ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Can Short Term Practice of Shavasana Modify Autonomic Status in Early Stage of Bronchial Asthma?

KA Chandrashekar*[1], KF Kammar[2], Jnaneshwara P Shenoy[3], Shivakumar J[2], Preethi G Pai[4]

[1]Department of Physiology, Vijayanagar Institute of Medical Sciences, Bellary, Karnataka, India.
[2]Department of Physiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, India.
[3]Department of Physiology, Father Muller Medical College, Mangalore, Karnataka, India.
[4]Department of Pharmacology, Kasturba Medical College, Mangalore, Manipal University, Karnataka, India.

ABSTRACT

Changes in the caliber of airways in asthma reflect a parallel change in the heart rate. Cardiac vagal reactivity does indeed appear to be increased in asthma, as demonstrated by the cardiac response to various autonomic functions tests. In addition, emotional stress is also known to be one of the major contributing factors for asthma. The present study is an attempt to evaluate the autonomic function tests (AFT) in asthmatic patients. Additionally the effect of Shavasana (an asana wherein the body and mind are completely relaxed) on AFT in asthmatics was also explored. Thirty male, uncomplicated asthmatic patients with disease duration of 2-5years and the mean age of 28.73years were compared for AFT with thirty healthy male with mean age of 27.17years. The AFT was repeated in these patients following a brief exposure to training in shavasana twice a day for three weeks. The results were analyzed by students unpaired and paired't' test. There was no significant change in valsalva ratio and 30/15 ratio. However a statistically significant heart rate variation to deep breathing was observed in asthmatics compared to controls. However, the autonomic function tests didn't change significantly after shavasana. The results of the study suggest a hyper-responsive parasympathetic system in asthmatic patients. Shavasana training has not improved these values significantly, which suggests the absence of an impact of practice of shavasana on autonominc functions when practiced as a single asana for short duration.
Keywords: Bronchial asthma; Shavasana; Deep breathing, Valsalva ratio, Parasympathetic

Corresponding author

INTRODUCTION

Modern age is the age of stress and the stress related disorders are posing great challenges to the society. Various pathophysiological studies on autonomic activity to human airways in asthma have shown abnormal control mechanisms. These altered neurogenic responses may lead to disturbed autonomic integrity and airway hyper responsiveness. Early evidence of autonomic dysfunction is often a reduced cardiovascular response to a stimulus [1, 2]. These autonomic abnormalities in asthmatic patients in whatever component of the autonomic nervous system are generalized and not limited to airways only. The cardiovascular and respiratory autonomic efferent fibers have a common central origin, and hence, the altered cardiovascular and respiratory responses may reflect these abnormalities [3]. Hence study of cardiovascular autonomic function tests is essential to assess dysfunction.

The morbidity and mortality from asthma appears to be increasing, in fact it has been suggested that medications used to treat asthma are actually contributing to this trend [4].The failure of conventional medicine to provide complete cure of this psychosomatic ailment has prompted researchers to delve into alternative methods of treatment [5].

Although Yoga is historically a spiritual discipline, it has also been used clinically as a therapeutic intervention Yoga is a practical discipline incorporating wide variety of practices whose goal is the development of a state of mental and physical health, wellbeing and inner harmony. Yoga is capable of inducing a coordinated psycho physiological response which is the antithesis of the stress response. This relaxation response consists of a generalized reduction in both cognitive and somatic arousal as characterized by a modified activity of the hypothalamic pituitary axis and the autonomic nervous system [6]. However in yoga the relaxation should be the main element in the process of the practitioner's energetic regeneration. Shavasana is considered as one such asana wherein the body and mind are completely relaxed. So the present study was undertaken to assess the effects of short term practice of Shavasana on individuals with bronchial asthma of 2-5 years disease duration, in terms of cardiovascular autonomic function tests.

MATERIALS AND METHOD

The present study was conducted in the department of physiology, Karnataka Institute of Medical Sciences, Hubli, after obtaining the approval from Institutional ethics committee.

Thirty adult males in the age group 20-40 years, leading a sedentary life style with history and clinical features of bronchial asthma as per American thoracic society [10] for the past 2-5 years, with at least two acute asthmatic exacerbations in any year were considered as study group. Thirty age and physical activity matched healthy male individuals formed the control group.

