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HAEMODYNAMIC CHANGES FOLLOWING SPINAL ANAESTHESIA: A COMPARISON IN PATIENTS UNDERGOING TURP BETWEEN PRELOADING WITH CRYSTALLOIDS AND COLLOIDS

ROUF BASHIR,* Faisal M.Qureshi, Sheikh Imran & Showkat Ahmad Gurcoo.

*Assistant Professor, Department of Anaesthesiology, SKIMS Medical College & Hospital,Bemina,Srinagar

Lecturer,Department of Anaesthesiology, SKIMS Medical College & Hospital,Bemina,Srinagar

Lecturer,Department of Anaesthesiology, SKIMS Medical College & Hospital,Bemina,Srinagar

Professor, Department of Anaesthesiology, Critical Care, Sher-i-Kashmir Institute of Medical Sciences, Soura ,Srinagar

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Spinal Anaesthesia, TURP, bupivacaive, hypotensio

Abstract

Spinal anesthesia consists of temporary interruption of nerve transmission within the subarachnoid space produced by injection of a local anesthetic solution into cerebrospinal fluid. Used widely, safely and successfully for more than 100 years, spinal anesthesia has many potential advantages over general anesthesia, especially for operations involving the lower abdomen,the perineum and the lower extremities. The advantages claimed with spinal analgesia for such operation include reduced blood loss and better operating conditions , minimal effect of arterial oxygen and carbon dioxide tensions of the patient , preference by surgical and nursing staff and a generally comfortable recovery. The technique can permit early detection of complications such as TUR syndrome and bladder perforation.[1,2].In our study conducted in the Department of Anaesthesiology,SKIMS on 80 male patients aged 45-75 years,undergoing TURP surgery under spinal anaesthesia,we studied the haemodynamic changes after the spinal anaesthetic and compared haemodynamic response and hypotension between patients preloaded with crystalloids and those preloaded with colloids.We found no significant difference between the groups.

Introduction

Background

Spinal anesthesia consists of temporary interruption of nerve transmission within the subarachnoid space produced by injection of a local anesthetic solution into cerebrospinal fluid. Used widely, safely and successfully for more than 100 years, spinal anesthesia has many potential advantages over general anesthesia, especially for operations involving the lower abdomen,the perineum and the lower extremities. The advantages claimed with spinal analgesia for such operation include reduced blood loss and better operating conditions , minimal effect of arterial oxygen and carbon dioxide tensions of the patient , preference by surgical and nursing staff and a generally comfortable recovery. The technique can permit early detection of complications such as TUR syndrome and bladder perforation.[1,2]

The injection of local anesthetics solutions into subarachnoid space produces important and often widespread physiologic responses.

The most important physiologic responses to spinal anaesthesia involve cardiovascular system. They are mediated by combined effects of autonomic denervation and with higher levels of autonomic blockade, the added effects of vagal nerve innervations. [3]

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Sympathetic denervation produces arterial and more important arteriolar vasodilatation. Because peripheral vascular resistance decreases only 15 to 18 per cent, mean arterial pressure decreases only 15 to 18 percent in the presence of normal cardiac output.[2,4]

Heart rate decreases during spinal anesthesia in the absence of autonomically active drugs and medications. The bradycardia is due in part to blockade of preganglionic cardiac fibres arising from $T_1 – T_4$. The bradycardia is also mediated by significant decreases in right atrial pressure and pressure in great veins as they enter right atrium. This can be seen during fixed levels of spinal anesthesia. Placing the patient in slightly head-down position increases venous return which increases right atrial pressure.[4,5,6].

Slight decreases in arterial pressure in normovolemic patients can be ascribed to decreases in after load. Severe hypotension can be due to decreases in cardiac output secondary to decreases in preload associated with peripheral pooling of blood in vasodilated capacitance vessels or to hypovolemia, or both.[7,8]

Decreases in systolic blood pressure to levels 33 per cent below resting control levels need not be treated during spinal anesthesia in healthy, asymptomatic patients.

If physiologic measures need to be supplemented by vasopressors, the most useful are ephedrine and mephentermine. Both have venoconstrictive properties without major undesirable effects on the ratio between myocardial oxygen supply and demand.[8,9]

Restoration of blood pressure alone is not the sole objective of treating hypotension. The objective is restoration of tissue oxygenation, especially myocardial oxygenation.[10,11]

Studies have shown that colloids decrease the extent of hypotension but do not prevent it.

