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Original research article

EFFECT OF CONTINUATION OF PREOPERATIVE BETA BLOCKERS IN PATIENTS WITH ESSENTIAL HYPERTENSION UNDERGOING CENTRAL NEURAXIAL BLOCKADE FOR INFRA-UMBILICAL SURGICAL PROCEDURES

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Abstract

Background: The incidence of hypotension following subarachnoid block is quite common. Hypertensive patients can have precipitated hypotension and bradycardia due to vascular reactivity or due to effect of anti-hypertensive drugs. Continuation or discontinuation of these antihypertensive medication can have varying effect following spinal induced sympathetic block and subsequent hemodynamic responses.

Materials and Methods: This prospective non randomized study was conducted on 90 patients with antihypertensive monptherapy either group B (betablocker) or group O [Angiotensin converting enzyme inhibitor (ACEI) or Angiotensin receptor blocker (ARB)] who underwent below umbilical surgery with subarachnoid block. Number of episodes of hypotension and bradycardia, total dose of vasoconstrictor or atropine was compared between the two groups. A probability value of less than 5% was considered as statistically significant.

Results: Hypotensive episodes and requirement of vasoconstrictor drug were seen to be less in group B as compared to group O. (p<0.001). Episodes of bradycardia and requirement of atropine was significantly more in the group B as compared to group O (p<0.001).

Conclusion: Preoperative continuation of morning dose of beta blocker inpatients

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under subarachnoid block results in statistically significant number of intraoperative bradycardia episodes but a statistically lower number of treatable hypotension episodes when compared to patients treated with other antihypertensive agents like ACEI or ARB.

Keywords: Spinal anaesthesia, adrenergic beta-antagonists, angiotensin-converting enzyme inhibitors, bradycardia, hypotension

Introduction

Sub arachnoid block (SAB) is widely used as a mode of regional anaesthesia for surgeries involving the lower abdomen, perineum and lower limbs. Bradycardia and hypotension are the most commonly associated complications with this anaesthesia primarily resulting from the sympathetic blockade caused by the local anaesthetic drug. Spinal anaesthesia induced hypotension (SAIH) is more common in elderly patients, parturients and more frequently correlates with the level of spinal anaesthesia, as higher level of block may be associated with activation of cardio inhibitory fibers as a result of blockage of cardio accelerator fibers of T_1 to T_4 leading to bradycardia and associated with hypotension. Fluid (crystalloid /colloid) preloading, coloading and prophylactic use of vasopressors like phenylephrine, mephenteramine, ondansetron serotonin receptor blocker in some cases reduce incidence of SAIH, and in some cases even nor adrenaline infusion is useful to prevent SAIH [1, 2]. Hypertensive patients can have structural changes (Medial hyperplasia and hypertrophy) as a result of disease itself (atherosclerosis) which can alter the hemodynamic response to anesthesia. Chronic hypertensive patients can have associated concentric hypertrophy and associated right shift of autoregulation. Long term antihypertensive medications can theoretically alter these structural changes both in the arterial level or in the heart level some with positive modulation and others effecting negatively. When these subset of population on long term antihypertensive are subjected to spinal anaesthesia, there can be exaggerated fall in blood pressure. Different antihypertensive medications have different action on cardiovascular system so post spinal effects can also be different for them. Hence, detailed information about these antihypertensive agents is essential for the anaesthesiologist to anticipate and prepare for the perioperative hemodynamic changes [3].

The SAB associated bradycardia and hypotension are similar to the cardio vascular effects of combined use of intravenous α -1 and β-adrenergic blockers. These effects are likely to get exaggerated with the preoperative use of beta-blockers. Chronic Beta blockers are recommended to continue even on the morning of surgery, may produce more bradycardia and hypotension in the intraoperative period during spinal anaesthesia. There have been conflicting reports regarding their interference in the quality of local anasethesia blockade and haemodynamic stability of the patient [4].

