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*Original Research Article*

# Comparison of intrathecal magnesium sulphate and dexamethasone in spinal anaesthesia as an adjuvant to hyperbaric bupivacaine in lower abdominal surgeries

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**Abstract**

Spinal anaesthesia using only local anaesthetics is associated with relatively short duration of action. Postoperative pain control is a major problem with spinal anaesthesia using only local anaesthetics alone, and thus early analgesic intervention is needed in postoperative period. Various adjuvants such as morphine, Opioids, Dexamethasone, Magnesium sulphate etc., have been studied to prolong the effect of spinal anaesthesia. This study is designed to compare the effect of adding Dexamethasone and magnesium sulphate to hyperbaric Bupivacaine in lower abdominal surgeries. Total of 80 adult patients aged between 18-50 years undergoing lower abdominal and lower limb surgeries. After institutional ethical committee approval, 80 patients aged between 18-50 years undergoing lower abdominal and lower limb surgeries are selected. Patient pain was assessed with VAS at 30 min post operatively and following results were observed. Mean VAS for D group was 4.5 and mean VAS for M group was 5.2. Hence it is observed that addition of Dexamethasone to bupivacaine had a better analgesic effect than Magnesium sulphate.

**Keywords:** Intrathecal magnesium sulphate, dexamethasone, spinal anaesthesia

## Introduction

Spinal anaesthesia is a safe, inexpensive and commonly performed anaesthetic technique for lower abdominal and orthopaedic surgeries. It is rapid in onset, provides good analgesia both intra-operatively and post-operatively. Spinal anaesthesia can be performed with a wide range of local anaesthetic drugs. spinal anaesthesia using only local anaesthetics is associated with relatively short duration of action. Postoperative pain control is a major problem with spinal anaesthesia using only local anaesthetics alone, and thus early analgesic intervention is needed in postoperative period. Various adjuvants such as morphine, Opioids 1, Dexamethasone, Magnesium sulphate etc., have been studied to prolong the effect of spinal anaesthesia. Various studies showed addition of Dexamethasone 2 morphine 3 as adjuvants improves the quality of block. Till date there are only few studies 4 done to compare the effects of addition of 2 milligrams of Dexamethasone to 15 mg of 0.5% hyperbaric Bupivacaine and 50 milligrams of magnesium sulphate to 15 mg of 0.5% hyperbaric Bupivacaine.

## Methodology

This study is designed to compare the effect of adding Dexamethasone and magnesium sulphate to hyperbaric Bupivacaine in lower abdominal surgeries. Total of 80 adult patients aged between 18-50 years undergoing lower abdominal and lower limb surgeries. After institutional ethical committee approval, 80 patients aged between 18-50 years undergoing lower abdominal and lower limb surgeries are selected. A detailed history, complete physical examination and investigations are done for all patients. Informed consent is taken.

The study population are divided into 2 groups with 40 patients in each group.

- **Group D:** Received 3ml of 0.5% Bupivacaine (H) (15mg) and 0.5ml (2mg) Dexamethasone under sterile conditions.

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- **Group M:** Received 3 ml of 0.5% Bupivacaine (H) (15 mg), 0.1 ml (50 mg) magnesium sulphate, 0.4 ml 0.9% Normal Saline under sterile conditions.

**Inclusion criteria**

1. ASA class I, II of both sex.
2. Age between 18-50 year.

**Exclusion criteria**

1. Emergency surgeries.
2. ASA class III, IV patients.
3. Known case of hypersensitive reaction to local anaesthesia.
4. Patients with coagulation disorders or on anti-coagulant therapy.
5. Cognitive or psychiatric disturbances.
6. Local infection at the site of proposed punctured for spinal block.

**Materials**

Inj. Hyperbaric Bupivacaine 0.5% Inj. Dexamethasone (2mg).
Inj. Magnesium sulphate(50mg) Normal saline (Sterile).

