Clinical note

Transient apical dysfunction syndrome (Tako-Tsubo) simulating acute myocardial infarction

M.J. Carrero Lérida, a M.C. Mariscal Cerrato, a,* C. Dávila Arias, a A. López Ruiz, a J. Caballero Güeto b

a Servicio de Medicina Nuclear, Hospital Clínico Universitario San Cecilio, Granada, Spain
b Servicio de Cardiología, Hospital Clínico Universitario San Cecilio, Granada, Spain

Introduction

The transient apical dysfunction syndrome (TADS), Tako-Tsubo, apical ballooning, broken heart syndrome, stress cardiomyopathy or neurogenic disturbance was described by Hiauru Sato in 1990. In 2006, the American Heart Association included this syndrome in its classification of cardiomyopathies as primary acquired cardiomyopathy. This syndrome simulates one of acute myocardial infarction (AMI) and is characterized by the presence of ischemic chest pain accompanied by an elevation in the markers of myocardial necrosis and electrocardiographic alterations as well as hypokinesis, akinesis or anteroapical dyskinesia, in absence of significant coronary disorders. It generally resolves in days or weeks with individualized support measures. We present the case of a female patient referred to our service for a myocardial perfusion imaging study due to a history suggestive of an acute coronary syndrome after a stressful event.

It usually resolves within days or weeks with individualized means of support. This syndrome predominantly affects the female sex with an age range of 60 to 80 years and is related to a picture of physical or emotional stress. The etiology is unknown despite several pathophysiological mechanisms having been described, among which involvement secondary to the discharge of catecholamines triggered by stress on a heart unable to maintain an adequate inotropic response is of note.

Clinical case

A 78-year-old hypertense woman receiving treatment without other cardiovascular risk factors arrived to the emergency department for long duration oppressive pain in the left hemithorax which irradiated to the throat after having been robbed in the street.

Physical examination found a bad general status, tachycardia with a trend to gallop and normal respiratory auscultation. Arterial pressure was 110/60 mm Hg. Electrocardiogram showed sinusal rhythm and T wave inversion in V2-V6 precordial without Q wave (fig. 1). Blood analysis showed a maximum peak of troponine of 0.6 ng/dL (range of normality 0.1) and myoglobin of 69 ng/mL. Cardiological examination by echocardiography showed marked
medioapical dysfunction on all the sides with severe ventricular
dysfunction (ejection fraction (EF) of 15 %) (fig.2). During the stay in
the emergency department observation unit she presented a picture
of hypotension and was admitted to an intensive care unit where
cardiac insufficiency and an episode of rapid auricular fibrillation at
130 beats per minute began. The following morning and after having
reverted to a sinusal rhythm a gated-SPECT study was performed
showing normal perfusion while septoapical akinesis-dyskinesis was
observed with an important alteration in the left ventricle EF (LVEF)
of 26 % (figs. 3 and 4).

The following day the patient was transferred to the
hemodynamics unit for coronariography which showed epicardic
coronary arteries without significant angiographic stenosis as well as
anteropical akinesis and hypercontractility of the basal segments
with a moderately depressed LVEF (figs. 5 and 6).

The clinical course was favorable and the patient was transferred
to the cardiology ward to continue the control of evolution. At three
weeks a new study was carried out with a control gated-SPECT which
showed complete recovery of contractility as well as an improvement
in the LVEF (58 %) (fig. 4).

Figure 1. Electrocardiogram demonstrating a rise in the ST segment which was more accentuated in the V2 and V3 derivations as well as inversion of the V5-V6 T wave.

Figure 2. Echocardiographic images. The left in systole and the right in diastole showing an optimum movement in the lateral side and akinesis at the septoapical level.

Figure 3. Perfusion study obtaining slice and polar maps showing the normality of the distribution of the tracer without evidence of signs of ischemia or necrosis.
Discussion

The TADS was described by Hiauru Sato in 1990. In 2001 it was typified as a clinical entity with the finding of a series of 88 cases in Japan and in 2003 the first cases were described in the US. In 2006 the American Heart Association incorporated the syndrome in its classification of cardiomyopathies as primary acquired cardiomyopathy.

In reference to TADS, it has been hypothesized that there may be a hyperactivity of the local sympathetic system secondary to a hyperadrenergic discharge with a brusque elevation of catecholamines accompanied by an “asymmetric” myocardial response. In addition,
clear similarities have been observed between TADS and myocardial disturbances. The discharge of catecholamines reported in both
diseases is also detected in entities such as subarachnoid hemorrhage
or pheochromocytoma crises. Another argument in favor of the
adrenergic thesis is the discovery of an experimental model of TADS
in which continued stress provokes hyperkinesia of the anteroapical
region of the LV with the changes in animals receiving supplementary
estrogens remaining attenuated or normalized after blockade of the
adrenoreceptor α or β.

Other causes which have been suggested are an abnormality in
the coronary anatomy in the apical region with the presence of an
anterior descending coronary artery with a large recurrent segment,
the presence of a sigmoid septum, dynamic medioventricular
obstruction, the appearance of an intraventricular gradient or viral
myocarditis. A reduction in apical and septodistal coronary flow and
normality of the flow in the mediobasal zone have been demonstrated
with techniques such as PET and echocardiography.