For patients undergoing elective surgeries under general anaesthesia, there is evidence based literature regarding continuation of beta blockers (BB) and calcium channel blockers (CCB) and discontinuation angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB).The literature tells to adapt the same principles as well for the patients who are posted for regional anaesthesia too. But in practice many times there is exaggerated fall in blood pressure due to continuation of BB on the other hand discontinuation of ARB or ACEI can raise intraoperative mean

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arterial pressures and lead to more bleeding. Theoritically continuation of BB can lead to sudden hypotension or bradycardia due to intrinsic properties of these drugs, which could have a detrimental effect in patients who are already vasodilated due to the sympathetic blockade of spinal anaesthesia. On the pre contest of some degree of end organ damage in case of chronic hypertensive patients and shift of autoregulation to right this can be futher detrimental [5, 6]. This study was thus carried out to study the effects of continuation of the morning dose of beta blockers in patients undergoing infraumbilical procedures under spinal anaesthesia, on the intraoperative haemodynamic parameters and level of sensory and motor blockade.

Methodology

This prospective non-randomized controlled study was conducted after institutional ethics committee approval with review letter number No. 60th ESGS/1327/2022 dated 12-03-2022 in a tertiary health care centre in South India. 90 hypertensive patients who were on antihypertensive monotherapy and admitted for elective infraumbilical surgeries like lower limb fractures, inguinal hernia, foot debridement, appendicectomies under subarachnoid block (SAB) were included in the study. Study participants were divided into two groups group B beta blocker group (n=45) patients who were asked to continue morning dose of beta blockers and group O (n=45) patients who were asked to omit morning dose of antihypertensives (ACEI and ARB). This included patients from either gender ASA status 2 in age group 18 to 60 who were on single anti-hypertensive for more than 3 year and less than 10 year and undergoing surgery with SAB alone. Patients with ASA grade more than 2, on multiple anti hypertensives, not willing to give conscent and those who required combined spinal epidural anaesthesia for longer surgical duration were too excluded from the study group. Patients in whom intraoperative conversion to general anaesthesia, blood loss more than 1.5 litre, who required inotrope or vasopreesor infusion to maintain blood pressure and with high level of spinal anaesthesia more than T_4 were excluded post initial inclusion. Sample size was calculated from a similar study by Meena S, Meena J, Joshi V in 2016 [7]. Using statistical software G power 3.1.9.2 (universistat, Dusseldorf, Germany) mean arterial pressure at end of 15 min and baseline value and ANOVA repeated measures-within factors was used. Considering an effect size of 0.25, α error probability of 0.05, and Power (1-β error) of 0.85 sample size of 80 was calculated and allowing a dropout rate of 10% sample size of 90 was decided (45 in each group). As it was a double blind study neither the anaesthesiologist who was giving SAB and collecting data nor the investigator were aware of the group i.e. type of anti-hypertensive patient was having.

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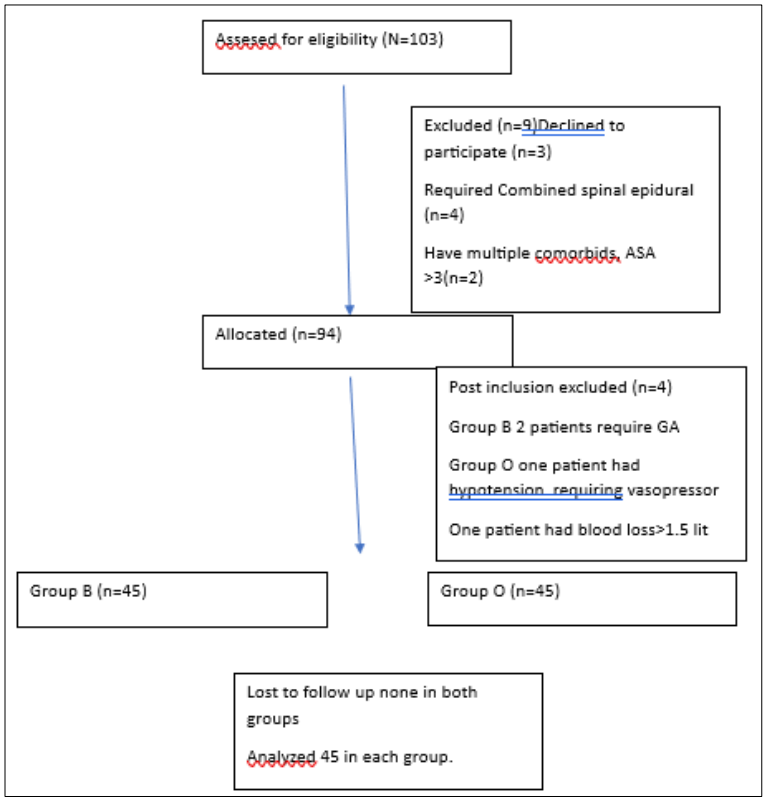

