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Case Report

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Takotsubo Cardiomyopathy Complicated by Ischemic Stroke: Cause or Consequence?

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Abstract

Introduction: *Takotsubo syndrome (TTS) or broken heart syndrome is a cardiomyopathy belonging to unclassifiable acquired cardiomyopathies according to the 2008 European Society of Cardiology classification. The syndrome is characterized by acute, transient, and reversible left ventricle systolic dysfunction. The aetiology remains unclear, with direct or indirect catecholamine cardiotoxicity as the principal mechanism. This condition, which mimics acute coronary syndrome, mainly affects elderly, post-menopausal women following emotional or physical stress such as an acute stroke.*

Case Presentation: *Here, we describe a case of TTS in an 80-year-old hypertensive woman who presented with regressive left hemiparesis at a funeral. Evaluation on admission revealed precordium T-wave inversion with elevated troponins and apical hypokinesia on echocardiography. Coronary angiography with ventriculography and cardiac MRI ruled out acute coronary syndrome, and the diagnosis of Takotsubo cardiomyopathy (TC) associated with right sylvien stroke was retained. The course was favorable, with systolic function recovery under medical treatment with beta-blockers and converting enzyme inhibitors.*

Conclusion: *A disorder of the elderly woman, TTS occurs in the aftermath of stress such as cerebral ischemia. However, when neurological disease and takotsubo syndrome occur concomitantly, it is difficult to distinguish whether ischemia is the causative factor or the consequence.*

Keywords: Acute, Cardiomyopathy, Systolic Dysfunction, Postmenopausal Woman, Reversible, Transient, Cerebral Ischemia, Stress, Takotsubo.

Abbreviations: Ischemic stroke: AVCI; Takotsubo cardiomyopathy: CT; Left ventricular ejection fraction: LVEF; Magnetic resonance imaging: MRI. Takotsubo syndrome: TTS; Acute coronary syndrome: ACS; Left ventricle: LV.

Introduction

Takotsubo cardiomyopathy (TC) or stress cardiomyopathy is an entity first described in 1990 by Sato et al. This syndrome (TTS) is characterized by transient, acute, and reversible dysfunction of the left ventricle (LV), with an appearance of apical ballooning giving the left ventricle the "octopus trap" "Takotsubo" appearance in Japanese. TTS generally affects elderly women in the postmenopausal period, following emotional or physical stress, suggesting hormonal involvement and the central role of the nervous system.

Its aetiology remains unknown, but several pathophysiological hypotheses have been put forward, including catecholamine-related cardiotoxicity. The clinical presentation mimics that of acute coronary syndrome (ACS), with electrical changes and increased markers of myocardial necrosis, but regional contractility disorders typically extend beyond a single coronary artery territory. This generally benign condition may be associated with rhythmic and thrombo-embolic complications, notably cerebral infarction (AVCI), with in-hospital mortality comparable to that of myocardial infarction.

We report the case of an 81-year-old hypertensive woman who presented at a funeral with malaise and left hemiparesis and was diagnosed with takotsubo syndrome complicated by atrial fibrillation and cerebral infarction.

Case Presentation

Mrs. M, aged 82, had cardiovascular risk factors such as menopause, hypertension, and dyslipidemia, and was hospitalized in the cardiology department. During a funeral, she experienced a malaise with sudden left hemiparesis and a fall that regressed after 20 minutes. A second regressive episode occurred when she was transferred by ambulance. Neurologically, the diagnosis was limited right deep sylvian ischemic stroke, confirmed by cerebral MRI (Figure 1.).

Cardiologically, there was no chest pain or signs of heart failure. The electrocardiogram (Figure 2.) showed an atrial fibrillation rhythm at 133/min (CHA2DS2-VASc score 5), negative anterior T waves and abrasion of precordium R waves. Biologically, troponin was elevated from 6459pg/mL to 2512pg/mL the following day; NT-Pro BNP to 3424pg/mL; creatinine to 6.1 mg/L with a GFR of 94ml/min/1.73m²; potassium to 3.8mmol/L haemoglobin 12.7g/dL and CRP to 47mg/L. Transthoracic echocardiography (Figure 3.) showed a non-dilated, non-hypertrophied left ventricle (LV), non-obstructive sub-aortic bulge, LVEF 45%, apical sequela extending to the medial segments giving an apical ballooning appearance, slight left atrial dilatation.

No significant mitro-aortic valve disease and the right ventricle was normokinetic. Myocardial scintigraphy showed complete myocardial viability, while coronary angiography revealed non-significant lesions on the anterior interventricular and right coronary arteries, with the appearance of ballooning on ventriculography. Doppler ultrasound of the supra-aortic trunks showed the right and left common, internal, and external carotid arteries to be permeable, with good symmetrical flow and rather hyperechoic atheromatous deposits in the carotid bifurcations, with no hemodynamic repercussions and no visible stenosis. Vertebral artery in V2 with anterograde flow and subclavian artery with triphasic flow.