The present study was conducted in the Department of Anesthesiology, SKIMS, wherein the effects of fluid preloading with crystalloids and colloids on haemodynamic parameters in 80 male' patients undergoing TURP operation (45 to 75 years) were studied.

The crystalloid selected was Ringer's lactate which is a balanced salt solution.The Colloid (Hemaccel) contains large molecules which remain intravascular for a longer period of time and maintains intravascular volume.

Bupivacaine was selected for spinal anesthesia in these patients. It combines the properties of an acceptable onset, long duration of action, profound conduction blockade, and signification separation by sensory anesthesia and motor blockade.

We use 0.5 per cent hyperbaric bupivacaine for producing spinal anesthesia in our study.

Methods

This prospective randomized study was carried out in the Department of Anaesthesiology, SKIMS between December 2004 and September 2006. After institutional ethics committee approval and written informed consent, 80 male patients of ASA grade I-II, aged 45-75 years, scheduled for elective transurethral resection of prostate (TRUP) were studied.

Patients with a history of hypertension, congestive cardiac failure, any active medication for cardiovascular system or any other absolute/relative contraindications to spinal anaesthesia were excluded from the study.

Patients were randomly allocated to two groups of 40 each.

i. Group I : Received 7 ml/kg of crystalloid preload (Ringers lacate) over 10-15 minutes ten minutes before spinal anaesthesia.

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ii. Group II : Received 7 ml/kg of colloid preload (Haemaccel) over 10-15 Minutes ten minutes before spinal anaesthesia.

No premedication was given to any patient. On arrival in operation theatre, a 18 cannula was secured in a peripheral vein, and an infusion by Ringers lactate 5 ml/kg hr was give to all patients during the procedure. Patient was connected to Datex monitor for electocardiogram (ECG),SPO2 and non-invasive blood pressure (NIBP) monitoring.

Baseline heart rate, systolic, diastolic and mean blood pressure were recorded with the patient in a semi-recumbent position. Baseline blood pressure was taken as mean of three readings soon after arrival in the operation theatre.
Patients were then placed in sitting position and under all aseptic precautions, a lumbar puncture was performed with a 24 G Quinckes spinal needle in L3-4 intervertebral space. All patients received 3 ml of 0.5 per cent heavy bupivacaine intrathecally. After withdrawal of the spinal needle, an antiseptic seal was applied at the site of lumbar puncture and patients placed in supine position with a slight head up tilt not exceeding 20^0. Haemodynamic variable : Heart rate, systolic blood pressure, diastolic blood pressure ad mean arterial pressure were recorded at 5 minutes intervals upto 20 minutes after commencement of spinal anaesthesia.

Hypotension was defined as a fall in baseline systolic blood pressure by 30 per cent of baseline or ≤ 90 mmHg which is in accordance with most studies in the literature. If hypotension occurred it was promptly treated by intravenous ephedrine in 5 mg boluses to raise the systolic blood pressure upto above 80 percent of the baseline value. The total amount of ephedrine used was recorded.

The data obtained was analysed using standard statistical methods including student t-test and chi-square test.

Results

Hypotension is the commonest problem following spinal anaesthesia. Rapid administration of crystalloid solutions to correct established hypotension was first advocated by Greiss and Crandell in 1965.

We randomly allocated the patients to two groups of 40 each:

I. Group I : Receiving 7 ml/kg of Ringer's lactate over 10-15 min Before spinal anaesthesia.
II. Group II : Receiving 7 ml/kg of Haemaecel.

Hypotension defined as a fall in baseline systolic arterial pressure by 30% or ≤ 90 mm Hg was treated by boluses of ephedrine in doses of 5 mg.

The following indices were taken and statistically analysed:

I. Systolic blood pressure – baseline, at 5 min 10 min, 15 min. and 20 min.
II. Diastolic blood pressure - at 5 min 10 min, 15 min. and 20 min.
III. Mena arterial pressure – baseline, at 5 min 10 min, 15 min. and 20 min.
IV. Need for vasopressors between the two group.

The statistical analysis of the data was done by using Student's t-test for different of means and chi-square test. These test were two sided and were referenced for p-value for their significance. Any p-value less than 0.5 ($p<0.5$) are taken to be significant.