Fig 1: Consort flow diagram Nishant

All the patients were given premedication of 0.5 mg of alprazolam and 40 mg of pantoprazole on previous night and on the morning of surgery. After wheeling in all of them were connected non-invasive blood pressure, pulse oximetry and saturation probe. Base line vitals were monitored and a large bore intra venous catheter was secured. SAB was given with a 25 gauze Quincke needle in L3 L4 inter vertebral space after through antiseptic preparation in sitting position with 2.8ml of bupivacaine 0.5% heavy and 25 µg of fentanyl. Dermatomal level of sensory block was assessed with pinprick and motor block was assessed with modified bromage scale at the end of 10 minutes of SAB. The time required for achieving motor and sensory block was too noted. Hemodynamics were monitored through out the intra operative period. Hypotension defined as MAP < 20% of the base line value for that patient, was treated with phenylephrine 50 microgram intravenously. Bradycardia as defined as heart rate less than 50 /minute was treated with atropine 0.6 mg intravenously. No of episodes of hypotension, bradycardia, total dose of vasopressors and anticholinergics required is noted in both group. Total amount of blood loss was also calculated. All the patients were given with initial hour 20 ml per kg body weight and subsequent hour they were given with 4ml/kg body weight.

Statistical analysis

Continuous data were expressed as mean with standard deviation and categorical data percentages. Categorical data was compared between two groups using chi-square test. Quantitative data was tested using t-test. A probability value of less than 5% was considered as statistically significant. (P value <0.05). Statistical software SPSS (Statistical package for social software) version 23, United States of America

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International Business Management corp. was used.

Results

Table 1: Table showing distribution of Demographic Data as well as associated comorbidies

	Group O(n=45)	Group B(n=45)	P-value
Age (years)	48.93± 9.41	50.02± 9.42	0.107
Gender ratio(M:F)	1.36: 1	1.5: 1	0.07
Height (cms)	157.5±0.89	160.62±6.14	0.1078
BMI(Kg/m2)	25.44± 3.85	25.75± 4.15	0.21
Thyroid disease	3 (6.7%)	4 (8.9%)	0.07
Diabetes mellitus	20 (44.4%)	17 (37.8%)	0.06
Asthma	1 (2.2%)	2 (4.4%)	0.08

Both the groups were statistically comparable in terms of mean age (years), gender distribution (M: F), mean height (cm), and BMI (kg/m^2). ($p>0.05$) All the data expredded in mean ± SD. Both groups were statistically comparable in terms of co-existing comorbidities. ($p>0.05$).

Table 2: Table showing mean sensory and motor dermatomal level achieved in both the groups

	Group O (n=45)	Group B(n=45)	P value
Mean sensory dermatomal level (T)	10.26±0.76	9.42±0.68	0.06
Mean motor dermatomal level (T)	12.45±0.84	11±0.63	0.08

There was no statistically significant difference in both groups in terms of mean sensory and motor dermatomal level of block achieved at the end of 10 minutes after SAB. ($p>0.05$).

Table 3: Table showing number of hypotensive episodes requiring vasoconstrictor medication and no of episodes of bradycardia requiring intervention with anticholinergic drugs

	Group O(n=45)	Group B(n=45)	P value
Number of hypotensive episodes	92(97%)	52(78.9%)	$p<0.001$**
Mean amount of vasoconstrictor used in microgram	580.93±5.21	312.4±2.97	$p<0.001$**
Number of bradycardia episodes	7 (15.6%)	14 (31.1%)	0.023
Mean amount of anticholinergic used in milligram	4.09±0.21	8.87±0.28	0.035

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There was high incidence of hypotension in both the groups. 97% patients in other antihypertensive group (group O) had atlaest one episode hypotension as compared to 78.9% of patients in betablocker group(groupB) which was statistically significant (p<0.001) Similarly we observed that mean amount of vasopressor required in microgram was less in beta blocker group (312.4±2.97) as compared to other group (580.93±5.21). (p<0.001) The incidence of bradycardia was more common in betablocker group (group B) 31.1% as compared to other (group O) 15.6%. (P value 0.023), accordingly in the betablocker group the requirement of atropine sulphate used in milligram was 8.87±0.28 as compared to other group where it was only 4.09±0.21 making it statistically significant (P value 0.035).

