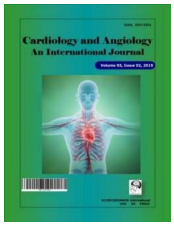

Cardiology and Angiology: An International Journal
5(3): 1-5, 2016, Article no.CA.27252
ISSN: 2347-520X, NLM ID: 101658392

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Anomalous Right Coronary Artery in Stress Cardiomyopathy: Coincidental or Contributory?

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Authors' contributions

This case study was conceived and completed by the concerted efforts of both authors. Both authors drafted the document, searched and confirmed the related literature associated with the clinical vignette and approved the final manuscript.

Article Information

DOI: 10.9734/CA/2016/27252
Editor(s):
(1) Francesco Pelliccia, Department of Heart and Great Vessels University La Sapienza, Rome, Italy.
(2) Gen-Min Lin, Division of Cardiology, Hualien-Armed Forces General Hospital, National Defense Medical Center, Taiwan.
Reviewers:
(1) Anonymous, Zurich University Hospital, Switzerland.
(2) Anonymous, Cleveland Clinic, Cleveland, OH 44195, USA.
(3) Mghaieth Zghal Fathia, University Hospital of la Rabta Tunis, University Tunis El Manar, Tunisia.
(4) Maddury Jyotsna, Nizam's Institute of Medical Sciences, Deemed University, India.
Complete Peer review History: http://sciencedomain.org/review-history/15167

Case Study

Received 25th May 2016
Accepted 21st June 2016
Published 25th June 2016

ABSTRACT

We report a case of a 72-year-old female with no known comorbidities who presented with dizziness and dyspnea while exercising on a treadmill. Upon presentation in the hospital, she became hemodynamically unstable with multiple episodes of retching and vomiting, eventually intubated for airway protection. Electrocardiogram revealed minimal ST elevation in the lateral leads which prompted performance of coronary angiography that revealed mild luminal irregularities but noted to have an anomalous right coronary artery. Left ventriculography demonstrated severe left ventricular dysfunction with apical ballooning. Echocardiogram showed dynamic left ventricular outflow obstruction with an ejection fraction of fifteen percent. The patient was aggressively managed including administration of inotropes, then gradually transitioned to cautious initiation of beta blockers, angiotensin converting enzyme inhibitor, and aldosterone antagonist. Transthoracic echocardiogram and cardiac magnetic resonance imaging two weeks later showed improved ejection fraction of forty to fifty five percent respectively. The patient denied syncope, angina, or exertional dyspnea on subsequent health maintenance evaluation.

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Keywords: Anomalous right coronary artery; stress cardiomyopathy; takotsubo cardiomyopathy; coronary angiography.

1. INTRODUCTION

Anomalous right coronary artery in stress cardiomyopathy is a rare anomaly often diagnosed by coronary angiography. It has not been described frequently in literature though it might have an associative effect to the occurrence of stress cardiomyopathy. On the other hand, it might just be an incidental finding with no correlation to the development of the syndrome.

2. CASE PRESENTATION

A 72-year-old female with no known medical comorbidities nor previous surgeries, noncontributory family profile, and unremarkable social history presented to the hospital because of acute onset of dizziness and dyspnea. She has active lifestyle described as independence in the performance of activities of daily living and participation in regular exercise regimen. At times, she is preoccupied on household concerns that easily makes her angry and frustrated on family issues at home.

On the day of admission, while she was exercising in a treadmill, she felt very dizzy and immediately stopped walking and lay herself on the floor. She denied chest pain, palpitations, or dyspnea. She was brought to the emergency room due to the persistence of dizziness. She was found to have systolic blood pressure in the 60`s mmHg. She was coherent and communicative and in mild respiratory distress. Cardiopulmonary evaluation did not reveal any wheezes, crackles, gallops, or murmurs. An electrocardiogram was performed which showed normal sinus rhythm with mobitz I atrioventricular block, minimal ST elevations in I and aVL, and frequent premature ventricular contractions (Fig. 1E). Chest radiograph showed normal cardiomediastinal silhouette with mild pulmonary congestion. Troponin was 0.2 ng/ml which peaked at 14.2 ng/ml while CKMB was 2.7 ng/ml which peaked at 24.7 ng/ml. Her blood pressure had been labile and unstable and did not respond to fluid resuscitation, eventually, started on pressor support. She continued to feel poorly and was retching and vomiting intermittently which prompted the decision to intubate her for airway protection. Patient subsequently underwent coronary angiography in the setting of abnormal electrocardiographic findings, hemodynamic instability, and impending respiratory failure.

