

Evaluation of postural hypotensive subjects by handgrip test

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ABSTRACT

Postural syncope may be noticed in otherwise normal persons with defective postural reflexes. Vasoconstrictor reserve – the extent to which total peripheral resistance can be increased from baseline condition is an important determinant of orthostatic tolerance. Women showed low autonomic support of blood pressure. The case of neurally mediated syncope is known to be greater in females in comparison to males. The present study was designed to compare vasoconstrictor reserve in male and female participants having no complaint of postural hypotension and the vasoconstrictor reserve in female volunteers having complaints of occasional postural hypotension. Vasoconstrictor reserve was determined by asking the subjects to sustain isometric handgrip at one third of maximum handgrip contraction for one minute using a handgrip dynamometer. Vasoconstrictor reserve was noted as difference between the maximum diastolic pressures at the end of one minute of sustained isometric handgrip minus baseline diastolic pressure. Results of the present study indicated less vasoconstrictor reserve in females compared to their male counterparts. When compared, the vasoconstrictor reserve of female participants experiencing occasional postural hypotension with that of the normal female volunteers, it was noticed that the same in them was much lower than that in normal female volunteers. This less vasoconstrictor reserve might be one of the causes of postural hypotension among the women participants experiencing it in our study population.

Keywords: Handgrip test, postural hypotension.

INTRODUCTION

Some of the otherwise normal ladies suffer from occasional postural hypotension. Postural (orthostatic) hypotension occurs in patients who have chronic defect in, or variable instability of vasomotor reflexes. Systemic arterial blood pressure falls on assumption of upright posture due to loss of vasoconstrictor reflexes in resistance and capacitance vessels of the lower extremities. Orthostatic hypotension may be a cause of syncope. Postural syncope may occur in otherwise normal persons with defective postural reflexes. The condition is often familial.¹

Vasoconstrictor reserve, i.e. the extent to which total peripheral resistance can be increased from baseline conditions, has been suggested to be an important determinant of orthostatic tolerance.² A decrease in vasomotor reserve in response to head up tilt,^{3,4} dynamic exercise,⁵ hypovolemia⁶ etc was also reported. Reports also indicated that sympathetic and haemodynamic response to postural stress might be affected by gender.^{7,8} Naturally, the persons having less vasoconstrictor reserve show less orthostatic tolerance and may be prone to postural hypotension.

In the present study an attempt was made to explore the vasoconstrictor reserve in normotensive male and female volunteers to find out whether any gender difference

exists in consideration to vasoconstrictor reserve. In persons who occasionally experienced postural hypotension, vasoconstrictor reserve in them was also determined to observe whether any alternations of vasoconstrictor reserve remain in comparison to the same in persons having no postural hypotension.

SUBJECTS AND METHODS

Normotensive nonsmoker students and staff of our medical college (male = 30, female=30) and persons suffering from postural hypotension (n=10) of age group 25 to 45 years participated in the study. None of them was taking any medication and none had a significant medical history. Blood pressure of each subject was recorded using a mercury sphygmomanometer. Before taking blood pressure the subject was allowed to rest in a chair quietly and comfortably with back support for at least 5 minutes.^{9,10}

Systolic blood pressure was determined at the point where Korotkoff sound became audible and diastolic blood pressure was measured at the point at which the sound disappeared.¹¹

Blood pressure was measured between 10:00 and 11:30 AM in the month of August September when room temperature was 23-25°C. Maximum Voluntary Contraction (MVC) was noted as the maximum pressure

Table-1: Blood pressure changes after 1 min handgrip test and vasoconstrictor reserve among the volunteers

Subjects	Systolic Blood Pressure (mm Hg)		Diastolic Blood Pressure (mm Hg)		Vasoconstrictor reserve (mmHg) (Mean + SD)
	Normal (Mean + SD)	After Handgrip test (Mean + SD)	Normal (Mean + SD)	After Handgrip test (Mean + SD)	
Male (n=30)	109.76 ± 9.56	116.48* ± 11.60	72.32 ± 8.43	81.44 * ± 8.74	9.12 ± 4.24
Female (n=30)	96.80 ± 8.28	100.40 ± 8.54	65.88 ± 7.13	71.36* ± 6.42	5.48* ± 1.85
Females with postural hypotension (n=10)	98.40 ± 9.66	101.10 ± 10.78	64.80 ± 9.62	64.90 ± 9.64	1.40* ± 0.96

