TORSADES DE POINTES AND THE CLASSIC SHORT-LONG-SHORT ACTIVATION SEQUENCE IN THE SETTING OF ATRIAL FIBRILLATION

CENTER FOR HEALTH SCIENCES
OKLAHOMA STATE UNIVERSITY

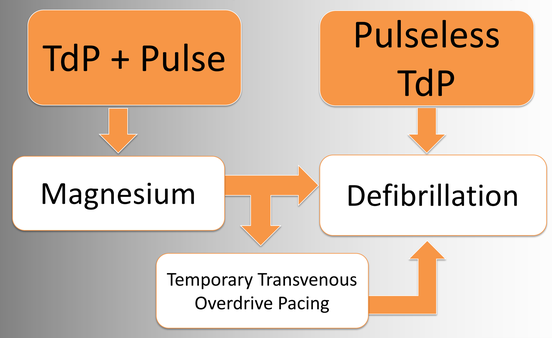
Tanner Hessman, OMS-III, Tom Hu DO, Reagan Robles DO, Steve Kim DO.

INTRODUCTION

Torsades de pointes (TdP) is an ominous form of rapid polymorphic ventricular tachycardia occurring in the setting of QT prolongation that must be addressed immediately as it often leads to ventricular fibrillation. The etiology of TdP is associated with many factors that prolong the QT interval (see below). We present a case of TdP in the setting of electrolyte abnormalities and atrial fibrillation with a classic short-long-short (SLS) activation sequence on EKG prior to deteriorating into TdP

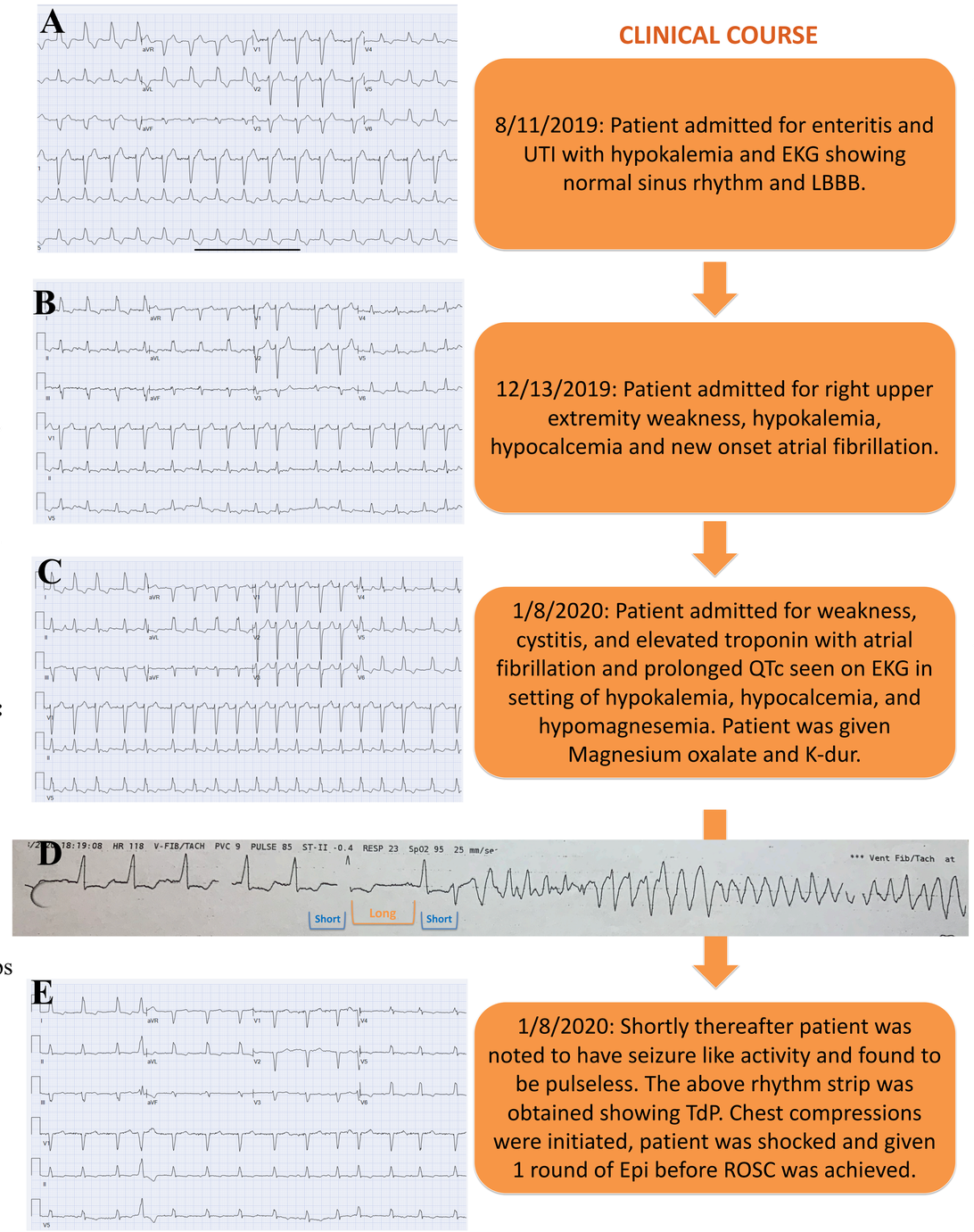
- Electrolyte Abnormalities
- Drugs
- Structural Heart Disease
- Bradyarrhythmias
- Congenital Long QT Syndrome

