Comparison of Intrathecal Dexmedetomedine with Dexamethasone as Adjuvant to Bupivacaine in Caesarian Section: A Double Blind Study

Naila Asad,[1] M. Azam,[2] Asma Samreen,[3] Ali Rehman,[4] Usman Jahangir[5]

Abstract

Objective: To compare the effects of dexmedetomidine versus dexamethasone as intrathecal additives in elective LSCS.

Material and Method: This double blind study was done in Services Hospital, Lahore after being approved from Institutional Review Board. Sixty parturients at term aged 18-40 years, were included in this study. Spinal anaesthesia was administered to all for caesarian section. 0.5% hyperbaric bupivacaine (10mg) was given to all patients. D group (n=30) was given dexamethasone 6mg as adjuvant. Dexmedetomedine (0.5 ml) 5µg was added in Group BD. Similar syringes were used for drugs to ensure blinding. Haemodynamic changes were measured. Pinprick method was used to assess the onset and duration of sensory block. Time to two segment sensory regre-ssion was documented. Modified Bromage scale assessed the onset and duration of motor block.

Results: The mean sensory block onset time was earlier with dexamethasone than Dexmedetomedine. Duration of analgesia and two segment sensory regression time and duration of motor block was significantly longer with dexmedetomidine (Table:2 & 3). Significant decrease in systolic and diastolic blood pressure was seen from baseline till uterine incision in both groups (Fig:B & C). Incidence of postoperative shivering, nausea and vomiting were significantly reduced with dexmedetomidine (Fig: D & E).

Conclusion: Dexmedetomidine is superior to dexamethasone in providing better sensory and motor block along with prolonged analgesia duration.

Keywords: Dexmedetomedine, Dexamethasone, Caesarian Section, Spinal Anaesthesia

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Introduction

Spinal anaesthesia is commonly administered for lower segment Caesarian Section (LSCS). It avoids the risks of general anaesthesia such as maternal awareness, aspi-ration of gastric contents and difficult airway manage-ment.[1] The main advantage of spinal anaesthesia is ade-quacy of block, quick onset, decrease in failure rate, and cost-effectiveness.[2-6] The sensory block till the level of T4 is required for caesarian section. Hemodynamic changes which occur with this high level can lead to reduced uteroplacental perfusion. This is associated with maternal nausea, vomiting and fetal acidosis.[2-4] The change in hemodynamics can be minimized by decreasing the dose of local anaesthetic but this can limit the duration of spinal anaesthesia and postoperative analgesia.[2] Different drugs are used in combination with local anesthetics for intrathecal administration. This helps in reducing dose of local anaesthetic, prolongs duration of anesthesia, provides better analgesia and minimal maternal and neonatal side effects.[6-9] Better quality of spinal anaesthesia and analgesia is provided by addition of adjuvants. Various drugs are used as additives with bupivacaine. The most common are opioids, neostigmine, ketamine, midazolam, clonidine and magnesium.[10] Dexmedetomidine is alpha 2-adrenergic recep-

1-5: Department of Anaesthesia, Services Institute of Medical Sciences Lahore

Correspondence:
Prof. Naila Asad, HOD Anaesthesia, SIMS Lahore.
E-mail: drnailaakhtar@gmail.com

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tor agonist. It is added to bupivacaine as an adjuvant. It provides stability in hemodynamics, better intraoperative anaesthesia as well as postoperative analgesia in patients undergoing cesarean section.[6,9] The maternal/fetal index of 0.77 provides the safety for its use in cesarean section.[4] It blocks the somatic and visceral pain. Bi YH et al used dexmedetomidine with bupivacaine for caesarian section. They found better quality of sensory block and analgesia with this combination.[6] Dexamethasone (a steroid) has an anti-inflammatory reaction on the body. The analgesic property of dexamethasone is due to the local action on nerve fibers and the systemic effects.[5] They block transmission of nociceptive C - fibers and suppress the neural discharge.[7,11] Sharma A et al reported an effective prolonged sensory block in spinal anaesthesia with addition of intrathecal dexamethasone to bupivacaine in abdominal surgeries.[11] Research has been done using these two drugs as adjuvants separately. There are few studies available comparing dexmedetomedine with dexamethasone as adjuvant in spinal anaesthesia for caesarian section. Hence the aim of this study was to evaluate and compare the intrathecal effects of adding dexmedetomidine versus dexamethasone as an adjuvant to 0.5% hyperbaric bupivacaine in elective LSCS.

