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CLINICAL VIGNETTE

A Classic Case of Takotsubo Cardiomyopathy

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Clinical Presentation

An 81-year-old female with hypertension was admitted with chest pain. Her chest pain was severe, pressure-like, and located in the middle of her chest with no radiation. There were no other associated symptoms. She reports increased stress the day of admission as her critically ill husband was discharged from the hospital earlier that day. She felt extremely anxious about caring for him at home. In the ER, she was hypertensive with BP of 190/111. There were no clinical signs of heart failure or shock on her physical exam. Her EKG showed normal sinus rhythm with Q waves in the anterior leads, deep T wave inversions in the anterolateral leads, and left ventricular hypertrophy (Figure 1). Her troponins were initially 0.1 and increased to 1.8, then 1.7 during her inpatient stay. A 2D echocardiogram showed systolic function was at the lower limits of normal with ejection fraction estimated at 50 %. There was moderate diffuse hypokinesis with distinct regional wall motion abnormalities. The entire mid-distal myocardial region was hypokinetic with the appearance of apical ballooning.

Given the findings and diagnosis of NSTEMI (non ST Elevation myocardial infarction), a coronary angiogram was performed to rule out obstructive coronary artery disease (CAD). Selective coronary angiography showed non-obstructive CAD in the left and right coronary system. (Figures 2a and 2b). A left ventriculogram showed ejection fraction of about 60% with hypokinesis of the entire mid-to-distal segments of the myocardium with a takotsubo type appearance (Figure 3).

