



Case Report

Reverse takotsubo cardiomyopathy followed by left ventricle outflow tract obstruction: A dangerous relay race



Marco Mele (MD)^{a,*}, Martino Pepe (MD)^b, Alessandro Maggi (MD)^a,
Rossella Troccoli (MD)^c, David Rutigliano (MD)^d, Alessandro Vilella (MD)^a

^a Cardiology Department, Masselli Mascia Hospital, San Severo (FG), ASL FG, Italy

^b Institute of Cardiology, University of Bari, Bari, Italy

^c Cardiology Department, Policlinico di Bari Hospital, Bari, Italy

^d Cardiology Department, San Paolo Hospital, Bari, Italy

ARTICLE INFO

Article history:

Received 6 December 2018

Received in revised form 21 March 2019

Accepted 1 April 2019

Keywords:

Reverse takotsubo cardiomyopathy

Takotsubo cardiomyopathy

Left ventricular outflow tract obstruction

ABSTRACT

Reverse takotsubo cardiomyopathy (rTTC) is a less frequent variant of takotsubo cardiomyopathy (TTC) with several differences about epidemiology and clinical aspects. While left ventricular outflow tract (LVOT) obstruction is relatively frequent in TTC patients, this complication has not been reported in the setting of rTTC yet. We describe the case of a female patient with rTTC complicated by LVOT obstruction and systolic anterior motion of mitral valve: the onset of these findings coincided with the regression of wall motion abnormalities. This dangerous “relay race” seems to be not casual but related to the characteristics of rTTC and should be always expected and prevented.

<Learning objective: Left ventricle outflow tract obstruction with systolic anterior motion of mitral valve is an insidious complication that may be associated with reverse takotsubo cardiomyopathy and not only with the classic takotsubo cardiomyopathy. This complication appears to be delayed and should be always expected. Close echocardiographic monitoring, careful fluid support and early start of beta-blocker therapy may prevent it.>

© 2019 Japanese College of Cardiology. Published by Elsevier Ltd. All rights reserved.

Introduction

Reverse takotsubo cardiomyopathy (rTTC) is a less known variant of the classic takotsubo cardiomyopathy (TTC). Several differences between these variants are described. Left ventricular outflow tract (LVOT) obstruction with or without systolic anterior motion (SAM) of mitral valve is described in one fifth of patients affected by TTC. However, this complication has not been described in rTTC patients to date. We describe an illustrative case.

Case report

A 69-year-old woman with dementia and Parkinson disease was admitted to the coronary care unit for acute myocardial infarction without ST-elevation. The only recognized stressor was

the change of caregiver. Electrocardiogram showed the inversion of T waves without Q waves in leads I, II, III, aVL, aVF, and V1–V6. Echocardiography revealed akinesia of anterior, lateral, and inferior mid-basal segments, hyperkinesia of the apex of left ventricle (LV), and a mild mitral regurgitation (MR) without SAM of mitral leaflets. Heart rate was 50 bpm, blood pressure 130/80 mmHg, with no signs of heart failure but evidence of mild dehydration. Biology showed mildly increased levels of urinary catecholamine, troponin I, creatine kinase-MB and N-terminal pro-brain natriuretic peptide, while C-reactive protein (CRP) levels were normal. We performed an urgent coronary angiography showing no significant obstructive lesions (Fig. 1A and B). Left ventriculography confirmed echocardiographic findings so we made a diagnosis of (rTTC) (Fig. 1C and D). We administered ramipril 5 mg, acetyl-salicylic acid 100 mg, but not beta blockers because of the low heart rate. With the exception of a mild reduction in blood pressure, the clinical course was not complicated so we planned the discharge on the fifth day of hospitalization. After talking with family members, we did not perform a cardiovascular magnetic resonance (CMR) examination because of

* Corresponding author at: S.C. di Cardiologia-UTIC-Riabilitazione Cardiologica, Ospedale Masselli Mascia, Viale 2 Giugno, 71016 San Severo (FG), Italy.
E-mail address: drmelemarco@yahoo.it (M. Mele).

