



Neurogenic T waves and the Concern They Infer

Authors

Dr Deepsheeka.G¹, Dr Badrinath.A.K²

¹Post Graduate, Department of General Medicine, Sri Manakula Vinayagar Medical College and Hospital

²Professor and Unit chief, General Medicine, SMVMCH

Abstract

The Brain and heart have many connections both in disease and physiology. Many literatures refer to Cardiac implications due to a underlying neurological event. In this case report we present a cardiac complication due to acute stroke, which is rather a common event but also a frequently overlooked entity. Here we present a patient developing ECG changes due to ischemic stroke. The ECG changes regressed along with neurological stabilization a few days later.

Keywords: Neurogenic T waves, insular cortex, ischemic stroke

Introduction

Acute stroke is associated with a variety of cardiac manifestations ranging from myocardial infarction, stress cardiomyopathy, arrhythmias.

Neurogenic T waves or cerebral T waves need to be differentiated from cardiac causes and other causes of ST-T changes. Usually neurogenic T waves occur in case of intracranial haemorrhage but here we present a case of ischemic stroke with ECG changes.

Case Report

A 72 year old female known case of systemic hypertension came with complaints of palpitations and giddiness for 1 week. She had no complaints of chest pain or weakness or sensory loss. Her Blood pressure at the time of presentation was 160/100 mm Hg. On examination cardiovascular system and central nervous system was normal with no focal neurological deficit. Her initial ECG showed T wave inversions in leads v2, v3 and v4 (Figure 2.1). Troponin I done was found to be negative. Her initial renal function, liver function test, Serum

electrolytes were all within normal range. 2D done showed normal chamber dimensions, no regional motion wall abnormality of LV, normal systolic function, impaired diastolic function and EF-60%. In view of persistent giddiness 24 hr holter monitoring was done which showed only episodes of atrial premature complexes. On the 4th day of admission patient developed severe headache followed by chest pain. At this time her vitals were Pulse rate -106/min and Blood pressure-100/80 mmHg. On examination of Central nervous system showed power of 4/5 in left upper limb and lower limb, right upper limb and lower limb power was 5/5, and plantar extensor on the left and flexor on the right with no sensory deficit. ECG done showed Deep T wave inversions in v2 to v6 and poor R wave progression (Figure 2.2). Plain CT brain showed acute infarct in right MCA territory with no haemorrhagic transformation (Figure 2.4). Troponin I was positive. D dimer was done which was also positive. Repeat 2D echo done showed LV dilated, regional motion wall abnormality, moderate

LV systolic function, EF-30 %. MRI done showed - acute infarct in right frontal lobe with no haemorrhagic transformation and age appropriate generalised cerebral atrophy with chronic small vessel ischemic changes. (Figure 2.5). Patient was treated with anticoagulants, antiplatelets and statins. Patient improved symptomatically and power in the left upper and lower limb improved gradually. Serial ECGs done showed regression of the deep inverted T waves (Figure 2.3).

