

ORIGINAL RESEARCH

## Study Comparing the Effectiveness of Intrathecal Bupivacaine and Clonidine versus Bupivacaine and Dexmedetomidine for Gynaecological Procedures

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### ABSTRACT

**Background and Aim:** Various adjuvant are being used with local anesthetics for prolongation of intra operative and postoperative analgesia. Dexmedetomidine, a highly selective alpha-2adrenergic agonist, has emerged as a valuable adjunct to regional anesthesia and analgesia. The study was aimed to compare the onset, duration of sensory and motor block, hemodynamic effects, post-operative analgesia, and adverse effects of dexmedetomidine and clonidine with bupivacaine for spinal anesthesia.

**Material and Methods:** Present study was conducted at GMERS Medical College and Hospital, Vadnagar, Gujarat for the duration of 2 years and 1 month. A total of 80 numbers of patients belonging to American Society of Anesthesiology (ASA) Grades 1 and 2 scheduled for gynecological surgery under subarachnoid block were enrolled after obtaining approval from the Hospital Ethics Committee. The patients were allocated in two groups (40 each). Group I bupivacaine + clonidine (B+C) received 17.5 mg of bupivacaine supplemented 45 mcg clonidine and Group II bupivacaine + dexmedetomidine (B+D) received 17.5 mg bupivacaine supplemented 5 mcg dexmedetomidine. The onset time of sensory and motor level, time to reach peak sensory and motor level, hemodynamic changes and side effects were recorded.

**Results:** Mean time of onset of sensory block in Group I and Group II were found to be  $3.69 \pm 0.12$  mins and  $2.14 \pm 0.01$  mins respectively ( $p > 0.05$ ). The onset of motor block in Group I was slightly less ( $3.99 \pm 0.44$  mins) than Group II ( $4.24 \pm 0.80$  mins), however, the difference was insignificant. Duration of sensory and motor block was significantly prolonged in group I as compared to group II ( $p < 0.05$ ) The duration of spinal anesthesia was shorter in group I as compared to group II ( $p < 0.05$ )

**Conclusion:** The use of intrathecal dexmedetomidine as an adjuvant to bupivacaine seems to be an attractive alternative to clonidine for long duration gynecological surgical procedures due to its profound intrathecal anesthetic and analgesic properties combined with minimal side effects.

**Key Words: Bupivacaine, Clonidine, Dexmedetomidine, Spinal Anesthesia****INTRODUCTION**

Anesthetic techniques have improved drastically over the last few decades. Many techniques and drug regimens have been tried from time to time with varied success, to eliminate the anxiety component during regional anaesthesia.<sup>1,2</sup> Gynaecological procedures such as vaginal hysterectomy, abdominal hysterectomy are often done under regional anaesthesia.<sup>3,4</sup> Bupivacaine is defined as majorly utilized local anesthesia for spinal block but the time period of action of anaesthesia in the body is found as low and confined. To minimize the issue of shorter period of activation as well as to enhance peri-operative hemodynamic stability and analgesia standard, several adjuvants are now utilized in subarachnoid space along with bupivacaine.<sup>5</sup> Numerous subarachnoid adjuvants, include ketamine, fentanyl, midazolam and morphine, are utilized to enhance the standard as well as time period of analgesia.<sup>6</sup>

Most of the clinical studies about the intrathecal  $\alpha_2$  adrenergic agonist are related to clonidine.<sup>7</sup> Dexmedetomidine, a highly selective  $\alpha_2$  adrenergic agonist has evolved as a panacea for various applications and procedures in the perioperative and critical care settings.<sup>8</sup> It is also emerging as a valuable adjunct to regional anesthesia and analgesia, where gradually evolving studies can build the evidence for its safe use in central neuraxial blocks.<sup>9</sup> Based on earlier human studies, it is hypothesized that intrathecal 5  $\mu$ g dexmedetomidine would produce more postoperative analgesic effect with hyperbaric bupivacaine in spinal anesthesia with minimal side effects.<sup>10-13</sup>

Earlier human studies showed that, intrathecal 5 mcg dexmedetomidine would produce longer duration of analgesic effect in spinal anesthesia with minimal side effects.<sup>14</sup> In present study, the usefulness of intrathecal bupivacaine and clonidine combination was compared with bupivacaine and dexmedetomidine for gynaecological procedures.

**MATERIAL AND METHODS**

Present study was conducted at GMERS Medical College and Hospital, Vadnagar, Gujarat for the duration of 2 years and 1 month. A total of 80 numbers of patients belonging to American Society of Anesthesiology (ASA) Grades 1 and 2 scheduled for gynecological surgery under subarachnoid block were enrolled after obtaining approval from the Hospital Ethics Committee along with written and informed consent. Patients with contraindication to regional anesthesia, history of significant coexisting diseases like ischemic heart disease, hypertension, impaired renal functions, rheumatoid arthritis, and severe liver disease were excluded from the study.

