

A Comparison Of Intrathecal Hyperbaric Bupivacaine With Buprenorphine And Hyperbaric Bupivacaine Alone In Gynaecological Surgeries For Postoperative Analgesia

Research Article

Archana Jadhav^{1*}, Rashmi Bengali²

¹ Junior Resident, Department of Anaesthesiology, Government Medical College, Aurangabad, India.

² Associate Professor, Department of Anaesthesiology, Government Medical College Aurangabad, India.

Abstract

This study was performed at a tertiary care centre after the approval of the Institutional Ethical Committee and obtaining written informed consent from all patients. Sixty ASA I and II, aged 18- 65yrs, bodyweight 45-70kgs scheduled for gynaecological surgeries under spinal anaesthesia were chosen for the study and were divided into two groups named Group B and Group BN each comprising 30 patients. Group B received 3ml of 0.5% hyperbaric bupivacaine with 0.5 ml normal saline and Group BN received 3ml of 0.5% hyperbaric bupivacaine with 0.5ml (150mcg) of buprenorphine. Vital parameters like pulse rate, blood pressure, respiratory rate, SpO₂ were recorded at 0 (basal) 15, 30, 45, 90 and 180 minutes. Postoperatively heart rate, blood pressure, respiratory rate and SP0₂ were monitored at 3 ,6 ,12 and 24 hrs. The mean age, height, weight, duration of surgery were comparable. Time of onset of sensory blockade and motor blockade were noted. The time for rescue medication was 909.0±216.9 min in group BN with a range from 690 min to 1500 min and in group B it was 412.0±89.28 min with a range from 130 min to 195 min. Comparing both groups duration of effective analgesia was significantly higher in group BN with P<0.0001. thus, it can be concluded that addition of buprenorphine as an adjuvant in spinal anaesthesia excellently prolongs duration of analgesia in postoperative period with minimal side effects.

Keywords: Buprenorphine; Bupivacaine; Spinal Anaesthesia; Postoperative Analgesia.

Introduction

The rate of gynaecological surgeries has increased worldwide over recent years. Lower abdominal gynaecological surgeries are commonly Performed under spinal anaesthesia. The comparatively short duration of action of local anaesthetics dictates supplementation of Local anaesthetics with adjuvants. Postsurgical pain experienced by a patient is often significantly greater than expected by the patient.[1] knowing that inadequate analgesics adversely affect the patient's cardiovascular, Pulmonary and emotional status has incited the development of new and highly effective means of controlling pain. The benefits of postoperative analgesia are speedy recovery, reduction in physical and mental stress, improvement in pulmonary function (by allowing the patient to cough, breathe and move more easily), less stress on cardiac function, decreased prevalence of thromboembolic complications [1]. Intrathecal opioids enhance the sensory blockade of local anaesthetics with no effect on sympathetic activity.

Buprenorphine is a mixed agonist-antagonist with partial agonist activity at u-opioid receptor. High lipid solubility, high affinity for opioid receptors, and long duration of action make buprenorphine a good choice as an adjuvant to intrathecal LA for the management of moderate to severe postoperative pain. It has a ceiling effect on respiratory depression and not on analgesia.

Several studies have demonstrated the efficacy of buprenorphine as an adjuvant to local anaesthetics in Subarachnoid block; however optimum dose which provides a balance between analgesia and adverse effects has not been described and also there are limited studies in patients for gynaecological surgeries like Total abdominal or vaginal hysterectomies. This study aims to compare the efficacy of buprenorphine for postoperative analgesia as an adjuvant to hyperbaric bupivacaine in gynaecological surgeries. The side effects of intrathecal buprenorphine will also be assessed.

*Corresponding Author:

Archana Jadhav,
Junior Resident, Department of Anaesthesiology, Government Medical College, Aurangabad, India.
E-mail: archana293jadhav@gmail.com

Received: May 15, 2021

Accepted: October 11, 2021

Published: October 12, 2021

Citation: Archana Jadhav, Rashmi Bengali. A Comparison Of Intrathecal Hyperbaric Bupivacaine With Buprenorphine And Hyperbaric Bupivacaine Alone In Gynaecological Surgeries For Postoperative Analgesia. *Int J Anesth Res.* 2021;09(03):650-653. doi: <http://dx.doi.org/10.19070/2332-2780-21000129>

Copyright: Archana Jadhav[©] 2021. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Materials and Methods

