

Autonomic Dysfunctions in Diabetics Patients

S. Kabilamurthy

Saveetha Dental College and Hospitals,
No.162, P.H Road, Velappanchavadi, Chennai, Tamil Nadu, India.

Abstract:

The main of this study is to create awareness about the autonomic dysfunctions that occur in the diabetes patients. Autonomic dysfunctions is a serious and common and late complication of diabetes¹⁹. It is associated with multiple syndromes and impairments, the significance of autonomic dysfunctions in diabetic patients has not been fully appreciated. Autonomic neuropathy in diabetic patients frequently coexists with other neuropathies and other complications. As a result autonomic neuropathy has been considered to be late complication of the diabetic syndrome but it may be isolated, frequently preceding the detection of other complication. It can affect many organ systems throughout the body. It is also associated with genitourinary tract disturbances including bladder and/or sex dysfunctions.

INTRODUCTION:

Autonomic dysfunction (or dysautonomia or autonomic neuropathy) is defined as a disorder of the autonomic nervous system which is due to abnormalities of one or both of its sub-system. In the case of diabetics, dysautonomia is due to the damage of the nerve fibers of the autonomic system caused by glucose. Diabetic autonomic neuropathy is among the last recognised and understood complications of diabetes despite its significant negative impact on survival and quality of life in people^{1,2}. The autonomic nervous system is composed of nerves serving the heart, lungs, blood vessels, bones, adipose tissue, sweat gland, gastrointestinal system and genitor-urinary system. Autonomic neuropathy can affect any of these organ system. The most commonly recognised autonomic dysfunction in diabetics is orthostatic hypotension, or fainting when standing up. In the case of diabetic autonomic neuropathy, it is due to the failure of the heart and arteries to appropriately adjust heart rate and vascular tone to keep blood continually and fully flowing to the brain. This symptom is usually accompanied by loss of respiratory sinus arrhythmia – the usual change in heart rate seen with normal breathing. These two findings suggest autonomic neuropathy. Subclinical autonomic dysfunction can, however, occur within a year of diagnosis in type 2 diabetes patients and within two years in type 1 diabetes patients⁵.

DISCUSSION:

PATHOGENESIS:

Hypothesis concerning the multiple etiologies of diabetic neuropathy include a metabolic insult to nerve fibres, neurovascular insufficiency, autoimmune damage and neurohormonal growth factor deficiency⁴. Activation of protein kinase C induces vasoconstriction and reduces neuronal blood flow⁶. Increased oxidative stress, with increased free radical production, causes vascular endothelium damage and reduces nitric oxide bioavailability^{7,8}. Excess nitric acid production may result in damage of endothelium and neurons known as nitrostatic stress^{9,10}. In sub-population of neuropathic individuals immune mechanisms may also involve^{11,12,13}. Reduction in neurotrophic growth factors¹⁴, deficiency of essential fatty acids¹⁵ also occurs as a result.

CLINICAL MANIFESTATIONS:

Clinical manifestations of autonomic dysfunctions and other microvascular complications frequently occur concurrently but in inconsistent pattern³. Clinical manifestations of autonomic dysfunction in various systems are categorised below:

Cardiovascular system:

- Intraoperative and perioperative cardiovascular instability
- Exercise intolerance
- Orthostatic hypotension
- Silent myocardial ischaemia and bradycardia syndromes
- Cardiorespiratory arrests

Gastrointestinal system:

- Oesophageal dysmotility
- Gastroparesis diabeticorum
- Constipation
- Diarrhoea
- Fecal incontinence

Genitourinary system:

- Neurogenic bladder
- Erectile dysfunction
- Retrograde ejaculation

Pseudo motor dysfunction:

- Anhidrosis
- Heat intolerance
- Severe sweating
- Dry skin

Papillary dysfunction:

- Pupillomotor function impairment
- Argyll-Robertson pupil

The differential diagnosis involves excluding the following conditions:

- Idiopathic orthostatic hypotension
- Multiple system atrophy with autonomic failure (formerly called as shydramer syndrome)
- Addison's disease and hypopituitarism
- Hypovolemia
- Medications with anticholinergic or sympatholytic effects (insulin, vasodilators etc...)

