

Electroconvulsive therapy on patients with Takotsubo cardiomyopathy: Case reports and literature review

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Background

Electroconvulsive therapy (ECT) is highly effective treatment modality in psychiatry with low morbidity and mortality rate. Takotsubo cardiomyopathy (TCM), or stress-induced cardiomyopathy, is acute but transient heart failure characterized by left ventricular apex ballooning and wall-motion abnormalities, most often reported in post-menopausal women in relation to an emotional trigger (1). TCM associated with ECT has been reported; currently, 21 cases of TCM in patients treated with ECT are reported in the literature with 10 cases of successful ECT post-TCM diagnosis. Here, we report three cases of successful ECT treatments in patients with recent or remote TCM.

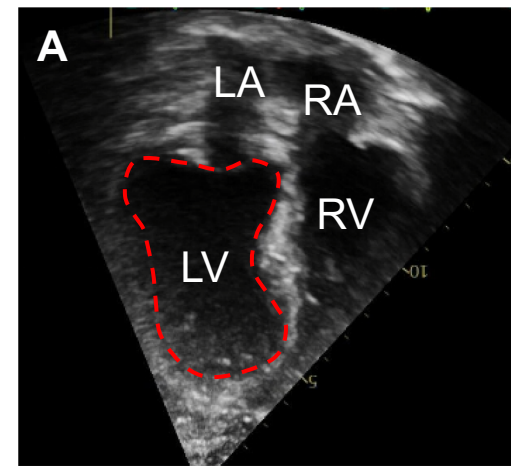


Figure 1. (A) TTE. Apical four-chamber view at end-diastole showing wall-motion abnormality of mid-apical LV in characteristic apical-ballooning pattern, suggestive of TCM. (B) Japanese Tako (Octopus)-Tsubo (pot) trap.

Case 1 - JP

- Demographics:** 67-year-old, Caucasian female
- Psychiatric history:** Schizoaffective disorder, heavy nicotine use, alcohol use, remote cocaine and amphetamine use. ECT planned for depression and psychosis uncontrolled by antipsychotics.
- Medical history:** HTN, HLD, COPD, CVA (1 y prior), bilateral DVTs (recent), hypothyroidism, Raynaud's phenomenon, small PFO seen in TEE performed 1.5 y prior, cardiac catheterization done at the same time showed mild, non-obstructive CAD
- Medications:** Clozapine 350 mg nightly, fluphenazine 5 mg nightly, apixaban 5 mg BID, losartan 50 mg daily, amlodipine 5 mg BID, aspirin 81 mg daily, atorvastatin 20 mg nightly, Synthroid 100 mcg daily
- ECT course:**

1st session: bradycardia to 34 BPM post-procedure, was given labetalol 20 mg, nicardipine 200 mg for elevated BP to 200s/170s

Prior to 2nd session: troponin elevated (92 ng/L; reference range <19 ng/L). EKG with precordial biphasic T-waves, T-wave inversions, and prolonged QTc. Patient asymptomatic

ECT paused

Negative coronary angiogram, TTE showed apical segmental wall motion abnormality of LV, LVEF preserved (55%). Troponin down-trended.
TCM diagnosis → Started metoprolol 12.5 mg BID, decreased losartan to 25 mg daily

13 days

Resumed ECT: episodes of bradycardia to 50s bpm, hypertension requiring labetalol 7.5-20 mg, nicardipine 200-500 mg each sessions. No further adverse cardiac events. Completed **12 total sessions**.

Case 2 - MT

- Demographics:** 50-year-old, Asian female
- Psychiatric history:** MDD with psychotic features. ECT planned for severe depression resulting in serious suicide attempt, poor oral intake.
- Medical history:** No cardiac history
- Medications:** Sertraline 50 mg daily, olanzapine 10 mg nightly, temazepam 30 mg nightly and 15 mg q8h PRN
- Hospital/ECT course:**

ED: brought in after suicide by hanging. CPR initiated by family. GCS on arrival 8, intact airway, good O₂ saturation. CT head normal. ECG with QTc prolongation (508 ms), troponin 91→64 ng/L. Patient initially encephalopathic but mental status improved to baseline on the next day.

Day 3: ECG with deep symmetric T waves in anterior leads. Asymptomatic. Troponin decreased (18 ng/L), pro-BNP elevated (719 pg/mL; ref range <125 pg/mL). TTE showed mid-to-distal anteroseptal hypokinesis, LVEF preserved (50-60%). **TCM diagnosis** → no new med, but continued telemetry monitoring, repeat ECT. QTc normalized on day 6

12 days

Repeat ECT with anteroseptal T wave abnormality suggestive of ischemia. Patient asymptomatic. Coronary angiogram without obstructive coronary artery disease. Repeat TTE normal LV systolic function.

