



Autonomic Dysfunction in Bronchial Asthma

KEYWORDS

bronchial asthma ,autonomic disfunction.

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ABSTRACT Forty patients with bronchial asthma and healthy subjects matched for age and sex were subjected to standardized tests to evaluate autonomic nervous system. Due care was taken to remove factors which could interfere with the results of the test. Tests requiring stimulation of the parasympathetic system e.g Deep breathing test, valsalva maneuver, showed heightened response. In deep breathing test P value was significant. (p value <.005). In Valsalva maneuver P value was significant (P<0.001). postural fall of blood pressure and sustained hand grip chiefly concerned with evaluation of sympathetic system did not show significant differences so these results suggest that hyper responsiveness of the parasympathetic system might be an important factor in pathogenesis of bronchial asthma.

INTRODUCTION

Autonomic nervous system controls every system of the body including respiratory system. Autonomic nervous system regulates airway smooth muscle tone. It also influences mucus secretions from sub mucosal glands, transport of fluid across epithelium, blood flow in bronchial circulation and release of mediators from various inflammatory cells². These are probable mechanisms in pathogenesis of bronchial asthma.

These abnormalities in asthmatic patients are generalized and not limited to airways³. The cardiovascular and respiratory autonomic efferent fibers have common central origin. Hence the altered cardiovascular and respiratory response may reflect these abnormalities².

AIMS AND OBJECTIVES

This study was undertaken with a view to assess the degree of involvement of autonomic functions in patients with bronchial asthma and compare this findings with normal population. It was also aimed to correlate autonomic dysfunction with duration of bronchial asthma.

MATERIAL AND METHODS

The present study comprises of two groups. One study group had 40 patients with bronchial asthma and control group had 10 healthy subjects. Patients were selected from indoor patients admitted in different medical wards and patients attending medical O. P. D.

Selection criteria of patients were age between 10-50 yrs, duration of bronchial asthma more than 2 yrs. Patients should not be on any medication modifying autonomic nervous system. Patients should not be suffering from any other illness that affects central nervous system or autonomic nervous system.

Five tests for evaluation of A.N.S. were carried out. These included,

1. Heart rate variation to valsalva maneuver and valsalva ra-

tio according to the largest and shortest RR interval on ECG,

2. Heart rate variation during deep breathing.
3. Change in heart rate on standing from lying down.
4. Fall in blood pressure in response to standing.
5. Rise in blood pressure to sustained hand grip.

All patients were submitted to spirometry. They were evaluated for forced vital capacity (FVC), Forced expiratory volume in 1 second (FEV₁) and Peak expiratory flow rate (PEFR).

OBSERVATIONS AND RESULTS

In study group, out of 40 patients with bronchial asthma and 10 control normal subjects, the male to female ratio was 1.22:1.06 and 1.5:1.00 respectively. In study group 6 patients had asthma less than 10 yrs duration, 16 patients had duration of disease between 10-20 yrs and 18 had duration more than 20 yrs.

The tests after evaluation of parasympathetic system showed significant difference between two groups. They showed respiratory variation to deep breathing. The P value was significant.

On comparing two groups for evaluation of sympathetic function test i.e. Blood pressure response to standing, blood pressure response to sustained hand grip, did not show significant difference between two groups. (Table I, II, III)

DISCUSSION

Autonomic dysfunction is well documented by the above study. Parasympathetic response was heightened in the study in the form of heightened response to valsalva maneuver and sinus arrhythmia to deep breathing. Previously other investigators has also obtained the same results.^{6,7,8} Some authors have also obtained enhanced parasympathetic response to deep breathing test². In test for sympathetic system evaluation like rise in blood pressure to sustained hand grip was observed in asthmatic patients in comparison to normal subject, but was not significant. Same results were obtained by different authors in past.

