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Original Research Article

Comparative Analysis of Intrathecal Bupivacaine Plus Clonidine Vs Bupivacaine Plus Dexmedetomedine for Gynaecological Procedures

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Conflict of interest: Nil

Abstract:

Background and Aim: The incorporation of adjuvants into intrathecal medications that are routinely administered is essential for the safe and effective extension of single-shot spinal blocks used in gynaecological surgery. In resource-constrained nations, where the expense of epidural anaesthesia typically prevents its use, adjuvants are frequently employed to extend the duration of regional anaesthesia. Comparing the efficacy of intrathecal bupivacaine and clonidine to that of bupivacaine and dexmedetomedine for gynaecological procedures was the purpose of the present study.

Material and Methods: A prospective, randomised, and double-blind study was conducted to enrol a cohort of 80 adult females who were scheduled to undergo gynaecological surgery under subarachnoid block and were members of the American Society of Anesthesiology (ASA) Grades 1 and 2. Forty patients were divided into two distinct categories. A participant in Group I was administered 17.5 mg of bupivacaine in combination with 45 mcg of clonidine. In Group II, they were administered 17.5 mg of bupivacaine in addition to 5 mcg of dexmedetomidine. The duration of spinal anaesthesia, the onset and duration of sensory block, the highest level of sensory block, the time required to reach the highest dermatomal level of sensory block, the time required to complete motor block recovery, and the highest level of motor block were all documented.

Results: There were no significant statistical differences observed in the demographics of the patients, ASA grade, or duration of surgery. Group I experienced sensory block for 350.14±32.34 minutes, while Group II did so for 404.24±23.69 minutes. Group I encountered motor block for 210.22±40.16 minutes, while Group II experienced it for 369.54±53.22 minutes. In comparison to group B, the duration of sensory and motor block was considerably extended in group A (p0.05). In comparison to group B, the duration of spinal anaesthesia was comparatively reduced in group A.

Conclusion: Adjunctive use of intrathecal dexmedetomidine in conjunction with bupivacaine appears to be a viable substitute for fentanyl and clonidine in the context of lengthy surgical procedures. This is attributed to the potent anaesthetic and analgesic properties of intrathecal dexmedetomidine, which are complemented by its minimal adverse effects.

Keywords: Bupivacaine, Clonidine, Dexmedetomidine, Fentanyl.

Introduction

Single-shot spinal anaesthesia continues to be the preferred method of regional anaesthesia for lower limb and abdominal surgery due to its cost-effectiveness, superior blockade, reduced infection risk, and decreased failure rate compared to other techniques. [1] It reduces the incidence of postoperative thromboembolic events, time to ambulation, voiding, and complete resolution of block after surgery, thereby mitigating the stress response to surgery and facilitating early discharge. [2] Gynecological procedures requiring regional anaesthesia frequently include vaginal and abdominal hysterectomy. Bupivacaine is frequently administered as spinal anaesthesia for such procedures. Administration of standard doses of bupivacaine has been found to induce sustained and intensive sensory and motor block, as well as substantial sympathetic block. Bupivacaine, when administered in modest doses, restricts the dissemination of spinal block and promotes a comparatively swift recuperation; however, it might not deliver sufficient sensory block. [3-5] A range of adjuvant are being employed in conjunction with local anesthetics to extend the duration of analgesia during and after the procedure. The duration of action of spinal anaesthesia achieved with bupivacaine alone is comparatively brief, necessitating prompt

administration of analgesics in the post-operative phase. In order to address this drawback, the notion of co-inducing anaesthesia has been proposed through the administration of a selective α2 agonist such as clonidine. This would reduce the dosage needed of bupivacaine and its associated side effects, while also extending the duration of analgesia during the post-operative phase. [6] As a highly selective alpha-2adrenergic agonist, dexmedetomidine has been recognized as a beneficial adjunct in conjunction with regional anaesthesia and analgesia. [7] In addition to conventional anesthetics, it has gained significant usage due to its numerous beneficial effects, including hemodynamic, sedative, anxiolytic, analgesic, neuroprotective, and anesthetic sparing properties.8 It is hypothesized, on the basis of previous human studies, that intrathecal 5 g dexmedetomidine would generate a greater postoperative analgesic effect when combined with hyperbaric bupivacaine during spinal anaesthesia, while causing fewer adverse effects. [8-11] comparing the efficacy of intrathecal bupivacaine and clonidine to that of bupivacaine and dexmedetomedine for gynaecological procedures was the purpose of the present study.