Asthmatics going through an acute exacerbation, smokers, individuals with history of upper or lower respiratory tract infections in the past 3 weeks, present or past history of cardiac disease, diabetes mellitus, endocrine disorders, tuberculosis, central or peripheral nervous system disease and also those who are on any drug modulating the autonomic nervous system for the preceding two weeks of test were excluded from the study.

Written informed consent was taken from each participant after explaining the detailed procedure and purpose of the study. The recordings were done between 10.00 am to 1.00 pm. All the techniques of measurement, duration, instruments were maintained uniformly throughout the study. The participants were made to relax and be comfortable prior to the tests.

Standing height was measured up till last 0.1cms without foot wear, with the subjects back to a wall and with both heels placed together and touching the base of the wall. Weight was recorded without foot wear, and with empty pockets.

Autonomic function tests

In the present study all five standard cardiovascular autonomic function tests (Ewing's) were performed after giving detailed instruction to the participants. The instruments used were Electrocardiograph, Sphygmomanometer and Hand-grip Dynamometer. Due care was taken to remove factors which could interfere with the results of the tests.

The following five established autonomic functions tests were performed. Results of tests were expressed as ratios and differences which have been accepted by Ewing and Clarke [7, 8].

1. Heart rate response to Valsalva maneuver (Valsalva ratio)

The subject was made to sit comfortably on a chair and the resting E.C.G. was recorded for 15 seconds in lead II. Afterwards the subject was asked to blow the mercury manometer up to 40 mm Hg and to maintain mercury column there (at 40 mm Hg) for 15 seconds, while a continuous E.C.G. recording was done. E.C.G. recording was again carried out for 15 seconds after the release of pressure. The result was expressed as the Valsalva Ratio, derived from dividing the longest R-R interval after the maneuver by the shortest R-R interval during the maneuver. A Valsalva ratio of 1.21 or greater was considered as normal and a value of 1.10 or less was considered as abnormal response.

2. Heart rate variation during deep breathing

The subject in supine position was asked to breathe quietly and deeply at a rate of six breaths per minute. An E.C.G. was recorded throughout the period of deep breathing. The onset of inspiration and expiration was marked. The maximum and minimum R-R interval were measured during expiration and inspiration respectively and expressed as so many beats per minute. The difference between the maximum and minimum heart rates was calculated. A difference of 15 beats or more per minute was taken as normal and 10 beats or less per minute was taken as an abnormal response.

3. Immediate heart rate response to standing

This test was performed with the subject lying down quietly on the bed for about 5 minutes and then was asked to stand up unaided immediately. The point at starting to stand was marked on the continuous E.C.G. recording; from this point successive 31 beats were recorded. The result was expressed as the 30^{th} / 15^{th} beat ratio. A 30: 15 ratio (also called as Postural Tachycardia Index) of 1.04 and above was considered as normal and a value ≤1 as an abnormal response.

4. Blood pressure response to standing

The subject was asked to rest in a supine position. The resting BP was recorded by using a sphygmomanometer. The subject was then asked to stand unaided and to remain standing unsupported for 3 minutes. The BP was recorded at 30 seconds and 3 minutes after standing up. The difference between the resting and the standing BP levels was calculated. The postural fall in blood pressure was taken as the difference between the systolic blood pressure on lying down and the systolic blood pressure on standing. A postural fall of systolic blood pressure of 10 mm Hg or less considered as normal, 11 to 29 mm Hg as Border line and 30 mm of Hg or more was taken as an abnormal response.

5. Blood pressure response to sustained hand grip exercise

The maximum voluntary contraction was first determined using a Hand –grip dynamometer. The subject was then asked to maintain the hand grip at 30 % of that maximum as long as possible up to five minutes. Blood pressure was recorded at the beginning and at the end of the procedure. The rise of diastolic blood pressure at the end of the procedure was calculated. A rise of diastolic blood pressure of 16 mm hg or more was taken as normal, 11 to 15 mm Hg as borderline and 10 mm Hg or less considered as an abnormal response.

Above mentioned 3 parasympathetic and 2 sympathetic function tests were carried out on 30 male healthy controls. After explaining in detail the various procedures, the controls were asked to perform various maneuvers employed in each test. All the corresponding ratios and differences were calculated. And the results were interpreted.