This study was performed at a tertiary care centre after the approval of the Institutional Ethical Committee and obtaining written informed consent from all patients. Sixty ASA I and II, aged 18- 65yrs, bodyweight 45-70kgs scheduled for gynaecological surgeries under spinal anaesthesia were chosen for the study. The patients were randomly allocated into two groups(N=30). After confirming overnight fasting and consent patient was taken to the operation table, and baseline vitals like BP, pulse rate, respiratory rate were recorded. A 20G intravenous cannula was inserted at the forearm level and for preloading lactated Ringer's solution was administered as a bolus of 10ml/kg before subarachnoid block to all patients. Vitals were noted just before lumbar puncture. Spinal anaesthesia was performed at L3-L4 space with the patient in a sitting position by using a 23G Quincke needle under strict aseptic precautions. Free flow of cerebrospinal fluid was verified before Injection of the anaesthetic solution.

The drug compositions were according to a group to which patients were allocated. Group B (n=30) received 3ml of 0.5% hyperbaric bupivacaine with 0.5 ml normal saline to make total volume 3.5 ml; Group BN(n=30) received 3ml of 0.5% hyperbaric bupivacaine with 0.5ml (150mcg) of buprenorphine to make total volume 3.5 ml. All patients were immediately placed in a supine position. Monitoring was done using continuous electrocardiography, heart rate, non-invasive blood pressure and continuous pulse oximetry (SpO₂), Respiratory rate. All patients were given 4.0L/min of oxygen by facemask. Vitals were checked every 5 minutes for the first 30 minutes then every 15 minutes till the end of the surgery. Then the patient was positioned for the planned surgery. Sensory blockade was assessed. The onset of sensory block is defined as the time from the intrathecal injection of the study drug to the time taken to achieve L3 of sensory block. The highest level of the block and the time to achieve the same was noted. Regression of sensory block was defined as the time taken for the sensory block to regress up to two segments of dermatome from the highest level achieved. Motor blockade was assessed using Modified Bromage Scale. The onset of motor block was defined as the time taken to achieve a complete motor block (Bromage Score-3). Duration of motor block was assessed by recording the time elapsed from the maximum to the lowest Bromage score (3-

0). Hypotension was defined as a fall of MAP by more than 20% from baseline or a fall in SBP below 90mmHg and it was treated with I.V fluids, leg raising and incremental doses of Mephentermine 6mg IV. Bradycardia was defined as a heart rate below 60 bpm and was treated with Injection atropine 0.6mg IV. Postoperatively, the pain was assessed by using a visual analogue pain scale (VAS) between 0 and 10 (0- no pain, 10- most severe pain). It was assessed every 30 minutes up to the first three hours followed by 6,12,24 hrs monitoring for pain. Patients were allowed to receive rescue analgesic i.e. injection tramadol 50 mg IV on a VAS score of 3. The time from intrathecal Injection to first administration of rescue analgesic (total duration of analgesia) was noted. The incidence of adverse effects such as nausea, vomiting, shivering, respiratory depression, sedation and hypotension were observed.

Patients were shifted to the ward after the sensory and motor blocks started regressing. In the ward, patients were assessed three, six, twelve and twenty-four hours following surgery. Computerized statistical analysis was performed using SPSS software version 25. Data Were presented as mean +SD. Haemodynamic data including heart rate, systolic and diastolic blood pressure were compared by paired and unpaired t-test. A p-value of less than 0.05 was considered significant.

Results

A total of 60 patients were recruited in the study. The mean age, height, weight, duration of surgery were comparable and the difference was statistically insignificant between the groups. In the present study, the mean duration of onset of sensory blockade in group B was 69.33±9.44 sec whereas the mean duration for group BN was 60.00±8.55 sec. P-value being >0.05 denoting statistical insignificance. The mean time required for the onset of motor blockade was 77 sec in group B and 75 sec in group BN. As P >0.05, there was no statistically significant difference in the onset of a motor blockade in the two groups (Table I). The maximum level of sensory block ranged between T4 to T8. From group B, 14 patients achieved T6 level compared to 16 patients in group BN. Whereas 5 patients from group B achieved level T4 and 8 patients from group BN achieved T4 level. As the p-value was >0.05 when the two groups were compared there was no significant difference in maximum sensory dermatomal level achieved (Table II).

Table 1. Comparison of mean Sensory onset and mean motor onset.

