Overwhelming infection causing takotsubo syndrome

Introduction

A middle-aged women presented with severe sepsis resulting in a transient apical ballooning of the left ventricle (takotsubo syndrome). This article briefly explains the association and mechanism of this syndrome with severe medical illness, in addition to the recognized affiliation with stressful life events.

Discussion

Considerable evidence supports emotional stressors (bereavement and other major life events) as precipitants of takotsubo cardiomyopathy or 'broken heart syndrome' (Gianni et al, 2006). This condition is more common in women, with estimates ranging from 70–100%, compared to 5–30% in men and particularly in postmenopausal women (Kawai et al, 2000).

An association with severe medical illness and/or sepsis is less well appreciated. Several studies investigating the effects of physiological stressors, including severe illness, suggest these occur through similar mechanisms, caused by surges in serum catecholamine levels. Elevated serum catecholamine levels are described in 70% of takotsubo cases (Pilgrim and Wyss, 2008).

Ordinarily, catecholamines activate myocardial beta-adrenergic receptors in order to increase contractility. Nevertheless, excessive levels have been found to cause direct cardiac myocyte toxicity through an intracellular calcium overload, mediated by cyclic AMP and oxygen free radicals. This results in overall myocardial stunning. The classical appearance of apical ballooning seen in takotsubo syndrome can be explained by the high density of beta-adrenergic receptors in the apex of the heart (Bolli and Marban, 1999).

The role of raised levels of endogenous catecholamines is supported by several studies describing takotsubo cardiomyopathy in association with phaeochromocytoma (Schurmeyer et al, 1997). A reduced sympathetic response, caused by 'excessive' circulating catecholamines, can be demonstrated by using I-123 radiolabelled meta-iodobenzylguanidine (mIBG) cardiac imaging that demonstrates decreased uptake of tracer in the apex of the heart (Akashi et al, 2004).

In addition, severe sepsis will frequently cause transient global biventricular impairment as opposed to left ventricular apical ballooning. The underlying pathophysiology behind this phenomena is widely thought to be related to the production of cardiosuppressive actions of tumour necrosis factor-alpha and interleukin-6. In states of severe sepsis, catecholamines may lose their beneficial properties of inhibiting cardiosuppressive cytokines, becoming deactivated by sepsis-induced oxidative stress and free radicals. An alternative pro-

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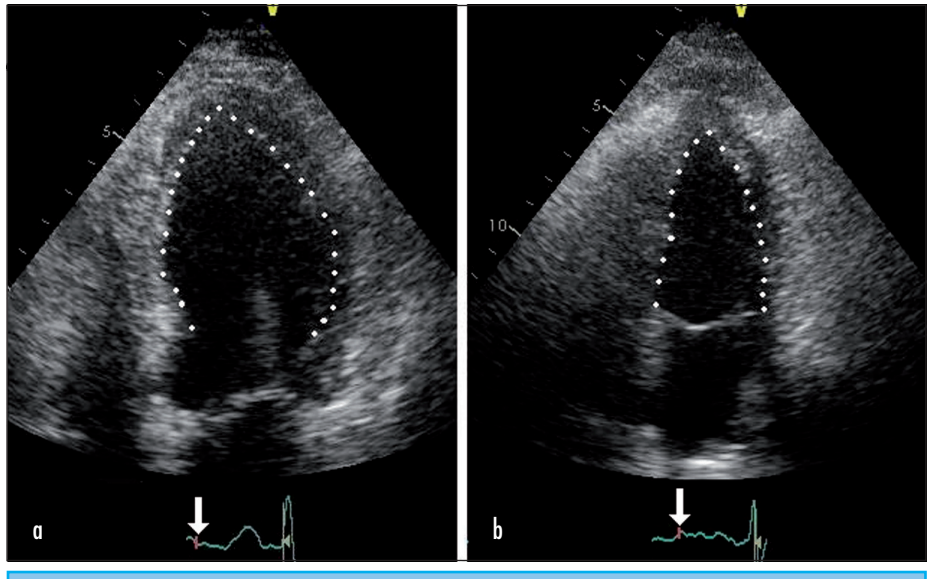
Figure 1. Apical views of the left ventricle in end systole (a) while unwell and exhibiting an apical ballooning phenomena and (b) at a later stage once recovered, showing normal global systolic function.



Case Report

A 57-year-old woman presented with a 1-week history of severe lethargy. Past medical history included hypertension and asthma. On arrival the patient was profoundly hypotensive (82/56 mmHg) and oliguric with an acute kidney injury (creatinine 469 μmol/litre). Although afebrile, severe urinary sepsis was suspected, based on positive urine analysis and raised inflammatory markers (white cell count 25.0 x10^9/litre, neutrophils 23.1 x10^9/litre, C-reactive protein 269 mg/litre).

The sepsis improved with administration of intravenous broad spectrum antibiotics for a total of 16 days. Following fluid resuscitation, the patient developed acute pulmonary oedema.

An electrocardiogram showed deep T-wave inversion laterally. Echocardiography revealed a markedly reduced ejection fraction of 30% with extensive apical akinesis (*Figure 1a*).