The patients were allocated in two groups (40 each). Group I bupivacaine + clonidine (B+C) received 17.5 mg of bupivacaine supplemented 45 mcg clonidine and Group II bupivacaine + dexmedetomidine (B+D) received 17.5 mg bupivacaine supplemented 5 mcg dexmedetomidine. All patients were examined and investigated a day prior to surgery, and were familiarized with visual analogue scale (VAS) and its use for measuring the postoperative pain. They were advised fasting for 6 h and received alprazolam 0.5 mg as premedication a night before and 0.25 mg in morning on the day of the surgery. In the operation theatre, electrocardiogram (ECG), pulse oximetry, and noninvasive blood pressure were attached and baseline parameters were recorded and monitoring was initiated. Intravenous (IV) access was secured and all patients were preloaded with ringer lactate 10 ml/kg.

The study solutions were prepared in a 5 ml syringe by an anesthesiologist who then handed them over in a coded form to the attending anesthesiologist. Blinded to the nature of drug given. Subarachnoid block was administered at the L2–3 or L3–4 vertebral level using 26-gauge spinal needle with patients in the sitting position under all aseptic precautions. Patients

were made supine following the block. The onset and duration of sensory block, highest level of sensory block, time to reach the highest dermatomal level of sensory block, motor block onset, time to complete motor block recovery, and duration of spinal anesthesia were recorded.

### STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

### RESULTS

A total of 80 adult females belonging to ASA) Grades 1 and 2 scheduled for gynecological surgery under subarachnoid block were studied. To make the comparison unbiased, the number of patients under each type of gynecological surgery performed was kept similar among the groups. No statistical difference was seen in patient's demographics or ASA grade and duration of surgery as well. Abdominal hysterectomy was the commonly performed gynecological surgery in both groups. Table 3 depicts comparison of sensory and motor block characteristics in both the groups. Mean time of onset of sensory block in Group I and Group II were found to be  $3.69 \pm 0.12$  mins and  $2.14 \pm 0.01$  mins respectively ( $p > 0.05$ ). The onset of motor block in Group I was slightly less ( $3.99 \pm 0.44$  mins) than Group II ( $4.24 \pm 0.80$  mins), however, the difference was insignificant ( $p > 0.05$ ).

The duration of sensory block in Group I was  $349.10 \pm 32.40$  min and in Group II was  $403.21 \pm 23.14$  min and the duration of motor block in Group I was  $204.90 \pm 35.80$  mins and in Group II was  $366.18 \pm 54.22$  mins. Duration of sensory and motor block was significantly prolonged in group I as compared to group II ( $p < 0.05$ ) The duration of spinal anesthesia was shorter in group I as compared to group II ( $p < 0.05$ ) (Table 4). The mean values of mean arterial pressure and HR were comparable between the two groups throughout the intra-operative and postoperative period. None of the patients experienced respiratory distress at any point of time. SpO<sub>2</sub> of all the patients were greater than 96% at all the times and did not require additional oxygen in post- anesthesia room. Five patients in Group I and nine patients from group II had significant bradycardia and hypotension which was treated with mephentermine 6 mg IV. Nausea and vomiting was reported in one case in group I shivering was reported in 1 case of each group. However, the rate of complications was statistically insignificant between both the groups. Lower VAS values (<3) were observed in both the groups during the whole duration of surgery. None of the patients required additional analgesics intraoperatively. Post-operative VAS scores and total analgesic requirement in 24 hrs were minimal in Group II ( $p < 0.05$ ).

**Table 1: Comparison of Demographic Profile in Two Groups**

Variable	Group I	Group II	P value
Age (years)	$38.12 \pm 4.6$	$39.1 \pm 5.1$	0.12
Height (cm)	$168.12 \pm 2.4$	$169.1 \pm 4.2$	0.24
Weight (kgs)	$65.9 \pm 4.6$	$68.7 \pm 2.3$	0.31
ASA Grade (1:2)	28:2	26:4	0.18
Duration of surgery (min)	$92.6 \pm 30.4$	$94.4 \pm 32.5$	0.09

Statistically significance at  $p \leq 0.05$

**Table 2: Types of Gynecological Procedures**

Type of gynecological procedure performed	Group I (n=40)	Group II (n=40)
Abdominal hysterectomy	19	22
Vaginal hysterectomy	13	12
Laparotomy for ovarian mass	9	84
Tubal recanalization	6	

**Table 3: Characteristics of Spinal Anaesthesia**

Variable (Min)	Group I	Group II	P value
Time of onset of sensory block	3.69±0.12	2.14±0.01	0.10
Time of onset of motor block	3.99±0.44	4.24±0.80	0.24
Duration of sensory block	349.10±32.40	403.21±23.14	0.002*
Duration of motor block	204.90±35.80	366.18±54.22	0.03*
Duration of spinal anaesthesia	376±26.1	504.66±10.45	0.004*