The analysis of the data was performed as Statistical Package for Social Science (SPSS version 10.0) Chicago, USA, for windows.

Table -1 : Distribution of age (years in group I & II)

Group	ASA status (%)		p-value
	I	II	
I	31 (77.50)	9 (22.50)	

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II	**30(75.00)**	**10 (25.00)**	**X^2 2d.f**	**= 0.69**	**0.709**

There is a non-significant (NS) difference in the distribution of age in year in the two groups.

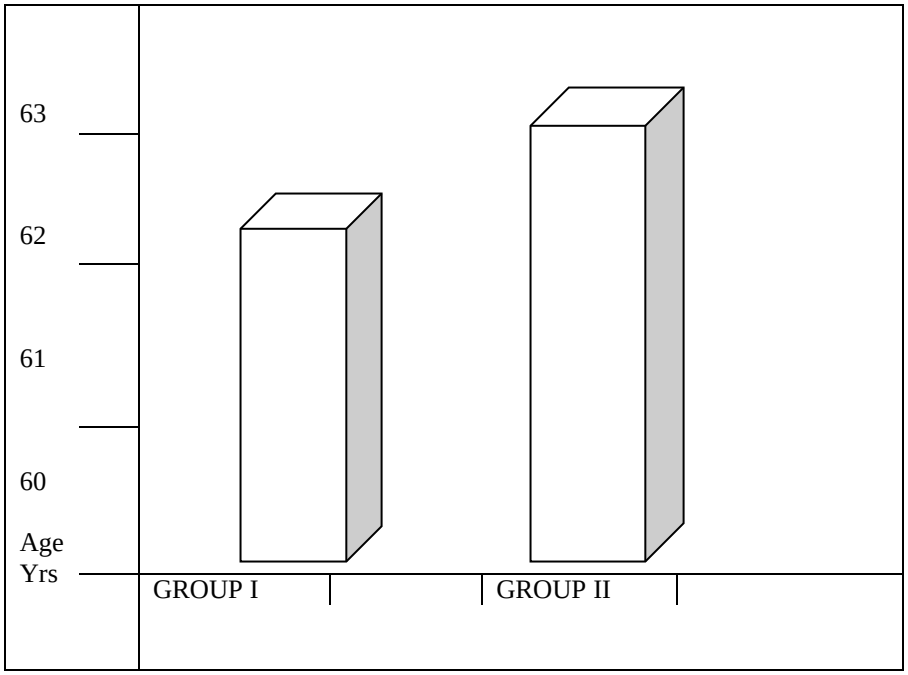

fig 1: Age distribution in group I & II

In group I, 77.2% patients were from ASA I 22.5% from ASA I and 25% from ASA II. There is a non-significant difference in the ASA status in two groups.

Table 2: Comparison of heart rate (beats/min) in group I versus group II

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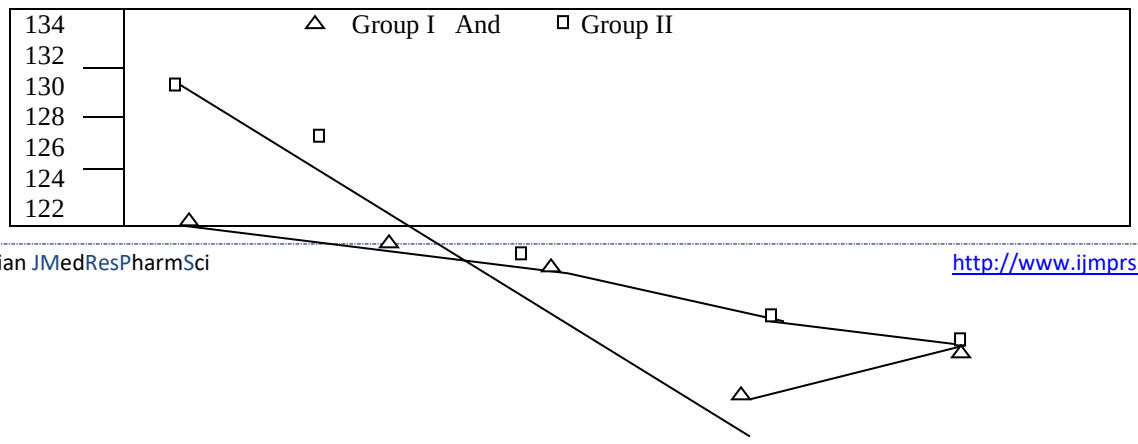
Heart rate	Group		t-value	p-value	Remarks
	I	II			
	(Mean ±S.D)	(Mean ± S.D)			
Baseline	77.03±12.85	73.70±10.67	1.225	0.228	NS
At 5 min.	74.68±13.38	73.58±11.52	0.394	0.696	NS
At 10 min.	73.73±14.97	72.40±12.83	0423	0.675	NS
At 15 min.	72.62±14.48	73.05±12.98	0.135	0.894	NS
At 20 min.	72.10±13.50	72.37±11.10	0.96	0924	NS

