Takotsubo cardiomyopathy

“Broken heart syndrome”

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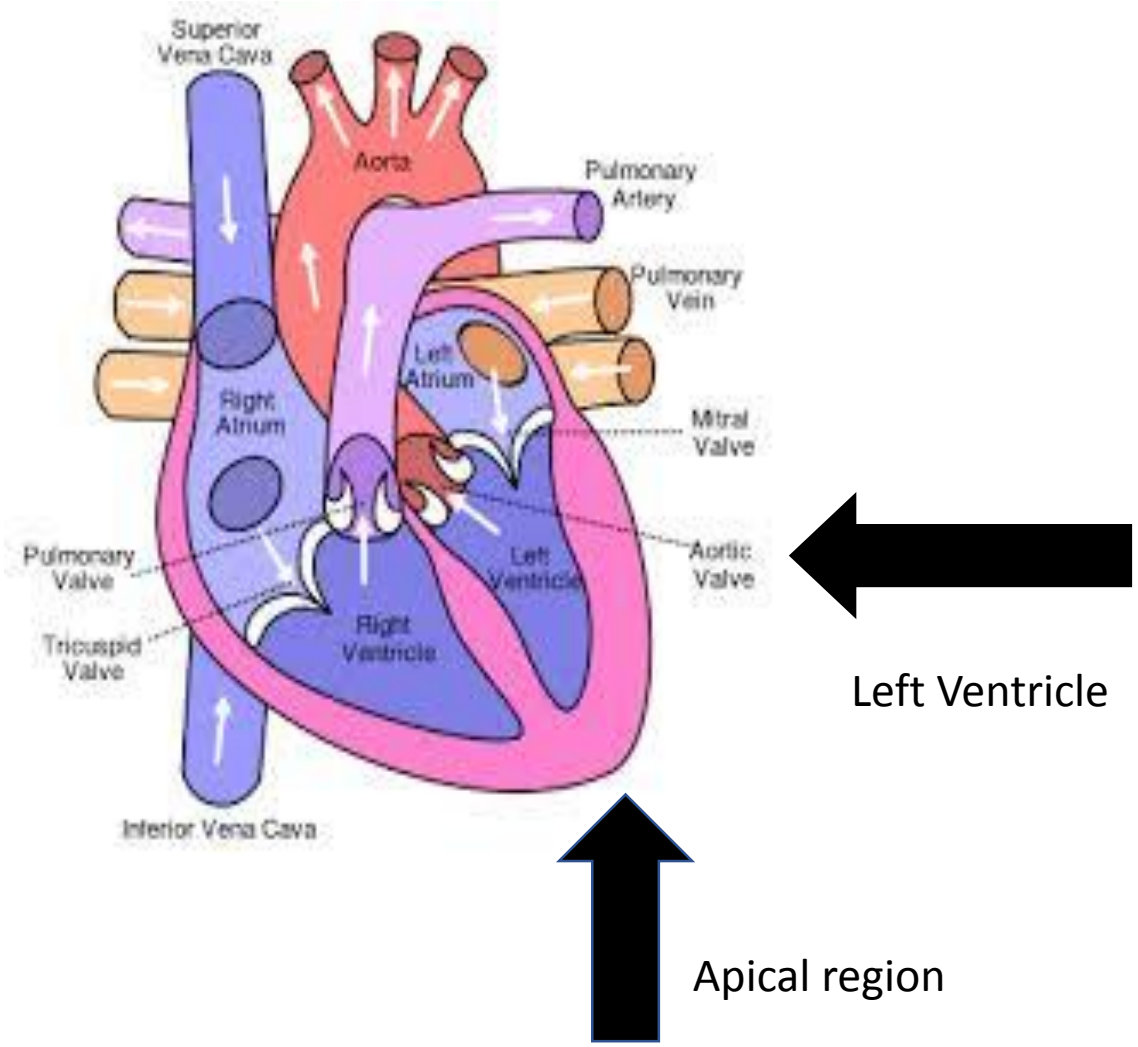
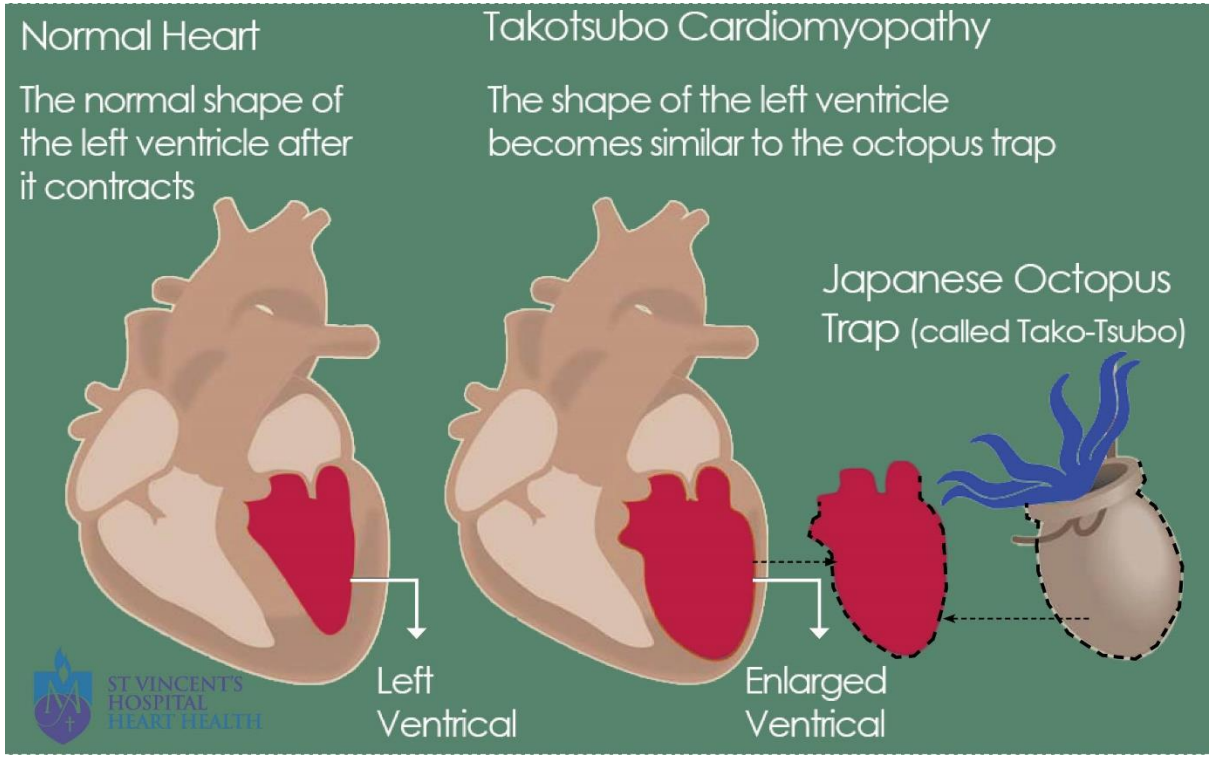
Takotsubo cardiomyopathy