After the ethical committee approval of our college, 80 ASA-I & ASA-II patients scheduled for lower abdominal and orthopedic surgeries under spinal anaesthesia were chosen for the study. Pre-anaesthetic check-up was done one day prior to the surgery. Patients were evaluated for any systemic diseases and laboratory investigations recorded. The procedure of SAB was explained to the patients and written consent was obtained. Preparation of patients included period of overnight fasting. Patients were pre-medicated with Tab. Rantac 150 mg and Tab. Anxit 0.5mg H.S. In pre-operative assessment, patients were asked about any history of drug allergy, previous surgeries, or prolonged drug treatment. General, systemic examinations, airway assessment were performed and patients were asked to fast for a minimum of 6 hours before the operation. Patients also received Ranitidine 150 mg orally the night before surgery and the following morning. All patients were clinically examined preoperatively, when the whole procedure was explained. All patients underwent investigations to determine the following: haemoglobin concentration with Hematocrit, total and differential leukocyte count, erythrocyte sedimentation rate, platelet count, blood sugar, blood urea, creatinine.

A 12 lead electrocardiogram (ECG) and chest radiograph were also taken. On entering the patient into the operative room, standard intraoperative monitors were attached (ECG, SpO2, NIBP) and baseline parameters were recorded using a multi parameter monitor. Each subject is cannulated with 18 G IV cannula and co-loading with ringer lactate at 15ml/kg/hour. The anaesthetic procedure was standardized for all patients. Patient was in a seated position for lumbar puncture at the L3 to L4 intervertebral space in median approach with a 23 G spinal (Quincke) needle using aseptic precautions.

**Results**

**Table 1:** Time from Injection to Highest Sensory Level and Sensory Regression Time to 2 Segments Below

| Variable | Group | | | | | | | | | | t-value | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | | | | | M | | | | | | |
| | N | Min. | Max. | Mean | SD | N | Min. | Max. | Mean | SD | | |
| Time from injection to highest sensory level (min) | 40 | 3 | 5 | 4.2 | 0.4 | 40 | 4 | 7 | 6.3 | 0.6 | 17.35 | <0.001 |
| sensory regression time to 2 segments below (min) | 40 | 94 | 128 | 112.0 | 8.9 | 40 | 55 | 105 | 75.0 | 9.3 | 15.78 | <0.001 |

Group D containing 40 subjects with 3-5min distribution time of highest sensory level from time of injection with mean of 4.2min with SD of 0.4 and Group M containing 40 subjects

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with 4-7min distribution time of highest sensory level from time of injection with mean of 6.3 min with SD of 0.6. Both groups are compared with t-value of 17.35 and the P value of <0.001 which is statistically significant.

Group D containing 40 subjects with 94-128min distribution for sensory regression of 2 segments from time of injection with mean of 112 min with SD of 8.9 and Group M containing 40 subjects with 55-105 min distribution for sensory regression of 2 segments from time of injection with mean of 75 min with SD of 9.3. Both groups are compared with t-value of 15.78 and the P value of <0.001 which is statistically significant.

**Table 2:** Time from Injection to Bromage 3 Scale and Bromage 0 Scale

| Variable | Group | | | | | | | | | | t- value | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | | | | | M | | | | | | |
| | N | Min. | Max. | Mean | SD | N | Min. | Max. | Mean | SD | | |
| Time to achieve bromage 3 Scale (min) | 40 | 2 | 4 | 3.0 | 0.5 | 40 | 3 | 8 | 7.0 | 0.9 | 0.22 | <0.001 |
| Time to achieve bromage 0scale (min) | 40 | 320 | 393 | 357.0 | 20.4 | 40 | 190 | 304 | 235.0 | 27.7 | 19.40 | <0.001 |

Group D containing 40 subjects with 2-4min distribution for bromage 3 scale from time of injection with mean of 3 min with SD of 0.5 and Group M containing 40 subjects with 3-8 min distribution for bromage3 scale from the time of injection of 2 segments from time with mean of 7 min with SD of 0.9. Both groups are compared with t-value of 20.22 and the P value of <0.001 which is statistically significant

Group D containing 40 subjects with 320-393 min distribution for bromage 0 scale from time of injection with mean of 357 min with SD of 20.4 and Group M containing 40 subjects with 190-304 min distribution for bromage 0 scale from time of injection with mean of 235 min with SD of 27.7. Both groups are compared with t- value of 19.40 and the P value of<0.001 which is statistically significant.