The heart rate at 0 min. in group I was 77.03 against 73.70 in group II, at 5 min. 74.68 vs 73.58, at 10 min. 73.73 vs 72.40, at 15 min. 72.62 vs 73.05 at 20 min. 72.37. The differences were statistically non-significant.

Table 3: Comparison of systolic blood pressure (mm Hg) in group I versus group II)

Systolic blood	Group		t-value	p-value	Remarks
	I	II			
Pressure (mm Hg)	(Mean ±S.D)	(Mean ± S.D)			
Baseline	132.05±7.45	129.00±7.86	1.773	0.084	NS
At 5 min.	128.35±7.88	126.63±9.79	0.803	0.427	NS
At 10 min.	124.30±8.64	124.40±9.01	0.051	0.959	NS
At 15 min.	121.23±11.85	122.57±9.08	0.136	0.892	NS
At 20 min.	121.73±9.46	122.07±7.96	0.169	0.867	NS

In group I, SAP was 132.05 on an average at 0 min. and in group II 129.00, AT 5 MIN. 128.35 VS 126.63 at 10 min. 124.30 vs 124.30 vs 124.40, at 15 min. 121.23 vs 122.57 and at 20 min. 121.73 vs 122.07 mm Hg. Statistically there was a non-significant difference in SAP and persisted in group I and II.



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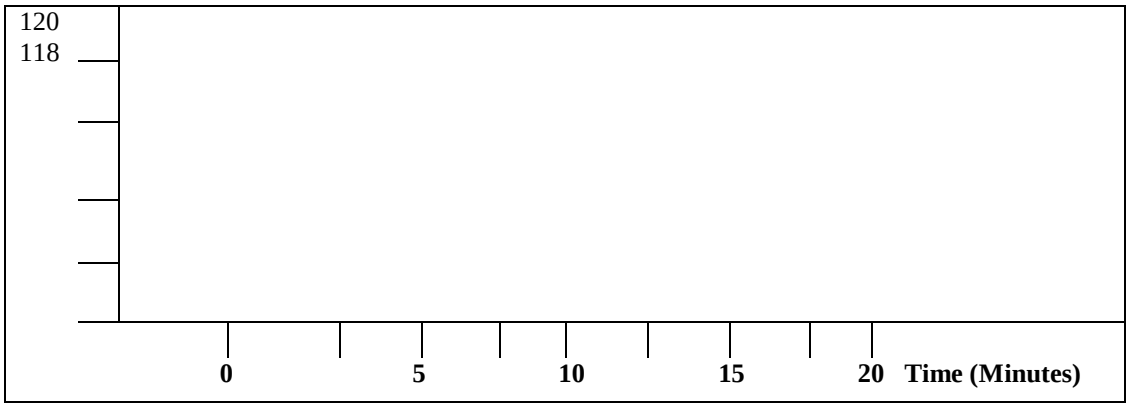
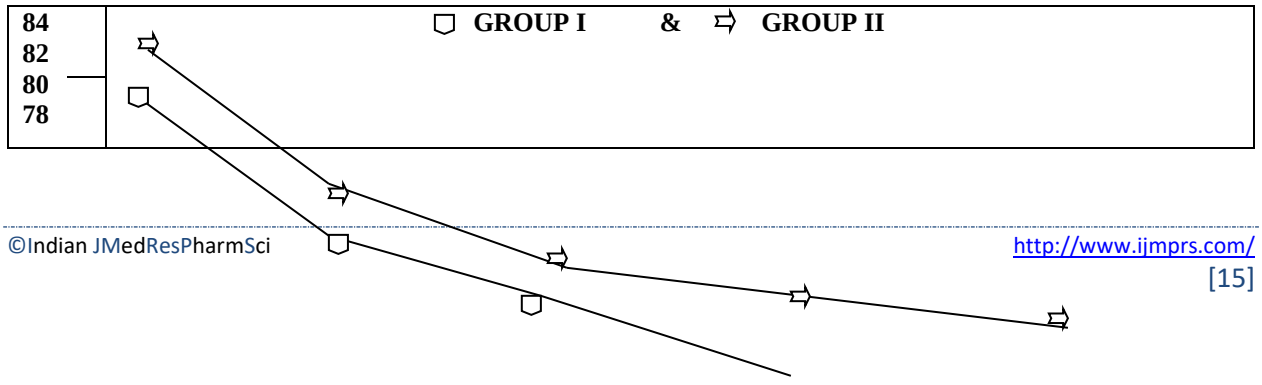