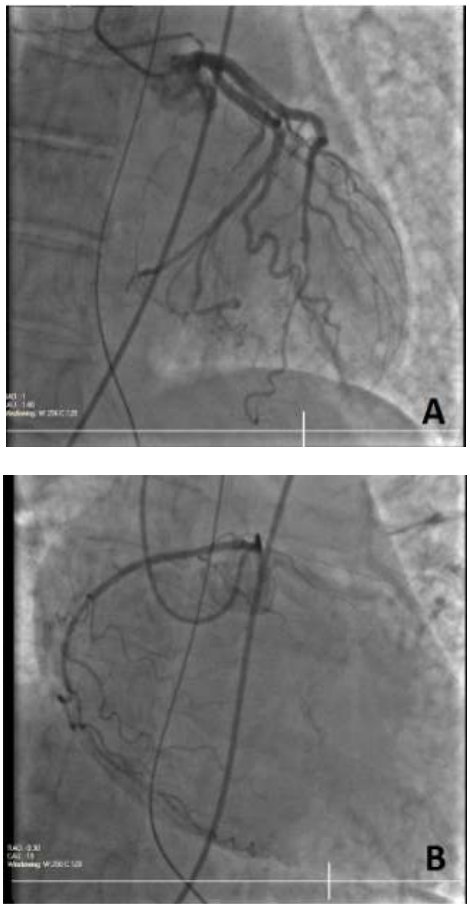

Fig. 1A. Coronary angiogram showing the left coronary system revealing a large caliber left anterior descending and a left circumflex arteries with luminal irregularities
B. Coronary angiogram demonstrating anomalous right coronary artery arising from left coronary cusps, compressed proximally between the great vessels and giving off small right ventricular branches

Coronary angiography was uneventful and did not show coronary obstructive lesions though with mild luminal irregularities but with an interestingly noted anomalous right coronary artery with its ostium near the left main ostium and runs an interarterial course with significant compression between the great vessels to supply a moderate-sized dominant right coronary artery (Figs. 1A and B). Left

ventriculography exhibited severe left ventricular dysfunction with hypercontractile basal segments with apical ballooning consistent with stress cardiomyopathy (Fig. 1C). Transthoracic echocardiogram showed severe segmental left ventricular systolic dysfunction, hyperdynamic basal segments, akinetic remaining myocardial segments, significant systolic anterior motion with dynamic left outflow tract obstruction, and an ejection fraction of fifteen percent (Fig. 1D).

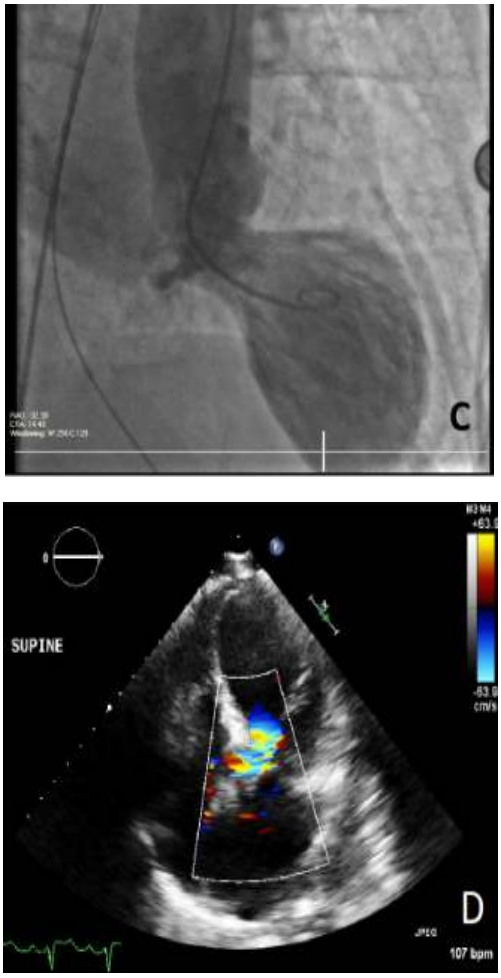

Fig. 1C. Left venticulography exhibiting significant apical ballooning with hypercontractile basal segments
D. Transthoracic echocardiogram displaying dynamic left ventricular outflow tract obstruction

During her course, she was initiated on neosynephrine for pressure support and for the left ventricle outflow tract obstruction which improved her hemodynamics and was eventually extubated. Then, she was cautiously started on beta blocker, an angiotensin converting enzyme inhibitor, and an aldosterone antagonist. A repeat transthoracic echocardiogram two weeks later showed improved ejection fraction of forty percent. Cardiac magnetic resonance imaging revealed an ejection fraction of fifty five percent. On subsequent evaluation, she denied syncope, angina, or exertional dyspnea.

