conditions, prolonging the time to require the first rescue analgesia.¹⁰

In the present study, comparison of ropivacaine with clonidine and ropivacaine with fentanyl was done and regarding the demographic data, on comparing the two studied groups, there were no significant differences between the two studied groups regarding age, HR, SPO2, SBP and DBP. Mean between the 2 groups is 5.6 in relation to age, 0.233 with respect to HR, 0.267 in relation to SP02, 0.300 with respect to SBP, -3.00 in relation to DBP and p values are 0.269, 0.920, 0.101, 0.897, 0.062 respectively indicating there is no statistically significant difference seen between Age, HR, SP02, SBP, DBP.

Similar to our study, Baptista et al, Voje & Manohin et al and Chand et al. all found no change in hemodynamics when a modest dose of clonidine was employed. In accordance to our study, Chaudhary et al. discovered that combining intrathecal fentanyl with low-dose

ropivacaine had no significant influence on hemodynamic changes in older patients. The oxygen saturation was stable over time and between groups.¹¹ Similarly, Nazareth et al. found comparable hemodynamic values in groups receiving intrathecal clonidine and fentanyl.¹²

In the present study, there is no statistical significance in onset of motor block between 2 groups, on comparison of VAS values, median in Group A and Group B is 4, mean $\pm$ SD of Group A is 3.73 ± 0.450 and Group B is 3.70 ± 0.466 bringing the mean difference between 2 groups to 0.033 and p value is 0.779.

In the present study, there is statistically significant difference between Group A and Group B. Duration of analgesia is more in Group A than Group B and the p value is <0.001 which is statistically significant i.e., duration of analgesia is more in clonidine than fentanyl.

A study by Signh R. et al stated that there was no significant prolongation of motor block in individuals given intrathecal fentanyl. However, patients who got intrathecal clonidine 15 μ g coupled with ropivacaine had a much longer motor block.¹²

In par with our study, Sagiroglu et al. utilized 15 μ g and 30 μ g clonidine as adjuvants in 1% ropivacaine (12 mg) and reported considerable extension of sensory and motor block with larger doses of clonidine. Kawaraguchi et al, Baptista et al and Gupta et al all had comparable results.¹³

In accordance to our study, Acc to chhabra A et al Patients who received clonidine as an adjuvant with ropivacaine in the spinal block experienced a prolonged sensory anesthesia, dense and longer duration of motor block, and significantly prolonged postoperative analgesia when compared to the ropivacaine-fentanyl group.¹⁴

Similar to our study, Curatolo et al and Gecaj-Gashi et al. (2012) found that adding clonidine to ropivacaine reduces the onset time and increases the duration of the block.

In accordance with our study, In a research by Shukla et al., patients in Group I (ropivacaine + fentanyl) required analgesic supplementation slightly earlier in the postoperative phase than Group II (ropivacaine + clonidine), but the difference was not statistically significant.¹³

In par with our study, another study by I constant et al Compared to groups O and F, the clonidine groups showed a lower increase in heart rate during recovery. This could be due to clonidine's direct effects or improved pain relief.¹⁵

In contrast to our study, Bathari R. et al stated that ambulatory knee arthroscopy, fentanyl 30 μ g may be more effective than clonidine 15 μ g due to its ability to prolong sensory block without extending motor block duration.¹⁰

In contrast to our study, Gupta et al. found that adding 20 μ g of intrathecal fentanyl to ropivacaine increased the onset of sensory and motor block and a study conducted by Yegin et al, evaluated the effect of intrathecal fentanyl 25 mcg added to 18 mg of ropivacaine for transurethral resection of prostate and found significant improvement in the duration and quality of anesthesia without causing substantial increase in frequency of major side effects.¹⁶

CONCLUSION

On comparing ropivacaine + clonidine and ropivacaine +fentanyl, group A (ropivacaine + clonidine) group has higher duration of analgesia than group B (ropivacaine + fentanyl).