Diagnosis and management of diabetic autonomic dysfunction:

There are several tests which are used to diagnose the diabetic autonomic dysfunction which are categorised below:

Tests reflecting the cardiac sympathetic damage:

- ✓ Heart-rate response to Valsalva manoeuvre
- ✓ Heart-rate variation during deep breathing
- ✓ Immediate heart-rate response to standing

Tests reflecting sympathetic damage:

- ✓ Blood-pressure response to standing
- ✓ Blood-pressure response to sustained hand grip

1.Heart-rate response to vasalva manoeuvre:

Position: Sitting

Apparatus required: Aneroid manometer, Electro cardiograph

Approximate time of test: 5 minutes

2.Heart-rate variation during deep breathing:

Position: Sitting

Apparatus required: Electrocardiograph

Approximate time of test: 2 minutes

3.Blood-pressure response to sustained handgrip:

Position: Sitting

Apparatus required: Handgrip dyanometer, sphygmomanometer

Approximate time of test: 5 minutes

4.Immediate heart-rate response to standing:

Position: Lying to standing

Apparatus required: Electrocardiograph

Approximate time of test: 3 minutes

5.Blood pressure response to standing:

Position: Lying to standing

Apparatus required: Sphygmomanometer

Approximate time of test: 3 minutes

Treatment of symptoms:

Postural hypotension: This is the most common symptom of the autonomic damage. There are different drugs available for this which include ephedrine, tyrosine, indomethacin and beta-blockers. The most effective treatment is by treating by fludrocortisone. Treatment with insulin can sometimes aggravate hypotension.

Gastric symptoms: The metaclopramide increases gastric motility and may improve symptoms in some patients who have symptomatic gastric atony and gastric retention¹⁸.

Diarrhoea: The Broad-spectrum chemotherapy such as tetracycline is given to reduce diarrhoea in the patients. Now-a-days it is found that metoclopramide is also an effective way to treat diarrhoea in autonomic damage.

Severe sweating: Excess sweating can be controlled using anticholinergic drugs such as propantheline hydrobromide can be used but it do have some side effects.

Bladder dysfunction: Patients with autonomic dysfunction of the bladder should be asked to void every three or four

hours during the day, if necessary using suprapubic pressure.

Cardio respiratory arrests: Sudden deaths could occur in autonomic neuropathy which is due to cardio respiratory arrest in association with hypoxia^{16,17}.

Prevention and reversal of autonomic damage:

As the symptoms have developed autonomic nerve damage is probably irreversible and carries a poor prognosis¹⁶. It is now become common as autonomic damage occurs on most of the diabetics patient. There are two ways to prevent and control it. First is that a very good metabolic control can achieve reversal of some autonomic abnormalities. The second way is that several drugs can be used prevent the autonomic damage such as those of the aldose reductase inhibitor group, but as yet it is too early to say whether or not prevention or reversal of the damage is possibly by this means.

CONCLUSION:

Autonomic dysfunction is a prevalent and serious complication for individuals with diabetes. The clinical manifestations of autonomic dysfunction can affect daily activities produce troubling symptoms and cause lethal output. The patient's history and physical examination are ineffective for early indications of autonomic nerve dysfunctions and thus recommended for the use of noninvasive tests that have demonstrated efficacy are warranted.

Given the clinical and economic impact of this complication, testing of diabetic individuals for cardiovascular autonomic dysfunction should be part of their standard of care. Such a recommendation does not diminish the importance of clinical evaluation and patient observation; rather, it enhances the clinical assessment of the diabetic patient by providing an objective, quantifiable, and reproducible measure of autonomic function.

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