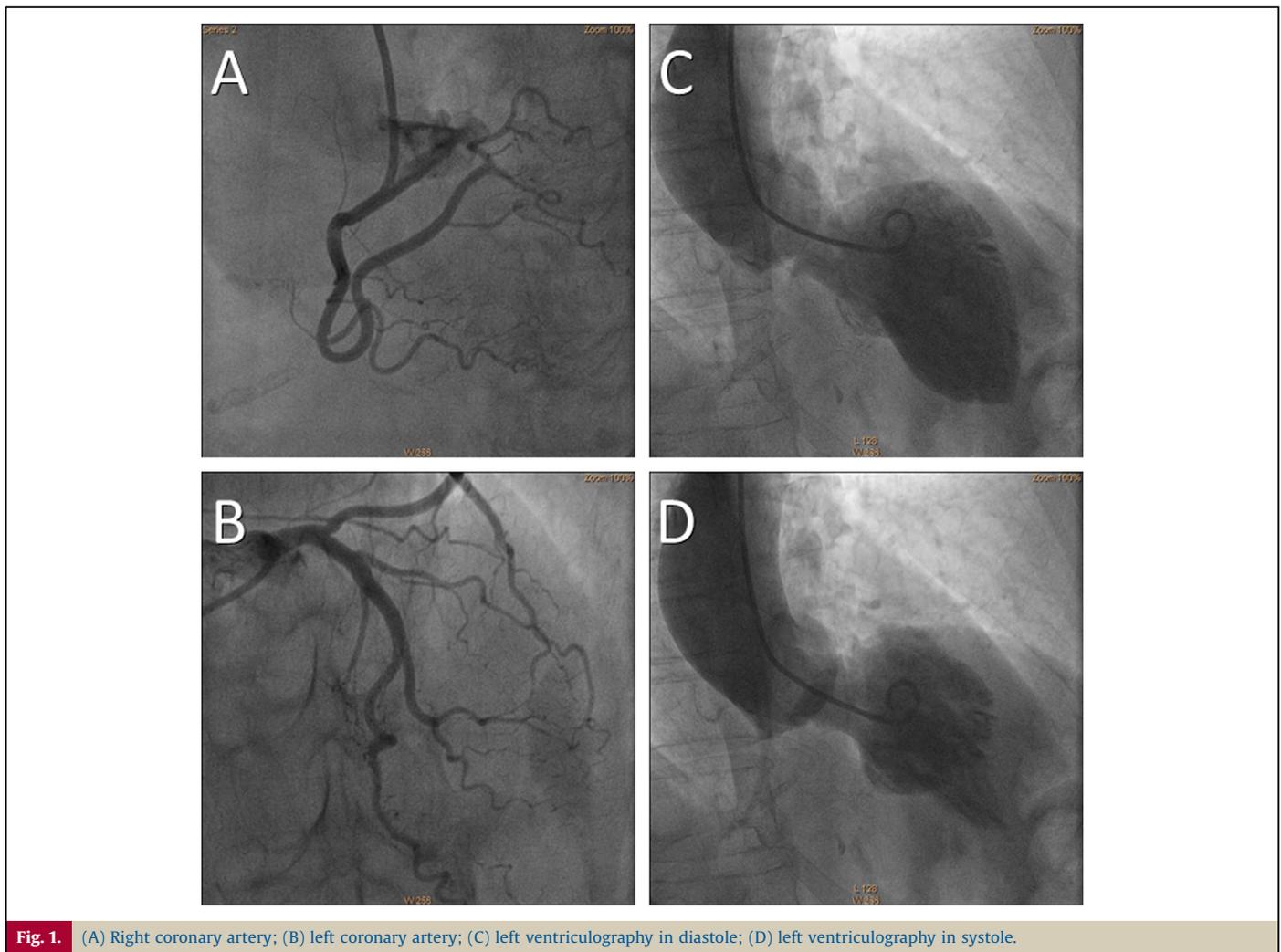


Fig. 1. (A) Right coronary artery; (B) left coronary artery; (C) left ventriculography in diastole; (D) left ventriculography in systole.

the serious neurological problems of the patient. The evening before the planned discharge the patient experienced breathlessness at rest with basal bilateral crepitations and hypotension. Echocardiography showed the regression of wall motion abnormalities, the LVOT obstruction (peak gradient 106 mmHg, mean gradient 57 mmHg) associated with a SAM and severe MR (Fig. 2A and B). We started treatment with plasma expanders to reduce afterload due to LVOT obstruction and subsequently with intravenous low-dose furosemide in order to reduce pulmonary congestion. After hemodynamic compensation we started bisoprolol 1.25 mg and furosemide 50 mg/die orally. The patient was discharged 5 days later with improved LVOT obstruction but persistent severe MR (Fig. 2C and D).

At 1-month follow-up echocardiogram revealed the complete regression of T wave inversion, severe MR, and LVOT obstruction.