Material and Methods

This double blind study was done in Services Hospital, Lahore after being approved from Institutional Review Board. Patients aged 18-40 years with ASA grade I and II were included who agreed for elective caesarean section under subarachnoid block. Those who refused, had some bleeding disorder, had history of drug abuse, infection at site of injection and allergic to study drugs were excluded. Written informed consent was taken after a detailed explanation. 60 parturients were divided randomly by lottery method into two groups of 30 each. 10mg of 0.5% hyperbaric bupivacaine was given in group D with dexamethasone 6mg. In Group BD hyperbaric bupivacaine (10mg) was used with dexmedetomedine 5µg (0.5 ml). To ensure blinding, a third person prepared the drugs and used similar syringes. Baseline blood pressure and heart rate were recorded. Ringer's Lactate (15ml/kg) was given to preload the patients with 20G branula before administering spinal anaesthesia.

Spinal Anaesthesia was administered at the level of L3–4 to all parturients. A 25 G pencil point needle was used in sitting position. Free flow of CSF was confirmed and study drug was administered. Immediately patient was placed in supine position. A leftward tilt was given for prevention of aortocaval compression. Changes in heart rate, systolic blood pressure, diastolic pressure and mean arterial pressure were recorded at 2-minutes interval till the uterine incision. Hypotension was treated with Norepinephrine (SBP less than 90mmHg or decreased greater than 20% from baseline). Atropine (0.3-0.5mg) was given as treatment of bradycardia (HR less than 50/minute). A 23 G needle was used to assess the onset of loss of pin prick sensation. In the first 15 minutes, it was assessed every 2 minutes after the administration of the drug. Then for 2 hours assessment was done every 30 minutes. The sensory block duration was noted. Sensory regression time of two segments was observed. Modified Bromage Scale was used to record the onset and duration of motor block. (0-Able to move hip, knee and ankle. 1-Unable to move hip. Able to move knee and ankle. 2-Unable to move hip and knee. Able to move ankle. 3-Unable to move hip, knee and ankle). Ketamine injection (1mg/kg) was used as rescue analgesic.

Mean sensory block onset was taken to calculate the sample size. Group BD it was (6.46±1.35 min) and in Group B (7.43±2.23 min). The alpha error was 0.05 and power of study 80%.7 Analysis of the data was done in computer software SPSS (Statistical Package for Social Sciences) 24.0. Mean±Sd represented Quantitative variables. The sensory block onset, time of sensory regression, time to reach maximum height, analgesia duration, motor block onset, maximum motor block time and duration were compared with Independent sample T-test among groups. Frequency and percentages were used for representing qualitative variables. Hemodynamics till the incision of uterus was compared between groups with repeated measures ANOVA. Chi Square was used for analysis of categorical variables. $p < 0.05$ was considered significant.

Results

There was no discernible difference in demographic data (Table:1). The mean time of sensory block onset was earlier with dexamethasone (2.10±0.30) vs (2.57 ± 1.10 min) in Group BD (p=0.03). The mean time taken to reach maximum height of sensory block did not vary significantly (p= 0.67). In Group BD, time of regression of sensations was longer (142±26.92) minutes (P<0.05) while in group D it was (105±25.57) minutes (Table:2). Significantly prolonged analgesia time was seen in BD

group. The mean time difference of 310 minutes was noted (Table:2). Earlier time of onset in motor block was seen in D group but was not significant. The mean time to reach maximum motor block was earlier with dexamethasone (3.73±0.86) than dexmedetomidine (5.23±1.99) ($p<0.05$). There was increase in duration of motor block significantly with dexmedetomidine than dexamethasone. The mean times in two groups were (373.33±63.15) (148.50±31.10) respectively ($p=0.000$) (Table.3). Comparison of heart rate from baseline

Table 1: *Demographic Data*

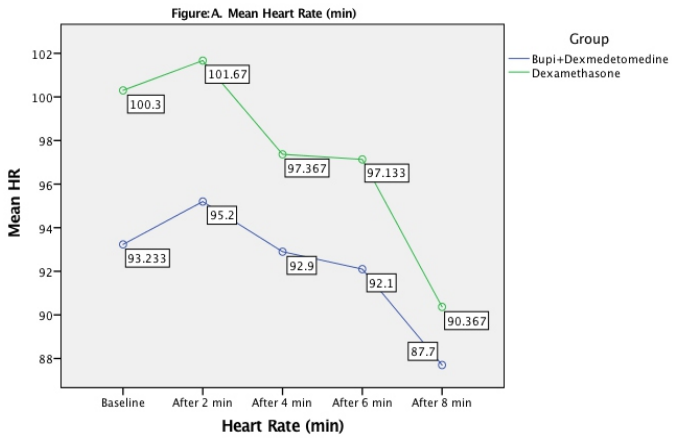
	Bupi + Dexmedetomidine (BD)	Bupi+ Dexamethasone (D)	P value
Age	26.57±4.56	28.67±4.56	0.07
Weight	73.37±11.6	72.33±10.80	0.72