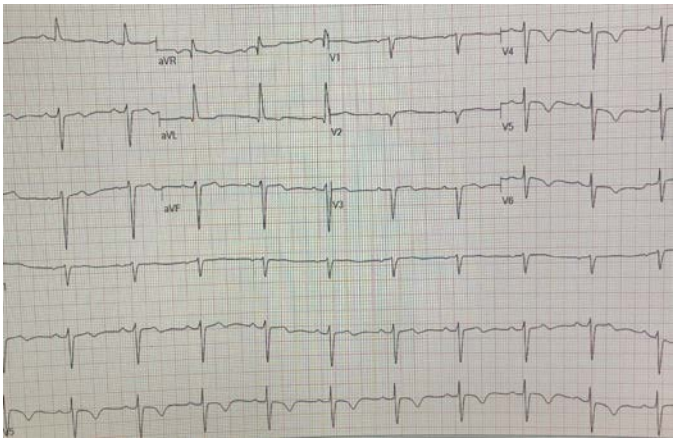

Figure 1

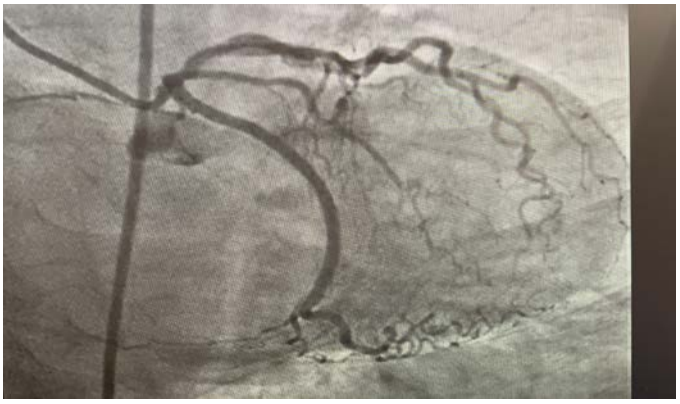
Figure 2a

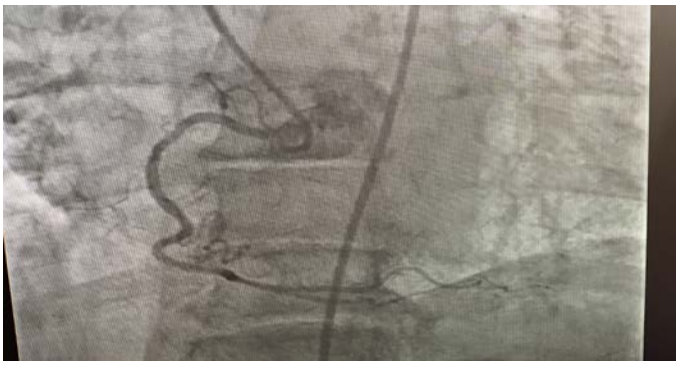
Figure 2b

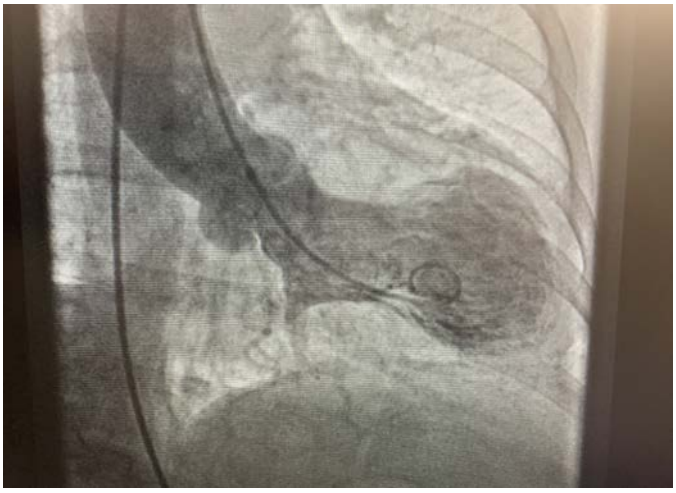
Figure 3

Discussion

Tako-tsubo cardiomyopathy (TTC) is also known as stress cardiomyopathy, broken heart syndrome, or apical ballooning syndrome. It was first described in Japan in 1990.[1] The term "takotsubo" originates from the name of an octopus trap, which is similar shape to the left ventricular systolic apical ballooning seen in this condition. The syndrome is characterized by transient regional systolic dysfunction of the left ventricle in the absence of obstructive coronary artery disease or acute plaque rupture on cardiac catheterization. The prevalence of TTC has been estimated in 1.2% of troponin-positive acute coronary syndrome presentations.[2] TTC is much more common in women, and in older ages. A report of even published series reported, women accounted for 80-100% of TTC cases with a mean age ranging from 61 to 76 years old.[3]

The pathogenesis of TTC is not yet clearly understood but suggested mechanisms include catecholamine surge,[4] microvascular dysfunction, and coronary artery spasm. It is known that physical or emotional stress is associated with TTC and it is postulated that the mechanism may be due to myocardial stunning caused by catecholamine-induced microvascular spasm or dysfunction.[5] Coronary angiography is necessary to rule out obstructive coronary artery disease, and in TTC, no obstructive lesions are found. A minority of patients will demonstrate coronary spasm with an acetylcholine challenge in the cardiac catheterization laboratory.[6]

TTC is frequently triggered by an intense emotional or physical stress such as the death of a loved one, domestic abuse, learning of a catastrophic medical illness, natural disasters, or a significant acute illness.[7] In the International Takotsubo Registry study, 36% had a physical trigger, 27.7% had an emotional trigger, and 7.8% had both physical and emotional triggers.[8] Our patient had both the emotional trigger of the stress of her very ill husband discharged from the hospital as well as the physical stress of hypertensive urgency, which could have been related to the emotional stressor.

The International Takotsubo Registry reported the most common presenting symptoms of TTC were chest pain (75/9%), dyspnea (46/9%), and syncope (7.7%). Approximately 10% of TTC patients develop cardiogenic shock. EKG abnormalities are frequent with ST elevations in 43.7%, ST depressions in 7.7%.[8] The registry also showed most patients with TTC had elevated serum troponin levels, with the median troponin >7 times the upper limit of normal. Of note, CK levels were usually not elevated.

Clinical suspicion for TTC is necessary when evaluating a patient with symptoms consistent with acute coronary syndrome, abnormal EKG, and elevated cardiac biomarkers, particularly if they have an emotional or physical trigger. Although this is not necessary. According to the Mayo Clinic diagnostic criteria, all 4 of the following criteria are required for diagnosis:[9]

1. Transient left ventricular systolic dysfunction, which are typically regional and cannot be explained by a single epicardial coronary distribution. Systolic apical ballooning accounted for 81% of wall motion abnormalities seen in the International Registry. The second most common (14.6%) was ventricular hypokinesis only in the mid-ventricle with sparing of the apex. Other variants include basal hypokinesis (2.2%) and focal type (1.5%) and very rarely global hypokinesis.[10]
2. No evidence of obstructive coronary artery disease or plaque rupture that can explain the wall motion abnormalities.
3. New EKG abnormalities OR troponin elevation.
4. Absence of pheochromocytoma or myocarditis. Myocarditis, if suspected based on pattern of wall motion abnormalities, can be evaluated by cardiac MRI. Pheochromocytoma should be suspected in patients with classic symptoms such as headache, sweating, and tachycardia.[11]

These criteria clearly requires EKG, troponin, angiography, and serial assessment of LV function. Our patient met all these criteria. Her left ventriculogram demonstrated the classic wall motion abnormalities which resolved on outpatient echocardiogram the following month. Our patient had mild coronary artery disease, and TTC patients generally have either normal vessels or mild to moderate atherosclerosis. Obstructive coronary artery disease (CAD) is seen in some TTC patients and likely is reflective of the overall prevalence of CAD in the population that is at risk for TTC.[12]

Management of TTC is generally supportive as it is a transient disorder. However, 5-10% of TTC patients develop cardiogenic shock.[13] Risk factors for development of shock include younger age, lower ejection fraction, and a physical rather than emotional trigger. Mortality rates in patients with shock are lower for those who have TTC compared to acute MI (15% vs 37%) but are 10-fold higher than for TTC patients without shock.[14]

Patients with acute heart failure are managed as usual with supplemental oxygen and diuretics, as there are no specific guidelines for an optimal medication regimen in TTC.[15] Beta-blockers and angiotensin converting enzyme (ACE) inhibitors are used for patients with reduced ejection fraction.

