Refactory Torsades de Pointes due to Dofetilide overdose

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Case Description
- 61-year-old white female presented to the emergency department after ingesting 20 dovetilide 500 mcg tablets which were initially prescribed to her for atrial fibrillation.
- On presentation, her only complaint was dyspnea, palpitations, and distress.
- Telemetry and EKG revealed repeated self terminating episodes of Torsade de pointes.
- Poison control recommended lidocaine drip to minimize shortening the QT interval.
- She mistakenly took this medication thinking it was morning medications, reportedly not suicidal.

Review of Systems
- Positive for dyspnea, palpitations, and lightheadedness.

Past Medical History
- HF with reduced EF complicated by atrial fibrillation
- CKD stage IIIb
- Morbid obesity complicated by DM II
- Hypertension

Physical exam
- HR-68, T-98.6, BP-184/89, RR-19, in distress

Diagnostic tests
- Creatinine 1.7, GFR 40.
- CBC, CMP otherwise normal.
- EKG revealed significantly prolonged QTc at 741 ms with a rate of 80, and frequent PVCs.
- Urine toxicology screen, salicylates, and acetaminophen were negative.
- Chest x-ray revealed pneumonia in the right mid and upper lung field consistent with aspiration pneumonia.
- COVID-19 was ruled out due to patient possibly being a risk for cardiopulmonary resuscitation.
- Echocardiogram was obtained which showed normal ejection fraction at 66% with mild concentric left ventricular hypertrophy.

Clinical Course
- Poison control center was contacted, they recommended lidocaine drip. In the emergency department, our on-call cardiologist recommended isoproterenol drip until a transvenous pacemaker could be placed.
- Patient was intubated for airway protection. Isoproterenol was not available at our hospital, hence, she was placed on a dopamine drip.
- She became unstable and required defibrillation five times.
- Interventional cardiology was called to place a transvenous pacemaker for prevention of TdP due to recurrent bradycardia, TdP and third degree heart block.
- She required acute intervention until day 4 when the pacemaker was set to a rate of 50 and she maintained a heart rate of 70.
- She was extubated, subsequently developing atrial fibrillation with RVR.
- Atrial fibrillation was controlled with rate control alone and the dofetilide was discontinued.

Discussion
- Dofetilide overdose has been described but acute treatment with magnesium sulfate with activated charcoal for gastrointestinal decontamination was sufficient to prevent further toxicity.
- Our patient presented 6 hours after ingestion so prolonged intervention to treat Torsade de Pointes was required.
- This case of Dofetilide induced TdP was treated as TdP from any cause with magnesium sulfate acutely with defibrillation as needed followed by overdrive pacing to suppress ventricular ectopy and recurrent TdP episodes.
- Dofetilide induced TdP management is mentioned in a review article by Jaiswal et. al which recommends to treat it as TdP from any cause. (1)
- Dofetilide is a potassium channel blocker which prolongs phase 3 repolarization allowing more time for abnormal calcium influx from L-type calcium channels to produce early afterdepolarizations which causes triggered activity leading to polymorphic ventricular tachycardia. (2)
- Magnesium acts to modulate and prevent release of calcium from the sarcoplasmatic reticulum and cellular membrane.
- Isoproterenol is a beta 1/beta 2 agonist which acts to increase heart rate pharmacologically while awaiting placement of a transvenous pacemaker.
- Overdrive pacing is effective due to heart rate dependent shortening of the QT interval with increased heart rate.
- Dofetilide also causes AV nodal conduction delay which predisposes to bradycardia further prolonging the QT and further predisposing to TdP (1)
- Lidocaine acts via inactivating the late sodium channel during phase 2 which causes intracellular sodium overload leading to intracellular calcium overload predisposing to calcium current during repolarization, lidocaine is not supported by the literature (3)

References

Fig 1: Telemetry strip showing Torsades de Pointes

Fig 2: EKG obtained on day 2 which shows the typical R on T phenomenon typical of early afterdepolarizations during bradycardia which predisposes to Torsade de Pointes

Fig 3: EKG obtained after ventricular pacing with suppression of ventricular ectopy