	Group B	Group BN	t-value	P-value
Sensory onset (Sec)	69.33 ± 9.44	60.00 ± 8.55	1.43	P=0.157 NS
Motor Onset (Sec)	77.00 ± 9.52	77.00 ± 9.52	0.891	P=0.484 NS

Table 2. Maximum sensory level of patients in Groups.

MSL	Group B		Group BN		Chi-square value	P-Value
	No	Percentage	No	Percentage		
T4	5	16.7	8	26.7	2.29	P=0.317 NS
T6	14	46.7	16	53.3		
T8	11	36.7	6	20		
Total	30	100%	30	100%		

Table 3. Comparison of mean Duration of effective analgesia (min) of patients in Groups (DEA).

DEA	Range	Mean \pm SD	t-value	P-value
Group B(min)	130 – 195	412.0 \pm 89.28	18.9	P<0.0001
Group BN(min)	690 – 1500	909.0 \pm 216.9		S

Duration of analgesia, the time for rescue medication was 909.0 \pm 216.9 min in group BN with a range from 690 min to 1500 min and in group B it was 412.0 \pm 89.28 min with a range from 130 min to 195 min. Comparing both groups duration of effective analgesia was significantly higher in group BN with P<0.0001 (Table III). In group B nausea and vomiting was less in the postoperative period compared to group BN. One patient from group B had nausea as compared to three patients of group BN. Whereas only one patient from group BN had vomiting post-operatively (P >0.05). Sedation, bradycardia, pruritus, respiratory depression or urinary retention was not observed in either group throughout the procedure.

Discussion

Regional analgesia has shown to improve surgical outcomes by decreasing intraoperative blood loss, postoperative catabolism, the incidence of thromboembolic events and by improving vascular graft blood flow and postoperative pulmonary function [2]. Spinal anaesthesia is a commonly used regional anaesthesia technique for lower limb and lower abdominal surgeries owing to its well-known advantages like quick onset, excellent sensory and motor block and avoidance of complications of general anaesthesia [3]. The discovery of opioid receptors in the brain and spinal cord started a new era in the field of postoperative analgesia [4]. Opioids, when compared to local anaesthetics, offers the advantage of providing good analgesia while allowing early ambulation of the patient by sparing sympathetic and motor nerves. we chose Buprenorphine as it is a long-acting, highly lipophilic opioid, which has proved to be a promising analgesic, by epidural and intrathecal route.

Patients demographic data, with respect to age, height and weight were comparable in the study and control group. Duration of surgery was also comparable in both groups and found to be statistically insignificant. Fauzea A. Khan, Gauhar A. (2006) [5] compared buprenorphine and fentanyl as an adjuvant to bupivacaine and found Onset of sensory block was 3.3 min in plain bupivacaine group; 3.2 min in buprenorphine group; 3.15 min fentanyl group. The average Time of onset of sensory analgesia in the present study was 69 sec in group B and 60 sec in group BN showed that it was not significantly altered by the addition of inj. buprenorphine. The vital parameters monitored are pulse rate, blood pressure, respiratory rate and oxygen saturation. There are no significant changes in the hemodynamic parameters monitored during the study which is comparable with the studies of Dakshinamoorthy et al. [6], Rashmi Dubey et al. [1] There is no statistical difference in the maximum level of sensory blockade achieved. In the majority of the cases, the level reached is T6. However, in studies done by Harsha Vardhan et al, comparing bupivacaine with bupivacaine and buprenorphine, the addition of buprenorphine showed a higher level of sensory blockade than the control group.

A dose of 60 μ g of Buprenorphine was used intrathecally by Dixit S et al. [7] with 1.7 ml of hyperbaric Bupivacaine in parturient undergoing elective caesarean section. He found that the addition of buprenorphine to bupivacaine prolonged the total duration of analgesia from 145.16 \pm 25.86 min in the Control group to 491.26 \pm 153.97 min in the Study group. Lata R [8] compared two doses of intrathecal buprenorphine as an additive to intrathecal lignocaine 5%. 70 patients were divided into two groups of 35 patients each viz., group A and group B who received 40 mcg and 80 mcg buprenorphine respectively. Duration of analgesia prolonged to 22 hrs in group B compared to 11 hrs for group A. Rabiee SM et al (2014) [9] studied the effect of intrathecal buprenorphine as an adjuvant to lignocaine and reported pain free interval was significantly prolonged to 18.73 hrs from 1.25.