Most patients with TTC recover. However, the risk of in-hospital complications is similar to that for acute coronary syndromes (ACS). The International Registry reports, the composite occurrence of pressor requirement, cardiogenic shock, ventilator use need for cardiopulmonary resuscitation, and death was 19.1% in TTC patients versus 19.3% in a control group of ACS patients. Overall, in-hospital mortality has ranged from 0-8% with a 4.1% mortality rate in the International Registry.[8]

REFERENCES

1. **Dote K, Sato H, Tateishi H, Uchida T, Ishihara M**. [Myocardial stunning due to simultaneous multivessel coronary spasms: a review of 5 cases]. *J Cardiol*. 1991;21(2):203-14. Japanese. PMID: 1841907.
2. **Kurowski V, Kaiser A, von Hof K, Killermann DP, Mayer B, Hartmann F, Schunkert H, Radke PW**. Apical and midventricular transient left ventricular dysfunction syndrome (tako-tsubo cardiomyopathy): frequency, mechanisms, and prognosis. *Chest*. 2007 Sep;132(3):809-16. doi: 10.1378/chest.07-0608. Epub 2007 Jun 15. PMID: 17573507.
3. **Akashi YJ, Goldstein DS, Barbaro G, Ueyama T**. Takotsubo cardiomyopathy: a new form of acute, reversible heart failure. *Circulation*. 2008 Dec 16;118(25):2754-62. doi: 10.1161/CIRCULATIONAHA.108.767012. PMID: 19106400; PMCID: PMC4893309.
4. **Paur H, Wright PT, Sikkel MB, Tranter MH, Mansfield C, O'Gara P, Stuckey DJ, Nikolaev VO, Diakonov I, Pannell L, Gong H, Sun H, Peters NS, Petrou M, Zheng Z, Gorelik J, Lyon AR, Harding SE**. High levels of circulating epinephrine trigger apical cardiodepression in a β2-adrenergic receptor/Gi-dependent manner: a new model of Takotsubo cardiomyopathy. *Circulation*. 2012 Aug 7;126(6):697-706. doi: 10.1161/CIRCULATIONAHA.112.111591. Epub 2012 Jun 25. PMID: 22732314; PMCID: PMC4890655.
5. **Gianni M, Dentali F, Grandi AM, Sumner G, Hiralal R, Lonn E**. Apical ballooning syndrome or takotsubo cardiomyopathy: a systematic review. *Eur Heart J*. 2006 Jul;27(13):1523-9. doi: 10.1093/eurheartj/ehl032. Epub 2006 May 23. PMID: 16720686.
6. **Tsuchihashi K, Ueshima K, Uchida T, Oh-mura N, Kimura K, Owa M, Yoshiyama M, Miyazaki S, Haze K, Ogawa H, Honda T, Hase M, Kai R, Morii I; Angina Pectoris-Myocardial Infarction Investigations in Japan**. Transient left ventricular apical ballooning without coronary artery stenosis: a novel heart syndrome mimicking acute myocardial infarction. Angina Pectoris-Myocardial Infarction Investigations in Japan. *J Am Coll Cardiol*. 2001 Jul;38(1):11-8. doi:10.1016/s0735-1097(01)01316-x. PMID: 11451258.
7. **Abe Y, Kondo M, Matsuoka R, Araki M, Dohyama K, Tanio H**. Assessment of clinical features in transient left ventricular apical ballooning. *J Am Coll Cardiol*. 2003 Mar 5;41(5):737-42. doi: 10.1016/s0735-1097(02)02925-x. PMID: 12628715.
8. **Templin C, Ghadri JR, Diekmann J, Napp LC, Bataiosu DR, Jaguszewski M, Cammann VL, Sarcon A, Geyer V, Neumann CA, Seifert B, Hellermann J, Schwyzer M, Eisenhardt K, Jenewein J, Franke J, Katus HA, Burgdorf C, Schunkert H, Moeller C, Thiele H, Bauersachs J, Tschöpe C, Schultheiss HP, Laney CA, Rajan L, Michels G, Pfister R, Ukena C, Böhm M, Erbel R, Cuneo A, Kuck KH, Jacobshagen C, Hasenfuss G, Karakas M, Koenig W, Rottbauer W, Said SM, Braun-Dullaeus RC, Cuculi F, Banning A, Fischer TA, Vasankari T, Airaksinen KE, Fijalkowski M, Rynkiewicz A, Pawlak M, Opolski G, Dworakowski R, MacCarthy P, Kaiser C, Osswald S, Galiuto L, Crea F, Dichtl W, Franz WM, Empen K, Felix SB, Delmas C, Lairez O, Erne P, Bax JJ, Ford I, Ruschitzka F, Prasad A, Lüscher TF**. Clinical Features and Outcomes of Takotsubo (Stress) Cardiomyopathy. *N Engl J Med*. 2015 Sep 3;373(10):929-38. doi: 10.1056/NEJMoa1406761. PMID: 26332547.
