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Original Article

Pak Armed Forces Med J 2017; 67 (Suppl-2): S145-49

ASSOCIATION OF AGE WITH HEMODYNAMIC RESPONSES TO THE HEAD-UP TILT TEST IN PATIENTS WITH VASOVAGAL SYNCOPE

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ABSTRACT

Objective: To access the end-result responses to the head-up tilt test in three different age groups explore the influence of age and gender on the head-up tilt test result in syncope patients.

Study Design: Cross sectional study design.

Place and Duration of Study: The data for this study was collected at Cardiac Electrophysiology department of AFIC / NIHD from Jan to Jun 2016.

Material and Methods: Two hundred and seventy one patients were enrolled, presenting with syncope to the cardiac electrophysiology department who undertook conventional head-up tilt table test. Head up tilt test (HUTT) was reported to be negative for patients who successfully completed both the procedure without onset of syncope or near-syncope. Whereas the test was terminated on development of syncope or near-syncope at any stage of the test and was labeled to be positive.

Results: Patients were categorized in three age groups including <20 years (group A), 21-60 years (group B) and >60 years (group C). Overall, 24 (88.8%) patients had a positive HUTT in group A, 137 (79.6%) patients in group B and 62 (86.6%) patients in group C (*p*-value 0.04). The rate of cardio inhibitory syncope was significantly more common in younger age groups while decreased after middle age (*p*-value 0.04), similarly rate of vasodepressive syncope was relatively higher in elderly age group as compared to younger age groups (*p*-value 0.03).

Conclusion: The age of syncope patient was associated with type of hemodynamic response to the head up tilt test.

Keywords: Head–Up tilt table test, Vasovagal syncope.

INTRODUCTION

Vasovagal syncope also known as neurally mediated syncope is the most common type of syncope and it appears when autonomic nervous system fails to activate the compensatory reflexes. Vasovagal syncope usually occurs unexpectedly and recovers within few seconds to minutes. It is defined as a temporary loss of consciousness due to decreased blood flow to the brain, followed by a decrease in muscle tone which leads to patient knocking-down[1]. Various tests and procedures are involved in the work-up of vasovagal syncope. Head-up tilt test is a gold standard diagnostic tool for unexplained vasovagal syncope and is considered to be a safe, useful and cost-effective modality. The sensitivity and specificity of head up tilt table test is well recognized internationally[2]. There are various versions of tilt test methodology with variable tilt duration, angle of tilt and type and dose of medication used during active phase. At our cardiac center, Standard Italian Protocol[3] of head up tilt test is being practiced, comprising of 30 minutes passive phase, 20 minutes active phase, a tilt angle of 70 degrees and 500 mcg sublingual nitroglycerine (Angised® - GSK) administration during the active phase[4].

Vasovagal syncope can occur in any stage of life, but it is commonly reported (about 40%) in adults. Older people are more prone to undergo syncopal attacks due to physiological changes related to aging, multiple co morbidities and polypharmacy which predispose them to hypotension[5,6]. Very few studies have evaluated

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the relationship between outcome of head up tilt table test and clinical characteristics of patients including age, gender, co morbidities, BMI etc. In this study we investigated the outcome responses of head up tilt test in vasovagal syncope patients presenting to Armed Forces Institute of Cardiology & National Institute of Heart Diseases, with an objective to explore any association between test outcomes, age and gender of the patient.

PATIENTS AND METHODS

Our study group comprised of 271 consecutive patients of all age groups. These patients presented with unexplained syncope with one or more attacks to the cardiac electrophysiology department of Armed Forces Institute of Cardiology & National Institute of Heart Diseases from January 2016 to June 2016. Patients with structural heart disease (coronary artery stenosis, mitral stenosis, left ventricular outflow obstruction), cardiomyopathies and/or allergy to nitrates were excluded from the study. Detailed medical history was taken, physical examination including weight and height was done for each patient along with informed consent for participation in the study. Throughout the test beat to beat blood pressures, heart rate and surface electrocardiograph at a speed of 25 mm/s were continuously recorded.

Enrolled patients undertook conventional head-up tilt table test using an electrically controlled tilt board with a foot rest for weight bearing. The test comprised of two phases; a passive and an active phase. During resting phase, supine blood pressure both systolic and diastolic, and heart rate were recorded electronically. After initial resting phase of 2 minutes, the patients were tilted to 70 degrees for 20 minutes in passive phase. Both systolic and diastolic blood pressures and heart rate were recorded after every two minutes during the passive phase. The test then proceeded to active phase for further 30 minutes, where 500 micrograms of sublingual nitroglycerine (Angised® - GSK) was administered to the tilted patient with continuous monitoring of systolic diastolic blood pressures and heart rate.