- What?
- When?
- Who?
- Why?
- How?
- Where?

The structure & function of the heart



What is takotsubo cardiomyopathy?



- The heart muscle, usually the left ventricle becomes suddenly weakened.
- Remarkably the left ventricle recovers most of it's normal shape and function quickly.
- Ongoing damage remains [4,5,6,7]

Historical perspective

- Takotsubo syndrome was described for the first time in the Unites States in 1986 in a woman, who presented after the suicide death of her son with transient left ventricular apical wall motion abnormalities, and normal coronary arteries [1].
- In 1990, Dr. Hikaru Sato named this mysterious condition of reversible left ventricular dysfunction in the absence of coronary artery disease; Takotsubo. He noted that physical or emotional stress was associated with the condition. “Takostubo” is a Japanese fishing pot; shaped like the left ventricle with apical ballooning [1,4,10].
- Ten years later Japanese researchers introduced the concept of “takotsubo cardiomyopathy” to the rest of the world.

Who gets takotsubo cardiomyopathy?

- Gender: 85-90% postmenopausal women [5,7,8,9,10]
- Incidence: 10% of women with acute coronary syndrome [5]
- Underdiagnosed[7,10]
- Ethnicity: usually Caucasians, more prevalent in Japanese men [7,9,10]
- Can affect anyone [6,10]
- Co-morbid neurologic or psychiatric disorder [7,10] 50% [9]