* p<0.05

(in kg) sustained during 3 seconds of handgrip using a handgrip dynamometer. Vasoconstrictor reserve was determined by asking the subject to sustain isometric handgrip at one third of MVC for one minute with the same instrument. Vasoconstrictor reserve was noted as difference between maximum diastolic pressures at the end of one minute of sustained isometric handgrip minus baseline diastolic pressure.¹²

The data were compared among male and female volunteers and among the normal female volunteers and female participants who used to experience postural hypotension. Data were analyzed using students t- test.¹³

RESULTS

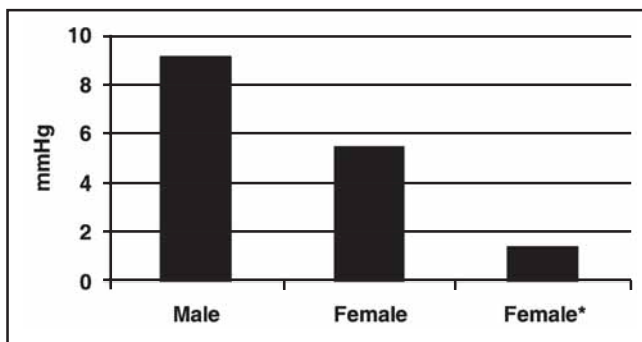
Results indicated that in all male and female participants having no complaints of postural hypotension, both the systolic and diastolic pressures was increased after 1 min handgrip test. However, there was only a slight increase in systolic blood pressure in female participants. In case of female volunteers having the complaints of occasional postural hypotension there was almost no

change in diastolic pressure following handgrip test (Table-1). All the participants who complained about occasional postural hypotension were females, It was also noted that all the ladies experiencing occasional postural hypotension had significantly less vasoconstrictor reserve (p<0.05) than the control female counterparts. (Fig. 1).

DISCUSSION

Exercise using a handgrip dynamometer is a type of isometric exercise where both the systolic and diastolic pressure increase normally. In case of male volunteers both the pressures increased significantly. In case of female counterparts diastolic pressure increased significantly but the rise of systolic blood pressure in response to exercise was not significant. This might be due to increment of basal systolic blood pressure before exercise in anticipation of physical activity and more sympathetic discharge, in case of female volunteers. Increment of systolic pressure in response to isometric exercise occurred no doubt, but as basal systolic pressure was already a bit high (anticipatory); only a slight increase of systolic blood pressure in them was noted.

That vasoconstrictor capability is a contributor to orthostatic tolerance in humans has been reported.² From our result it is evident that vasoconstrictor reserve is less in females compared to their male counterparts corroborating the results of previous studies which also reported the low autonomic support of blood pressure in females.⁸ The case of neurally mediated syncope is known to be greater in females than that in male counterparts.¹⁴ Sympathetic reflex responses to head up tilt between male and female were associated with decrement in postural vasomotor responses in women.¹⁵



* Females with postural hypotension

Fig. 1. Vasoconstrictor reserve (mm Hg) among the volunteers

The present study also revealed that, the persons with the complaint of occasional postural hypotension were all females. When compared the vasoconstrictor reserve of them with that of the normal female volunteers it was noticed with utter surprise that vasoconstrictor reserve in them is much lower than that in normal female volunteers having no complaint of postural hypotension. It may be opined from the results of the present study that, one of the causes of postural hypotension in the female victims is the less vasoconstrictor reserve in them.

ACKNOWLEDGEMENTS

Authors are thankful to Prof. P. Roychowdhury, HOD, and all the faculty and staff, Dept of Physiology, Dr. S B Rizyal, Principal, Nepal Medical College, for their active help and support. We are thankful to NMC Research Committee for the financial support.

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