CARDIOLOGY 2024

Is Sotalol the Right Medication to Treat JET?

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Children's Mercy KANSAS CITY

Junctional Ectopic Tachycardia

- Occurs 8-10%
- Within 24 hours of surgery
- Significant cause of morbidity
- Causes
  - Abnormal automaticity from a perioperatively damaged junctional area
  - Edema
  - Injury from suture lines
  - Long ischemic times
  - Long cross-clamp and bypass times

Children's Mercy KANSAS CITY

MANAGEMENT OF JET

- Overdrive pacing
  - Restoration of AV synchrony by pacing, atrial kick may increase CO by 30%
  - Cooling
- Medications – Limited options in pediatrics
  - Amiodarone or Sotolol
  - Dexmedetomidine
  - Adequate sedation
  - Decrease inotropic support as tolerated (difficult)
  - Correction of electrolyte imbalance (low K/Mg)

WHAT IS SOTALOL?

- Beta blocker with Class III antiarrhythmic properties
- Approved by US Food and Drug Administration in 2015
- Before Sotalol only IV Class III antiarrhythmic for peds was Amiodarone
- Intermittent IV infusion and PO
- Better SE profile
- Cons-prolonged QTc, pro-arrhythmic

IS SOTALOL SAFE?

Intravenous Sotalol in the Young

Safe and Effective Treatment With Standardized Protocols

Alejandro A. Borquez, MD, Othman A. Aljohani, MD, Matthew R. Williams, MD, James C. Perry, MD

- Retrospective study of all who received Sotalol
- 37 patients (Dec 2015 to Dec 2018)
  - 26 for acute arrhythmias
  - 2 maintenance dose
- 16 atrial flutter, 9 SVT, 1 AET
- All converted to NSR and/or maintained NSR
- No adverse events
- Clinical bias
- Limitations

SOTALOL & NEONATES

Sotalol in neonates for arrhythmias: Dosing, safety, and efficacy

Amy L. Kiskaddon PharmD, MBA, Jamie Decker MD

- Retrospective study evaluating sotalol dosing Jan 2011 – June 2021
- Neonates received PO or IV sotalol
- Goal to provide sotalol doses based on body weight and BSA

SOTALOL AND NEONATES

- 31 patients
  - 14% required dose increase
  - Median dose 8.5mg/kg/day (man rec 51.3mg/kg/day)
  - 7% needed a 2nd antiarrhythmic
  - 2 patients had hypotension
  - 1 had bradycardia requiring discontinuation
  - Only 6.8% change in QTC after initiation
  - Mean dosage much less than recommended dose
- Limitations

SOTALOL IN CHILDREN WITH CHD

IV Sotalol Use in Pediatric and Congenital Heart Patients: A Multicenter Registry Study

Lindsey E. Malloy-Walton ✉, Nicholas H. Von Bergen, Seshadri Balaji, Peter S. Fischbach, Jason M. Garnreiter, S. Yukiko Asaki, Jeffrey P. Moak, Luis A. Ochoa, Philip M. Chang, Hoang H. Nguyen, Akash R. Patel, Christa Kirk, Ashley K. Sherman, Jennifer N. Avari Silva and J. Philip Saul

Originally published 2 May 2022 | https://doi.org/10.1161/JAHA.121.024375 | Journal of the American Heart Association. 2022;11:e024375

- Multicenter registry study
- 85 patients received Sotalol – single dose
  - 45% (53pt) had CHD; 5% (4pt) > 18 yrs
- 79 (93%) patients had SVT, 4 (5%) had ventricular arrhythmias, 7 (9%) dec fxn

SOTALOL IN CHILDREN WITH CHD

- Median dose 1mg/kg; Median timing 60 minutes
- Successful termination in 31pt (49% CI [37-62%])
- Rate reduction 18pt (30% CI [19-41%])
- 11pt (16%) QTC prolongation
- 2 patients' developed hypotension and infusion terminated early
- Limitations