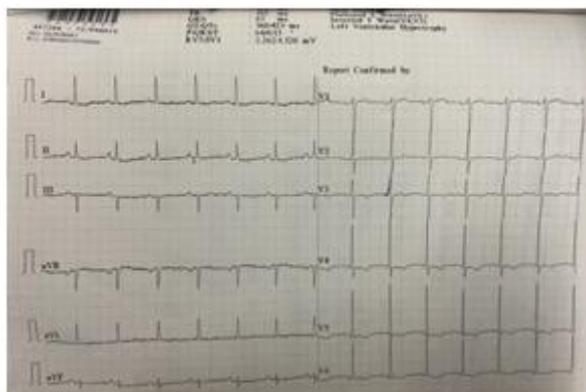


Figure 2.1 Initial ECG on Day 1

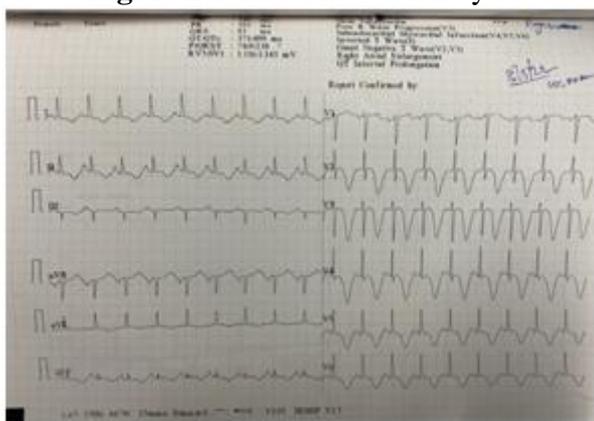


Figure 2.2 ECG showing deep T wave inversions

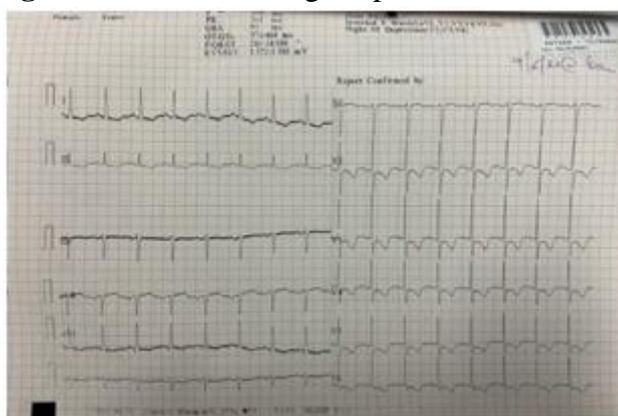


Figure 2.3 ECG done on the day of discharge showing regression of deep T waves

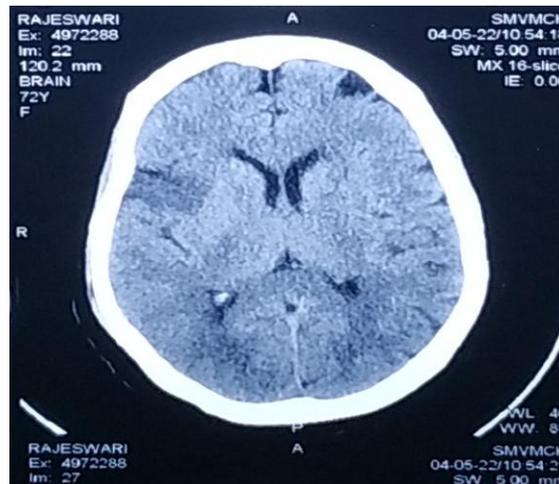


Figure 2.4 Plain CT brain

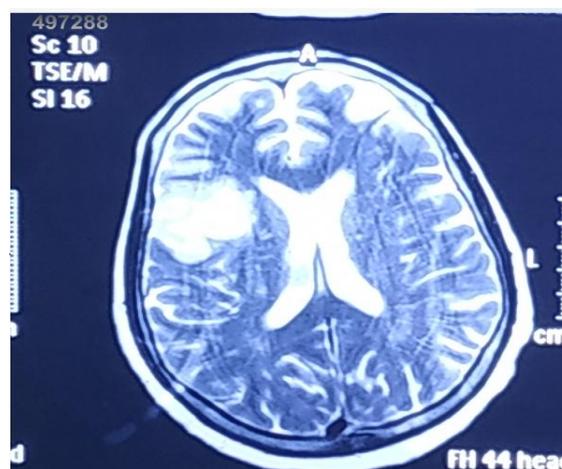


Figure 2.5 MRI brain

Discussion

The incidence and type of cardiac complications in acute stroke depends on the nature and region or area of brain parenchyma affected.

The most common ECG alterations seen in acute ischemia of brain include QT prolongation, ST segment alterations, T wave flattening or inversion and abnormal U waves, due to unbalanced autonomic control.

The differential diagnosis of deep T-wave inversions in ECG include - Myocardial ischemia and infarction, Bundle branch block, Ventricular hypertrophy, Pulmonary embolism, Hypertrophic cardiomyopathy, Raised intracranial pressure (eg: Subarachnoid haemorrhage), Neurogenic T waves . Brain injury causes complications by 1.Direct neuroinflammation causing SIRS which inturn lead to pulmonary dysfunction causing pulmonary

edema. 2. Hypothalamus affected causing parasympathetic dysfunction and unchecked inflammation leading to ATP depletion and myocyte death. 3.If insular cortex is affected either catecholamine release or parasympathetic dysfunction leading to myocyte death and into cardiac dysfunction - presenting as Hypotension, LV dysfunction, Cardiogenic shock.

The insular cortex plays an important role in the development of neurogenic T waves through its autonomic cardiovascular regulation .The left insula cortex mainly controls parasympathetic cardiac drive and the right insular cortex control of sympathetic tone.The increase in sympathetic activity increases serum catecholamine levels, which inturn leads to myocytolysis. Autopsy of stroke patients revealed petechial subendocardial haemorrhage and focal myofibrillar degeneration, which was reproducible with I.V administration of catecholamines.

From this case report we conclude that not all ECG changes are only due to cardiac causes and cardiac abnormalities can occur due to insults in the brain and diffrential diagnosis of a cerebrovascular event should always be considered.

References

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