Table 4: Table showing amount of total intraoperative blood loss in both the groups

	Group O(n=45)	**Group B(n=45)**	**P value**
Mean amount of intraoperative blood loss in ml	560.9±7.20	580±8.40	0.08

Both the groups were seen to be comparable in terms of mean intraoperative blood loss. (p>0.05)

Discussion

Hypotension following spinal anaesthesia is common and various predisposing factors can lead to exaggerated SAIH. As chronic hypertensive on long term antihypertensive drugs have altered structural and functional capability both at microcirculation level aswell as heart level. Hypertensive patients had altered hemodynamic response to anesthesia like exaggerated fall in blood pressure following spinal anaesthesia. Shingala *et al*. in their study to find the predictors of early hypotension found that short term antihypertensive less than one month had exaggerated fall in blood pressure as compared to patients on long term anti-hypertensive. Our set of patients had used hypertensive agents for more than three years atleast which are basically chronic patients and we had more episode of hypotension as we had included only chronic hypertensive patients, both BB and ACEI and ARB.

In our study we have found that both the groups were comparable in terms of age, gender distribution, and body mass index. Similarly the distribution of comorbidities (diabetes mellitus, thyroid disorders and asthma) was also similar in both the groups and they were not significant statistically. We have excluded those patients with more than ASA grade II and cardiovascular unstability to achieve a uniform patient population in both the groups.

It was seen that the mean Sensory and motor dermatomal level of Sub arachnoid block achieved at the end of 10 minutes in both the groups was also comparable. This was similar to the findings observed by Gebrargs L *et al*. in their study where they have compared between normotensives and well controlled hypertensives [8].

In our study the number of hypotensive episodes was more in the ACEI or ARB group of patients in whom morning dose of antihypertensive was withheld compared to beta blocker group. The observations of our study was in line with the study conducted by

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Kavyashree *et al*., where they compared normotensive patients with patients with betablocker and calcium channel blockers and found that hypotension was less common in beta blocker group as compared to other two groups [8]. Another study conducted by Amrita panda, *et al*. on antihypertensives patients has shown similar results where combined betablocker with calcium channel group had less incidence of hypotension and more episode of bradycardia as compared to only calcium channel blocker group or non hypertensives [10]. In literature there are sparse studies who had recommended discontinuation of fresh start of betablockade within 12 hour of spinal anesthesia ASA II patients with metabolic syndrome because of high incidence of intraoperative hypotension and bradycardia [11] Exaggerated hypotension in ACEI or ARB group in our case could be due to profound vasodilatation as we have preloaded with 10 ml/kg body weight of ringer lactate. Höhne C *et al*. have failed to find out similar effect with the long-term ACEI treatment as increased vasopressin concentrations compensated for the inhibited renin-angiotensin system [12]. Another plausible reason for less incidence of hypotension in BB group was because of the fact that most of commonly used antihypertensive beta blockers in our practice had some non-selective alpha-1 receptor blockage activity in addition to their beta1 and beta 2 blocking action, resulting in some protection against profound hypotension after sympathetic blockade from SAB. In our study around 39% population had carvedilol and rest had metoprolol as antihypertensive agent [13, 14].

The increased requirement of vasoconstrictor medication in Group O as compared to group B is well in line with the treatment of episodes of hypotensions. Our findings are similar to the observations of studies conducted with similar methodology. Similarly the increased requirement of atropine in Group B as compared to Group O could be because of the higher incidence of bradycardia.

It was seen that total amount of blood loss was comparable in both the groups during the surgery. Since the number of hypotensive episodes due to vasodilatation in group O were seen to be significantly higher than the beta blocker group, there was a possibility of the total amount of blood loss to be higher in group O. However, since the total amount of vasoconstrictor medication was also higher in the same group, this result can possibly be thus explained. Our efforts to maintain hemodynamic parameters by promptly administering phenylephrine for every fall in systolic BP reading, could possibly have prevented a significant difference in blood loss.

Conclusion

It can be concluded that preoperative continuation of morning dose of beta blocker in patients with well controlled essential hypertension undergoing surgical procedures under subarachnoid block resulted in higher number of intraoperative bradycardia episodes but a lower number hypotension episodes when compared to patients treated with other antihypertensive agents like angiotensin converting enzyme inhibitors (ACE I) or angiotensin receptor blocker (ARB).

Limitation of the study

This is a non randomized single centre study.

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Small sample size

Only anti-hypertensive monotherapy is included.

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