Material and Methods

A prospective, randomised, and double-blind study was conducted on a sample of 80 adult females who were scheduled to undergo gynaecological surgery under subarachnoid block and was members of American Society of Anesthesiology (ASA) Grades 1 and 2. Enrollment was contingent upon receiving written and informed consent from the participants, which was also approved by the Hospital Ethics Committee. The study excluded patients who met the following criteria: those who had a medical history of significant coexisting conditions such as ischemic heart disease, hypertension, impaired renal functions, rheumatoid arthritis, severe liver disease, or contraindications to regional anaesthesia. Forty patients were divided into two distinct categories. Group A (bupivacaine + clonidine) was administered 17.5 mg bupivacaine in conjunction with 45 mcg clonidine. In contrast, Group B (bupivacaine + dexmedetomidine) was administered 17.5 mg bupivacaine in conjunction with 5 mcg dexmedetomidine.

The day before surgery, each patient underwent an examination and investigation, during which they were also briefed on the use of the visual analogue scale (VAS) to quantify postoperative pain.12 They were instructed to fast for six hours and were administered 0.5 mg of alprazolam as premedication the evening before the operation and 0.25 mg in the morning of the day of the procedure. Electrocardiogram (ECG), pulse oximetry, and non-invasive blood pressure were affixed in the operating room, where baseline parameters were documented and monitoring commenced. A secure intravenous (IV) connection was established, and ringer lactate 10 ml/kg was preloaded for all patients. These patients were randomly assigned to one of the two groups in a double-blind fashion using the sealed envelope technique. An anesthesiologist prepared the study solutions in a 5 ml syringe and transferred them to the attending anesthesiologist in a coded form; the attending anesthesiologist was unaware of the nature of the drug administered. A 26-gauge spinal needle was utilised to administer a subarachnoid block at the L2–3 or L3–4 vertebral level while the patient was seated, adhering to all necessary aseptic precautions. Patients were placed in a horizontal position after the block.

The duration of spinal anaesthesia, the onset and duration of sensory block, the highest level of sensory block, the time required to reach the highest dermatomal level of sensory block, the time required to complete motor block recovery, and the highest level of motor block were all documented.

Vital signs were obtained five minutes prior to intrathecal injection, five, ten, fifteen, twenty-five, and twenty-five minutes after, and then every fifteen minutes thereafter. VAS pain scores were documented five minutes prior to intrathecal injection, following the initiation of surgery, and every 15 minutes until the conclusion of the procedure; VAS scores were then evaluated in the postoperative phase.

IV fluids were administered in order to sustain the patient's blood pressure. A correction for a heart rate (HR) below 50 pulses per minute was achieved by administering 0.6 mg of intravenous atropine sulphate. Sedation, pruritus, nausea, and vomiting incidence rates were documented. The De Kock sedation scale was implemented as follows: 1 indicated somnolent patients who responded to verbal commands; 2 patients somnolent patients who responded to manual stimulation but did not respond to verbal commands; and 3 patients somnolent patients who did not respond to either verbal commands or manual stimulation.

In addition to vital signs and VAS scores, motor block recovery, as measured by a modified Bromage score of zero, and sensory block regression were evaluated every 15 minutes in the post-anesthetic care unit (PACU) until the regression of two segments in maximum block. A 50 mg supplemental dose of IV tramadol was administered to any patient whose VAS was three or higher. The quantity needed by the patients within the subsequent twenty-four hours was documented in the respective groups.

