

Efficacy of Dexamethasone in Preventing Post Spinal Hypotension in Elderly Patients Undergoing Orthopedic Surgery; A Randomized Control Trial at a Tertiary Care Hospital

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ABSTRACT

Objective: To compare the efficacy of single pre-operative dose of intravenous Dexamethasone vs placebo in elderly patients undergoing orthopedic surgeries in spinal anesthesia in terms of number of hypotensive episodes.

Methodology: After ethical approval and clinical trial registration (NCT07052864), study was carried out at Department of Anesthesiology and Critical Care Medicine, PIMS Hospital, Islamabad from 30th June 2025 to 30th August 2025. A total of 134 patients were enrolled who were 50 years to 100 years belonging to ASA I & II. Group A patients were given single preoperative dose of dexamethasone 8 mg IV in 100 ml normal saline 1 hour before induction of spinal anesthesia in the pre-operative area while group B patients were given placebo. The primary outcome variable was number of intraoperative hypotensive episodes as well intraoperative phenylephrine consumption across two groups. **Results:** The incidence of intra operative hypotension was significantly higher in group B than group A. The incidence in group B was 70% and in group A it was 45% with p value being 0.003. Similarly, among 134 patients, intraoperative phenylephrine consumption was 0.00 (50.00) in group A while in group B it was 50.00 (200.00) with p value being 0.02.

Conclusion: Prophylactic administration of Intravenous Dexamethasone is effective in preventing post spinal hypotension and reducing intraoperative vasopressor requirements among elderly patients undergoing lower limb orthopedic surgeries.

Key words: Spinal Anesthesia, Post Spinal Hypotension, Dexamethasone.

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Introduction

Lower limb orthopedic surgeries are one of the most commonly performed surgeries. They are carried out under regional blocks or neuraxial anesthesia. They are most commonly performed under spinal anesthesia.¹ Spinal anesthesia is associated with sympathectomy resulting in hypotension.² Hypotension is more pronounced in patients that are volume depleted, elderly or having limited cardiovascular reserve.¹ Hypotension results in compromised end organ perfusion which can lead to end

organ damage.³ This can be prevented by prompt treatment of hypotension or administration of drugs that reduce the incidence of post spinal hypotension if they are administered prophylactically. One of the drugs that reduce the incidence of post spinal hypotension is Dexamethasone.⁴

Dexamethasone is a steroid which has found number of uses in the peri-operative medicine. It has been traditionally used for prophylaxis against post operative nausea and vomiting.⁵ Dexamethasone is also considered

as an analgesic and decreases the opioid requirement in the peri-operative period.⁶ These analgesic effects of Dexamethasone are thought to be due to its anti-inflammatory and immunosuppressive effects which reduces the production of inflammatory mediators responsible for pain.⁷ It is also used as an adjunct to peripheral nerve blocks and neuraxial anesthesia. IV administration of Dexamethasone is an effective agent to prolong the duration of spinal anesthesia, caudal epidural anesthesia increases the time to first rescue analgesia demand in the post operative period.^{8,9} Both intravenous and peri-neurally administered Dexamethasone was found to be effective in prolonging the duration of peripheral nerve blocks.¹⁰

Recently it was found that Dexamethasone can prevent post spinal hypotension as the drug causes increase in systemic vascular resistance thereby counteracting hypotension induced by spinal anesthesia.⁴ However limited literature is available which has evaluated the prophylactic administration of Dexamethasone and its effect on post spinal hypotension. In a recent randomized control administration of single dose of Dexamethasone in pre-operative period, the incidence of post spinal hypotension was significantly decreased from 38.8% to 18.8%.¹¹ There was also significant less requirement of vasopressors among patients who were given Dexamethasone in the pre-operative period.¹¹ Similarly, in elderly patients undergoing lower limb orthopedic surgeries under spinal anesthesia there was significant reduction of incidence of hypotension as compared to control group. The incidence of hypotension was 32.7% in control group while in group administered with prophylactic Dexamethasone the incidence was 14.5%.¹²

The blood pressure was also significantly higher among patients who were given Dexamethasone as compared to control group at 5 and 10 minutes following administration of spinal anesthesia.¹² Therefore, administration of single dose of Dexamethasone in the preoperative period not only reduces the incidence of post spinal hypotension but also results in significantly better hemodynamics following spinal anesthesia which can result in significantly better hemodynamics. Furthermore, the demand for intraoperative vasopressor and rescue fluid will decrease significantly due to better hemodynamics making pre-operative administration of single dose of intravenous Dexamethasone as a cost-effective prophylaxis. Due to limited literature further studies are required so that definitive guidelines can be laid down and patient based outcomes can be improved. This double-blind randomized

control trial was carried out to evaluate the efficacy of pre-operative prophylactic Dexamethasone in preventing post spinal hypotension in elderly patients undergoing lower limb orthopedic surgeries.