3. DISCUSSION

Stress cardiomyopathy, also known as takotsubo cardiomyopathy, broken heart syndrome, stress-induced cardiomyopathy, and apical ballooning syndrome is characterized by a reversible ventricular contractile dysfunction abnormalities involving the left ventricular apex and mid-ventricle without evidence of angiographic coronary obstruction [1,2]. The usual presentation of stress cardiomyopathy is an acute-onset left ventricular dysfunction following a physical or emotional stress [3] which is eighty nine percent more common in women than men and occurs predominantly in older adults with mean age of sixty six years [4]. The hypothesized mechanism of the pathogenesis of takotsubo syndrome includes myocardial stunning attributed to transient multivessel coronary vasospasm, a microvascular involvement or an endogenous catecholamine toxicity [5].

Our clinical vignette on stress cardiomyopathy with an anomalous right coronary artery is unusual which may be a coincidental finding or a contributory factor to the occurrence of the syndrome. A right coronary artery originating from the left coronary sinus is a rare condition with an incidence of 0.03-0.05 to 0.10-0.17% [6-8]. It is a component of congenital coronary artery anomalies which are uncommon however maybe associated with life-threatening sequela [9] since it has been linked with myocardial ischemia due to coronary spasm at the tunneled segment in the myocardial bridge [10,11] as well as compression of the anomalous right coronary artery as it courses between the pulmonary artery and the aorta [12] which could be an exercise induced vasospasm in normal coronary arteries [13]. It has been reported that right coronary artery vasospasm lead to takotsubo cardiomyopathy and intraventricular obstruction [14]. These mechanisms in effect cause direct myocardial injury as described in stress cardiomyopathy.

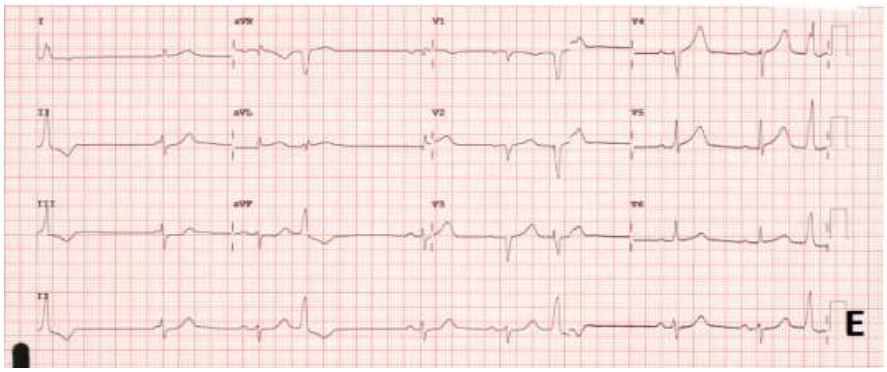

Fig. 1E. 12 lead electrocardiogram on presentation showing normal sinus rhythm with mobitz I, minimal ST elevations in I and aVL, and frequent premature ventricular contractions

Committing the diagnosis of stress cardiomyopathy with right coronary anomaly is challenging. Investigatory modalities which includes echocardiography and coronary angiography with ventriculography are essential to identify peculiar left ventricular (LV) morphology with the typical form characterized by LV apical ballooning with hypercontractility of the basal segments [15]. Though the anomalous coronary vessels will be evident in coronary angiography, coronary computed tomography angiography (CTA) will demonstrate accurately the anatomical course of the anomalous vessel [16], thus is a Class I recommendation for initial screening of congenital coronary anomalies of ectopic origin [17].

Stress cardiomyopathy management is analogous to acute coronary syndrome. Beta blockers will modulate the adrenergic stimulation for the management of stress cardiomyopathy and the anomalous coronary vessels [18]. Conservative treatment strategies can be considered for lone right anomalous coronary artery from the opposite sinus (ACAOS) in adults unless definitive signs of myocardial ischemia are evident [19]. The hemodynamic consequences and the predisposition to sudden cardiac death with an incidence of 25-40% [20] favor surgical approach in cases of congenital coronary artery anomalies [21] which includes coronary artery bypass grafting, coronary ostia reimplantation, and the more preferred coronary artery unroofing [22].

Additional investigatory studies needs to be conducted to validate the associative contributory effect of anomalous right coronary artery in the occurrence of stress induced cardiomyopathy, otherwise, it remains to be just coincidental.

4. CONCLUSION

Stress cardiomyopathy with anomalous right coronary artery is an infrequent dual phenomenon that merits further investigation in order to improve our understanding and thus institute optimal management.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/15167