Coronary angiography was avoided, in view of the existing renal impairment, the patient undergoing thallium myocardial perfusion scintigraphy on day 28 of the admission. This demonstrated an apical 'defect' (mild reduction of counts at the apex and some reduction in thickening of the antero-apical region) consistent with resolving takotsubo cardiomyopathy and no evidence of underlying inducible ischaemia. The patient was discharged home the same day.

Four months after discharge, the patient was fully recovered following this episode of sepsis and an apparent major cardiac 'event'. Repeat echocardiography showed resolution of the apical wall motion abnormality and normal systolic function (ejection fraction 70%) (*Figure 1b*) coinciding with electrocardiographic resolution of the lateral T-wave inversion.

posal is that excessive catecholamine levels in sepsis cause a downregulation of beta-adrenergic receptors as a protective mechanism against myocardial toxicity (Jozwiak et al, 2011).

Clinicians should be aware of this dual pathology which may contribute to severe transient ventricular dysfunction. BJHM

Akashi YJ, Nakazawa K, Sakakibara M et al (2004) 123I-MIBG myocardial scintigraphy in patients with "takotsubo"cardiomyopathy. *J Nucl Med* **45**(7): 1121–7

Bolli R, Marban E (1999) Molecular and cellular mechanisms of myocardial stunning. *Physiol Rev* **79**: 609–34

Gianni M, Dentali F, Grandi AM et al (2006) Apical ballooning syndrome or takotsubo cardiomyopathy: a systematic review. *Eur Heart J* **27**(13): 1523–9

Jozwiak M, Persichini R, Monnet X, Teboul JL (2011) Management of myocardial dysfunction in severe sepsis. *Semin Respir Crit Care Med* **32**(2): 206–14

Kawai S, Suzuki H, Yamaguchi H et al (2000) Ampulla Cardiomyopathy ("Takotsubo" Cardiomyopathy) – Reversible Left Ventricular Dysfunction: with ST Segment Elevation. *Jpn Circ J* **64**: 156–59

Pilgrim TM, Wyss TR (2008) Takotsubo cardiomyopathy or transient left ventricular apical ballooning syndrome: A systematic review. *Int J Cardiol* **124**(3): 283–92

Schurmeyer TH, Engeroff B, Dralle H et al (1997) Cardiological effects of catecholamine-secreting tumours. *Eur J Clin Invest* **27**: 189–95

LEARNING POINTS

- Emotional stress is an accepted precipitant of transient ventricular apical ballooning characteristic of takotsubo cardiomyopathy.
- Sepsis is most commonly associated with transient biventricular failure.
- Severe medical illness, including sepsis, may also cause takotsubo syndrome.
- A dual pathology may contribute to severe transient ventricular dysfunction.

Emphysematous pyelonephritis in a diabetic patient with autosomal dominant polycystic kidney disease

Emphysematous pyelonephritis is a rare, severe, gas-forming infection of the renal parenchyma that commonly occurs in diabetics or in patients with urinary tract obstruction.

A 77-year-old woman, known to have autosomal dominant polycystic kidney disease and diabetes, presented with fever and left flank pain. Computed tomography scan on the day of admission (*Figure 1*) showed cystic infection with abscess. On the third day the patient's symptoms (e.g. fever and chills) were worse. Computed tomography follow up (*Figure 2*) showed emphysematous pyelonephritis with an air pocket in the renal parenchyme along with cystic infection showing wall thickening. Blood culture showed extended spectrum beta-lactamase-producing *Escherichia coli*. Her antibiotics were changed from ciprofloxacin to meropenem.

Finally her vital signs and lab results got better, which was consistent with computed tomography scan results (*Figure 3*) showing complete regression of emphysematous pyelonephritis and cystic infection with abscess on the 21st hospital day. This highlights that emphysematous pyelonephritis can be cured by medical treatment, in this case using meropenem, without needing surgical intervention. BJHM

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Figure 1. Computed tomography scan on the day of admission showing multiple air fluid levelled cysts 3.6 x 2 cm in size, with abscess formation at the upper lateral portion of the left kidney suggesting cystic infection.

Figure 2. Computed tomography on the third day in hospital, showing the increased extent of cystic infection. A renal parenchyme air pocket (arrow) consistent with emphysematous pyelonephritis was newly noted.

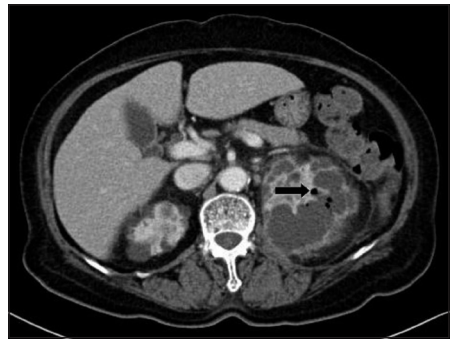

Figure 3. Computed tomography after 3 weeks, showing partial regression of the abscess and complete resolution of the renal parenchymal air pocket.