The subjects were trained in shavasana by a yoga expert. The duration of shavasana was 20-30 min, twice a day, for about 21 days. Autonomic function tests were repeated in asthmatics, after 21 days of shavasana training. The effects of shavasana on autonomic function tests were studied. All recordings and statistical analysis of results of the tests were done in similar fashion as it was done in controls. Mean and standard deviation values were evaluated for all measured parameters. The significance of mean difference in the value was analysed using students unpaired't' test and Students paired 't' test. A Probability ('P') value of less than 0.05 is taken as indicating significant difference between compared values.

RESULTS

Both the controls and subjects were well matched vis-à-vis age, height, weight and body surface area (table 1)

Table 1: Anthropometric Data

Parameters	Controls (C) Mean ± SD	Subjects Mean ± SD	'P' Value
Age(years)	27.17 ± 2.94	28.73 ± 3.82	NS
Weight(kgs)	61.97 ± 4.84	61.63 ± 8.48	NS
Height(cms)	167.86 ± 5.36	165.10 ±5.02	NS
Body surface area (in sq mt)	1.69 ± 0.14	1.68 ± 0.13	NS

NS- Not Significant

Table 2: Autonomic function test results in controls and in asthmatics before and after Practicing Shavasana

Autonomic function tests	Controls [n=30]	Asthmatics before Shavasana [n=30]	Asthmatics after Shavasana [n=30]
Valsalva ratio	1.24 ± 0.03	1.28± 0.08	1.25±0.08
Heart Rate Deep breathing	19± 3.03	31 ± 0.08*	28 ± 5.6
30:15 ratio	1.11 ± 0.04	1.14 ± 0.05	1.12 ±0.05
BP response to standing	7.13 ±1.71	6.93 ± 1.64	7.10 ± 1.64
Hand Grip test	21.07 ± 3.05	23.33 ± 3.12	21.33 ± 2.95

Values are expressed as Mean ± SD, *statistically significant($p < 0.01$)

On testing the parasympathetic functions of autonomic nervous system, a higher mean values were obtained in asthmatics, out of which only heart rate changes to deep breathing was significantly higher p value was less than 0.01. However these mean values of parasympathetic tests were reduced in asthmatics when recorded after the shavasana training, but this reduction was found to be statistically insignificant (as shown in Table 2).

In sympathetic function assessing tests, the mean value SBP response to standing was less in asthmatics which showed an improvement after practicing shavasana both the changes observed were statistically insignificant. Similarly a rise in DBP in response to isometric exercise in asthmatics was insignificant so as the change observed in mean value of DBP after shavasana practice (as shown in Table 2).

DISCUSSION

The human airways are innervated via efferent and afferent autonomic nerves, which regulate many aspects of airway function. It has been suggested that neural control of the airways may be abnormal in asthmatic patients, and that neurogenic mechanisms may contribute to the pathogenesis and pathophysiology of asthma. The parasympathetic nervous system is the dominant neuronal pathway in the control of airway smooth muscle tone. Stimulation of cholinergic nerves causes bronchoconstriction, mucus secretion, and bronchial vasodilation[9]. The role of environmental factors in asthma genesis has been the focus of many studies culminating in their inclusion in asthma preventive strategies, but the profound role of breathing is not sufficiently acknowledged as a therapeutic option. Recent trials of breathing techniques, posture, relaxation and stress reduction confirm their importance in treating asthma and lung diseases [10].

So the present study made an attempt to assess the status of autonomic nervous function in asthmatics with disease duration of less than 5 years and to evaluate the effect of short term practice of shavasana on it. The present study noticed a significantly higher value of change in heart rate to deep breathing in asthmatics, Shah PKD et al [3], also found similar results. Sinus arrhythmia is primarily due to fluctuations in parasympathetic output to the heart. During inspiration impulses in the vagi from the stretch receptors in the lungs inhibit the cardio inhibitory area in the medulla oblongata. The tonic vagal discharge that keeps the heart rate slowly decreases, and heart rate rises [11].In asthmatics more and more air is trapped in the lungs. During inspiration increased stretch receptor stimulation may lead to stronger suppression of dorsal vagal nucleus, resulting in drastic reduction in vagal tone, which could be the cause for abnormal heart rate variation in our subjects. Hypoxia is also a contributing factor [12].