Triggers for Takotsubo

- TCM is triggered by an **unexpected** and **extremely stressful** event
- This trigger may be **emotional** (hence the term ‘broken heart syndrome’) or **physical** [2,6,9,10,13]
  - Relationship breakdown
  - Death of a loved one
  - Sudden loss
  - A serious illness
  - Natural disaster
  - Surgical procedures [1,13]
  - Stroke [10,13,] ECT, epilepsy [13]
  - Pharmacologic; legal & illegal drugs, drug withdrawal from alcohol, metoprolol [1,13]
  - 28% of 1750 patients – no triggers [1,9,13]

Symptoms of takotsubo cardiomyopathy

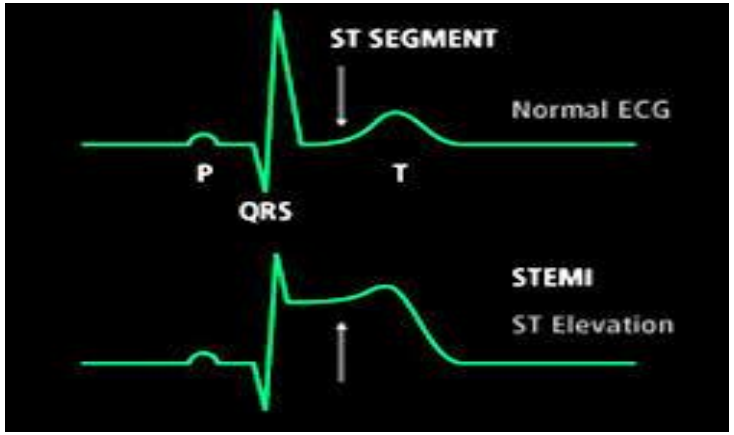
- Mimics heart attack [4,5,9,10] and presents suddenly as one or more of:

  - Chest pain
  - Shortness of breath
  - Dizziness -> syncope
  - Nausea
  - Cold sweat
  - Cardiac arrest [5]
  - Congestive heart failure [10,] pleural effusions [1]

  See *My heart, my life* [3] for symptoms of heart attack

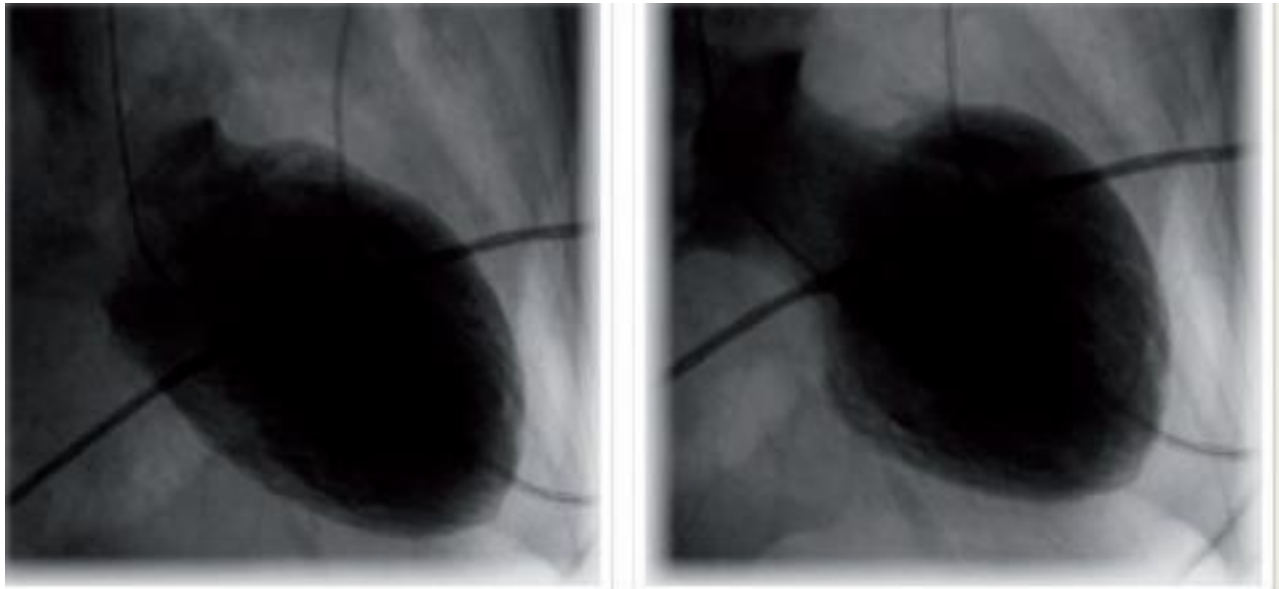
Diagnostic Findings for TCM –
GOLD standards for Heart Attack:

- Electrocardiogram (ECG)
  - may show signs of ischaemic heart disease [5,6,9]
- Troponin serum levels
  - usually elevated, indicating heart muscle damage [5,6,10]



- Echocardiogram
  - regional wall motion abnormalities, usually in apical region of left ventricle [5,6,7,8]
  - reduced left ventricle ejection fraction (LVEF)
  - reduced cardiac output
- Angiogram
  - usually no evidence of significant coronary artery stenosis [5,6,8]
    - 15% with CAD [9]

Transthoracic ultrasound (ECHO)



Takotsubo left ventriculogram

Takotsubo: the myth of rapid and complete recovery Dana K Dawson, DM, FRCP, D. Phil, FESC, *European Heart Journal*, Volume 39, Issue 42, 7 November 2018, Pages 3762–3763, https://doi.org/10.1093/eurheartj/ehy660

Physiological changes with Takotsubo

- During acute event:
  - Troponin - elevated
  - ECG – changes
  - Echocardiogram – deranged LV function
- Research has found highly elevated serum levels of catecholamines [5,6,7,8,10,13]
  - Adrenaline, Noradrenaline
  - Also B-type natriuretic peptide [6,8,9,10, 13]
- Myocardial oedema on Cardiac MRI [4,6,8,10]
  - May persist for months after acute event [4,5, 6]
  - Suggestive of microvascular damage [5]
  - Some research suggests that TCM has similar trajectory towards Heart Failure as does Acute Coronary Syndrome [4, 12; 45% of TCM have heart failure [12]

Treatment of Takotsubo

- After cardiac workup for suspected heart attack:
  - Usually Normal Angiogram !!! And therefore non-ischaemic [5,6]
  - But, can be diagnosed in conjunction with some coronary artery disease [6,9,13]
- Drugs & supportive therapy [13]
  - Initially same emergency treatment as heart attack
    - Nitrates, opioids to control pain
    - Correct electrolyte imbalances; K+, MgSo4
    - May need supportive inotropes [13] or antiarrhythmics
- Longer term treatment
  - ACE Inhibitors [6,9,11]
  - Not Beta blockers [6, 9,11,] Yes beta blockers [10, 13]
  - If CAD present then statin & aspirin [6]

Repeat events of takotsubo cardiomypathy

- Repeat events up to 22% [5,] 10% [10,] 3weeks to 6 years after first event[1,6,11.]
- Usually women [10;] Is TCM a chronic disease? [5]
- Ongoing symptoms; fatigue, chest pain, dyspnoea, poor sleep, reduced exercise tolerance, reduced QOL, same as ACS [4,5,11,13]
- Need to reduce risk factors to avoid repeat attack [5,6].
- Small Australian study found that women with TCM did not attend Cardiac Rehabilitation [5]
- Online support group for sufferers of takotsubo
  - www.takotsubo.net

TCM and Cardiac rehabilitation

- TCM has mortality & morbidity rates similar to ACS [6,9]
- Unlike acute coronary syndrome; there are no guidelines for TCM [5,6,10]
- Full recovery of LV function usually within months, but not all [1,4,10]
- Follow up echocardiogram to check this [13]
- Emotional support & education to manage stress, relieve anxiety, and to prevent repeat events [2,5]
- Need for multidisciplinary Cardiac Rehab team
- Ongoing oedema [1,4,5,6,7]
  - Reduced exercise tolerance (reduced peak VO_2)[4]
  - Consider intensity of the exercise

Case study 1 - TCM caused by stroke

Transthoracic echocardiogram report:

Patient: 55YO female

Indication: *Left ventricle artery blockage*

Physician Interpretation:

Left Ventricle: *Systolic function is moderately impaired at 35 to 40*. Indeterminate diastolic function. *Segmental left ventricular wall motion* abnormalities – *akinesis of mid anteroseptal, inferoseptal and anterior wall, hypokinesis of the mid anterolateral wall.* Normal apical and basal wall motion.

Right Ventricle: Normal

Summary: The left ventricular wall motion abnormalities could be consistent with a *mid-variant form of Takotsubo cardiomyopathy*. The wall motion abnormalities do not appear to follow the distribution of a single coronary artery territory.

Case study 1 - TCM caused by stroke

Patient medical history; cardiology review notes:

PMHx: sciatica on periodic cortisone injections

HOPC: No ischaemic symptoms. Gross ECG/rhythm changes; bradycardic with ectopy/occasional VE's. T wave inversion.

