

# Takotsubo Cardiomyopathy—A Rare but Serious Complication Following Microwave Ablation of the Liver—Case Report

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# Abstract

Takotsubo cardiomyopathy is a form of stress cardiomyopathy which is reversible. It can clinically mimic an ST-segment elevation myocardial infarction. We present a case of a 63 year old female, who was diagnosed with takotsubo cardiomyopathy in the immediate postoperative period, following microwave ablation for a metastatic liver lesion. Despite takotsubo cardiomyopathy only accounting for a small percentage of acute coronary syndrome presentations, it is still an important differential to be considered when dealing with acute cardiac events, as the subsequent management is different as compared to the other more often encountered forms of acute cardiac events.

# **Keywords**

Takotsubo, Cardiomyopathy, Microwave Ablation, Hepatocellular Carcinoma

# **1. Introduction**

# Takotsubo cardiomyopathy

Takotsubo cardiomyopathy is a syndrome characterised by transient left ventricular systolic and diastolic dysfunction, electrocardiographic features, and myocardial enzyme elevation similar to the acute myocardial infarction but in the absence of obstructive epicardial coronary artery disease. It manifests predominantly in postmenopausal females in the presence of stressful triggers [1]. Mechanisms proposed for the development of takotsubo syndrome include elevated levels of circulating plasma catecholamines and their metabolites, microvascular dysfunction, inflammation, oestrogen deficiency, spasm of the epicardial coronary vessels, and aborted myocardial infarction. The overall prognosis is observed to be good with most making a nearly full recovery without aggressive management [2]. However, caution should still be exercised as about 1% to 2% of patients experience recurrence and mortality rates of 3% to 4% have been reported [1].

#### Microwave ablation

Microwave ablation is a recent development in the field of tumour ablation. It can be performed percutaneously making it an attractive minimally invasive technique. It utilises dielectric hysteresis to produce heat, thus inducing cellular death via coagulation necrosis. It has promising potential in the treatment of primary and secondary liver disease [3]. Microwave ablation can also be safely performed in liver lesions that are near the heart, without adverse complications of arrhythmias, haemodynamic instability, and myocardial tissue damage [4]. We present a rare case of takotsubo cardiomyopathy following microwave ablation of a liver lesion in a patient with metastatic colon cancer.

#### 2. Case Presentation

A 63 year old female was admitted for ultrasound guided microwave ablation of segment VI/VII metastatic lesion. She was 157 cm tall, 35 kg, with a body mass index of 14.2. She had no other significant comorbidities apart from her on-cological history of metastatic colon cancer. She had an open high anterior resection with a defunctioning ileostomy 2 years prior. Earlier on in the year, radiofrequency ablation of the segment VII metastatic liver lesion was performed. She also had microwave ablation of her right lung lower lobe metastatic nodule, which was uneventful. All the procedures were conducted under general anaesthesia.

She was assessed preoperatively by the anaesthetic team and deemed suitable to undergo the procedure under general anaesthesia. A 20 gauge (G) intravenous (IV) cannula was inserted.

The American Society of Anaesthesiologists (ASA) set standards for anaesthesia monitoring were in place prior to and throughout the procedure. This included continuous monitoring of oxygenation, ventilation electrocardiography. The patient's blood pressure was measured non-invasively every 3 minutes.

She was induced with IV Midazolam 1 mg, IV Fentanyl 50 mcg, IV Propofol 60 mg. A laryngeal mask airway was inserted, and she was maintained on se-voflurane with an oxygen/air mixture to achieve a minimum alveolar concentration (MAC) of 1.0.

Ultrasound guided microwave ablation of the segment VI/VII liver lesion was carried out. Two 15 G, 15 cm long Neuwave antennae were inserted into the target lesion, which measured 3 cm [Figure 1]. The first antenna was inserted cranially. The lesion was ablated at 95 watts (W) for 3 minutes followed by 65 W for 10 minutes. The second antenna was inserted via a caudal approach and the lesion ablated at 95 W for 3 minutes followed by 65 W for 10 minutes.



Figure 1. Computed tomography showing the target lesion.

Minutes into the ablation, the patient developed a transient sinus tachycardia, with a heart rate that reached a maximum of 140 BPM (baseline 70 BPM). This was coupled with a severe hypertensive response with the blood pressure peaking at 211/112mmHg. She was not a known hypertensive and her baseline blood pressure had ranged from systolic 110 - 120 mmHg. This hypertension and tachycardia subsequently settled fentanyl and esmolol boluses. The procedure was completed uneventfully thereafter, and the patient was extubated and sent to the recovery unit.

In the recovery unit, the patient was awake and alert. She was, however, hypotensive, with a systolic blood pressure ranging from 75 - 80 mmHg. This responded minimally to fluids. She also had a computed tomography of the abdomen, which did not reveal any hematoma or bleed around the ablation site. There were no complaints of chest pain, tightness or dyspnoea. She was subsequently managed medically in the high dependency unit where she required dopamine support for her blood pressure. She had a normal electrocardiogram (ECG) preoperatively showing a normal sinus rhythm. The postoperative ECG revealed a sinus tachycardia and new T wave inversions in leads V3 to V6 [Figure 2]. The cardiac troponins were raised at 1099 NG/L (normal < 30 NG/L) as was the CKMB 10 UG/L (normal 1.0 - 5.0 UG/L). Haemoglobin was normal.