Methodology

Ethical approval was taken from institutional ethical approval board. Afterwards this randomized control trial was registered at clinicaltrials.gov with clinical trial number being (NCT07052864). The study was carried out at Department of Anesthesiology and Critical Care Medicine, PIMS Hospital, Islamabad. The study was conducted from 30th June 2025 to 30th August 2025. A total of 134 patients were enrolled in the study who fulfilled the inclusion criteria. The sample size was calculated using WHO calculator for 2 proportions using; $P_1=14.5\%$ (12) and $P_2=32.7\%$ ¹², power of test = 80 % at 95 % confidence level and $\alpha = 0.05$. The patients were enrolled by non-probability consecutive sampling who fulfilled inclusion criteria that was age being 50 years to 100 years, undergoing orthopedic surgery under spinal anaesthesia, ASA I & II. While the patients who were known case of ischemic heart disease, patients having contraindication to spinal anesthesia (e.g.- coagulopathy, thrombocytopenia, allergy to local anesthetic agent), patients using corticosteroids or drugs that affect serotonin (e.g., selective serotonin reuptake inhibitor), patients with uncorrected hypovolemia were excluded from the study.

Informed consent was taken from each enrolled patient and then they were divided randomly into two groups using computer generated random numbers. Group A patients were given single preoperative dose of dexamethasone 8 mg IV in 100 ml normal saline 1 hour before induction of spinal anesthesia in the pre-operative area while group B patients were given 100 ml normal saline. Under aseptic measures skin was infiltrated with local anesthesia and Spinal anaesthesia was employed using 25G spinal needle by an anesthetist and Hyperbaric Bupivacaine 15mg was injected slowly over 20 seconds. Systolic blood pressure, Diastolic blood pressure and mean arterial pressure was measured non-invasively as a part of standard ASA monitoring before induction of anesthesia and then at 5 minutes interval till 30 minutes. Frequency of number of hypotensive episodes that was more than 20% fall in blood pressure from baseline were noted in all patients. Hypotension was managed with rescue medications such as 50-100 mcg phenylephrine bolus and rapid infusion of fluid until the Mean arterial pressure returned to within 20% of the normal baseline value or greater than 65 mm of Hg which ever was

appropriate for the patient. Total number of intraoperative hypotensive episodes along with total amount of intraoperative phenylephrine consumed as well as rescue fluid boluses was noted for both groups.

Results

The mean age of presentation was similar across two groups. The mean age of presentation among patients who were given Dexamethasone was 66.15 ± 5.45 years while in control group 66.12 ± 4.77 years with p value being 0.97. The distribution of gender and ASA classification across two groups is shown in table I.

Table I: Distribution of Gender and ASA classification across two groups.

Parameter		Group A	Group B	P value (Chi Square test)
Gender	Male	42	47	0.360
	Female	25	20	
ASA classification	ASA I	34	35	0.90
	ASA II	33	32	

The distribution of BMI was similar across two groups with mean BMI in group A was 22.60 ± 1.57 while in group B it was 23.69 ± 1.48 with p value being 0.98. The baseline hemodynamic profile was comparable across two groups as shown in following table II.

The incidence of intra operative hypotension was significantly higher in group B than group A. The incidence in group B was 70% and in group A it was 45% with p value being 0.003 Shapiro wilk test had a p value of less than 0.05 indicating that data is non-parametric in distribution. Comparison across two groups is shown in following table III. Comparison of Intraoperative

Table III: Comparison of Intra operative hemodynamics across two groups.

Parameter	Group A Median (IQR)	Group B Median (IQR)	P value (Mann Whitney U test)
SBP at 5 minutes	129.00 (10.00)	106.00 (6.00)	0.00
DBP at 5 minutes	77.00 (11.00)	65.00(13.00)	0.00
MAP at 5 minutes	79.00 (17.00)	64.00 (9.00)	0.00
SBP at 10 minutes	133.00 (8.00)	112.00 (15.00)	0.00
DBP at 10 minutes	78.00 (7.00)	74.00 (7.00)	0.00
MAP at 10 minutes	80.00 (13.00)	69.00 (7.00)	0.00
SBP at 15 minutes	135.00 (8.00)	127.00 (9.00)	0.00
DBP at 15 minutes	79.00 (8.00)	76.00 (7.00)	0.006
MAP at 15 minutes	83.00 (10.00)	80.00(12.00)	0.009
SBP at 20 minutes	139.00 (6.00)	128.00 (10.00)	0.000
DBP at 20 minutes	81.00 (11.00)	80.00 (8.00)	0.22
MAP at 20 minutes	88.00 (9.00)	78.00 (11.00)	0.000
SBP at 25 minutes	135.00 (6.00)	133.00 (10.00)	0.001
DBP at 25 minutes	80.00 (8.00)	81.00 (6.00)	0.490
MAP at 25 minutes	84.00 (11.00)	80.00 (6.00)	0.001
SBP at 30 minutes	137.00 (9.00)	135.00 (11.00)	0.008
DBP at 30 minutes	79.00 (8.00)	80.00(7.00)	0.485
MAP at 30 minutes	85.00 (10.00)	86.00 (13.00)	0.490

hypotensive episodes, phenylephrine and rescue fluid consumption is shown in table IV.