The most extended opinion is that TADS is due to a multiple and
as yet unclear etiology with the possible causes ranging from spasms
of the responsible epicardiac coronary arteries also from another
clinical entity of ischemic heart disease: Prinzmetal angina. The
difference between the two entities lays in the triggering factors, the
risk factors and the variations in the clinical manifestations. The
TADS is more frequent in women over the age of 60 years associated
with stress as the triggering factor. It simulates an acute myocardial
infarction producing a transient ventricular dysfunction and is
usually a benign disease, although it may present complications
(cardiogenic shock, arrhythmias, mural thrombi, wall rupture).
Prinzmetal angina however, is more frequent in young men and is
related to smoking but is not associated with stress and does not
produce ventricular dysfunction.

Moreover, the differential diagnosis should extend to the
previously mentioned diseases: subarachnoid hemorrhage, pheochromocytoma, myocardial disturbances, toxic substances such
as cocaine and myocarditis.

The clinical presentation of the picture is similar to that of ACS.
The onset may include chest pain (53–71%) with similar characteristics
and irradiation as that of ischemic cardiopathy with dyspnea (7–20%
and, more rarely, with cardiogenic shock (5%)).

The electrocardiogram shows elevation of the ST segment on the
anterior side in up to 90% of the cases. Around 25% of the
patients show pathological Q waves with a mirror image in the
inferior side being rare. The electrocardiographic changes may last
days or evolve to disappearance of the Q wave (90–100%),
normalization of the ST segment and the presence of deep negative
T waves (84–97%).

Only 50% of the patients present an elevation in the myocardial
genesis markers and this is much lower than that expected in
relation to the alterations described.

The echocardiography shows an alteration in the EF, medioapical
hypokinesis or akinesia and a normal or hyperkinetic base which
normalizes in days or weeks.

Coronariography shows the arteries to be normal or without
significant stenosis, although at present, and without demonstrated
clinical evidence, the role of coronary angiography with multislice
CT without the need for a hemodynamic study should be considered
in the evaluation of the coronary tree.

Although it is true that there are no clear therapeutic
recommendations and that those that are present limit the means of
individualized support for each patient, the importance of achieving
a rapid differential diagnosis with ACS lays in the possibility of
avoiding fibrinolytic treatment and the risk it carries, and the
benefit of administering alpha-adrenergic agonists.

The echocardiographic findings provide differential diagnosis
with acute myocardial infarction with elevation of the ST segment by
the total occlusion of a dominant anterior descending artery
(surrounding the apex and irrigating part of the inferior wall). The
transient character of the alterations in contractility determines the
relationship between the two entities which is why clear diagnosis
of TADS is always late and never in the acute phase. Thus, the use of
a gated-SPECT study demonstrating the recovery of the alterations in
contractility and LV EF aids in establishing the definitive diagnosis.

The TADS presents more initial complications than ACS: acute
pulmonary edema (22%), cardiogenic shock (15%), ventricular
arrhythmias (9%) but a better short and medium term prognosis.

Conclusion

In the presence of clinical manifestations suggestive of ACS in
elderly patients (mainly women) with a trigger related to physical
or emotional stress, electrocardiographic alterations suggestive of
involvement of the anterior side, nul or minimum elevation of
biochemical data and important hypokinesis, akinesia and even
septoapical dyskinesia not correlated with a slight alteration in the
myocardial markers of necrosis, TADS should be suspected.

Coronariography continues to support the diagnosis since the
significant stenosis is observed. Nonetheless, definitive diagnosis is
obtained on demonstrating the recovery of contractility. Myocardial
perfusion studies with gated-SPECT obtained in the first phase in
the absence of perfusion defects suggestive of necrosis and associated
with important disorders in septoapical motility may aid in
establishing the diagnosis of TADS. Although it is true that diseases
with minimum necrosis may adopt a similar perfusion pattern, it is
very difficult for the motility study to reveal important hypokinesis,
akinesia and even dyskinesia. Late gated-SPECT is of great utility in
demonstrating the recovery of LV functionality and regional
contractility.

With respect to TADS, the medical literature does not provide
clear therapeutic recommendations and what is available is limited
to means of individualized support for each patient. The importance
of achieving a rapid differential diagnosis compared with ACS lays in
the possibility of avoiding the use of inotropic drugs and nitrates
which may increase the dynamic gradient and fibrinolytic treatment
due to its inherent risk.

Although it has not been completely demonstrated, the
management of these patients should consider the foreseeable
benefit of careful administration of beta-blockers, IECA and alpha-
adrenergic agonists.

References

1. Sato H, Tateishi H, Uchida T. Tako-Tsubo-like left ventricular dysfunction due to
multivessel coronary spasm. In: Kodama K, Hori M, editors. Clinics aspect of
2. Davis M, Hardebeck C. Reverse Takotsubo syndrome diagnosed with 99mTc
3. Liviniov I, Kotowycz M, Waismann S. Iatrogenic epinephrine-induced reverse
Takotsubo cardiomyopathy: Direct evidence supporting the role of catecholamines
in the pathophysiology of the «broken heartsyndrome». Clin Res Cardiol.
4. Ono Y, Kawaihara T, Ito J, Kanayama S, Miura T, Kikuchi F. Ampulla (takotsubo-
cardiomyopathy associated with subarachnoid hemorrhage worsening in the late
induces transient left ventricular hypokinesia in the rat via activation of cardiac
adrenoreceptors: A possible animal model of Takotsubo cardiomyopathy.
del síndrome Tako-Tsubo con la arteria coronaria descendente anterior con
González R, Penas Lado M. Síndrome de discinesia apical transitoria sin lesiones
8. Segovia Cubero J, Pérezera Moral JR. Disfunción apical transitoria: un síndrome