Statistical analysis

Following the compilation and entry of the recorded data into a spread sheet application (Microsoft Excel 2007), the information was exported to the data editor tab of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). The levels of significance and confidence were established at 5% and 95%, respectively, for every test.

Results

Eighty ASA) Grades 1 and 2 adult females who were scheduled to undergo gynaecological surgery while under subarachnoid block were the subjects of this research. In order to ensure objectivity in the comparison, the amount of patients undergoing each type of gynaecological surgery was maintained consistently across all groups. There were no statistically significant variations observed in the demographics of the patients, ASA grade, or duration of surgery (Table 1). In both categories, abdominal hysterectomy was the most frequently performed gynaecological procedure. A comparison of the sensory and motor block characteristics of the two groups is presented in Table 2. The study determined that the mean time of onset of sensory block was 3.60±0.45 minutes for Group I and 2.74±0.11 minutes for Group II ($p>0.05$). Although Group I experienced a marginally shorter onset of motor block (4.07±0.5 mins) than Group II (4.39±0.74 mins), this distinction was not statistically significant ($p>0.05$). Group I experienced sensory block for 350.14±32.34 minutes, while Group II did so for 404.24±23.69 minutes. Group I encountered motor block for 210.22±40.16 minutes, while Group II experienced it for 369.54±53.22 minutes. In comparison to group B, the duration of sensory and motor block was considerably extended in group A ($p\leq0.05$). In comparison to group B, the duration of spinal anaesthesia was comparatively reduced in group A.

A comparison was made between the two groups regarding the mean values of mean arterial pressure and HR during the entire intraoperative and postoperative period. At no juncture did any of the patient's exhibit signs or symptoms of respiratory distress. All patients maintained a SpO2 greater than 96% throughout the procedure and did not necessitate supplementary oxygen in the post-anesthesia chamber. Mephentermine 6 mg IV was administered to six patients in Group A and ten patients in Group B who presented with significant bradycardia and hypotension, respectively. One case of regurgitation and nausea was reported in group A, while one case of shivering was reported in each group.

The incidence rates of complications, however, did not differ significantly between the two categories. A reduction in VAS values was noted in both groups throughout the entire surgical procedure. Intraoperatively, no additional analgesics were necessary for any of the patients. In Group II B+D, postoperative VAS scores and total analgesic requirement in 24 hours were minimal. ($p\leq0.05$).

Table 1: Comparison of demographic profile in two groups

Variables	Group A	Group B	P value
Age (Years)	38.54 ±6.1	39.1 ±5.4	0.5
Weight (kgs)	66.6±7.4	69.2±3.2	0.23
ASA Grade (1:2)	37:3	35:5	0.14

Statistically significance at $p\leq0.05$.

Table 2: Characteristics of spinal anaesthesia

Variables (Min)	Group A	Group B	P value
Time of onset of sensory block	3.60±0.45	2.74±0.11	0.09
Time of onset of motor block	4.07±0.5	4.39±0.74	0.1
Time to reach max. sensory level	7.60±0.10	7.80±2.36	0.36
Duration of sensory block	350.14±32.34	404.24±23.69	0.03*
Duration of motor block	210.22±40.16	369.54±53.22	0.001*
Duration of spinal anaesthesia	379.65±24.2	510.78±09.47	0.002*

* Indicates statistically significance at $p\leq0.05$.