Table II: Comparison of baseline hemodynamic profile across two groups.

Parameter	Group A	Group B	P value (Independent t test)
Systolic Blood Pressure	139.80 ± 7.30	140.59 ± 8.25	0.558
Diastolic Blood Pressure	84.16 ± 6.58	85.55 ± 7.16	0.245
Mean Blood Pressure	93.20 ± 8.85	96.19 ± 12.21	0.122

Table IV: Comparison of Intraoperative hemodynamics, rescue fluid and phenylephrine consumption.

Intraoperative hypotensive episodes		
Group	Median (Inter Quartile range)	P value (Mann Whitney U test)
Group A	0.00 (2.00)	0.03
Group B	2.00 (2.00)	
Intraoperative Phenylephrine consumption		
Group	Median (Inter Quartile range)	P value (Mann Whitney U test)
Group A	0.00 (50.00)	0.02
Group B	50.00 (200.00)	
Intraoperative rescue fluid boluses consumption		
Group	Median (Inter Quartile range)	P value (Mann Whitney U test)
Group A	0.00 (2500.00)	0.167
Group B	200.00 (600.00)	

Discussion

This study provides useful insight to use of Dexamethasone as a prophylactic agent to prevent post spinal hypotension. The baseline demographic profile and

baseline hemodynamics were comparable across two groups. However intraoperative hemodynamics and total amount of Phenylephrine consumed significantly differed between two groups. Intraoperatively diastolic blood pressure at 20, 25 and 30 minutes and Mean blood pressure at 30 minutes were similar between two groups while at rest of time intervals hemodynamics (Systolic, Diastolic and Mean blood pressure) were significantly higher and better among patients who were pre treated with IV Dexamethasone before spinal anesthesia. The findings are similar to a study done by Ashoor TM et al.¹²

Intraoperatively Systolic Blood Pressure, Diastolic Blood Pressure and Mean Blood Pressure were significantly higher among patients who were pre-treated with Dexamethasone at 5,10,15 minutes interval than those who didn't receive any Dexamethasone.¹² In our study difference is prominent till 15 minutes and afterwards Diastolic blood pressure and mean blood pressure becomes similar across two groups. However higher age group 75.8 ± 5.4 vs 75.6 ± 5.0 years was studied by Ashoor TM et al.¹² While in our study comparatively lower age group 66.15 ± 5.45 vs 66.12 ± 4.77 years was evaluated. Never the less pre-treatment with Dexamethasone is helpful in preventing post spinal hypotension irrespective patient age.

Furthermore, the population studied by Ashoor TM et al was predominantly female while this study had a pre dominant male population. The total intraoperative Phenylephrine consumption was significantly different between two groups. Those who were pre-treated with Dexamethasone had median intraoperative phenylephrine consumption of 0.00 (50.00) while in control group it was 50.00 (200.00) with p value of 0.02. In study done by Ashoor TM et al. Ephedrine was used to treat hypotension and its consumption was significantly higher in group not pre-treated with Dexamethasone with p value being 0.025.¹² The incidence of intra operative hypotension in group B was 70% and in group A it was 45% with p value being 0.003.

The incidence of hypotension observed by Ashoor TM et al was lower but significantly different between two group with lower incidence among patients pre-treated with Dexamethasone with p value being 0.025(12). In another study involving younger age obstetric patients' similar findings were reported. The incidence of hypotension was significantly lower among patients pre treated with Dexamethasone 18.8% vs 38.8% with p value being less than 0.05.¹¹ Similarly phenylephrine requirements were significantly lower among patients pre-treated with

Dexamethasone with p value being less than 0.05.¹¹ However, in another study evaluating obstetric patients no significant difference was found between two group in terms of incidence of hypotension.¹³ Similarly in another study involving younger patients undergoing lower abdominal surgeries under spinal anesthesia; no significant difference was found in hemodynamics between patients who were pre-treated with Dexamethasone and those who received placebo in terms of intraoperative hemodynamics.¹⁴ This could be due to the fact Dexamethasone maybe more effective in preventing post spinal hypotension among older patients as compared to younger age group. None the less due to fewer number of studies available regarding prophylactic use Dexamethasone in preventing post spinal hypotension further studies are required to draw definitive evidence.

Conclusion

The findings of this study clearly demonstrate that intraarticular cocktail injection in TKR not only alleviates pain but also facilitates early recovery and rehabilitation.

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