Echo taken in ED consistent with *Stress Cardiomyopathy*; Dilated LV.

Trop rise

MRI Brain: *posterior circulation stroke* in context of brain stem/cerebellar injury.

O/E: alert, oriented, appropriate

HR 35-50 (asymptomatic); BP 146/71, SpO_2 100% on $2lO_2$

Dual HS. JVPNE, Nil peripheral oedema. This could be explained as an *acute neurogenic CM.*

Case study 2 - TCM caused by induction of anaesthesia

Data from Medical discharge summary from ICU to ward:

- **Patient**: Female 46yo, caucasian
- **Diagnosis**: asystolic cardiac arrests during operation for knee arthroscopy & post IV cannulation
- **Angiogram**: 20% occluded LAD, no other abnormalities.
- **Ongoing issues**:
  - Sore throat, mild haemoptysis secondary to traumatic ETT insertion
  - *Takotsubo Cardiomyopathy*
  - Cause for asystole arrest ?excessive vasovagal response; *normal coronary arteries* (on angiogram).
- **Plan**: Transfer care to Cardiology; may need AICD and pacemaker
- **Haemodynamic status**: BP 107/85, HR 97, Temp36^{9}'C, RR 18, GCS 15
- **Wounds**: L)knee x 1 puncture; R)groin angio sheath removal site.

Case study 2 - TCM caused by induction of anaesthesia

Transthoracic echocardiogram report: 05/03/14

Patient: Female, 46YO

Indications: Bradycardia on ***anaesthetic induction with asystole***

Sonographers comments: Echo performed with patients supine and on artificial respirator.

Physical Interpretation:

Left Ventricle: *Systolic function is severely impaired, EF 20-25%.* Impaired LV relaxation (Grade 1) pattern of diastolic function. Basal function preserved, remainder is akinetic.

Right Ventricle: *Global RV systolic function is low normal*.

Tricuspid Valve: Mild-moderate tricuspid regurgitation with dilated IVC and raised right atrial pressure >15mmHg.

Summary: *Severe left ventricular systolic dysfunction*. Wall motion abnormalities suspicious for *Takotsubo cardiomyopathy*. Low normal RV systolic function. Mild to moderate tricuspid regurgitation.

Case study 2 - TCM caused by induction of anaesthesia

Transthoracic echocardiogram report: 18/03/14

Patient: Female, 46YO

Indications; Post Takotsubo

Physical Interpretation:

Left Ventricle: *Normal left ventricular size and systolic function* with grade one diastolic dysfunction (impaired relaxation) *EF estimated at 60%.*

Right Ventricle: Normal

Tricuspid valve: Trivial tricuspid regurgitation.

Summary: LV function has now normalised.

Moderately dilated right atrium.

Case study 3 – Acute myocardial infarction, December 2017

- **Data from Medical record:**
- Patient: Female 61YO
- Past medical history: T2DM, hypertension, dyslipidaemia, obesity, contrast allergy with anaphylaxis, interstitial lung disease and **previous traumatic subdural haemorrhage** .
- Diagnosis: with NSTEMI, diffuse T-wave inversion on ECG. Troponin 0.43. Underwent PCI to RCA, PDA & PLV; mild diffuse disease in other coronary arteries.
- Echocardiogram (May 2018): *Normal left ventricular size and systolic function. EF 60-65%.* RV dilatation/pulmonary hypertension.

Case study 3 – Acute myocardial infarction or TCM? January 2019

Transthoracic echocardiogram report:

Patient: Female 61YO

Indications: NSTEMI on background of NSTEMI 2017. Troponin 0.39.

Physical Interpretation:

Left Ventricle: *Mild-moderately impaired systolic function due to mid-apical akinesis, possible Takotsubo. EF 40%.*

Right Ventricle: The cavity is severely dilated. *Global RV systolic function is severely reduced.*

Tricuspid valve: Mild tricuspid regurgitation with velocity indiating a moderately elevated RV systolic pressure of 67mmHg. Dilated IVC.

Case study 3 - Acute myocardial infarction or TCM ?

Selective Coronary Angiography and Left Ventriculogram – January 2019:

Patient: Female 62YO

Procedure Indication: Known ischaemic heart disease with previous PCI to the right coronary artery, PDA and PLV. Background of likely interstitial lung disease, T2DM, *previous SDH*, presenting with a NSTEMI with ongoing chest pain. *Echocardiogram was suggestive on either LAD disease or Takotsubo cardiomyopathy*.