SOTALOL AND POST-OP ARRHYTHMIA

FULL TEXT ARTICLE

Safety and Efficacy of Intravenous Sotalol Following Congenital Heart Surgery

Ellis Rochelson MD, Maria Gutierrez MD, Santiago O. Valdés MD, Katherine Lemming PharmD, Taylor S. Howard MD, Tam Dan N. Pham MD, Christina Y. Miyake MD, MS, Vicken Asadourian BA, Raajen Patel MS and Jeffrey J. Kim MD

JACC: Clinical Electrophysiology, 2024-01-01, Volume 10, Issue 1, Pages 135-136, Copyright © 2024 American College of Cardiology Foundation

- Retrospective study (August 2016 to July 2022)
- 96 pt – med age 42days, med weight 3.9kg
- 24 (25%) mod CHD, severe 68 (71%)
- 44% single ventricle physiology

SOTALOL AND POST OP ARRHYTHMIA

- 63% given bolus dose (given over 1 hr), 38% maint therapy
- Successful treatment 89% of post-op arrhythmia
- 20 pt with JET; 80% success rate
- No discontinuation d/t prolonged QTC
- No significant hypotension with administration
- Limitations

SOTALOL AND ADVERSE EVENTS

Adverse event rate during inpatient sotalol initiation for the management of supraventricular and ventricular tachycardia in the pediatric and young adult population

Stephanie F. Chandler, MD,*[1] Esther Chu, PharmD,[†] Robert D. Whitehill, MD,*[2]
Laura M. Bevilacqua, MD,* Vassilios J. Bezzerides, MD, PhD,* Elizabeth S. DeWitt, MD,*
Mark E. Alexander, MD, FHRS,* Dominic J. Abrams, MD, MRCP,*
John K. Triedman, MD, FHRS,* Edward P. Walsh, MD, FHRS,* Douglas Y. Mah, MD*

- Retrospective analysis of pt < 21 yrs of age
- Oral Sotalol for SVT or VT
- January 1, 2007 to July 1, 2016
- 190 patients met criteria
- 60% had CHD
- AVRT, A Flutter, EAT, A Fib

SOTALOL AND ADVERSE EVENTS

- Primary AE were prolonged QTc and bradycardia
- Only 5 patients (3%) had AE
  - Bradycardia with HR<40 and <100
  - QTc prolongation
  - All had CHD
- No deaths or malignant rhythms
- Limitations

SOTALOL AND ADULT CHD

Efficacy and adverse effects of sotalol in adults with congenital heart disease

Benjamin M. Moore [1], Rachael L. Cordina [1], Mark A. McGuire [1], David S. Celermajer [*,1]

- Retrospective review of pt >16 in adult CHD database
- Highly complex CHD
- Prescribed sotalol between 2000-2017
- AE (pro-arrhythmic)

SOTALOL AND ADULT CHD

- 82 patients given Sotalol (9%)
- Effective in 48%, partially effective in 46%, non-effective in 6%
- 15 patients discontinued d/t SE
- No torsades or sudden cardiac death
- 11 patients with significant bradycardia
  - 4 required pacemaker
- Safe and effective in low doses
- Bradycardia more common in Fontans
- Limitations

SOTALOL VS AMIODARONE

Sotalol vs amiodarone for postoperative junctional ectopic tachycardia: Citius, Altius, Fortius?

Sandra Kikano MD and Prince J. Kannankeril MD, MSCI, FHRS

Heart Rhythm, 2022-03-01, Volume 19, Issue 3, Pages 457-458, Copyright © 2021 Heart Rhythm Society

- Retrospective study in children <5 yrs
- 12 children given IV Sotalol vs 20 children given IV amiodarone
- Success reduction in HR <170 w/in or return to NSR
- 83% success rate with Sotalol vs 75% with Amiodarone
- 2 patients with Amiodarone required discontinuation d/t hypotension
- IV Sotalol achieved HR control faster
- Much higher drug price

SOTALOL VS AMIODARONE

Sotalol versus amiodarone for postoperative junctional tachycardia after congenital heart surgery

Ellis Rochelson, MD,* Santiago O. Valdés, MD,* Vicken Asadourian, BA,†
Raajen Patel, MS,† Katherine Lemming, PharmD,* Taylor S. Howard, MD,*
Tam Dan N. Pham, MD,* Christina Y. Miyake, MD, MS,* Jeffrey J. Kim, MD*

