Reversible Cardiomyopathy in Guillain Barre Syndrome

Pushpendra Nath Renjen*, Laxmi Khanna**, Kamal Ahmed***

Abstract
The clinical manifestations of Guillain Barre syndrome are usually confined to the nervous system, however in 20% cases there can be cardiovascular involvement in patients with dysautonomia contributing to the mortality. The cardiovascular manifestations of Guillain Barre syndrome are electrocardiographic changes, cardiac enzyme abnormalities and reversible left ventricular dysfunction. The term neurogenic stunned myocardium has been used to summarise these cardiovascular abnormalities in the setting of severe central nervous system injury, in the absence of coronary artery disease. Our case report of reversible cardiomyopathy in Guillain Barre syndrome documents the occurrence of cardiovascular changes in a case of Guillain Barre syndrome with dysautonomia which were reversible with appropriate treatment.

Case Report
A 59 year old man, non-smoker developed rapidly progressive weakness of all four limbs three days after a febrile illness with diarrhoea. His symptoms progressed rapidly with breathlessness and difficulty in speaking. He was admitted to the intensive care unit, urgent nerve conduction study was done and patient was intubated and placed on ventilator support.

On initial physical examination, his heart rate was 120 beats/min regular in rhythm, his blood pressure was 158/106 mm Hg and he was afebrile. On cardiovascular system examination, there was no cardiomegaly, the heart sounds S1 and S2 were heard normally, and there was no S3 gallop or no murmurs. On neurological examination, patient was drowsy. His pupils were 3mm in size reacting to light and his eye movements were normal. He had bilateral LMN facial palsy with inability to blow out cheeks and purse lips. His palatal movements were normal and gag reflex was present. There was hypotonia of all four limbs with areflexia. The power in all groups of muscles was 0/5. The plantar responses were flexor. There was no sensory involvement.

Routine laboratory tests were normal except for a slightly increased white blood cell count. Cerebrospinal fluid obtained on the first hospital day was normal. Aetiological investigations, including anti-GM1, anti-GM2, anti-GD1a, anti-GM1b, anti-GT1a, anti-GQ1b, anti-GD1b, anti-GT1b titres, were all negative. Results of thyroid function tests, urinary porphyrins, angiotensin converting enzyme level, serum electroimmunophoresis, and polymerase chain reaction analysis for CSF tuberculosis and herpes simplex virus were all normal. Cranial magnetic resonance (MR) imaging and MR angiography showed no abnormal lesions. EEG was normal. Nerve conduction studies showed a motor demyelinating and axonal radiculoneuropathy of upper and lower limbs. On the basis of the neurological findings, we established a diagnosis of Guillain Barre syndrome. The patient was administered intravenous immunoglobulin 20 grams/day for five days (0.4 gm/kg body weight). He remained areflexic with quadripareisis for two weeks requiring ventilator support. He was subsequently treated with a 12 litre plasma exchange over ten days along with antibiotics and other supportive treatment.

There was no chest pain during admission to our hospital, however, an ECG on the first hospital day showed sinus tachycardia with normal ST segments and T waves in chest leads. Patient continued to have persistent resting tachycardia with a heart rate of 120 to 150 beats per minute with labile hypertension. At this stage ECG showed
evidence of diffuse symmetric T wave inversions in leads I, II, AVL and V1-V6. Serum Creatinine kinase of 140 UL (Normal 38-174) with CKMB normal. There were episodes of excess sweating, abdominal distension, intermittent diarrhoea and constipation. He had periods of urinary retention as well. These events led us to suspect an autonomic dysfunction and we evaluated him further with bedside tests for sympathetic and parasympathetic autonomic dysfunction. Parasympathetic autonomic function tests consisted of valsalva ratio and RR interval in the ECG during rest and deep breathing while the sympathetic autonomic function was assessed by blood pressure responses to sustained handgrip and active standing. These tests were found to be abnormal (Table 1). We estimated serial levels of plasma cortisol, urinary vanillylmandelic acid, urinary metanephrine, urinary nor metanephrine, 24 hour urinary vanillylmandelic acid and plasma cortisol which were all found to be abnormal (Table 1). Trop T and CPK MB levels were normal. His echocardiogram done in the acute phase showed moderate LVH, hypokinesia in anterolateral and diaphragmatic surface, LVEF 40%, normal LV size, good RV systolic function. Mild MR. No AS/AR. No pericardial effusion. Grade I diastolic dysfunction. No LA/LV clot (Figure 1). He undertook a coronary angiogram. Although the coronary arteries were free of any lesions, a left ventriculogram showed severe hypokinesia in the anterolateral, apical, and diaphragmatic segments, with an ejection fraction of 34%.