Patient pain was assessed with VAS at 30 min post operatively and following results were observed. Mean VAS for D group was 4.5 and mean VAS for M group was 5.2. Hence it is observed that addition of Dexamethasone to bupivacaine had a better analgesic effect than Magnesium sulphate.

**Table 3:** Duration of Analgesia and Time of First Voiding

| Variable | Group | | | | | | | | | | t- value | P-value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | | | | | M | | | | | | |
| | N | Min. | Max. | Mean | SD | N | Min. | Max. | Mean | SD | | |
| Duration of Analgesia (min) | 40 | 315 | 390 | 361.9 | 18.4 | 30 | 194 | 360 | 251.9 | 30.1 | 17.07 | <0.001 |
| Time of first Voiding (min) | 40 | 336 | 408 | 374.2 | 16.7 | 30 | 220 | 382 | 274.6 | 30.9 | 15.54 | <0.001 |

Group D containing 40 subjects with 315-390 min distribution of analgesia from time of injection with mean of 361.9 min with SD of 18.4 and Group M containing 40 subjects with 194-360 min distribution of analgesia from time of injection with mean of 251.9 min and SD of 30.4. Both groups are compared with t- value of 17.07 and the P value of <0.001 which is statistically significant.

Group D containing 40 subjects with 336-408 min distribution of first voiding from time of injection with mean of 374.2min with SD of 16.7 and Group M containing 40 subjects with 220-382 min distribution of first voiding from time of injection with mean of 274.6min and SD of 30.9. Both groups are compared with t- value of 15.54 and the P value of <0.001 which is statistically significant.

## Discussion

In our study also magnesium sulphate delays the onset of both motor and sensory onset but prolongs the duration of motor block and analgesia. Fentanyl not included in our study, but the results obtained with Magnesium group are in contrast to above study with prolongation of duration of anaesthesia.

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Mohamed Ks, Abd-Elshafy SK., *et al*. [5] studied the impact of Magnesium sulfate as adjuvant to intrathecal Bupivacaine on intra-operative surgeon satisfaction and postoperative analgesia during laparoscopic gynaecological surgery a randomized clinical study. Sixty female patients were enrolled in this prospective, randomized, double-blind controlled clinical trial study. All patients were operated for gynecological laparoscopic surgery under spinal anesthesia. Patients were divided into two groups (Bupivacaine and Magnesium). Group Bupivacaine (30 patients) received intrathecal Bupivacaine 0.5% only (15 mg), while 30 patients in group Magnesium received intrathecal Bupivacaine (15 mg) in addition to intrathecal Magnesium sulfate (50 mg). The sensory block level, the intensity of motor block, the surgeon satisfaction, the intraoperative visual analog scale (VAS) for pain assessment, the postoperative VAS and side effects were recorded during the intraoperative period and within the first 24 hours after surgery in the post-anesthesia care unit. Magnesium sulfate if used intrathecally as an adjuvant to Bupivacaine would provide a better surgeon satisfaction and would improve the analgesic effect of spinal anesthesia used for gynecological laparoscopic surgery.

In our study we not included the surgeon's satisfaction but analgesic effects are similar to that above study.

Khafagy HF6, Refaat AI, El-Sabae HH, Youssif MA revealed that epidural bupivacaine-dexamethasone admixture had almost the same Analgesic potency as bupivacaine-Fentanyl with opioid-sparing and Antiemetic effects Intra-operative fentanyl requirements were comparable among groups. Time to first analgesic requirement was significantly prolonged (5.2 times) in the BF group and (4.8 times) in the BD group compared with group B ($p$<0.01). There was significant reduction in postoperative meperidine consumption during the first 24 h in the BF and BD groups (65, 62.5% respectively) in comparison with group B ($p$<0.01). VAS scores were significantly lower and patient satisfaction score was significantly higher in the BF and BD groups compared with group B ($p$<0.01). Postoperative nausea was significantly lower in the BD group versus the B and BF groups ($p$<0.05).

In our study we compared the Duration of analgesia Dexamethasone group and Magnesium sulphate group, along with postoperative nausea when compared to the above study dexamethasone group showed increased postoperative analgesia and decreased postoperative nausea.