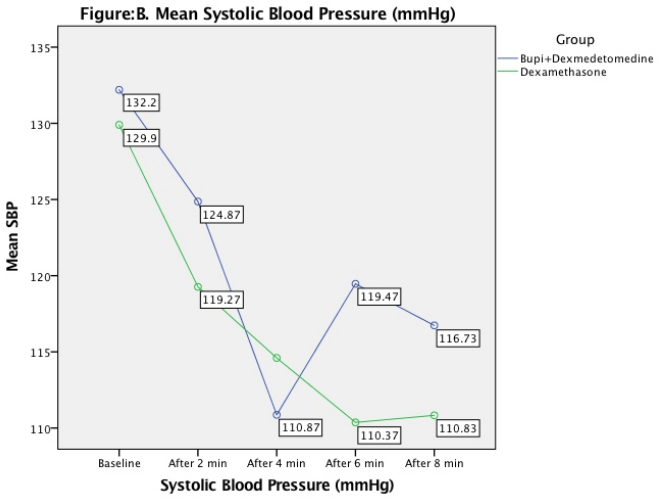
Table 2: *Characteristics of Sensory Block*

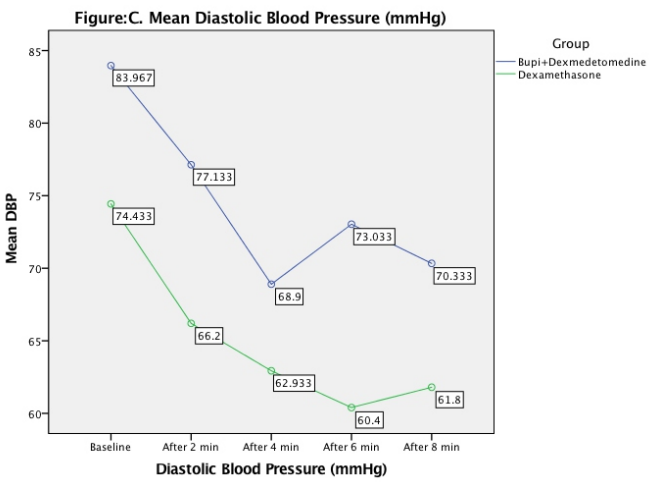
	Bupi + Dexmedeto-midine (BD)	Bupi + Dexametha-sone (D)	P value
Onset time (min)	2.57±1.10	2.10±0.30	0.03
Time to reach maximum height (min)	5.80±1.88	5.60±1.77	0.67
Duration of Block (min)	460±61.70	150±46.60	0.000
Time to two segment regression (min)	142±26.92	105±25.57	0.000

Table 3: *Characteristics of Motor Block*

	Bupi + Dexmedeto-midine (BD)	Bupi + Dexa-methasone (D)	P value
Onset time (min)	2.20 ±0.61	2.00±0.00	0.07
Time to reach maximum block (min)	5.23±1.99	3.73±0.86	0.00
Duration of Block (min)	373.33±63.15	148.50±31.10	0.00







till uterine incision showed a significant drop in both groups (Fig:A). In both groups, the decrease in systolic and diastolic blood pressure was significant from baseline till uterine incision (Fig: B & C).The incidence of hypotension was 33% with dexmedetomidine and phenylephrine had to be given.

The incidence of postoperative shivering was less with dexmedetomidine (97%) compared to dexamethasone (88%) ($P=0.04$) Nausea and vomiting was less significant in BD group as compared to D group ($p=0.02$). Six patients in dexamethasone group complained of vomiting.