We continued with supportive treatment, beta blockers, diuretics and angiotensin converting enzyme blockers for the cardiac involvement. The autonomic dysfunction persisted for a few months. There was a fall in levels of serum cortisol, urinary metanephrine, VMA estimated three months later (Table 2). Corresponding, bedside tests for sympathetic and parasympathetic dysfunction remained abnormal (Table 2). ECG showed T wave inversion resolved. Echocardiogram repeated three months later showed good LV and RV systolic function. Mild LVH. No regional LV wall motion abnormality. LVEF 60%. Mild MR. No AS/AR. No clot in LA appendage. No pericardial effusion. Grade I diastolic dysfunction (Figure 2).

Gradually, patient recovered power in the upper limbs first and later in the lower limbs, he was weaned off ventilator. Plasma and urinary catecholamines normalised and the autonomic dysfunction improved. Patient was discharged from hospital after three
months with improving power of all four limbs and a normal cardiovascular status.

**Discussion**

There have been case reports of reversible cardiomyopathy coinciding with clinical and biochemical manifestations of autonomic dysfunction in Guillain Barre syndrome. Supraphysiological levels of serum catecholamines appear to cause a reversible cardiomyopathy. Dysregulation of the autonomic tone with excessive sympathoadrenal activation has been reported with elevated catecholamines and their metabolites in a 24 hour urine collection in patients with Guillain Barre syndrome. Significant fluctuations in autonomic tone and high surges in serum catecholamine levels are sufficient to induce acute catecholaminergic myocardial stunning in susceptible individuals. The term neurogenic stunned myocardium has been used to summarise these abnormalities that occur in the setting of severe central nervous system disease in the absence of coronary artery disease. Clinical manifestations of sinus tachycardia and labile hypertension have been attributed to damage to the afferent pathways. The autonomic nervous system is responsible for the moment to moment variation in the heart rate, force of myocardial contraction, capacitance of blood vessels and their resistance to forward flow. The cardiac nerves control the cardiac output, arterial pressure and perfusion to the tissues. The sympathetic and parasympathetic preganglionic cells, receive both inhibitory and excitatory impulses from the cardiovascular centre in the medulla and nerves. Vasomotor control can be disturbed with hypertension and postural hypotension. Patients can die suddenly due to arrhythmias, both bradycardia and paroxysmal tachycardia may occur necessitating a demand pacemaker. Cardiac monitoring should be done whenever one suspects respiratory and trunk muscle involvement. Decreased baroreceptor inhibition and alteration of the baroreceptor and chemoreceptor reflexes results in efferent sympathetic overflow as a consequence of the demyelinating process. Autonomic dysfunction has been described more in the acute demyelinating subtype of Guillain Barre syndrome.

In a survey of patients treated at the Mayo Clinic, the syndrome was fatal in 20% children with trunk and respiratory muscle involvement. Cardiac monitoring should be instituted whenever assisted ventilation is needed so that deaths can be avoided by predicting potentially dangerous impairment of the cardiac autonomic system. The pathological regularity of the heart is more pronounced in those with the more severe muscle paralysis. Vagal paresis manifests with sinus tachycardia and fluctuation in blood pressure as is seen in this patient. Resting tachycardia, hypertension, blood pressure changes on sitting, tilting, standing and valsalvas manoeuvre have been demonstrated in patients with Guillain Barre syndrome and is attributed to lesions of the afferent nerves from the arterial baroreceptors. Pathological changes like contraction band necrosis can be found in the hearts of patients who died of Guillain Barre syndrome. Serial estimation of plasma norepinephrine, 24 hour urinary vanylmandelic acid and plasma cortisol was done in a study by Ahmed et al. In patients with Guillain Barre syndrome, the maximum rise of plasma norepinephrine and vanylmandelic acid occurred at the height of paralysis and levels normalised as the motor power improved. In this case report similar findings were observed. The levels of plasma nor epinephrine, 24 hour urinary vanylmandelic acid and plasma cortisol were high coinciding with the cardiac irregularities at the peak of the illness. Simultaneously, there were features of dysautonomia like resting tachycardia, hypertension and a neurogenic stunned myocardium with a low ejection fraction in the echocardiogram. The bedside tests for sympathetic and parasympathetic dysfunction were abnormal. When the patient recovered his motor power the echocardiogram, biochemical changes normalised. However, the bedside tests for autonomic dysfunction continued to be abnormal. Thus, we conclude that cardiac involvement is not uncommon in Guillain Barre syndrome. A state of reversible cardiomyopathy has been described at the peak of the illness which is referred to as neurogenic stunned myocardium. We recommend that a cardiac evaluation is necessary in cases of Guillain Barre syndrome with respiratory muscle involvement to identify cardiac arrhythmias and predict the occurrence of fatal complications.

**References**