Discussion

TTC is a transient systolic dysfunction not related to significant obstructive coronary artery disease involving usually the apex of the LV [1]. rTTC, a less frequent variant form of TTC, is characterized by akinesia/dyskinesia involving the basal and mid-ventricular segments rather than the apex [2,3]. TTC and rTTC probably represent the same disease that involves different parts of LV but several differences are described in the literature [4–6]. Patients with rTTC are usually younger and more frequently with an evident stressor in comparison with TTC patients [2,6]. An important

difference consists of the association with LVOT obstruction that is observed in about 20% of patients with TTC. In rTTC this complication has not been described and this may contribute to a lower incidence of dyspnea, hypotension, and need for hemodynamic support [4,5,7]. In patients with TTC several factors seem to contribute to LVOT obstruction. First, apical akinesia/dyskinesia is usually associated with a compensatory basal hypercontractility and alterations of the usual LV geometry leading to a “shrinking effect” on LVOT during mid and end-systole [8]. Moreover, Venturi effect and drag forces at LVOT level, causing a SAM of mitral anterior leaflet, are further subsidiary mechanisms contributing to LVOT obstruction [8]. A delayed onset of LVOT obstruction in the setting of TTC has been recently described. The mechanism seems to be largely linked to a pre-existing myocardial diseases as hypertrophic cardiomyopathy determining a permanent intraventricular obstruction [9]. In rTTC patients LVOT obstruction and SAM have not been described to date probably because the mid-basal akinesia/dyskinesia could account for more a “widening effect” than a “shrinking effect” on LVOT [5]. In the case described, at admission the patient with rTTC was hemodynamically stable and at first echocardiogram neither LVOT obstruction nor significant MR had been detected. These findings were confirmed at left ventriculography (Fig. 1C and D). A few days later the patient presented with hypotension and dyspnea related to a new onset severe MR and LVOT obstruction. We speculated that the rapid regression of basal akinesia, associated with high levels of circulating catecholamines, dehydration, and hypovole-

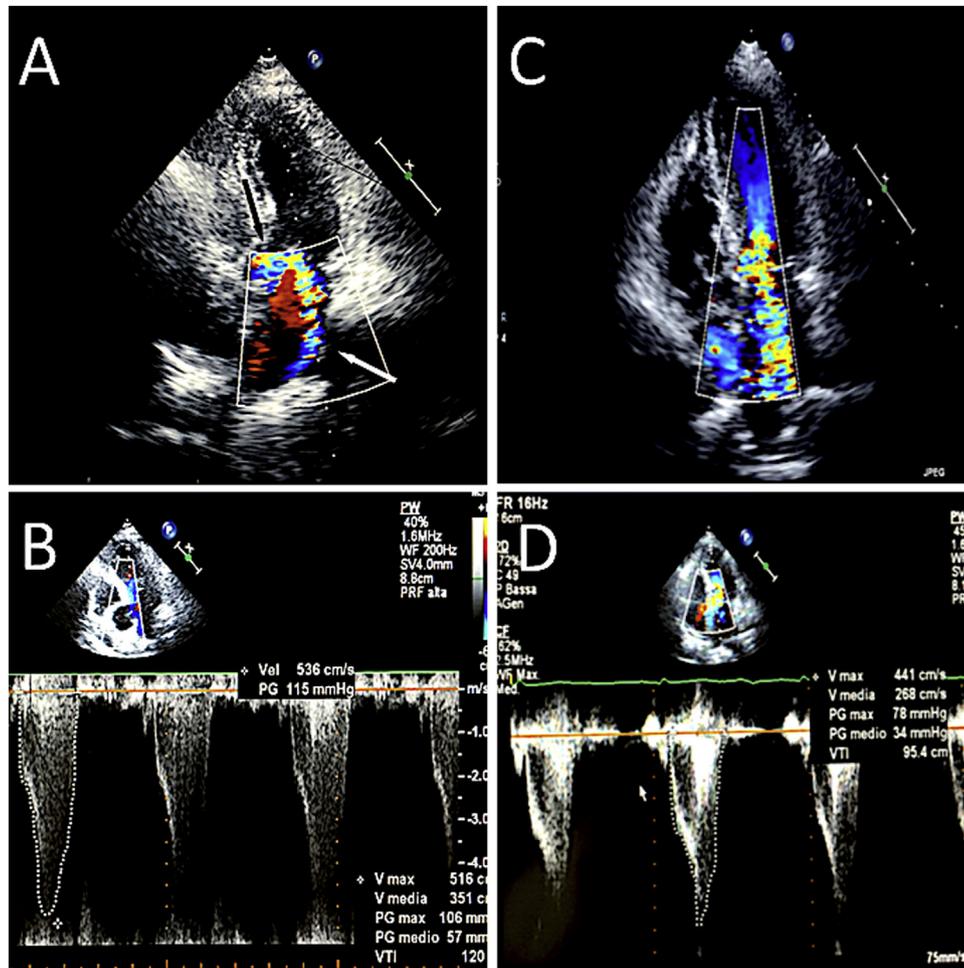


Fig. 2.