9. **Bybee KA, Kara T, Prasad A, Lerman A, Barsness GW, Wright RS, Rihal CS.** Systematic review: transient left ventricular apical ballooning: a syndrome that mimics ST-segment elevation myocardial infarction. *Ann Intern Med*. 2004 Dec 7;141(11):858-65. doi: 10.7326/0003-4819-141-11-200412070-00010. PMID: 15583228.
10. **Eitel I, von Knobelsdorff-Brenkenhoff F, Bernhardt P, Carbone I, Muellerleile K, Aldrovandi A, Francone M, Desch S, Gutberlet M, Strohm O, Schuler G, Schulz-Menger J, Thiele H, Friedrich MG**. Clinical characteristics and cardiovascular magnetic resonance findings in stress (takotsubo) cardiomyopathy. *JAMA*. 2011 Jul 20;306(3):277-86. doi: 10.1001/jama.2011.992. PMID: 21771988.
11. **Dastidar AG, Frontera A, Palazzuoli A, Bucciarelli-Ducci C**. TakoTsubo cardiomyopathy: unravelling the malignant consequences of a benign disease with cardiac magnetic resonance. *Heart Fail Rev*. 2015 Jul;20(4):415-21. doi: 10.1007/s10741-015-9489-4. PMID: 25896529; PMCID: PMC4464602.
12. **Reeder GS, Prasad A.** Clinical manifestations and diagnosis of stress (takotsubo) cardiomyopathy. *UpToDate*. Retrieved 12/2020 from https://www.uptodate.com/contents/clinical-manifestations-and-diagnosis-of-stress-takotsubo-cardiomyopathy
13. **Vallabhajosyula S, Barsness GW, Herrmann J, Anavekar NS, Gulati R, Prasad A.** Comparison of Complications and In-Hospital Mortality in Takotsubo (Apical Ballooning/Stress) Cardiomyopathy Versus Acute Myocardial Infarction. *Am J Cardiol*. 2020 Oct 1;132:29-35. doi: 10.1016/j.amjcard.2020.07.015. Epub 2020 Jul 13. PMID: 32762963.
14. **Di Vece D, Citro R, Cammann VL, Kato K, Gili S, Szawan KA, Micek J, Jurisic S, Ding KJ, Bacchi B, Schwyzer M, Candreva A, Bossone E, D'Ascenzo F, Sarcon A, Franke J, Napp LC, Jaguszewski M, Noutsias M, Münzel T, Knorr M, Heiner S, Katus HA, Burgdorf C, Schunkert H, Thiele H, Bauersachs J, Tschöpe C, Pieske BM, Rajan L, Michels G, Pfister R, Cuneo A, Jacobshagen C, Hasenfuβ G, Karakas M, Koenig W, Rottbauer W, Said SM, Braun-Dullaeus RC, Banning A, Cuculi F, Kobza R, Fischer TA, Vasankari T, Airaksinen KEJ, Opolski G, Dworakowski R, MacCarthy P, Kaiser C, Osswald S, Galiuto L, Crea F, Dichtl W, Empen K, Felix SB, Delmas C, Lairez O, El-Battrawy I, Akin I, Borggrefe M, Gilyarova E, Shilova A, Gilyarov M, Horowitz J, Kozel M, Tousek P,**

Widimský P, Winchester DE, Ukena C, Di Mario C, Prasad A, Böhm M, Bax JJ, Lüscher TF, Ruschitzka F, Ghadri JR, Templin C. Outcomes Associated With Cardiogenic Shock in Takotsubo Syndrome. *Circulation*. 2019 Jan 15;139(3):413-415. doi: 10.1161/CIRCULATIONAHA.118.036164. PMID: 30586690.

15. **Reeder GS, Prasad A** Management and prognosis of stress (takotsubo) cardiomyopathy. *UpToDate* Retrieved 12/2020 from https://www.uptodate.com/contents/management-and-prognosis-of-stress-takotsubo-cardiomyopathy