Discussion

For total abdominal hysterectomy, spinal anaesthesia with hyperbaric bupivacaine 0.5% is the most frequently used neuraxial anesthetic technique due to its low cost, ease of administration, and provision of brief, effective analgesia for patients. It is frequently accompanied by insufficient analgesics, visceral pain, nausea, and vomiting, all of which contribute to patient distress. Adjuvant composed of opioids marginally extends the duration of analgesia. However, they are accompanied by adverse effects including pruritus, nausea, vomiting, and delayed respiratory depression. At a dose of 15–150 mcg/kg, intrathecal administration of clonidine as an adjuvant induces bradycardia, hypotension, and sedation. [13] Dexmedetomidine, an alpha 2 adrenoceptor agonist with an α2:α1 binding selectivity ratio of 1620:1 (compared to 220:1 for clonidine), is notably specific and selective. It is expected to reduce the adverse effects of α1 receptors; however, there is ongoing uncertainty

regarding the optimal dosage for its administration. [8]

Dexmedetomidine has been employed by researchers at concentrations of 2, 3, 5, 10, 15, and 20 µg, yielding diverse outcomes. Analgesics with a significantly protracted duration of action are associated with a higher incidence of hypotension and bradycardia when used in concentrations greater than 5 µg. In a similar vein, Al-Ghanem et al. [14] found that the administration of dexmedetomidine and fentanyl as adjuvant to isobaric bupivacaine did not affect patients' onset times. At 5 mcg dexmedetomidine intrathecally, the duration of motor block was prolonged. In contrast to the duration of motor block as documented in the studies conducted by Kanazi et al. and Al-Ghanem et al. [14] Hala EA A dose-dependent extension of motor and sensory blockade was observed by Eid et al. [15], who also noted a reduction in the need for analgesics as the intrathecal dose of dexmedetomidine increased.

Bupivacaine has been administered in dosages ranging from 3 to 15 mcg as an adjunct for spinal anaesthesia. A dose-dependent prolongation of analgesic effects has been observed. Multiple studies have documented that the use of dexmedetomidine as an adjunct to epidurals extends the duration of motor and sensory block as well as provides post-operative analgesia, all while preventing any additional morbidity. [16,17] Clonidine and dexmedetomidine both offer effective hemodynamic stability and intraoperative analgesia. The current study found that the addition of clonidine and intravenous dexmedetomidine to bupivacaine reduced both visceral and somatic pain. The statistically significant difference in analgesic efficacy between Group II and Group I was evident in the former. According to the research of Al-Ghenam et al. [14] and Mahendru et al. [18], intrathecal dexmedetomidine as an adjuvant to bupivacaine appears to be a viable substitute for clonidine and fentanyl during lengthy surgical procedures.

Hypotension and bradycardia are the most frequently observed adverse effects of dexmedetomidine infusion. Bradycardia is a reflex response to transient hypertension that occurs during the beginning of the infusion. The subsequent reduction in heart rate can be attributed to the cessation of central sympathetic outflow. Hypotension can be ascribed to a reduction in the central sympathetic outflow. Due to the use of clonidines in conjunction with local anaesthetics and low quantities of intrathecal dexmedetomidine, these adverse effects were inconsequential in the current investigation. The adverse effects observed in our study were comparable to those reported in a meta-analysis conducted by Jiang et al. [19].

Conclusion

Based on the findings of our study report, intrathecal dexmedetomidine appears to be a viable substitute for fentanyl and clonidine when used in conjunction with bupivacaine as an adjuvant. This is because bupivacaine possesses potent intrathecal anaesthetic and analgesic properties, while also exhibiting minimal adverse effects. Nevertheless, extended periods of motor inhibition induced by dexmedetomidine may not be optimal for brief surgical interventions or ambulatory procedures.