(A) Apical five-chamber echocardiogram view showing LVOT obstruction (black arrow) and severe MR (white arrow); (B) systolic gradient of LVOT evaluated with pulsed Doppler. (C) apical five-chamber echocardiogram view showing persistence of severe MR; interestingly, the change in direction of MR jet is evident, probably due to left ventricle geometric variations; (D) reduction in systolic gradient of LVOT evaluated with pulsed Doppler. LVOT, left ventricular outflow tract; MR, mitral regurgitation.

mia and absence of beta-blocker therapy, contributed to a “shrinking effect” on LVOT. On the other hand, it is known that a LVOT obstruction is possible also in patients with structurally normal hearts and this finding seems to be related to a catecholamine excess and hypovolemia [10]. However, in the case described the abrupt variation of geometry and segmental wall motion of left ventricle, that is observed in about 60% of rTTC patients within 4 days [2], appeared to be decisive for the development of LVOT obstruction, SAM, and severe MR. Similarly, the rapid and unpredictable geometric variations of LV could explain the persistence of severe MR in presence of an improved but persistent LVOT obstruction. This concept may be supported by the apparent change in direction of MR jet.

A limitation of this report is the lack of a crucial diagnostic tool as CMR but, if we consider the InterTAK Diagnostic Score for TTC, the probability of rTTC appears to be high [1]. Moreover, the absence of signs/symptoms of viral infection and the absence of significant pericardial effusion associated with both normal CRP make alternative diagnosis unlikely.

On these assumptions, LVOT obstruction associated with SAM in the setting of rTTC has not been described to date and could be considered a specific and reversible complication of this variant.

In general, the risk of delayed hemodynamic complications of TTC, as LVOT obstruction associated with SAM, may be under-

estimated. In the first 4 days after admission, when most patients with rTTC experience regression of LV dysfunction, close clinical and echocardiographic monitoring (with particular attention to intraventricular gradient, worsening of MR and LV geometric variations), fluid support, and early start of beta blocker therapy may prevent serious adverse events.

Conflict of interest

The authors declare that there is no conflict of interest.

References

- [1] Ghadri JR, Wittstein IS, Prasad A, Sharkey S, Dote K, Akashi YJ, et al. International expert consensus document on takotsubo syndrome (part I): clinical characteristics, diagnostic criteria, and pathophysiology. *Eur Heart J* 2018;39:2032–46.
- [2] Kumai T, Inamasu J, Watanabe E, Sugimoto K, Hirose Y. Differences between Takotsubo cardiomyopathy and reverse Takotsubo cardiomyopathy associated with subarachnoid hemorrhage. *Int J Cardiol Heart Vasc* 2016;11:99–103.
- [3] Tagami T, Mertens A, Rothschild D, Chowdhury P. A case of reverse takotsubo cardiomyopathy caused by an eating disorder. *J Cardiol Cases* 2016;15:77–9.
- [4] Ramaraj R, Movahed MR. Reverse or inverted takotsubo cardiomyopathy (reverse left ventricular apical ballooning syndrome) presents at a younger age compared with the mid or apical variant and is always associated with triggering stress. *Congest Heart Fail* 2010;16:284–6.

- [5] Song BG, Chun WJ, Park YH, Kang GH, Oh J, Lee SC, et al. The clinical characteristics, laboratory parameters, electrocardiographic, and echocardiographic findings of reverse or inverted takotsubo cardiomyopathy: comparison with mid or apical variant. *Clin Cardiol* 2011;34:693–9.
- [6] Patankar GR, Choi JW, Schussler JM. Reverse takotsubo cardiomyopathy: two case reports and review of the literature. *J Med Case Rep* 2013;7:84.
- [7] De Backer O, Debonnaire P, Gevaert S, Missault L, Gheeraert P, Muyltermans L. Prevalence, associated factors and management implications of left ventricular outflow tract obstruction in takotsubo cardiomyopathy: a two-year, two-center experience. *BMC Cardiovasc Disord* 2014;14:147.
- [8] Meuwese CL, Boulaksil M, van Dijk J, Polad J, Meijburg HW. Transient left ventricular outflow tract obstruction with systolic anterior motion of the mitral valve: a stunning cause. *Echocardiography* 2017;34:1089–91.
- [9] Yalta K, Yetkin E. Late-onset dynamic outflow tract gradient in the setting of tako-tsubo cardiomyopathy: an interesting phenomenon with potential implications? *Indian Heart J* 2017;69:328–30.
- [10] Yang JH, Park SW, Yang JH, Cho SW, Kim HS, Choi KA, et al. Dynamic left ventricular outflow tract obstruction without basal septal hypertrophy, caused by catecholamine therapy and volume depletion. *Korean J Intern Med* 2008;23:106–9.