Nadia Bani-Hashem, Bahman Hassan-Nasab (2011) [7] Addition of intrathecal Dexamethasone to Bupivacaine for spinal anesthesia in orthopedic surgery. A total of 50 patients were scheduled for orthopedic surgery under spinal anesthesia. The patients were randomly allocated to receive 15 mg hyperbaric bupivacaine 0.5% with 2 cc normal saline (control group) or 15 mg hyperbaric bupivacaine 0.5% plus 8 mg dexamethasone (case group) intrathecally. The patients were evaluated for quality, quantity, and duration of block; blood pressure, heart rate, nausea, and vomiting or other complications. There were no signification differences in demographic data, sensory level, and onset time of the sensory block between two groups. Sensory block duration in the case group was 119±10.69 minutes and in the control group was 89.44±8.37 minutes which was significantly higher in the case group ($p$<0.001). The duration of analgesia was 401.92±72.44 minutes in the case group; whereas it was 202±43.67 minutes in the control group ($p$<0.001). The frequency of complications was not different between two groups. This study has shown that the addition of intrathecal dexamethasone to bupivacaine significantly improved the duration of sensory block in spinal anesthesia without any changes in onset time and complications.

In our study low doses of dexamethasone(2mg) to decrease the volume of the drug. This also prolonged duration of analgesia of Group D which was 361.9±18.4 where as it was 259.1±30.4 in group M ($p$<0.001).

MM Haque, MA Aleem, FH Haque, AB Siddique (2018) [4] Efficacy of 0.5% Hyperbaric Bupivacaine with Dexamethasone versus 0.5% Hyperbaric Bupivacaine alone in Spinal Anaesthesia for Patient Undergoing Lower Abdominal Urological and Lower Limb Orthopedic Surgeries. Seventy two (72) adult patients scheduled for lower abdominal urological and lower limb orthopedic surgery under spinal anaesthesia were included. They

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were divided in two groups; each group comprised 36 patients to receive 20mg 0.5% hyperbaric bupivacaine (Bupivacaine group) or 15mg 0.5% hyperbaric bupivacaine plus 5mg dexamethasone (Bupivacaine-Dexamethasone/case group) intrathecally. The patients were evaluated for quality, quantity and duration of sensory block/surgical analgesia, post-operative analgesia/pain free period, blood pressure, heart rate, nausea, and vomiting or other complications. There were no significant differences in demographic data, sensory level and onset time of the sensory block between two groups. Duration of sensory block/Surgical analgesia in the bupivacaine group was 92.32±8.34 minutes and in the bupivacaine-dexamethasone/case group was 122.11±10.59 minutes which was statistically highly significant ($p$<0.001). The duration of post-operative analgesia/pain free period was 208.78±41.57 minutes in the bupivacaine group; whereas it was 412.82±71.51 minutes in the bupivacaine-dexamethasone/case group which was also statistically highly significant ($p$<0.001). The frequency of complications was not different between two groups. This study has shown that the addition of dexamethasone to bupivacaine in spinal anaesthesia significantly improved the duration of sensory block/surgical analgesia as well as post-operative analgesia/pain free period without any complications.

Our study results are also in accordance with the above study with prolonged duration of analgesia of Group D which was 361.9±18.4 ($p$<0.001) with hemodynamic stability.

Mohamed Ghanem, Mona gad, *et al*. Efficacy of Epidural Dexamethasone Combined with Intrathecal Nalbuphine in Lower Abdominal Oncology Operations8. Recorded that Group D significantly took longer times to 1st analgesic request, sensory regression to S1 and modified bromage Score 0 with significant lower number of patients that had abdominal dragging pain in comparison with Group P. Visual analog score in the first four postoperative hours, total postoperative nalbuphine dose in 1st 24 h and incidence of nausea and vomiting were

significantly lower in Group D. Heart rate and mean arterial pressure were comparable in both groups. Postoperative headache incidence was comparable in both groups. Both patient and surgeon satisfaction were significantly higher in Group D compared to Group P.