Fig 3: Comparison of systolic blood pressure (mm Hg) in group I & II.

Table 4: Comparison of diastolic blood pressure (mm Hg) in group I versus group II

Diastolic B.P (mm Hg)	Group		t-value	p-value	Remarks
	I	II			
	(Mean ±S.D)	(Mean ± S.D)			
At 0 min.	80.60±7.26	82.15±5.63	0.971	0.375	NS
At 5 min.	77.63±7.37	78.75±7.84	0.690	0.494	NS
At 10 min.	75.80±7.43	76.38±7.48	0.358	0.722	NS
At 15 min.	73.38±7.63	75.57±8.29	1.209	0.234	NS
At 20 min.	73.68±7.46	74.41±6.56	0.412	0.683	NS

In group I, DAP (mm Hg) is 80.80 (average) versus 82.15 (average) in group II at 0 min, 77.63 vs 78.75 at 5 min, 75.80 vs 76.38 at 10 min, 73.38 vs 75.57 at 15 min and 73.68 vs 74.41 at 20 min, respectively . Differences are statistically non-significant.



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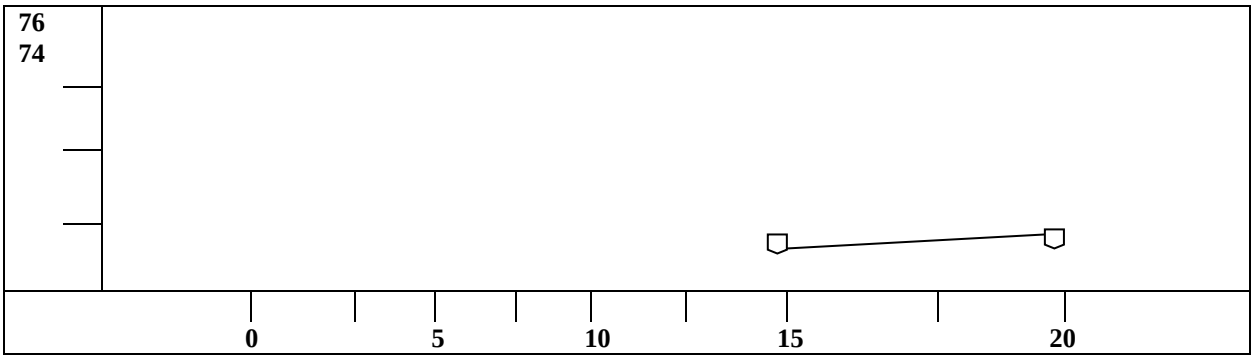
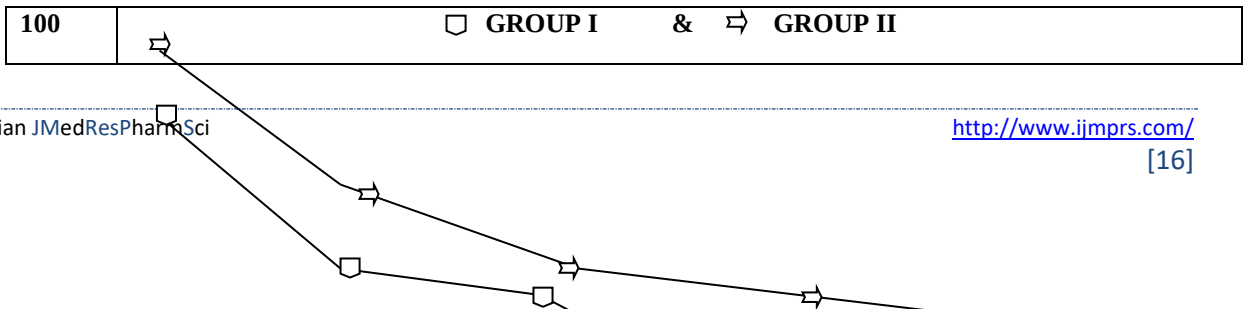


