ELSEVIER

International Journal of Cardiology 135 (2009) 370–375

International Journal of Cardiology

www.elsevier.com/locate/ijcard

Transient apical ballooning syndrome — clinical characteristics, ballooning pattern, and long-term follow-up in a Swiss population

Parham Eshtehardi, Simon C. Koestner, Patrick Adorjan, Stephan Windecker, Bernhard Meier, Otto M. Hess, Andreas Wahl*, Stéphane Cook

Cardiology, Bern University Hospital, 3010 Bern, Switzerland

Received 6 December 2007; accepted 6 March 2008
Available online 3 July 2008

Abstract

Background: Transient apical ballooning syndrome (TABS) or Takotsubo cardiomyopathy mimics acute ST-elevation myocardial infarction, but is considered to have a good prognosis with only moderate elevation of myocardial enzymes and full recovery of left ventricular function. Although it is increasingly reported, its exact incidence, clinical presentation, and prognosis in non-Asian populations remain largely unknown.
Objective: To describe the clinical characteristics and long-term follow-up of patients who presented with TABS at our institution over a 3 year-period.
Methods: Patients were retrospectively retrieved from our local database. Patient charts were carefully reviewed and the diagnosis of TABS was based on the Mayo Clinic diagnostic criteria. Moreover, psychosocial stress or gastrointestinal disease was recorded.
Results: During the study period, 13,715 coronary angiographies were performed at our institution, including 2459 patients presenting with an acute coronary syndrome (ACS). Forty-one TABS were diagnosed, which represents an incidence of 1.7% of ACS-patients and 0.3% of all coronary angiographies performed, respectively. Mean age was 65 years, with 85% women. Clinical presentations included chest pain, dyspnoea, and cardiogenic shock. A preceding psychological or physical condition perceived as "stress" was reported in 61%. At a mean follow-up of 675±288 days, none of the patients died of cardiac causes, but two patients had a recurrence of symptoms.
Conclusions: This is the largest cohort of TABS patients reported out of Europe so far. The good overall prognosis and low likelihood of recurrence were confirmed.

Keywords: Transient apical ballooning syndrome; Takotsubo cardiomyopathy; Acute coronary syndrome; ST-segment elevation myocardial infarction; Emotional stress

1. Introduction

Transient apical ballooning syndrome (TABS) or Takotsubo cardiomyopathy is found in 1.7–2.2% of patients presenting with acute coronary syndrome (ACS) [1]. It classically mimics ST-segment elevation myocardial infarction, and is characterised by acute onset of transient ventricular apical wall motion abnormalities (ballooning) accompanied by chest pain, dyspnoea, ST-segment elevation, T-wave inversion or QT-interval prolongation on the electrocardiogram (ECG). Elevation of myocardial enzymes is moderate at worst and there is absence of significant coronary artery disease (CAD). Even when ventricular systolic function is heavily compromised at presentation, it typically improves within the first few days and normalises within the first few months [1–9].

The incidence, clinical presentation, and prognosis of TABS in Europeans remain largely unknown. Accordingly, the aim of the present study was to estimate the incidence of the disease, describe the population, and evaluate the long-

* Corresponding author. Tel.: +41 31 632 05 34; fax: +41 31 632 47 70.
E-mail address: andreas.wahl@insel.ch (A. Wahl).

0167-5273/$ - see front matter © 2008 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.ijcard.2008.03.088