- Evaluate safety and efficacy of IV Sotalol vs Amiodarone for JET
- Retrospective single center study
- 32 patients: 20 received IV amiodarone, 12 received IV sotalol
- JET rate decreased faster after Sotalol (25 beats/min/hr vs 8 beats/min/hr w/Amio)
- Termination of JET: 75% of pt given Amiodarone vs 83% w/Sotalol
- Amiodarone infusion was stopped early in 2 pt d/t hypotension

AMIODARONE

- Loading dose 5mg/kg (max 15mg/kg) over 60 minutes
- Hypotension common
- Continuous infusion 5-15mg/kg/min
- Common SE – N/V, stomach pain, HA, flushing, fatigue
- Severe SE – change in eyesight, photosensitivity, liver problems, thyroid problems, lung problems, muscle weakness, shortness of breath, balance issues
- Still at risk for SE once discontinued due to prolonged duration of action and half life
- Many drug interactions

Hamilton et al, 2020

AMIODARONE AND THE THYROID

- Can cause hypo or hyperthyroidism
  - Hypothyroidism more common in children
  - Children can develop thyroid changes in as early as 2 weeks after initiation
- Impacts thyroid function through iodine excess-associated alterations
  - 75mg iodine in 200mg tab; 18.7mg/ml iodine in IV solution
  - Decreased production of T3 and T4
- Hypothyroidism can last for months after discontinuation
  - Lipophilic nature
- Treatment includes Levothyroxine and frequent lab monitoring

Barrett & Bauer, 2021

AMIODARONE AND THE LUNGS

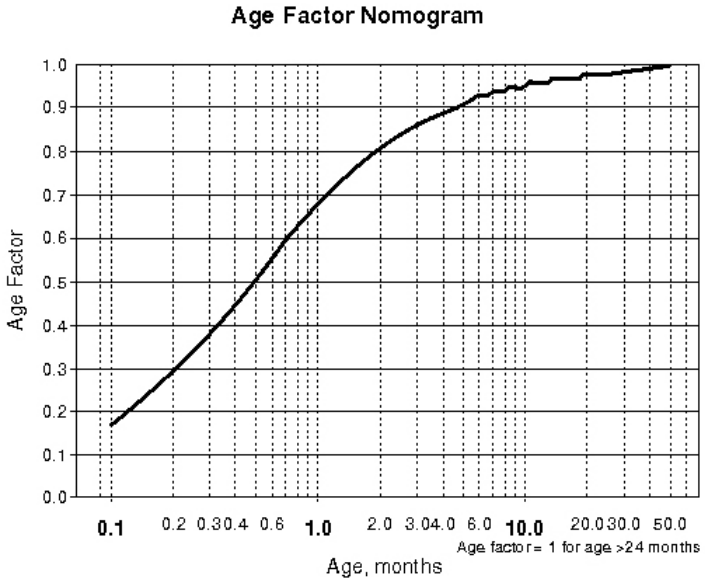
- Presents as interstitial lung disease or hypersensitivity syndrome
- Occurs 4-6% of the time but has significant impact
- Fatal approximately 10% of the time
- Should be avoided in those with asthma or those on oxygen d/t increased risk
- PFTs and annual CXR

Barrett & Bauer, 2021

SOTALOL DOSING

- Facility w/cardiac resuscitation and ECG monitoring
- Dosing recommendations based on doses per m2
- Need QTc and creatinine clearance prior to initiation
- 30mg/m2/dose Q8 hours using age-related factor
- Lower dosing with renal impairment
- Complicated dosing
- Expensive

AGE FACTOR NOMOGRAM



Adapted from U.S. Food and Drug Administration.
http://www.fda.gov/cder/foi/label/2001/2115s3lbl.PDF

SOTALOL SIDE EFFECTS

- Common SE
  - Fatigue, dyspnea, bradycardia, dizziness, abdominal pain, N/V, diarrhea, musculoskeletal pain, visual disturbance
  - Prolonged QTc - if >500 reduce vs stop drug
- Serious SE
  - Sinus node dysfunction, arrhythmias, heart block
- Do not abruptly discontinue

CONCLU

- Overall safe
- Most comm
- Small studi
- Need larger