Discussion

A major concern after caesarian section is postoperative pain relief. Mostly opioids are used as spinal adjuvants for effective and prolonged postoperative analgesia. The trend of using opioids is rapidly changing due to some of the side effects like vomiting, respiratory depression and pruritis.[10] Dexmedetomedine and dexamethasone have been used as additives to local anaes-

thetics. In spinal cord, activation of α2 –agonist receptors by dexmedetomidine cause inhibition of the release of nociceptive neurotransmitter substance P.[10,12] The hyperpolarization of dorsal horn neurons by intrathecal administration and decrease in the release of transmitters of C fibers are responsible for pain relief.[10] Intracellular movement of potassium is blocked which leads to pain relief. Both visceral and somatic pain is affected by the antinociceptive action of intrathecal α2 receptors.[12] Dexamethasone suppresses neural discharge from nociceptive C fibers. Thus it acts as anti-inflammatory and an analgesic. Intrathecal administration of dexamethasone may affect the intraspinal prostaglandin synthesis.[1]

The current study compared in spinal anaesthesia the effects of addition of dexmedetomidine and dexamethasone to bupivacaine. The findings of our study found dexmedetomidine more effective than dexamethasone in prolongation of duration of anaesthesia and postoperative analgesia. The mean time to reach maximum height in the two groups was not different. Dexmedetomedine 5 microgram increased the time to two segment regressions (142 ± 26.92 vs105 ± 25.57), duration of motor block (373.33 ± 63.15 vs 148.50 ± 31.10) and duration of pain relief (460±61.70 vs 150±46.60) compared to dexamethasone. This is in accordance with Abdelhady BS et al who compared Dexamethasone and Dexmedetomidine as analgesics when given intrathecally with bupivacaine in Caesarean Sections. The duration of postoperative analgesia between dexmedetomidine and dexamethasone was (418 ± 133min vs 190 ± 35) respectively. The motor block duration was greater with dexmedetomidine (324 minutes) than dexamethasone group (144 min) ($P < 0.001$).[1] Similar results were reported by El-Hamed Hassan AA et al. They compared \dexamethasone and dexmedetomidine with bupivacaine as intrathecal additives. Spinal anaesthesia was found to be significantly prolonged in duration with dexmedetomidine in comparison to dexamethasone. The time of sensory block regression was 359.50 ± 20.32 min with dexmedetomidine versus dexamethasone 199.75±18.22 min ($p<0.001$). Motor block regression time was 319.00±21.00 vs 170.00±20.00. Significantly prolonged analgesia with dexmedetomidine was seen as the time to request for analgesia was 293.50±15.57 compared to dexamethasone (178.40±19.26) ($p<0.001$).[7]

Comparable with our study results Elshahawy ME et al found increase in time of sensory block regression to L1 dermatome (p 0.001) with dexmedetomidine (295.08 ± 39.77) when compared to dexamethasone (208.80 ± 42.76). Spinal anaesthesia was given with these adjuvants in Emergency for Orthopedic Lower Limb Surgery. The motor block duration increased significantly with dexmedetomidine (229.2±35.4) vs (181.3±22.5) dexamethasone group ($p<0.001$).5 Noor El-Din et al determined the effect of intrathecal dexmedetomidine with fentanyl. These were used as adjuvants to bupivacaine in patients of Cesarean Section. In agreement to our results they also reported that dexmedetomedine was better in providing analgesia postoperatively. Also motor and sensory block duration was increased.[13]

Shahid A et al analyzed postoperative analgesia with intrathecal dexmedetomidine after Cesarean Section. They gave the report of increase in the time of onset of postoperative pain with dexmedetomidine (364.07 ± 35.58min). The postoperative analgesic requirement was in 51.7 % patients.[14] Ismaiel MAMAN et al studied the prevention of shivering comparing intrathecal dexamethasone with dexmedetomidine in cesarean section. Contrary to our results, they noted that dexamethasone was better than dexmedetomidine in prolonging the sensory block duration and analgesia. Statistically significant longer two segment regression time (minutes) was noted with dexamethasone (96.32±9.8) compared to (76.24±8.34) dexmedetomidine ($p<0.001$). The sensory block duration was prolonged in group B (dexamethasone) (161.83±7.00) compared to (124.50±6.72) group A (dexmedetomidine) ($p<0.001$). The time of rescue analgesia was prolonged with dexamethasone (198.21±21.22) compared to dexmedetomedine (174.44 ±16.3) ($p<0.001$). The difference in results could be due to the variation in dose of dexamethasone. We used 6mg while they used 8mg.[15] Small sample size is one limitation of our study. Another is that the sedation score was not evaluated. In future, different doses of these drugs can be compared along with assessment of sedation.

Conclusion

The results of our study conclude that dexmedetomidine provides better spinal anaesthesia along with postoperative analgesia as adjuvant with bupivacaine for intrathecal injection in comparison to dexamethasone.

Conflict of Interest *None*

Source of Funding *None*

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