Head up tilt test was reported to be negative for patients who successfully completed both the phases without onset of any syncopal symptom. Whereas the test was terminated on development of syncopal symptom at any stage and was labeled to be positive. The test was also

Table-I: Demographic and clinical characteristics of patients (n=271).

Sr No.	Characteristics	Age groups		
		Group A (<20 years) n = 27	Group B (21-60 years) n = 172	Group C (>60 years) n = 72
1.	**Gender**			
	Males (n%)	15 (55%)	143 (83.1%)	60 (83.3%)
	Females (n%)	12 (45%)	29 (16.8%)	12 (16.6%)
2.	**Anthropometry**			
	Weight in kg (Mean ± SD)	45.8 ± 10.2	68.7 ± 7.8	65.2 ± 5.5
	Height in cm (Mean ± SD)	155 ± 8.7	168 ± 10.4	163 ± 8.6
3.	**Comorbidities**			
	Hypertension	-	17 (9.8%)	15 (20.8%)
	Diabetes Mellitus	1 (3.7%)	10 (5.8%)	10 (13.8%)
	Coronary Artery Disease	-	12 (6.9%)	10 (13.8%)
4.	**Test outcome**			
	Negative	3 (11.1%)	35 (20.3%)	10 (13.8%)
	Positive	24 (88.8%)	137 (79.6%)	62 (86.6%)

terminated on development of any adverse event, arrhythmia or if requested by participant. Positive result was classified according to VASIS classification[7] as mixed response (Type I), cardio inhibitory without a systole (Type II A and B), and vasodepressor (Type III):

- **Mixed type:** The heart rate falls at the time of syncope, but it does not fall to under 40 beats per minute (bpm) for less than 10 seconds. The blood pressure falls before the heart rate falls.
- **Cardio Inhibitory Type:**

a. Type IIA: Cardio inhibition without a systole occurs when the heart rate falls to a ventricular rate below 40 bpm for longer than 10 seconds but a systole of shorter than 3 seconds does not occur. The blood pressure drops prior to the fall of the heart rate.

b. Type IIB: Cardio inhibition with a systole is defined as the occurrence of a systole for more than 3 seconds. The heart rate fall coincides with or precedes the blood pressure fall.

- **Vasodepressor type:** The heart rate does not fall more than 10% from its peak value at the time of syncope.

Statistical Analysis

Data were entered and analyzed in software SPSS (version 22). Mean and standard deviation were presented for continuous data whereas frequency and percentage for the categorical data. Comparison between groups of continuous variables was calculated by independent samples t test. Statistical significance between categorical variables was explored by Chi Square test. A *p*-value of ≤0.05 was considered to be significant.

Table-II: Comparison of hemodynamic parameters between age groups of syncope patients.

Parameters	Group A <20 years n = 27	Group B 21-60 years n = 172	Group C >60 years n = 72
Resting parameters			
Systolic BP in mmHg (Mean ± SD)	112.1 ± 9.5	122.7 ± 13	137.5 ± 20.7
Diastolic BP in mmHg (Mean ± SD)	66.8 ± 8.2	75.8 ± 9.2	80.6 ± 10.6
Heart rate in bpm (Mean ± SD)	102.6 ± 9.7	77.6 ± 15.6	70.49 ± 13.8
Parameters at start of tilt phase			
Systolic BP in mmHg (Mean ± SD)	102.6 ± 9.7	111.2 ± 11.3	110.2 ± 17.1
Diastolic BP in mmHg (Mean ± SD)	61.6 ± 8.9	71.7 ± 9.0	65.7 ± 12.1
Heart rate in bpm (Mean ± SD)	122.6 ± 13	110.6 ± 19.7	102.0 ± 18.5
Parameters at end of tilt phase			
Systolic BP in mmHg (Mean ± SD)	109.4 ± 10.1	112.7 ± 12.3	114.0 ± 12.7
Diastolic BP in mmHg (Mean ± SD)	62.4 ± 8.2	67.1 ± 8.5	68.2 ± 9.5
Heart rate in bpm (Mean ± SD)	81.5 ± 17.7	84.5 ± 15.7	78.2 ± 15.4
Parameters at onset of syncope/near-syncope			
Systolic BP in mmHg (Mean ± SD)	52.8 ± 6.5	55.9 ± 8.5	57.5 ± 12.4
Diastolic BP in mmHg (Mean ± SD)	29.2 ± 7.5	32.2 ± 7.1	38.8 ± 10.8
Heart rate in bpm (Mean ± SD)	35.5 ± 6.6	37.4 ± 8.0	82.8 ± 12.2

RESULTS

Two hundred and seventy one patients were enrolled in the study. Patients were categorized in three age groups including <20 years (group A), 21-60 years (group B) and >60 years (group C). There were 27 (10.0%), 172 (63.5%) and 72 (26.6%) patients in group A, B and C respectively with 55% vs 45%, 83.1% vs 16.8% and 83.3% vs 16.6% males vs females respectively. Patient's demographic and clinical characteristics were summarized in table-I.