In our study we compared the Duration of analgesia was prolonged, but patients with Bromage score 0 onset time (357±20.4min in group D and 235±0.27.7min in group M) patients of Group D did not complain of any abdominal dragging pain compared with Group M of our study.

MM Haque, MA Aleem, FH Haque, AB Siddique (2018) [4] Efficacy of 0.5% Hyperbaric Bupivacaine with Dexamethasone versus 0.5% Hyperbaric Bupivacaine alone in Spinal Anaesthesia for Patient Undergoing Lower Abdominal Urological and Lower Limb Orthopedic Surgeries. Seventy two (72) adult patients scheduled for lower abdominal urological and lower limb orthopedic surgery under spinal anaesthesia were included. They were divided in two groups; each group comprised 36 patients to receive 20mg 0.5% hyperbaric bupivacaine (Bupivacaine group) or 15mg 0.5% hyperbaric bupivacaine plus 5mg dexamethasone (Bupivacaine-Dexamethasone/case group) intrathecally. The patients were evaluated for quality, quantity and duration of sensory block/surgical analgesia, post-operative analgesia/pain free period, blood pressure, heart rate, nausea, and vomiting or other complications. There were no significant differences in demographic data, sensory level and onset time of the sensory block between two groups. Duration of sensory block/Surgical analgesia in the bupivacaine group was 92.32±8.34 minutes and in the bupivacaine-dexamethasone/case group was 122.11±10.59 minutes which was statistically highly significant ($p$<0.001). The duration of post-operative analgesia/pain free period was 208.78±41.57 minutes in the bupivacaine group; whereas it was 412.82±71.51 minutes in the bupivacaine-dexamethasone/case group which was also statistically highly significant ($p$<0.001). The frequency of complications was not different between two groups. This study has shown that the addition of dexamethasone to bupivacaine in spinal anaesthesia significantly improved the duration of sensory block/surgical analgesia as well as post-operative analgesia/pain free period without any complications.

Our study results are also in accordance with the above study with prolonged duration of analgesia of Group D which was 361.9±18.4 ($p$<0.001) with hemodynamic stability.

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## Conclusion

- Onset of sensory and motor block faster in Dexamethasone group than Magnesium sulphate group.
- Duration of sensory and motor block significantly longer in Dexamethasone group than Magnesium sulphate group.
- Duration of analgesia is significantly prolonged in Dexamethasone group than Magnesium sulphate group with better VAS in Dexamethasone.

## References

1. 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.
2. 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 procedure. Saudi Med J. 2009;30:365-70.
3. Pascual-Ramirez J, Gil-Trujillo S, Alcantarilla C. Intrathecal magnesium as analgesic adjuvant for spinal anaesthesia NA meta-analysis of randomized trials. Minerva anestesiol. 2013;79(6):66.
4. MM Haque, MA Aleem, FH Haque, AB Siddique. Efficacy of 0.5% Hyperbaric Bupivacaine with Dexamethasone versus 0.5% Hyperbaric Bupivacaine alone in Spinal Anaesthesia for Patient Undergoing Lower Abdominal Urological and Lower Limb Orthopedic Surgeries Mymensingh Med J. 2018 Apr;27(2):375-381.
5. Mohamed KS, Abd-Elshafy SK, *et al*. The impact of magnesium sulfate as adjuvant to intrathecal bupivacaine on intra-operative surgeon satisfaction and postoperative analgesia during laparoscopic gynecological surgery: randomized clinical study. Korean J Pain. 2017 Jul;30(3):207-213.
6. Khafagy HF, Refaat AI, El-Sabae HH, Youssif MA. Efficacy of epidural dexamethasone versus fentanyl on postoperative analgesia. J Anesth. 2010;24:531-6.
7. Nadia Bani-Hashem, Bahman Hassan-Nasab. Addition of intrathecal Dexamethasone to Bupivacaine for spinal anesthesia in orthopedic surgery. Saudi J Anaesth. 2011 Oct;5(4):382-6.
8. Mohamed Ghanem, Mona Gad, *et al*., Efficacy of Epidural Dexamethasone Combined with Intrathecal Nalbuphine in Lower Abdominal Oncology Operations. Anesth Essays Res. 2019 Jul-Sep;13(3):560-567.