After shavasana heart rate variation didn't change significantly. Madanmohan et al [13], also didn't find significant difference even after a six week practice of shavasana in healthy volunteers.

The other two parasympathetic tests conducted in the present study, Valsalva ratio and 30:15 ratios did show numerical increase in asthmatics, though it was not statistically significant. These results are suggestive of a hyperresposive parasympathetic system in asthmatics [3].

Sympathetic function tests in the present study were not statistical significant between controls and subjects. This aspect is similar to the results obtained by Shah PK.D et al [3], and Kallen Bach et al [14]. However, Manoj kumar et al [15], found sympathetic hyperactivity in patients of bronchial asthma, where disease duration of participants in their study was more than 5years. But in our asthmatic subjects with disease duration 2-5 years, we did not observe sympathetic hyperactivity. Khanum A et al [16], have also found higher sympathetic functions in asthma patients but they had both male and female patients as their subjects with average disease duration of 13.55 years.

Practice of shavasana did not produce any observable changes in the values of both sympathetic and parasympathetic tests in asthmatics. This indicates that short term practice of shavasana may not produce a tangible change in the autonomic status in asthmatics.

CONCLUSION

The interpretation of improved cardiovascular reflex activity is complex as the methods of autonomic tests are indirect and abnormal test results cannot be equated with a lesion in autonomic neurons with certainty, since the haemodynamics of circulation are also involved in cardiovascular reflex activity.

In spite of these dilemmas, a heightened response to parasympathetic tests, may point towards a parasympathetic hyperactivity as one of the important factors in decreasing the airway caliber in asthma. Shavasana when practiced as a single asana has not brought any significant improvement in asthmatics, whereas yoga consisting of multiple asanas has been known to provide fruitful results. Also these subjects have undergone first time shavasana training in their life, therefore repeated shavasana training or training for longer duration may produce encouraging results.Scarcity of literature regarding the effect of shavasana on autonomic function status necessitates further work in this field.

REFERENCES

[1] Bal BS, Multani AS, Avinash J, Singh TP, Salwan S, Shivcharan. J Assoc Phys Ind 2003; 51: 1203-1204.
[2] Lewis MJ, Shorta AL, Lewis KE. Respiratory Medicine 2006; 100: 1688-1705.
[3] Shah Prabhath KD, Lakotia M, Sanjay M, Jain Suresh K, Gulzari LG. Chest 1990; 98: 1408-1413.
[4] Sathyaprabha TN, Hemalatha M, Murthy BT. Indian J Physiol Pharmacol 2001; 45(7): 80-86.
[5] Nagarathna R, Nagendra HR, Seethalakshmi R. The Indian Practitioner 1991; 44(7): 491-493.
[6] Satbir SK. Indian J Physiol Pharmacol 2004; 48 (3): 269-285.
[7] Gillian PL, Philip DH, Allan M. Br Heart J 1992; 68: 205-211.
[8] Ewing DJ, Martyn CN, Young RJ, Clarke BF. Diabetes Care 1985; 8: 491-98.
[9] Van Der Velden VH, Hulsmann AR. Neuroimmunomodulation 1999; 6(3):145-159.
[10] Lisa Saffron. htpp://www.positivehealth.com/ issue - 25, 1998.
[11] William F Ganong, Cardiovascular regulatory mechanisms, Exercise, Review of Medical Physiology, 22 Ed: Singapore: Mc Graw Hill: 2005: 597-633.
[12] Dunnill MS. J Clin Pathol 1960; 13: 27-33.
[13] Madanmohan, Bhavanani AB, Prakash ES, Kamath MG, Amudhan J. Indian J Physiol Pharmacol 2004; 48 (3):370-73.
[14] Kallenbach JM, Webster T, Dowdeswell R, Reinach SG ,Scottmiller RN, Zwi S. Chest 1985; 87:644-48.
[15] Manoj Kumar, Verma NS, Tiwari S, Pandey US. Ind J Physiol Pharmacol 2005; 49 (1): 89-94.
[16] Khanam AA, Usha S, Guleria R, Deepak KK. Ind J Physiol pharmacol 1996; 40(4): 318-324.