Head up tilt test was found to be positive in 223 (82%) of the total 271 study population, where 24 (88.8%), 137 (79.6%) and 62 (86.6%) positive responses in group A. B and C respectively. No significant difference has been found between the negative and positive responses in terms of gender and age (p=0.7 and 0.1 respectively).

Among the group of patients with positive head up tilt test response, the rate of cardio inhibitory syncope was significantly more common in younger age groups while decreased after middle age (p=0.04), similarly rate of Vasodepressive syncope was relatively higher in elderly age group as compared to younger age groups (p=0.03). This trend of relationship between type of syncope and age is depicted in fig.

Passive phase positive responses were more commonly encountered in cardio inhibitory syncope, while active phase positive responses were more frequently observed in mixed type syncope (p 0.04). Physiological parameters were almost same in all patients at start of the test while they varied significantly later in the test procedure accordingly. Hemodynamic and physiological parameters are summarized in table-II.

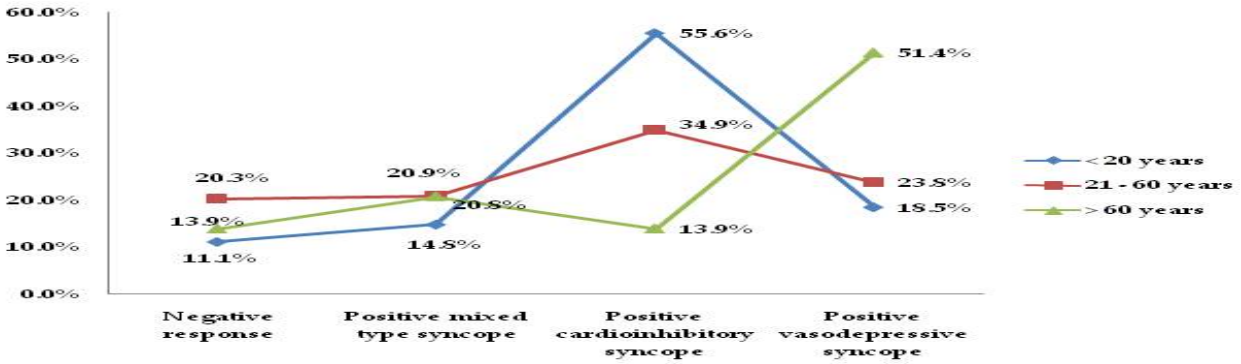

Figure: Relationship trend between type of syncope and age group.

DISCUSSION

In our study, we have observed head up tilt test responses for 271 syncope patients, out of which 223 (82%) developed positive response while remaining 48 (18.0%) had a negative response. Elderly patients significantly underwent Vasodepressive type of syncope as compared to youngsters. Similarly, cardio inhibitory syncope was significantly more common in younger age group as compared to elderly. However we failed to find any significant difference between gender and type of syncope based on head up tilt test results.

The results of two studies conducted by Kochiadakis and Kazemi reports that age has a significant association with type of syncope. These authors concluded that cardioinhibitiry and mixed type syncope is observed in younger patients and Vasodepressive syncope in older patients[8,9]. Their conclusion is in line with the results of our present study. Another study conducted by Galetta in 2004 reported that 65% subjects developed Vasodepressive response which was the most frequent cause of syncope in older subjects, while vasovagal response is the commonest cause of syncope of young patients[10]. The reason for this mechanism, as reported by Louise can be the fact that elderly patients experience more blood pooling in lower extremities as compared to younger patients because of loss of muscle tone of blood vessels[11]. Another reason for Vasodepressive response to be more frequent in elderly group can be the inability of aging heart and autonomic nervous system to compensate for stress induced by orthostatic position during head up tilt test[12,13].

Similarly, in our study frequency of cardio inhibitory response was significantly higher for

young patients, which is evident in results of studies conducted by Duan and Yozgat who have concluded that cardioinhitory response is more common among young and pediatric patients[14,15].

CONCLUSION

It was concluded that the age of syncope patient is associated with type of hemodynamic response to the head up tilt test. More such studies are required to be carried out in order to fully establish the effect of age on path physiology of syncope.

ACKNOWLEDGEMENT

The author wishes to express profound gratitude and kind regards to Col Azmat Hayat, head of electrophysiology department AFIC, for his excellent supervision; and Brig Samina Javed for her continuous support and guidance. I would also like to thank Miss Hina Shafique of research & development department AFIC for assisting in data entry.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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