Optimal evidence-based therapy for TdP is based on the presence or absence of a pulse.



CASE PRESENTATION

- **HPI**: An 88-year-old female with a history of atrial fibrillation and dementia presented to the emergency room with progressive weakness and foul smelling urine. Patient requires total care from her son at baseline.
- **PMH:** Alzheimer's dementia, atrial fibrillation not on anticoagulation, CVA with residual right-sided weakness, HTN, HLD, TIIDM.
- **Family History**: Son denies any premature cardiac history.
- **Social History**: Denies tobacco, alcohol, and illicit drug use.
- **QT Prolonging Medications:** Trazodone
- **Vitals on presentation**: BP 140/65; HR 97; RR 20; Temp 36.7C; 97% on R/A
- **Cardiovascular Exam:**
  - Irregular rate and rhythm
  - No murmurs, rubs, or gallops
  - PMI is nondisplaced.
  - No edema
- **Labs:**
  - Hypokalemia: 3.0
  - Hypomagnesemia: 1.2
  - Hypocalcemia: 7.2
  - Troponin: 0.75



CLINICAL COURSE

8/11/2019: Patient admitted for enteritis and UTI with hypokalemia and EKG showing normal sinus rhythm and LBBB.

12/13/2019: Patient admitted for right upper extremity weakness, hypokalemia, hypocalcemia and new onset atrial fibrillation.

1/8/2020: Patient admitted for weakness, cystitis, and elevated troponin with atrial fibrillation and prolonged QTc seen on EKG in setting of hypokalemia, hypocalcemia, and hypomagnesemia. Patient was given Magnesium oxalate and K-dur.

1/8/2020: Shortly thereafter patient was noted to have seizure like activity and found to be pulseless. The above rhythm strip was obtained showing TdP. Chest compressions were initiated, patient was shocked and given 1 round of Epi before ROSC was achieved.

Figure 1. 12 lead EKG on 8/11/19 shows normal sinus rhythm with LBBB, QTc 492 (A). EKG on 12/13/19 shows sinus rhythm with PACs and LBBB, QTc 531 (B). EKG on 1/8/20 shows atrial fibrillation with RVR and LBBB, QTc 565 (C). Polymorphic ventricular tachycardia with SLS activation sequence (D). EKG on 1/8/20 after ROSC shows atrial fibrillation with competing junctional pacemaker, QTc 487 (E).

CONCLUSION

- TdP is an uncommon but well recognized polymorphic ventricular tachycardia pattern that involves a "twisting" of the QRS complexes around the isoelectric line.
- In the setting of QTc prolongation, a SLS activation sequence that precedes TdP has been theorized to promote heterogeneity of myocardial repolarization, creating the potential reentry that results in TdP.
- Atrial fibrillation adds another layer of arrhythmia, making calculation of the QTc using the Bazett formula difficult due to the R-R variation.
- Atrial fibrillation has been described in literature to be associated with TdP when treated with Class III antiarrhythmics for rhythm control. TdP occurring in atrial fibrillation in the absence of antiarrhythmic drugs is poorly understood.
- Prompt recognition of this life-threatening arrhythmia and prompt defibrillation to restore perfusion rhythm continues to be the cornerstone of treatment for an unstable patient with TdP.

REFERENCES

- Berul, Charles, et al. "Acquired long QT syndrome: Definitions, causes, and pathophysiology." UpToDate, 2020.
- Passman R, Kadish A. "Polymorphic ventricular tachycardia, long Q-T syndrome, and torsades de pointes. Med Clin North Am 2001; 85:321.
- Khan IA. Long QT syndrome: diagnosis and management. Am Heart J 2002; 143:7.