Nausea and vomiting are one of the distressing side effects of intrathecal buprenorphine which warrants the use of inj. ondansetron for premedication. After receiving intrathecal buprenorphine four patients had nausea and one patient had vomiting in the post-operative period. One of the feared complications of buprenorphine being respiratory depression did not occur in any of our patients. Buprenorphine being lipid-soluble when administered intrathecally passes rapidly via arachnoid granulations into venous and lymphatic vessels. Hence the rostral spread of the drug to the respiratory centre via the cerebrospinal fluid is minimized [10]. In a study by Sandhya Gujar et al [11] none of a patient required respiratory assistance and oxygenation in the post-operative period.

Harshavardhan et al [12] concluded that the main advantages of selective blockade by spinal opioid in the absence of sympathetic blockade and postural hypotension, allowing patients to ambulate earlier and also the technical ease and single injection of spinal anaesthesia the addition of 1 μ g/kg (not > 50 μ g) of buprenorphine to 0.5% hyperbaric bupivacaine decreases the time of onset of sensory blockade, increase the duration and quality of postoperative analgesia i.e. around 10 hours without causing any gross haemodynamic disturbances.

Conclusion

Based on the above facts, it can be concluded that intrathecal buprenorphine is a suitable drug for postoperative analgesia as it enhances the sensory blockade of local anaesthetics without affecting the sympathetic activity. Anaesthesia was superior when buprenorphine was mixed with bupivacaine (0.5%) as compared to bupivacaine (0.5%) when used alone. The benefits of neuraxial opiates are significant and far outweighs the side effects.

References

- [1]. Dubey R, Ali RZ, Baghel N, Beg K. A comparative study on postoperative pain relief by intrathecal buprenorphine hydrochloride with control group. *Int J Adv Med.* 2016 Oct; 3: 880-7.
- [2]. Bafna U, Yadav H, Sharma N. COMPARISON OF INTRATHECAL BU-

- PRENORPHINE VERSUS CLONIDINE AS AN ADJUVANT TO 0.5% HYPERBARIC BUPIVACAINE IN LOWER ABDOMINAL SURGERIES. *IJMBS*. 2020Apr.8; 4(4).
- [3]. Mishra JC, Maharana PK. Intrathecal Buprenorphine as an adjuvant to 0.5% bupivacaine in vaginal hysterectomy. *IAIM*. 2017; 4(11): 99-105.
- [4]. Rajan US, Manjula R. Comparative Study of Bupivacaine with Nalbuphine and Bupivacaine with Buprenorphine Intrathecally for Post-Operative Analgesia for Lower Limb and Lower Abdominal Surgeries-Prospective Randomised Study. *Ini-Scholar Conference Proceedings 2017 Aug 1; 3(3)*.
- [5]. Khan FA, Hamdani GA. Comparison of intrathecal fentanyl and buprenorphine in urological surgery. *J Pak Med Assoc*. 2006 Jun; 56(6): 277-81. PMID: 16827252.
- [6]. Muruganatham V, Azar N. A comparative study between the efficacy of fentanyl with bupivacaine 0.5% and buprenorphine with bupivacaine 0.5% for lower abdominal and lower limb surgeries in a Government Tertiary Care Teaching Hospital.
- [7]. Dixit S. Post operative analgesia after caesarean section: An experience with intrathecal buprenorphine. *Indian journal of anaesthesia*. 2007 Nov 1;51(6):515.
- [8]. Lalla RK. Low dose intrathecal buprenorphine for postoperative analgesia. *Indian J Anaesth*. 1997; 41: 38-9.
- [9]. Rabiee SM, Alijanpour E, Jabbari A, Rostami S. Benefits of using intrathecal buprenorphine. *Caspian J Intern Med*. 2014 Summer; 5(3): 143-7. PMID: 25202441.
- [10]. Celleno D, Capogna G. Spinal buprenorphine for postoperative analgesia after caesarean section. *Acta Anaesthesiol Scand*. 1989 Apr;33(3):236-8. PMID: 2728828.
- [11]. Gujar S. Adjuvants to Spinal Anaesthesia-What is Better, Comparison Between Intrathecal Clonidine with Intrathecal Buprenorphine. *SJAMS*. 2014;2(4B):1274-7.
- [12]. Vardhan, P Harsha. COMBINATION OF HYPERBARIC BUPIVACAINE WITH BUPRENORPHINE IN LOWER ABDOMINAL SURGERY - A COMPARATIVE STUDY. *Journal of Science*. 2015: 484-488.