TABLE-I
AUTONOMIC TESTS IN RELATION TO AGE GROUPS

| Age Group (yrs) | | VM ¹ (bpm) (mean ± 2SD) | DB ² (bpm) (mean ± 2SD) | LS ³ (bpm) (mean ± 2SD) | SHG ⁴ (mm Hg) (mean ± 2SD) | PB ⁶ (mm Hg) (mean ± 2SD) |
|-----------------|------------|------------------------------------|------------------------------------|------------------------------------|---------------------------------------|--------------------------------------|
| 10-25 | Case (n=9) | 44.9±16.52 | 34.0±11.36 | 24.10±4.84 | 27.70±8.00 | 27.78±8.00 |
| | Control | 18.33±1.52 | 17.00±2.00 | 24.67±6.12 | 21.33±4.62 | 27.78±8.00 |

| | | | | | | |
|-------|-------------|-------------|-------------|------------|------------|------------|
| 26-40 | Case (n=13) | 61.93±15.78 | 44.56±10.84 | 28.38±6.06 | 26.70±5.04 | 26.70±5.04 |
| | Control | 21.00±2.45 | 16.00±7.30 | 25.50±2.00 | 26.50±3.82 | 20.50±3.82 |
| 41-55 | Case (n=18) | 63.14±21.7 | 44.85±17.78 | 26.14±6.56 | 26.43±5.76 | 26.13±7.56 |
| | Control | 21.00±2.00 | 18.00±5.28 | 21.33±8.32 | 23.33±2.30 | 23.33±2.30 |

1. Valsalva maneuver
2. Deep breathing
3. Lying down to standing
4. Sustained hand grip
5. Postural blood pressure

TABLE-II
AUTONOMIC TEST IN RELATION TO SEVERITY OF DISEASE

| FEV ₁ % (Pred.) | | Basal HR | VM (bpm) | DB (bpm) | LS (bpm) | SHG (mm Hg) | PB (mm Hg) |
|----------------------------|-----|----------|----------|----------|----------|-------------|------------|
| <30% (n=10) | M | 92.33 | 62.50 | 43.33 | 27.83 | 27.33 | 8.67 |
| | 2SD | ±9.36 | ±17.80 | ±11.30 | ±5.38 | ±3.50 | ±4.14 |
| | | NS | <0.001 | <0.001 | NS | NS | NS |
| 30-50% (n=13) | M | 86.67 | 54.93 | 40.69 | 27.13 | 25.75 | 6.88 |
| | 2SD | ±14.08 | ±26.91 | ±10.64 | ±7.18 | ±7.28 | ±13.50 |
| | | <0.001 | NS | NS | NS | NS | NS |
| 50-80% (n=17) | M | 82.44 | 59.44 | 42.78 | 27.89 | 27.72 | 7.11 |
| | 2SD | ±14.16 | ±21.26 | ±3.78 | ±7.84 | ±6.60 | ±3.94 |
| | | | <0.001 | <0.001 | NS | NS | NS |

TABLE-III
AUTONOMIC TESTS IN RELATION TO DURATION OF DISEASE

| Duration (yrs) | | Basal HR | VM (bpm) | DB (bpm) | LS (bpm) | SHG (mm Hg) | PB (mm Hg) |
|----------------|-----|----------|----------|----------|----------|-------------|------------|
| 0-10 | M | 82.67 | 39.33 | 28.17 | 24.67 | 6.33 | 22.00 |
| | 2SD | ±17.28 | ±7.44 | ±5.58 | ±10.32 | ±3.00 | ±2.52 |
| | | NS | <0.001 | <0.001 | NS | NS | NS |
| 11-20 | M | 83.38 | 53.69 | 39.75 | 27.69 | 13.78 | 26.43 |
| | 2SD | ±15.44 | ±13.02 | ±9.46 | ±5.64 | ±4.78 | ±4.38 |
| | | NS | <0.005 | <0.001 | NS | NS | NS |
| >20 | M | 89.78 | 68.28 | 48.67 | 26.89 | 7.89 | 30.44 |
| | 2SD | ±13.44 | ±8.8 | ±4.80 | ±5.78 | ±2.0 | ±3.78 |
| | | NS | <0.001 | 0.005 | NS | NS | NS |

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