Broken Heart Syndrome: A Case of Reverse Takotsubo Cardiomyopathy and Coronary Anomaly Induced by a Spinal Arteriovenous Malformation

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Purpose

Though extensive protocols exist for addressing cardiomyopathies, reverse takotsubo cardiomyopathy presents in a unique manner through its connection with clinical physiology and neurological disease. Understanding this variant of the already interesting takotsubo cardiomyopathy along with its clinical presentation, distinct imaging, and neurological linkage, is vital in proposing further study into heart diseases. Osteopathic considerations to aid in the treatment of patients presenting with chest pain are also discussed as well as the uniqueness of the patient presentation.

Case Presentation

24-year-old white male with no known past medical history presented to the emergency room with chest pain. Reportedly, the patient was lifting a heavy piece of equipment when he developed chest pain. EKG results supported that he was suffering from an ST elevation myocardial infarction and a complete heart block. Upon left ventricular angiography, classic wall motion abnormalities of Reverse Takotsubo syndrome were noted. Also, upon coronary angiography, an anomalous obtuse marginal branch originating directly from the aortic root was discovered. The wall motion abnormalities were confirmed on echocardiography. Later, the patient complained of being unable to move their extremities. An MRI of the spine revealed an arteriovenous malformation with hemothorax.

Background

Reverse Takotsubo Cardiomyopathy (RTC)

(RTC) is an uncommon variant of stress-induced cardiomyopathy. The condition is characterized by a stress-induced hypocoagulability localized to the basal left ventricle. This acute and reversible dysfunction is highlighted by acute chest pain which can mimic acute cardiac syndrome. Following a stressful episode, the left ventricle develops wall motion abnormalities leading to chest pain and heart failure. Particularly, in RTC, the basal segments of the ventricle fail to contract appropriately. Moreover, these abnormalities may be present even in the absence of stress.

However, the RTC variant may also present with patients who are suffering from a neurological disorder.

Splan Arteriovenous Malformation (AVM)

AVMs occur when a group of blood vessels form incorrectly in the body. The arteries and veins are interlinked in such a way allowing them to bypass normal tissue. Many AVMs develop before or shortly after birth. Typically, there are no associated symptoms or presentation of signs in the AVM. Their discovery occurs only when they present for separate concerns or when they rupture. Sometimes, AVMs can decrease the amount of oxygen that is reaching the brain. Capsules do not exist within the malformed vessel network. Thus, the velocity of blood is never decreased to deliver oxygen and nutrients to parts of the body.

Diagnostic Testing

A patient presenting with an acute ST-elevation myocardial infarction (STEMI) may benefit from an initial protocol of thrombolytic treatment followed by angiographic therapy and revascularization. In this case, the following indications are made for The Five Models of Osteopathic Treatment.

1. Biomechanical: Identify dysfunctions along the affected T1-T5 cardiac segments and treat.
2. Neurological: Identify and treat cardiac viscerasomatic reflexes from T1-T5 on the left and right somatic reflexes located anteriorly on the left 2nd intercostal space near the sternal. Posteriorly, between the transverse processes of T2 and T3.
3. Respiratory/Circulatory: Identify and treat cardiovascular, right, and diaphragm allowing for an increase in blood and lymphatic circulation.
4. Behavioral: Counsel patient on exercise and diet to improve and maintain adequate cardiac health.
5. Metabolic: Blood oxygenation and workload on the heart will improve with heightened circulation and immune system function.

Discussion/Conclusion

This is a case of a young male patient presenting with reverse takotsubo cardiomyopathy, a rare presentation of an already rare condition. RTC usually presents with chest pain and dyspnea presented by an emotional or physical stressful event. Patients usually present with mild congestive heart failure and a decreased ejection fraction. EKG typically reports ST elevations as well as QT prolongation and inverted T waves. Many of these indications align with STElevation myocardial infarctions which the patient was immediately treated for. However, further complications developed upon arrival to the catheter lab. After becoming quadriplegic and losing the ability to speak, a spiral MRI portrayed the presence of an acute hematoma in the caudal spine which extended superiority from the thoracic spine. Further diagnostic imaging of the heart indicated hypokinesia of the basal segments of the left ventricle. Angiographic imaging was conducted and led to the discovery of a coronary anomaly (Figure 4C). The unique aspects of this case as well as the string of unfortunate events within the patient’s stay at the hospital prompts consideration into how further complications could have been prevented. Since RTC correlates with a previous stressful episode triggering a catecholamine surge, it is suspected that the dislodgement of the spiral AVM could lead to a similar response if not adequately managed in the patient. In addition, the release of catecholamines from the heart’s release of back muscles by the patient led to the hematoma observed on spiral MRI (Figure 3). The spread of blood within the spinal column led to sympathetically activated the body and the release of catecholamines to the heart. The presence of an anomalous coronary branch alongside the neurotransmitter toxicity sustained by the patient contributed to the hypokinesia of the heart. The apex of the left ventricle continued its contraction while the basal segment adopted a sustained dilation through subsequent cardiac cycles. Consequently, portraying significant EKG changes can be associated with a suspected acute myocardial infarction. A diagnosis of RTC can be managed with many different options. Beta blockers can be used to reduce the contractility of the affected myocardial segment. If the patient is at risk for further complications, prophylactic anticoagulation can be used. Magnesium sulfate can also be used for the QT prolongation observed on ECG. However, the patient’s condition was already considered in the presence of a neurological abnormality. Onset of symptoms precipitate the formation of a thrombus leading to possible myocardial infarction in RTC. Of note, being takotsubo cardiomyopathy as well as its reverse variant. Patients presenting in a similar manner should be considered for stress induced cardiomyopathies especially if the history is consistent with emotional and physical triggers before the onset of symptoms.

REFERENCES