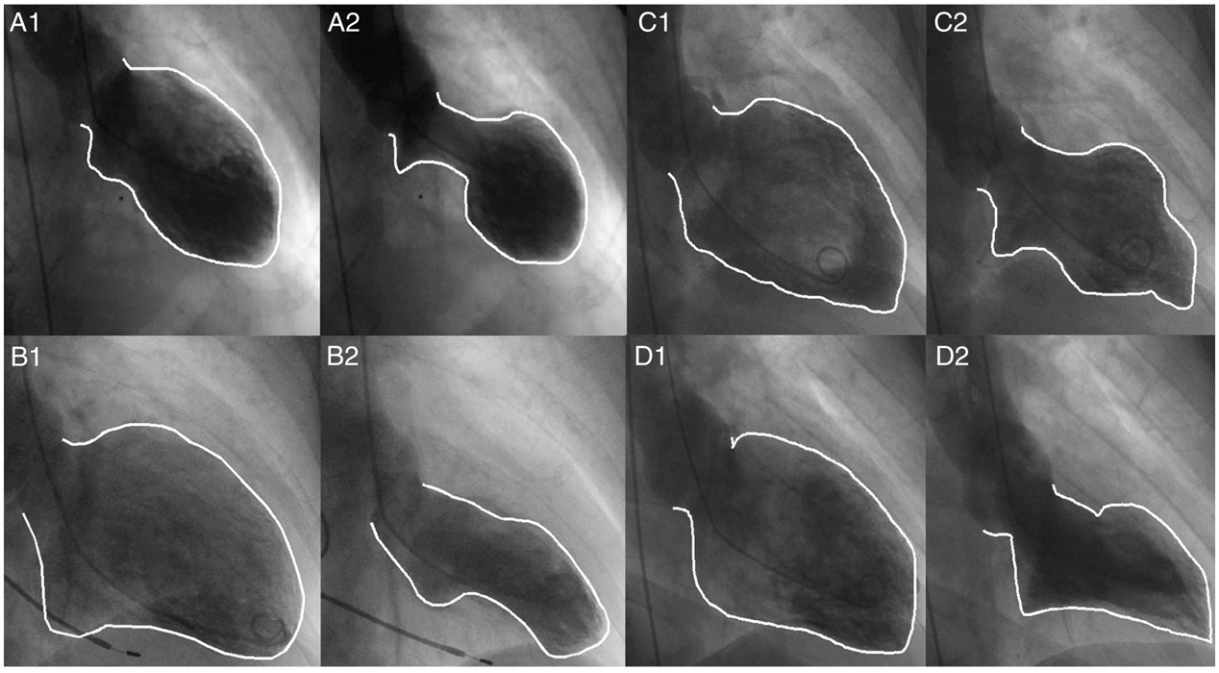

Fig. 1. Takotsubo type ballooning pattern represents apical akinesis and basal hyperkinesis (A1: Diastolic view, A2: Systolic view). Reverse Takotsubo is described with basal akinesis and apical hyperkinesis (B1: Diastolic view, B2: Systolic view). Mid-ventricular type represents mid-ventricular ballooning accompanied by basal and apical hyperkinesis (C1: Diastolic view, C2: Systolic view). Any other segmental left ventricular ballooning with clinical characteristics of Takotsubo-like left ventricular dysfunction describes as localised type (D1: Diastolic view, D2: Systolic view).

term prognosis of patients suffering from TABS diagnosed at our institution.

2. Methods

All patients presenting at our institution with an ACS between June 1, 2004 and June 1, 2007 were retrospectively retrieved from our database. Of these, 41 patients fulfilled the Mayo Clinic diagnostic criteria for the diagnoses of TABS. Medical records, including medical history and physical examination, laboratory tests, coronary angiography and ventriculography, 12-lead ECG, and, when available, echocardiographic and cardiac magnetic resonance (CMR) findings were carefully reviewed.

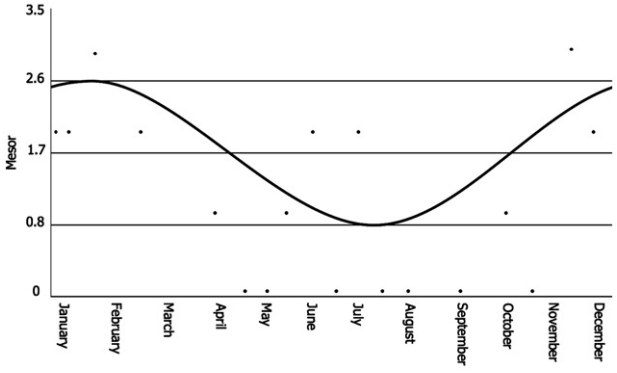

Fig. 2. Seasonal variation of TABS. The cosinor curve demonstrates a winter peak (acrophase) on January 22. Mesor 1.7, Amplitude 0.9, Phase 23°, $p=0.3$.

This study complied with the Declaration of Helsinki regarding investigations in humans and was approved by the Institutional Ethics Committee at the University Hospital Bern, Switzerland (KEK-BE 135/07).

2.1. Definitions

The Mayo Clinic diagnostic criteria are the presence of new ECG abnormalities, absence of significant CAD, transient akinesia or dyskinesia of the left ventricle and absence of pre-existing cardiomyopathy, head trauma, intracranial bleeding or phaeochromocytoma [5]. CAD was

Table 1
Baseline patient characteristics.

Age (years ± SD)	65 ± 11	
Female gender, *n* (%)	35	(85)
Postmenopausal female, *n* (%)	32	(78)
Acute emotional stress, *n* (%)	19	(46)
Physical stress, *n* (%)	6	(15)
Gastrointestinal-examination or active gastrointestinal disease, *n* (%)	1	(2)
Hyperlipidemia, *n* (%)	16	(39)
Diabetes mellitus, *n* (%)	2	(5)
Arterial hypertension, *n* (%)	23	(56)
Family history of coronary artery disease, *n* (%)	9	(22)
Current smoking, *n* (%)	11	(27)
Chest pain, *n* (%)	31	(76)
Dyspnea, *n* (%)	10	(24)
ST-elevation in precordial leads, *n* (%)	16	(39)
T-inversion or Q-wave, *n* (%)	19	(46)
Cardiogenic shock, *n* (%)	1	(2)