She was referred to cardiology and their initial impression was that of a Type 2 myocardial infarction. She was started on aspirin on post operative day 1 with the addition of clopidogrel on post operative day 2. The echocardiogram reported a normal left ventricle size with moderately impaired left ventricular systolic function. The visually estimated left ventricular ejection fraction (LVEF) was 35% - 40%. Regional wall motion abnormalities (RWMA) were seen – hypokinesia in



**Figure 2.** Postoperative ECG showing sinus tachycardia and T wave inversions in leads V3 to V6.

the mid ventricular region. There was also impaired left ventricular diastolic function. Differentials then included ischaemic heart disease or mid ventricular Takotsubo cardiomyopathy. She was weaned off dopamine and started on bisoprolol for heart rate control. There were no abnormalities detected in the computed tomography of the coronary arteries and was subsequently treated as takotsubo cardiomyopathy. The dual antiplatelets were stopped. She was discharged well.

On follow up with cardiology 3 months later, the echocardiogram showed an improved LVEF of 40% - 45%, left ventricular systolic function was still mildly impaired. There was no left ventricular diastolic dysfunction. She subsequently made a full recovery and a repeat echocardiogram 9 months after the initial insult showed a normal left ventricle size and left ventricular systolic function. The LVEF was 55% with no RWMA. Left ventricular diastolic function was normal. She was discharged from cardiology follow up thereafter.

# 3. Discussion

Takotsubo cardiomyopathy is a form of non-ischaemic cardiomyopathy. It is characterised by transient regional systolic dysfunction of the left ventricle mimicking acute myocardial infarction but with only minimal release of cardiac enzymes. There is a paucity of angiographic evidence of obstructive coronary artery disease or acute plaque rupture. In most cases, the regional wall motion abnormality extends beyond the territory perfused by a single epicardial coronary artery. Importantly, myocardial dysfunction can be induced by a catecholamine surge [2].

Clinical findings include abnormal ECG readings, in particular ST segment elevation in precordial leads, and evolutionary T wave inversion. Elevation of cardiac biomarkers such as troponins, CK-MB and brain natriuretic peptide are expected [2].

Since the initial presentation of takotsubo cardiomyopathy is similar to an acute coronary syndrome, the initial treatment involves aspirin, beta blockers, angiotensin converting enzyme inhibitors, lipid lowering agents and coronary angiography to rule out obstructive coronary artery disease. The therapy is guided by the patient's clinical presentation and haemodynamic status [5]. Although takotsubo cardiomyopathy is thought to be a benign condition, the recent observation data suggest that cardiogenic shock and death rates are comparable to patients with acute coronary syndrome [6]. This was observed in our patient where she was hypotensive post operatively, requiring inotropic support in the medical high dependency unit.

Major complications of microwave ablation include vascular complications such as bleeding and pseudoaneurysm formation; biliary complications and mechanical complications, such as diaphragmatic injury and adjacent viscus perforation [7]. The association between takotsubo cardiomyopathy and microwave ablation has been rarely reported, of which there have only been 4 case reports thus far. These include hypertensive crises occurring, following the ablation of segment VIII lesions that are adjacent to the normal adrenal gland, resulting in sudden massive release of catecholamines and subsequent myocardial dysfunction [8]. Activation of catecholaminergic structures due to the proximity of the ablation needle to the sympathetic chain has also been reported [9]. Microwave ablation of thoracic lesions near the heart has also rarely caused direct injury to the myocardial tissue [10]. Of note, our patient was very small in size, as often encountered in the Asian population, and though her lesion was not in segment VIII, the ablation of the lesion in segment VI/VII could have affected the adrenal gland, causing a catecholamine surge as evidenced by the intraprocedural tachycardia and hypertension. Indeed, this was also noted by Elgazzar et al. where microwave ablation of the segment VII lesion resulted in an ablation zone involving the adjacent adrenal gland [11].

Microwave ablation of lesions by interventional radiologists has been increasing recently. They also engage the help of anaesthetists to provide general anaesthesia for such cases. Though the radiologist may be familiar with the procedure it is also important for the practising anaesthetist to be cognizant of the common complications of microwave ablation. The location of the lesion is also paramount and prior discussion with the radiologist will help in the planning of the anaesthetic. This case highlights to the anaesthetist how they can anticipate and prevent such occurrences. In this instance, an easily titratable opioid like a remifentanil infusion could have helped to blunt the hypertensive response effectively. We could have been better prepared with short acting beta blockers on standby before the commencement of ablation. Given the close proximity of the lesion to the adrenal gland, the use of hydrodissection to separate the liver edge from the adjacent adrenal gland could be a technique employed by the radiologist to limit the ablation zone. Good communication during the case will serve to improve patient outcome, and the radiologist should inform the anaesthetist prior to ablation of the lesion during the procedure.

# 4. Conclusion

As microwave ablation becomes an increasingly attractive technique, as anaesthetists, we should be aware of its potential complications, despite its reported safety. Good communication with the interventional radiologist and prior discussion with regards to the location of the lesion will also enable us to plan our anaesthetic more effectively. This allows us to anticipate the problems that might occur, which in turn affects patient outcome and treatment success.

# **Conflicts of Interest**

The author declares no conflicts of interest regarding the publication of this paper.

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