Case Report

Takotsubo cardiomyopathy after microwave ablation of hepatocellular carcinoma

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A B S T R A C T

Takotsubo cardiomyopathy is a form of stress cardiomyopathy that can clinically mimic an acute ST-segment elevation myocardial infarction (STEMI). It involves transient anomalies in left ventricular wall motion secondary to myocardial stunning. Specific causes have still not been elucidated, and several mechanisms have been proposed, including catecholamine surges following intense emotional or physical stress. We present a case of a 74-year-old woman, diagnosed with Takotsubo cardiomyopathy following percutaneous microwave ablation of hepatocellular carcinoma. Although Takotsubo cardiomyopathy comprises a small percentage of acute coronary syndrome presentations, it should be considered in the differential for acute cardiac events as its management varies compared to other more common forms of acute cardiac events.

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Introduction

Takotsubo cardiomyopathy (TCMP), or stress cardiomyopathy, is a reversible syndrome that mimics an acute ST-segment elevation myocardial infarction (STEMI). It derives its name from the Japanese term for an octopus trap, due to the heart assuming the shape of an octopus trap from dyskinesia in the muscles of the mid and apical segments and subsequent ballooning of the left ventricle [1]. The most common demographic for this disease process is postmenopausal women. Overall, prognosis is observed to be good, and resolution often occurs without any aggressive management [2].

Separately, microwave ablation (MWA) is a relatively recent advancement in minimally invasive therapy which depends on the generation of electromagnetic waves to create frictional heating and cell death by coagulative necrosis [3]. MWA is commonly used in the liver for local control of primary or metastatic tumors and is a well-established treatment modality which has proven to be safe and effective. MWA can

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be performed percutaneously with minimal complications [4]. Cardiac complications or significant hemodynamic changes secondary to MWA are not expected nor well documented. Here, we present a rare case of TCMP following MWA of liver lesion in a patient with hepatocellular carcinoma.

Case presentation

A 74-year-old woman with a history of primary biliary cirrhosis and hypertension was diagnosed with a 3.1 × 2.7 cm seg VII hepatocellular carcinoma abutting the medial margin of the liver (Fig. 1). As per multidisciplinary recommendations, she underwent subselective TACE of the seg VII lesion and presented for MWA of the same lesion. As the ablation zone barely extends beyond the probe tip, the probe was pointed against the right adrenal gland, to protect it. This was confirmed on the CT fluoroscopic images (Fig. 2A). Ablation was carried out at 140 Watts for 4 minutes. Approximately 30 seconds before the completion of the ablation cycle, there was a transient period of tachycardia with heart rate in the 130 s (baseline at 68 BPM) and systolic pressures as high as 200 mmHg (baseline at 110 mmHg). CT image during the same monitoring scan showed no hematoma but extension of the gas bubbles and lipiodol into the retroperitoneal space (Fig. 2B), suggesting ablation zone involving the adjacent adrenal gland, likely causing sudden release of catecholamines. The patient’s vital signs returned to baseline after intravenous Esmolol and were transferred to recovery in stable condition. The patient remained asymptomatic in the recovery and had no chest pain, breathing difficulties, diaphoresis, or dizziness in the recovery room.

An EKG obtained during this episode was significant for T wave inversion in leads V2-V6, but no other acute abnormalities were found (Fig. 3). Repeat EKGs showed further deepening of the T wave inversions seen on the patient’s first study. An uptrend in the patient’s troponin was also observed following her procedure (1458–2181–2201). These values appeared higher than expected based on the presumed diagnosis of myocardial stress related to catecholamine surge. She also reported mild fatigue on exertion; however, the patient underwent left heart catheterization which demonstrated patent coronary arteries, ruling out ischemic etiologies.

Treatment

Given that the patient was asymptomatic postoperatively, without any coronary artery disease, and hemodynamically stable, aggressive management was deferred, and the patient was placed on cardiac monitoring and assessment to rule out potential worsening of her mitral regurgitation or the development of systolic dysfunction during the admission. The remainder of the patient’s hospitalization was uneventful, and she was discharged on post-op day 2.

Discussion

TCMP is an acute, transient anomaly in myocardial wall motion involving the apex and mid left ventricle in the absence of obstructed epicardial coronary arteries. The etiologies of TCMP are still not well defined; however, several mechanisms have been proposed, such as multivessel epicardial spasm, microvascular dysfunction in the absence of obstructive disease, and myocardial dysfunction induced by catecholamine damage, which also serves as a method in differentiating TCMP from an acute MI [2].

Clinical findings of this disorder include abnormal EKG readings, particularly ST-segment elevation in precordial leads and evolutionary T-wave inversion. Elevation of cardiac biomarkers, such as troponin and brain natriuretic peptide may be found as well [2].

As patients of acute MI and TCMP present with similar signs and symptoms, initial management is also similar, consisting of antithrombotic therapy, heart failure drugs, and aggressive treatment with statins [5–7]. Generally, this condition is self-limiting and does not warrant extensive active management in hemodynamically stable patients, as was done in this case.

The major categories for complications with MWA include vascular complications, such as bleeding and pseudoaneurysm formation; biliary complications, such as formation of strictures and bile leakage; and mechanical complications, such as diaphragmatic injury and adjacent viscus perforation [4]. To our knowledge, the association between TCMP and MWA has rarely been reported. Previous hypotheses have included the frequency of the microwaves used (900–2450 MHz), the emotional aspects of the disease for the patient, or activation of catecholaminergic structures due to the proximity
Fig. 2 – (A) MWA probe tip at the medial margin of the seg VII hepatocellular carcinoma which shows lipiodol staining from prior TACE (yellow arrow). (B) MWA periprocedural shows gas bubbles (yellow arrow) and lipiodol (red arrow) leaking into the retroperitoneum.

Fig. 3 – EKG findings demonstrating T waves inversions in leads V2-V6.

of the ablation needle to the sympathetic chain [8]. There is higher risk of hypertensive crisis when treating tumors adjacent to a normal functioning adrenal gland, as in this case. The extension of the ablation zone into the adjacent normal adrenal gland resulted in sudden massive release of catecholamines stored in the gland, leading to the crisis [9]. The prior TACE also supplemented in a larger ablation zone due to prior embolization. Use of hydrodissection to separate the medial liver edge from the adjacent adrenal gland could have limited the ablation zone to involve the adrenal gland. Also, the use of pre-procedure alpha and beta blocker medications should be considered, if anticipating hypertensive crisis [10]. To ensure patient safety and treatment success, any hemodynamic changes or evidence of acute cardiac insult should be promptly investigated.

Ethics approval and consent to participate

Not applicable.

Patient consent

Consent for publication was obtained at the time of the initial and subsequent procedures.
Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2022.11.025.

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