References

1. Chestnut DH, Wong CA, Tsen LC, Kee WDN, Beilin Y, Mhyre JM. Anesthesia for caesarean delivery. Chapter 26. In: (Eds). Chestnut's Obstetric Anesthesia: Principles and Practice, Philadelphia: Elsevier Saunders. 2014; 545-603.
2. Frey K, Holman S, Milkait-stevens M, Vazquez J, White L, Pedicini E et al. The recovery profle of hyperbaric spinal anesthesia with lidocaine, tetracaine, and bupivacaine. Reg Anesth Pain Med. 1998; 23(2):159–163.
3. Alahuhta S, Kangas-Saarela T, Hollmen AL, Edstrom HH. Visceral pain during caesarean section under spinal and epidural anesthesia with bupivacaine. Acta Anesthesiol Scand 1990; 34:95-98.
4. Pedersen H, Santos CA, Stinberg ES, et al. Incidence of visceral pain during cesarean section: the effect of varying doses of spinal bupivacaine. Anesth Analg 1990; 69:46-49.
5. Kim SY, Cho JE, Hong JY, Koo BN, Kim JM, Kil HK. Comparison of intrathecal fentanyl and sufentanil in lowdose dilute bupivacaine spinal anaesthesia for transurethral prostatectomy. Br J Anaesth 2009; 103:750-754.
6. Ben-David B, Solomon E, Levin H, Admoni H, Goldik Z. Intrathecal fentanyl with small-dose dilutes bupivacaine: Better anesthesia without prolonging recovery. Anesth Analg 1997; 85:560-5.
7. Grewal A. Dexmedetomidine: New avenues. J Anaesthesiol Clin Pharmacol. 2011; 27:297-302.
8. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman, et al. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anaesthesiol Scand. 2006; 50:222-7.
9. Al Ghanem SM, Massad IM, Al-Mustafa MM, Al-Zaben KR, Qudaisat IY, Qatawneh AM, et al. Effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics in gynecological procedures: A double blind controlled study. Am J Appl Sci. 2009; 6:882-7.

10. Al-Mustafa MM, Abu-Halaweh SA, Aloweidi AS, Murshidi MM, Ammari BA, Awwad ZM, et al. Effect of dexmedetomidine added to spinal bupivacaine for urological procedures. Saudi Med J. 2009; 30:365-70.
11. Gupta R, Verma R, Bogra J, Kohli M, Raman R, Kushwaha JK. A Comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to Bupivacaine. J Anaesthesiol Clin Pharmacol. 2011; 27:339-43.
12. Murthy TV, Singh R. Alpha 2 adrenoceptor agonist-dexmedetomidine role in anaesthesia and intensive care: A clinical review. J Anaesth Clin Pharmacol. 2009; 25:267-72.
13. Elia N, Culebras X, Mazza C, Schifer E, Tramèr MR. Clonidine as an adjuvant to intrathecal local anesthetics for surgery: systematic review of randomized trials. Reg Anesth Pain Med. 2008; 33(2):159–167.
14. Al Ghanem SM, Massad IM, Al-Mustafa MM, Al-Zaben KR, Qudaisat IY, Qatawneh AM, et al. Effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics in gynecological procedures: A double blind controlled study. Am J Appl Sci. 2009; 6:882-7.
15. Hala EA, Shafie MA, Youssef H. Dose related prolongation of hyperbaric bupivacaine spinal anaesthesia by dexmedetomidine. Ain-Shams J Anaesthesiol. 2011; 4:83-95.
16. Bajwa SJ, Bajwa SK, Kaur J, Singh G, Arora V, Gupta S, et al. Dexmedetomidine and clonidine in epidural anaesthesia: a comparative evaluation. Indian J Anaesth. 2011; 55(2):116-21.
17. Salgado PF, Sabbag AT, Silva PC, Brienze SL, Dalto HP, Módolo NS, et al. Synergistic effect between dexmedetomidine and 0.75% ropivacaine in epidural anesthesia. Rev Assoc Med Bras. 2008; 54(2):110-5.
18. Mahendru V, Tewari A, Katyal S, Grewal A, Singh MR, Katyal R. A comparison of intrathecal dexmedetomidine, clonidine, and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery: a double blind controlled study. J Anaesthesiol Clin Pharmacol. 2013; 29(4):496-502.
19. Jiang J (2021) Shen Huasu, Zhang Jin, Wu Z, Shao X, Cui J, Zhang B and Ma X Comparative study of the adverse events associated with adjuvant use of dexmedetomidine and clonidine in local anesthesia. Front Med. 2021; 8:602966.