REFERENCES

1. Lee SC, Kim TH, Choi SR, Park SY. No Difference between Spinal Anesthesia with Hyperbaric Ropivacaine and Intravenous Dexmedetomidine Sedation with and without Intrathecal Fentanyl: A Randomized Noninferiority Trial. *Pain Res Manag*. 2022 Jan 13;2022:3395783.
2. Olawin AM, M Das J. Spinal Anesthesia. [Updated 2022 Jun 27]. In: StatPearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537299/>
3. Kallio H., Snäll E.-V. T., Tuomas C. A., Rosenberg P. H. Comparison of hyperbaric and plain ropivacaine 15 mg in spinal anaesthesia for lower limb surgery. *British Journal of Anaesthesia*. 2004;93(5):664-669.
4. Ramos-Matos CF, Bistas KG, Lopez-Ojeda W. Fentanyl. [Updated 2023 May 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK459275/>
5. Cohen S, Chhokra R, Stein MH, Denny JT, Shah S, Mohiuddin A, Naftalovich R, Zhao R, Pashkova A, Roller N, Patel AG, Hunter-Fratzola CW. Ropivacaine 0.025% mixed with fentanyl 3.0 μ g/ml and epinephrine 0.5 μ g/ml is effective for epidural patient-controlled analgesia after cesarean section. *J Anaesthesiol Clin Pharmacol*. 2015 Oct-

- Dec;31(4):471-7.
6. Patil KN, Singh ND. Clonidine as an adjuvant to ropivacaine-induced supraclavicular brachial plexus block for upper limb surgeries. *J Anaesthesiol Clin Pharmacol*. 2015 Jul-Sep;31(3):365-9.
7. Wahedi W, Nolte H, Klein P. Ropivacaine for spinal anesthesia. A dose-finding study. *Anaesthesist*. 1996;45:737-44.
8. Ravipati P, Isaac GA, Reddy PN, Krishna L, Supriya T. A Comparative Study between Intrathecal Isobaric Ropivacaine 0.75% Plus Dexmedetomidine and Isobaric Ropivacaine 0.75% Plus Fentanyl for Lower Limb Surgeries. *Anesth Essays Res*. 2017 Jul-Sep;11(3):621-626.
9. Chatterjee S, Bisui B, Mandal A, Sheet J, Sengupta S, Majumdar S, et al. Effects of intrathecal hyperbaric ropivacaine versus hyperbaric bupivacaine for lower limb orthopedic surgery. *Anesth Essays Res*. 2014;8:349-53.
10. Bathari R, Bhalotra AR, Anand R, Kumar V. A randomised trial to compare the effect of addition of clonidine or fentanyl to hyperbaric ropivacaine for spinal anaesthesia for knee arthroscopy. *Southern African Journal of Anaesthesia and Analgesia*. 2015;22(1), 14-18.
11. Chaudhary A, Bogra J, Singh PK, Saxena S, Chandra G, Verma R. Efficacy of spinal ropivacaine versus ropivacaine with fentanyl in transurethral resection operations. *Saudi J Anaesth*. 2014;8:88-91.
12. Singh R, Kundra S, Gupta S, Grewal A, Tewari A. Effect of clonidine and/or fentanyl in combination with intrathecal bupivacaine for lower limb surgery. *J Anaesthesiol Clin Pharmacol*. 2015 Oct-Dec;31(4):485-90.
13. Nigam S, Rastogi S, Tyagi A, Bhandari R. A Comparative Study for the Analgesic Efficacy and Safety Profile of Fentanyl versus Clonidine as an Adjuvant to Epidural Ropivacaine 0.75% in Lower Abdominal Surgeries. *Anesth Essays Res*. 2017 Jul-Sep;11(3):692-696.
14. Chhabra A, Dawoodi S, Jagtap S. Comparison of clonidine versus fentanyl as an adjuvant to intrathecal ropivacaine for major lower limb surgeries: A randomized double-blind prospective study. *Indian Journal of Pain* 2013;27(3):170.
15. I Constant, O Gall, L Gouyet, M Chauvin, I Murat. Addition of clonidine or fentanyl to local anaesthetics prolongs the duration of surgical analgesia after single shot caudal block in children. *British Journal of Anaesthesia*;1998;80(3):294-298.
16. Yegin A, Sanli S, Hadimioglu N, Akbas M, Karsli B. Intrathecal fentanyl added to hyperbaric ropivacaine for transurethral resection of the prostate. *Acta Anaesthesiol Scand*. 2005 Mar;49(3):401-5.