6 days

ECT initiated: labetalol 20 mg, nicardipine 500 during sessions. No further cardiac events. Completed **5 total sessions** (terminated due to symptom improvement and Covid-19 infection and multifocal pneumonia).

Case 3 - NE

- Demographics:** 68-year-old Caucasian female
- Psychiatric history:** MDD with psychotic features and catatonia, ECT planned for severe depression and catatonia
- Medical history:** HTN, MI (3 mo prior), peripheral vascular disease, breast CA in remission, on tube feed
- Medications:** mirtazapine 15 mg nightly, HCTZ 25 mg daily, amlodipine 10 mg daily, lisinopril 10 mg daily, atorvastatin 20 mg daily
- ECT course:**

2007: Had suspected TCM after having a course of ECT for depression.

14 years

ECT initiated. **During 3rd ECT:** 4-sec asystole on telemetry, immediately after succinylcholine, with rapid return of pulse, stable HR & BP. Rest of the procedure uneventful. Post-procedure ECG with LV hypertrophy and L anterior fascicular block, unchanged from prior.

Continued ECT: Rocuronium instead of succinylcholine. No further asystole/arrhythmia. Labetalol up to 40 mg and nicardipine up to 1600 mg needed for high BP during sessions. Completed **12 total sessions**.

| Reference | Sex | Age (Y) | Cardiac history | Timing of TCM | Time until ECT resumption | # of ECT post TCM | Cardioprotective medications post TCM |
|--------------------------|-----|---------|--------------------------------|-----------------------------------------------------|---------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Zhu et al. (2) | F | 77 | No | Unknown | 6 mo | 5 | Nitrates, diltiazem after the first episode. Labetalol 15 mg after the second episode |
| Eitzman et al. (3) | F | 76 | No | 15 min after the session | Unknown | Unknown | Unknown |
| Kent et al. (4) | F | 71 | No | After 3 stimulations during 1 st session | 2 mo | 19 | metoprolol 50 mg BID, aspirin 325 mg daily, atorvastatin 80 mg daily, clopidogrel 75 mg daily, esmolol and nicardipine drip during session. |
| Satterthwaite et al. (5) | F | 72 | Unknown | After 1 st session | 9 mo | 25 | Metoprolol, labetalol 10-20 mg before each session |
| Celano et al. (6) | F | 76 | No | After 11 th session | 1.5 mo | 33 | Atenolol 25 mg nightly, aspirin 81 mg nightly, IV labetalol 10-25 mg for each session |
| Binhas et al. (7) | F | 85 | No | Within 48 h of 3 rd session | 3 w | 8 | Ramipril, aspirin, bisoprolol |
| Kudling et al. (8) | N/A | 63 | No | In the morning before 12 th session | 5 w | Unknown | Aspirin, metoprolol, ramipril, spironolactone, simvastatin |
| Clifford et al. (9) | F | 65 | MV regurgitation s/p MV repair | After 26 th session (mECT) | 4 w | 6 | Metoprolol 50 mg daily |
| Meyer et al. (10) | F | 77 | No | 1 month prior to ECT initiation | 1 mo | Unknown | Esmolol 20 mg bolus with infusion (250 ug/kg/min) during session |
| Guiné et al. (11) | F | 69 | HCM, LBBB | After 1 st session | 35 d | 34 | Bisoprolol 5 mg BID, replacing patient's home atenolol |

Discussion/ Conclusion

- Cardiovascular complications of ECT driven by initial parasympathetic outflow induced by stimulus, followed by seizure-related parasympathetic and sympathetic surge, resulting in systemic catecholaminergic storm (10).
- TCM/stress-induced cardiomyopathy predominantly occur in post-menopausal women and 2/3 of cases involve stressful emotional or physical events (1). The exact mechanism of TCM pathogenesis is unknown, but the surge of catecholamine is thought to be involved.
- Patients who are receiving treatments for ECT are often experiencing severe emotional stress.
- Other factors reported to be associated with elevated catecholamine levels include, antidepressants, caffeine & nicotine use, many confounding in the ECT patient population (12, 13).
- Several reports including our cases with successful ECT course post TCM diagnosis; as soon as 13 days post-TCM. Risk of TCM recurrence should be weighed against the benefit of ECT to treat severe psychiatric conditions.
- Things to consider in resuming ECT: normalization of cardiac function, close monitoring of symptoms, ECG changes, and cardiac enzymes, and pharmacologic mitigation of cardiac risk (beta-blocker, ACEi).

References

