

Autonomic Report

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Particulars: A 54-year old male was referred for autonomic function test with a clinical impression of: Toxic neuropathy due to exposure to contaminated cabin air.

Body Mass Index: was 33.4 kg/m² indicating that he is overweight (Normal range, 19-25 kg/m²).

Results

Cardiovascular reflexes: Resting cardiac vagal tone (CVT): was 4.99 units in the linear vagal scale (LVS) which is a low resting cardiac vagal tone, (Normal range, 5-10 units in the LVS), associated with few Abnormal Spontaneous Brainstem Activation (ASBAs). There was normal spontaneous baroreflex function. **Resting heart rate:** was 59 beats/min, which is an inappropriately low heart rate for this low level of CVT. **Breathing:** there was tachypnoea at the rate of 20 breaths/min. **Deep breathing:** CVT was 17.68 units and the maximum CVT was 24.26 units in the LVS indicating over-reaction of CVT in the brainstem during deep breathing. **Carotid massage:** CVT increased by 2.8 units in the LVS showing a low cardiodepressor effect (normal increase 5-20 units), blood pressure (BP) changed by -17.0 mmHg indicating a normal vasodepressor effect (normal drop 10-25 mmHg). **Baroreflex responsiveness in isometric exercise:** was 3.88 ms/mmHg but 7.22 ms/mmHg was predicted from the patient's height, it indicates a normal central gain of the baroreflex system. **Valsalva's ratio:** was 1.47 indicating a normal Valsalva's ratio (normal range, 1.2-1.8).

Nutritive Peripheral Circulation: Supine pO₂ was 91.2 (should be above 60 mmHg) and supine pCO₂ was 35.0 mmHg (normal range; 39-44 mmHg). There was unsatisfactory nutritive circulation in peripheral tissues at rest showing evidence of mild and chronic respiratory alkalosis. There was also predominantly carbon dioxide response during deep breathing suggesting poor oxygen diffusion into peripheral tissues.

Orthostasis: Cardiac response: showed a normal response in a 30:15 ratio test. **BP stability:** was good, systolic BP varied by -22.0 mmHg, normal variation is <25 mmHg. Mean supine arterial BP was 63.7 mmHg indicating moderate to severe supine hypotension (the normal range of supine mean arterial BP, 80-110 mmHg). **Orthostatic hypotension:** Postural change in diastolic BP was 15.1 mmHg. Therefore, no postural hypotension was detected. There was inotropic fatigue on standing upright.

Sympathetic function in general: There was no test done for postganglionic damage. The BP evidence suggests a low baseline supine sympathetic tone. There was good baseline inotropic function. **Control of resistance blood vessels in skeletal muscles during isometric exercise:** showed a normal muscle sympathetic tone. There was good inotropic response when sitting upright. **Cardioaccelerator function in isometric exercise:** showed a normal cardioaccelerator function. There was poor inotropic response to isometric exercise. **Blood pressure response to Valsalva's manoeuvre:** BP change in phase IIe was -56.5 mmHg and in phase III was -2.5 mmHg showing evidence of reduced venous return. BP change in phase IIIi was 9.5 mmHg indicating a normal splanchnic sympathetic tone.

Cutaneous sympathetic function:

Sudomotor function

Emotional sudomotor function was not assessed



Vasomotor failure

Thermoregulatory vasomotor failure was detected in all 4 limbs



Interpretation: The results show evidence of normal muscle sympathetic tone, normal cardioaccelerator function and a normal splanchnic sympathetic tone in the deep target organs of the sympathetic division of the autonomic nervous system. There was evidence of reduced venous return to the heart. In the cutaneous targets, there was generalised vasomotor failure. In the parasympathetic division, there was a low resting cardiac vagal tone. Baroreflex system had a normal central gain but there was over-reaction of the CVT in the brainstem during deep breathing. There were low cardiodepressor but normal vasodepressor effects of the carotid reflex. Of the non-specific tests, there was no postural hypotension, a normal Valsalva's ratio and normal response of the heart to standing upright.

Conclusion and Recommendations: This patient has patchy dysautonomia affecting target organs in the skin, in blood vessels and in the brain. The central parasympathetic dysfunctions is similar to what we have observed in air crews exposed to contaminated cabin air. Sympathetic failure is restricted to the skin and is not severe enough to cause postural hypotension. There was evidence of unsatisfactory nutritive circulation in peripheral tissues at rest with mild respiratory alkalosis and poor oxygen diffusion. The poor inotropic response during isometric exercise means the patient will have exercise intolerance and will fatigue easily. He therefore requires support of the inotropic function of the heart through dietary supplements. This patient should also take extra care in cold environments because of the risk of losing too much heat and difficulty of regaining the lost heat due to poor body heat regulation.



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