Fig 4: Comparison of diastolic blood pressure (mm Hg) in group I & II.

Table 5: Comparison of mean arterial pressure (mm Hg) in group I versus group II

Mean arterial B.P (mm Hg)	Group		t-value	p-value	Remarks
	I	II			
	(Mean ±S.D)	(Mean ± S.D)			
At 0 min.	97.17±6.17	97.77±5.65	0.435	0.666	NS
At 5 min.	94.00±6.28	94.65±7.84	0.395	0.695	NS
At 10 min.	91.88±6.95	92.30±6.75	0.300	0.766	NS
At 15 min.	89.02±8.03	90.90±7.93	1.058	0.296	NS
At 20 min.	89.75±7.11	90.33±6.05	0.388	0.700	NS

MAP (mm Hg) in group I was 97.17 (average) versus 97.77 (average) in group II at 0 min, 94.00 vs 94.00 vs 94.65 at 5 min, 91.88 vs 92.30 at 10 min, vs 90.90 t 15 min and 89.75 vs 90.33 at 20 min, respectively. Differences were statistically non-significant.



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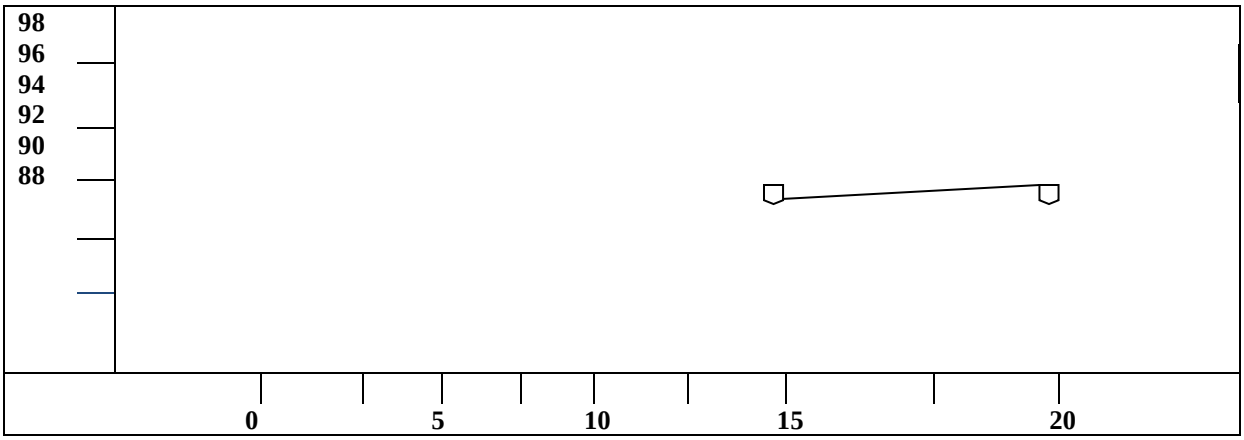

Fig 5: Comparison of mean arterial pressure (mm Hg) in group I & II.

Table 6: Comparison of need for vasopressor (ephedrine) in group I and II.

Vasopressor Used (ephedrine)	Yes(%)	No %)		p-value
Group I	2 (5.00)	38 (95.00)		
Group II	3 (7.50)	37 (92.50)	$X^2 = 1.05$	0.591

Conclusions

There appears to be no difference between crystalloids and colloids used for preloading before spinal anaesthesia to prevent hypotension especially in elderly men undergoing transurethral resection of prostate[TURP] under spinal anaesthesia,who may rather get complications secondary to preloading with excessive intravenous fluids.In case of hypotension,it can be treated with vasopressors like ephedrine to increase systemic vascular resistance

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