Faced with this picture of myocardial infarction in healthy coronaries, the diagnosis of Takotsubo syndrome complicated by AF and AVCI was retained in view of the presence of an identified potential triggering factor (recent death in the entourage, acute neurological ischemic event), the presence of four (4) criteria proposed by the Mayo-Clinic and an Inter TAK score of 77. Cardiac MRI (Figure 4) for etiological purposes showed an appearance compatible with resolving Takotsubo, with no evidence of ischemic heart disease and mild LV hypertrophy.

Initially treated as an acute coronary syndrome, the evolution was favorable with recovery of left ventricular systolic function, LVEF 55% on day 11, the patient was discharged on atorvastatin 40 mg/d; Bisoprolol 1.25 mg/d; Ramipril 5 mg/d and Xarleto 20 mg/d The double anti-aggregation having been stopped after excluding an acute coronary syndrome.

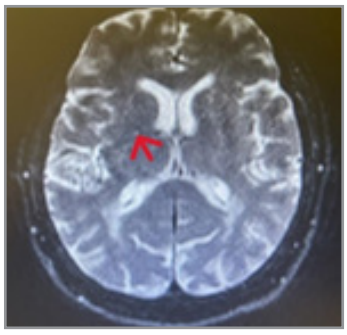

Figure 1: ischemic stroke

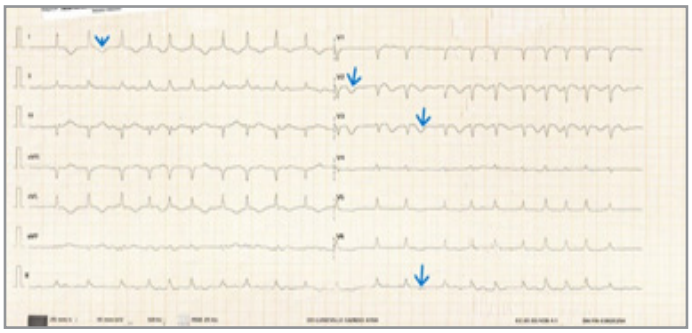

Figure 2: ECG showed negative T waves in precordium. in the right sylvien deep.

