Case Report

Takotsubo Cardiomyopathy and Canalith Repositioning Procedure for Benign Paroxysmal Positional Vertigo

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Abstract

Background: Takotsubo cardiomyopathy, also known as left ventricular apical ballooning syndrome, ampulla cardiomyopathy, or transient left ventricular dysfunction is characterized by chest pain, electrocardiographic changes, transient left ventricular apical aneurysm, and normal coronary arteries. Takotsubo is a round-bottomed, narrow-necked Japanese octopus trap and lends its name to takotsubo cardiomyopathy because of its resemblance to echocardiographic and ventricular angiographic images of the left ventricle in this condition. This appearance takes its source from peculiar, transient regional systolic dysfunction involving the left ventricular apex and mid-ventricle with hyperkinesis of the basal left ventricular segments. Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo caused by peripheral vestibular dysfunction. The symptoms of BPPV are attributed to intralabyrinthine particles, presumed displaced otoconia. Thus, the treatment recommended for BPPV is head repositioning maneuvers.

Purpose: To present the first takotsubo cardiomyopathy case in the English literature related to BPPV undergoing canalith repositioning procedure.

Conclusion: This report will provide additional information for physicians encountering acute-onset chest pain and vertigo. It will also expand the spectrum of clinical correlates of the increasingly well recognized but poorly understood syndrome, takotsubo cardiomyopathy.

Key Words: Benign paroxysmal positional vertigo, canalith repositioning procedure, complication, takotsubo cardiomyopathy, vertigo

Abbreviations: BPPV = benign paroxysmal positional vertigo

Takotsubo cardiomyopathy, also known as left ventricular apical ballooning syndrome, ampulla cardiomyopathy, or transient left ventricular dysfunction, is characterized by peculiar, transient regional systolic dysfunction involving the left ventricular apex and midventricle with hyperkinesis of the basal left ventricular segments. Takotsubo cardiomyopathy was first described in 1991 by Dote and colleagues (1991) in Japan and named takotsubo-like left ventricular dysfunction because of the resemblance of the left ventricle to the appearance of a round-bottomed, narrow-necked Japanese octopus trap on echocardiogram. Patients with takotsubo cardiomyopathy usually present with sudden-onset chest pain associated with ST segment elevation in the anterior electrocardiographic leads (V1–V4), relatively
Benign paroxysmal positional vertigo (BPPV) is the most common cause of vertigo caused by peripheral vestibular dysfunction (Froehling et al., 2000). The symptoms of BPPV are attributed to intralabyrinthine particles, presumed displaced otoconia (Schuknecht, 1969). Thus, the treatment recommended for BPPV is head repositioning maneuvers that were introduced by Semont (Semont et al., 1988) and modified by Epley (1992). These maneuvers include rotational head and body movements in order to relocate the floating particles from the involved semicircular canal into the vestibule of the labyrinth. The repositioning therapies might be repeated in recurrent or refractory cases.

We present the first case with takotsubo cardiomyopathy in the English literature that was triggered by canalith repositioning procedures (Bybee et al., 2004b).

Takotsubo cardiomyopathy was first recognized and described in the Japanese population (Dote et al., 1991; Kawai et al., 2000; Tsuchihashi et al., 2001; Kurisu et al, 2002) as being characterized by chest pain, electrocardiographic changes, transient left ventricular apical aneurysm, and normal coronary arteries. Typical presentation is usually in postmenopausal women.
experiencing an inciting stressful event. In 2004, Bybee and colleagues (2004b) proposed Mayo criteria for diagnosis of this syndrome (Table 1). Most takotsubo cardiomyopathy cases present with acute-onset chest pain, and initial work-up reveals electrocardiographic changes such as ST segment elevation followed by T wave inversions and QT prolongation and a mild but rapid increase in cardiac enzymes (Bybee et al, 2004b). The diagnosis of takotsubo cardiomyopathy is made by the absence of significant epicardial coronary artery stenosis despite the presence of transient apical and left midventricular systolic dysfunction. Case reports suggest that the vast majority of patients are women older than 60 yr of age presenting with sudden-onset chest pain after an episode of acute emotional or physiological stress (Bybee et al, 2004b). Reversibility of the left ventricular dysfunction is a hallmark of the syndrome (Akashi et al, 2003a).