\* indicates statistically significance at  $p \leq 0.05$

## DISCUSSION

Post-operative analgesia should be efficient with decreased side effects. In favor of spinal block, 0.5% hyperbaric bupivacaine is most widespread local anesthesia utilized. Nevertheless, its post-surgery analgesic time period is confined. Therefore, a chemical addition to this local anesthesia is a consistent method to extend the time period of anesthesia. A basic method has been broadly established. Many adjuvants like (1) benzodiazepines include midazolam, (2) opioids includenalbuphine, buprenorphine, pethidine, and fentanyl, (3) ketamine, and (4) neostigmine have been utilized. Opioids are considered as the foundation for post-operative analgesia.<sup>15</sup> Opioids injected in subarachnoid space extend the time period of analgesia but can have overdue as well aserratic respiratory problems, urinary retention, nausea, pruritus, and vomiting.<sup>16</sup> Thus, it has necessity for improved adjuvants that lengthens analgesia lacking the opioids associated consequences.

Clonidine's analgesic consequences are arbitrated by the stimulation of post-synaptic alpha-2 adrenoreceptors in the area of substantia gelatinosa located in the spinal cord. This lowers the discharge of nociceptive materials from the area of substantia gelatinosa by stimulating the downward inhibitory medullary spinal pathways.<sup>4</sup> Several researches showed that clonidine was injected in subarachnoid space. It has been found to be an ultimate adjuvant to extend the analgesia's time interval. As well as, Dexmedetomidine is defined as an alpha-2 -receptor adherent more particular as compared to clonidine. In general anesthetics, it is generally utilized as a pre-medicant. It decreases the need of opioid and inhalational anesthesia. There are especially few researches accessible for the adjuvant such as dexmedetomidine and its subarachnoid block effectiveness.<sup>17</sup> Therefore, it has a requirement to evaluate its efficiency.

In present study, time of onset of sensory blocks was similar in both groups. Al-Ghanem et al<sup>18</sup> also observed no difference in the onset time in patients receiving dexmedetomidine and fentanyl as adjuvant to isobaric bupivacaine ( $p > 0.05$ ). The intrathecal 5 mcg dexmedetomidine shown prolonged duration of motor block. When compared to the duration of motor block in Kanazi et al<sup>19</sup> study and in Al-Ghanem et al study.<sup>18</sup> Hala EA Eid et al<sup>20</sup> observed dose dependent prolongation of motor and sensory blockade with reduced analgesic requirement with increasing dosage of intrathecal dexmedetomidine. Doses varying from 3 to 15 mcg have been used as adjuvant to bupivacaine for spinal anaesthesia.

There has been dose-dependent prolongation of analgesia. It is observed in various studies that dexmedetomidine as an epidural adjuncts prolong the motor and sensory block duration time and post-operative analgesia without any additional morbidity.<sup>21,22</sup> Both dexmedetomidine and clonidine provide good quality of intra-operative analgesia and hemodynamic stability. Intrathecal dexmedetomidine and clonidine added to bupivacaine reduce both visceral and somatic pain in present study. The analgesia was significantly better in Group II B+D as compared to Group I B+C and it was statistically significant. This research agrees with the study performed by the research. Al-Ghenam et al<sup>18</sup> and Mahendru et al<sup>19</sup> study shows that the use of intrathecal dexmedetomidine as an adjuvant to bupivacaine seems it to be an attractive alternative to fentanyl and clonidine for long duration surgical procedures. Clinical studies exhibit potentiation of neuraxial local anesthetics, decrease in intraoperative anesthetic requirements with prevention of intraoperative awareness, improved intraoperative oxygenation, and postoperative analgesia when epidural or caudal dexmedetomidine was used in conjunction with general anesthesia.<sup>23-25</sup> Bradycardia and hypotension are the major side effects observed following dexmedetomidine infusion. Hypotension is attributed to decreased central sympathetic outflow. In the present study, these side effects were not significant due to small doses of intrathecal dexmedetomidine and clonidines with local anesthetics were used. The 15 µg intrathecal dose of dexmedetomidine used by Hala EA Eid et al<sup>20</sup> showed significantly higher sedation scores which can be beneficial for patients undergoing lengthy complex surgeries as an alternative to epidural or prolonged general anesthetics and can preclude the use of IV sedatives. However, such high sedation scores may be harmful in elderly and high risk surgical patients owing to the risk associated with excessive sedation and respiratory depression.

## CONCLUSION

The use of intrathecal dexmedetomidine as an adjuvant to bupivacaine seems to be an attractive alternative to clonidine for long duration gynecological surgical procedures due to its profound intrathecal anesthetic and analgesic properties combined with minimal side effects.

## CONFLICT OF INTEREST

None

## SOURCE OF SUPPORT

Nil

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