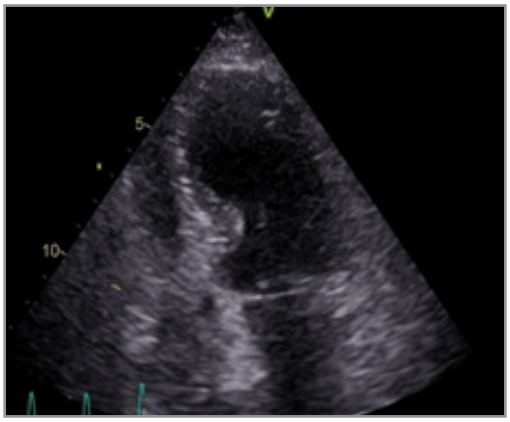

Figure 3 : apical ballooning, LVEF: 45%

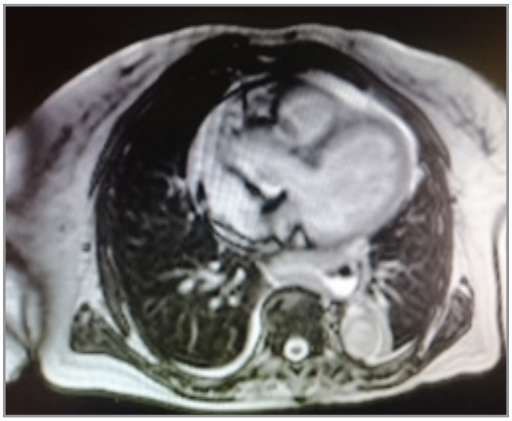

Figure 4 : MRI compatible with resolving Takotsubo

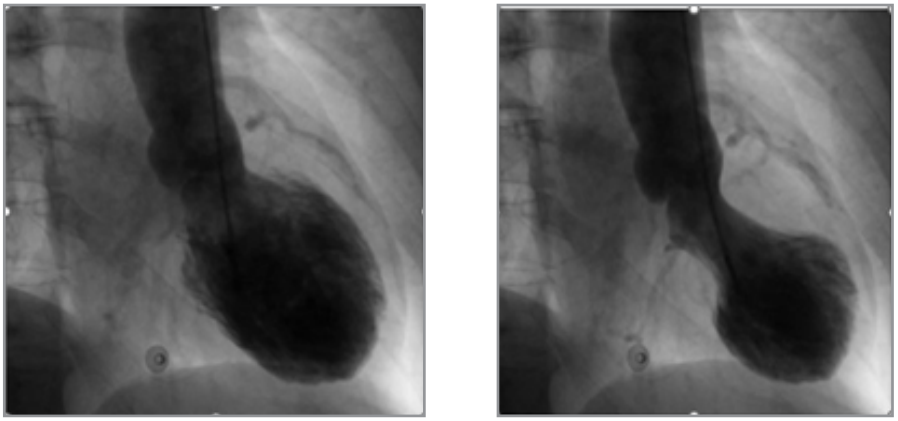

Figure 5 : ventriculography
A : diastole**; B :** systole

Discussion

Stress cardiomyopathy is an acute cardiac syndrome characterized by reversible left ventricular systolic dysfunction [1]. TTS usually occurs in the context of emotional or physical stress [1-3]. The triggering factor cannot be found in a third of patients [1,4]. Its prevalence is around 1-3% of all acute coronary syndromes (ACS), and all age groups are affected [4-5]. This incidence is on the rise, in line with the increase in stress linked to the concerns of daily life, as underlined by the high frequency reported during the COVID-19 pandemic [6]. Older, post-menopausal women account for 90% of cases, with oestrogen playing a key role in pathogenesis [1,4,7-10].

Men, often with co-morbidities, have atypical forms and are more likely to develop complications such as cardiogenic shock and hospital death [1]. In our case, the patient was elderly, post-menopausal woman whose stressor was the funeral of a close relative.

The aetiology of TTS remains poorly elucidated, but several hypotheses have been put forward to explain this fascinating multifactorial syndrome [2-3,7,11]. The first mechanism is cardiotoxicity to catecholamines, released into the circulation in response to emotional or physical stress [1,11]. Catecholamines induce myocardial sideration, either by causing microvascular endothelial dysfunction and spasm of multiple epicardial vessels via β-adrenergic receptors, or by direct action on the myocardium [8-11].

The β-receptors are denser in the left ventricular apex, which explains the classic apical ballooning of the LV shape [10]. The second mechanism is linked to autonomic nervous system dysfunction, with increased sympathetic impulses and parasympathetic depression [5,10]. The third mechanism is linked to oestrogen deficiency, and hence the loss of their permissive (sympatholytic) role, leading to increased sympathetic activation and endothelial dysfunction [5,9-10].

Other mechanisms include altered myocardial metabolism, itself a consequence of abnormal coronary blood flow, and inflammation [9-11]. Inflammation, circulating catecholamine load and metabolic alteration of the myocardium will contribute to electrophysiological disturbances and the occurrence of rhythmic complications in these Takotsubo patients [11].

The clinical presentation is polymorphous and mimics an ACS, with symptoms ranging from chest pain, dyspnea or syncope to cardiogenic shock, heart failure and ventricular tachycardia [1- 2]. Electrically, ST-segment elevation dominates (44-53.9%), followed by T-wave inversion (41%), in the absence of obstructive lesions. [1, 11-12]. Echocardiography reveals ventricular systolic dysfunction and a-hypokinesis, with the predominant appearance of classic apical ballooning [12-13].

The medioventricular form is found in 15% of cases, the basal form only in 5% and biventricular involvement in a third of cases [1,11]. In addition to the InterTAK diagnostic score, coronary angiography with ventriculography and cardiac MRI are essential for differential diagnosis, in particular obstructive coronary angiography, and to retain the diagnosis [1,4,12].Our patient had presented with a malaise with regressive left hemiparesis, an aspect of apical ballooning and T-wave inversion, as was the case in the French OFSETT study where T-wave inversion accounted for 71.6%[14]. Coronary angiography does not show obstructive lesions, and cardiac MRI favours TTS in resolution.

TTS is a generally benign, reversible disease, but in a fifth of cases it can be associated with the onset of major cardiac or cerebrovascular complications [1-3]. One such complication, which may also be the cause of TTS (physical stress factor), is ischemic stroke [1,3]. Cerebral ischemia is recognized as a physical stressor, responsible for secondary Takotsubo syndrome [1,3]. Other complications include cardiogenic shock, ventricular rhythm disorders, thromboembolic events and death [1,4].

Factors associated with the occurrence of complications and death are the presence of a physical trigger, male sex, acute neurological or psychiatric illness, troponin, LVEF<45%. Mortality in the acute hospital phase is around 4-5%, comparable to that of myocardial infarction [1,2]. In our case, cerebral ischemia was discovered concomitantly with takotsubo syndrome, following a bereavement. This raises the question of whether cerebral ischemia is the cause or consequence of TTS. The evolution was also good under medical treatment and psychological care, with no recurrence after one year's follow-up.

Conclusion

Takotsubo syndrome or broken heart syndrome is an acute, reversible cardiomyopathy. In a small proportion of patients, major cardiovascular or cerebrovascular events such as cerebral ischemia may occur, as in our octogenarian patient. The concomitant occurrence of cerebral ischemia with TTS presents a dilemma in distinguishing cause from consequence between the two entities.

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