Our patient was a 76-yr-old woman referred to the emergency department with acute-onset chest pain immediately after undergoing a canalith repositioning procedure for BPPV. Her clinical presentation and subsequent course were entirely consistent with takotsubo cardiomyopathy. The incidence of takotsubo cardiomyopathy within patients diagnosed with acute myocardial infarction has been reported to be from 1.5 to 2.2% (Akashi et al, 2003a; Bybee et al, 2004a). Although the exact cause of takotsubo cardiomyopathy remains unknown, many theories about the underlying mechanisms have been proposed. Among these are abnormal fatty acid metabolism in the apex, coronary microcirculatory dysfunction, increased catecholamine in response to stress inducing myocardial dysfunction, and diffuse epicardial spasm. However, neurogenic myocardial stunning is the leading candidate mechanism (Bybee et al, 2004b; Brenner and Powers, 2008). It is not known

**Figure 1.** Echocardiographic apical four-chamber view at presentation. A. End-diastolic frame reveals normal left ventricular size and contour. B. End systolic frame reveals apical dyskinesis and typical “tako-tsubo” configuration caused by basal hyperkinesis (arrows) and apical akinesis/dyskinesis (arrow heads).

**Figure 2.** Echocardiographic apical four-chamber view at follow-up, four months later. A. End-diastolic frame reveals normal left ventricular size and contour. B. End systolic frame reveals normal regional and global systolic function with resolution of the apical dyskinesis.
why the apex of the heart is affected while the basal segments are spared. However, it may partly be explained by increased adrenergic receptor density, increased sympathetic innervation, or increased adrenergic sensitivity in the apical myocardium (Mori et al, 1993). The explanation for the strong female predominance of the syndrome is also still unclear; however, it is speculated to be related to reduced postmenopausal estrogen levels leading to alterations of endothelial function (Celemajer et al, 1994) and catecholamine-mediated microvascular reaction (Ueyama et al, 2003).

Japanese physicians identified that the predominant and significant factor present in all cases of takotsubo cardiomyopathy is internal (emotional) or external (physiological) stress. They found that the death or funeral of a family member, argument with a spouse or partner, or intense excitation as well as medical disorders such as acute asthma and noncardiac medical procedures are common presenting events (Park et al, 2005). In our patient, the precipitating factor was the canalith repositioning procedure applied for her existing BPPV. It was noted that the patient was anxious that day because of her persisting symptoms despite repetitive canalith repositioning procedures. She expressed skepticism that canalith repositioning would really help. Presumably this emotional stress or the physiologic and/or psychological stress induced by her adverse response to the maneuver triggered the onset of takotsubo cardiomyopathy at that particular session: despite the fact that she had undergone repetitive canalith repositioning procedures previously without complications.

Appropriate management of takotsubo cardiomyopathy is supportive medical care with angiotensin converting enzyme inhibitor and beta-blockade, aspirin, and intravenous diuretics as needed. Treatment should be continued until left ventricular function returns to normal on echocardiogram (Bybee et al, 2004b; Sealove et al, 2008). Anticoagulation is generally deferred unless apical thrombi are detected on imaging studies or embolic events are suspected.

The short-term and long-term prognosis of patients with takotsubo cardiomyopathy is quite favorable (Sealove et al, 2008). However, reported in-hospital mortality rates range from 0 to 8% (Bybee et al, 2004b). The most frequently reported complication is left-sided heart failure with or without pulmonary edema (Bybee et al, 2004b). Infrequently reported complications include cardiogenic shock, ventricular arrhythmias, left ventricular thrombus, mitral valve dysfunction, pulmonary embolism, and left ventricular rupture (Tsuchihashi et al, 2001; Bybee et al, 2004b). Our patient did not have any immediate or late cardiac complications; at postevent fourth-month follow-up, the patient was asymptomatic, and echocardiogram revealed no abnormality except some mild mitral regurgitation.

The misdiagnosis of takotsubo cardiomyopathy as an acute myocardial infarction may result in unnecessary administration of fibrinolytic medications, with their attendant risk of bleeding complications. It is important for emergency physicians as well as cardiologists to recognize a suggestive clinical history of takotsubo cardiomyopathy, especially in elderly female patients, so that these patients may be referred for emergent coronary angiography, which offers optimal triage and management. However, if an emergency coronary angiogram cannot be obtained, patients should be treated with standard acute myocardial infarction therapy.

To our knowledge this is the first takotsubo cardiomyopathy case in the English literature related to BPPV undergoing canalith repositioning procedure. We believe that this report will provide additional information for physicians encountering acute-onset chest pain and vertigo. It will also expand the spectrum of clinical correlates of the increasingly well-recognized but poorly understood syndrome, takotsubo cardiomyopathy.

### REFERENCES


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