Procedure findings: LMCA, LAD, LCX all mild to moderate disease. RCA mild to moderate disease with patent stents.

Left Ventriculogram; *severe LV systolic dysfunction with severe apical, mid anterior to mid inferior hypokinesis in keeping with Takotsubo cardiomyopathy.*

Assessment: Moderate coronary artery disease present, however this presentation can be attributed to *Takotsubo cardiomyopathy*.

References - 1

1. Andre Dias, Ivan J. Núñez Gil, Francesco Santoro, et al., Takotsubo syndrome: State-of-the-art review by an expert panel – Part 1. Carrev (2018),https://doi.org/10.1016/j.carrev.2018.11.015
2. St Vincent's Hospital Heart Health: www.svhhearthealth.com.au › Conditions
3. *https://www.heartfoundation.org.au/images/uploads/main/HF_Myheartmylife.pdf, p. 137*
4. Takotsubo: the myth of rapid and complete recovery Dana K Dawson, DM, FRCP, D. Phil, FESC, *European Heart Journal*, Volume 39, Issue 42, 7 November 2018, Pages 3762–3763, https://doi.org/10.1093/eurheartj/ehy660
5. Schubert Simone Claire, Kucia, Angela, & Hofmeyer, Anne, 'The gap in meeting the educational and support needs of women with takotsubo syndrome compared to women with acute coronary syndrome', *Contemporary Issues n Education Research – Fourth Quarter 2018, vol 11, No. 4.*
6. Jelena-Rima Ghadri, Ilan Shor Wittstein, Abhiram Prasad, et al., International Expert Consensus Document on Takotsubo Syndrome (Part II): Diagnostic Workup, Outcome, and Management, *European Heart Journal* (2018) 0, 1–16, http://doi:10.1093/eurheartj/ehy077
7. Jelena-Rima Ghadri, Ilan Shor Wittstein, Abhiram Prasad, et. al., International Expert Consensus Document on Takotsubo Syndrome (Part I): Clinical Characteristics, Diagnostic Criteria, and Pathophysiology, *European Heart Journal* (2018) 0, 1–15 http://doi:10.1093/eurheartj/ehy076
8. Slowly resolving global myocardial inflammation/oedema in Tako-Tsubo cardiomyopathy: evidence from T2-weighted cardiac MRI, Christopher Neil,1,2 Thanh Ha Nguyen,1,2 Angela Kucia,3,4 Benjamin Crouch,1 Aaron Sverdlov,1,2 Yuliy Chirkov,1,2 Gnanadevan Mahadavan,1,2 Joseph Selvanayagam,5 Dana Dawson,6 John Beltrame,1,2 Christopher Zeitz,1,2 Steven Unger,1,2 Thomas Redpath,6 Michael Frenneaux,6 John Horowitz1,2, Heart 2012;98:1278e1284. doi:10.1136/heartjnl-2011-301481.

References - 2

9. Templin C, Ghadri JR, Diekmann J, et. al., Clinical Features and Outcomes of Takotsubo (Stress) Cardiomyopathy. N Engl J Med 2015;373:929-938.

10. Ranieri M., Finsterer J., Parati, E.A. & Bersano, A., Takotsubo Syndrome: Clinical Features, Pathogenesis, Treatment, and Relationship with Cerebrovascular Diseases, Current Neurological and Neuroscience Reports (2018) 5:20, https://doi.org/10.1007/s11910-018-0833-7 .

11. Singh, K. Carson, K., Usmani, Z., Sawhney, G. & Horowitz, J, 2014, Systematic review and meta-analysis of incidence and correlates of recurrence of takotsubo cardiomyopathy, International Journal of Cardiology, vol 174, pp. 696-701, http://dx.doi.org/10.1016/j.jicard.2014.04.221 .

12. Izumo, M. & Akashi, Y.J., Role of echocardiography for takotsubo cardiomyopathy: clinical and prognostic implications, *Cardiac Diagnosis and Therapy*, 2018, vol 8, no 1, pp. 90-100.

13. Lyon, AR., Bossone, E., Schneider, B. et al., 2015, Current state of knowledge on Takotsubo syndrome : a position statement from the task force on Takotsubo syndrome of the Heart Failure Association of the European Society of Cardiology, *European Journal of Heart Failure*, vol 18, pp 8-27.

QUESTIONS?