Junction Ectopic Tachycardia

EXECUTIVE SUMMARY

Physician Owner(s): Laura Ortmann, MD

Primary Objective

Children's Hospital and Medical Center a high rate of treated post-operative arrhythmias in the cardiac ICU. The most common post-operative arrhythmia is junctional ectopic tachycardia (JET). JET leads to longer ICU stay and puts the patients are risk for hemodynamic compromise. Rapid treatment of JET may lead to improved ICU outcomes.

Inclusion criteria: All children that have had cardiac surgery and are diagnosed with JET.

Exclusion criteria: Non-operative JET, any arrhythmia that is not JET, patients on extracorporeal membranous oxygenation.

Recommendations

The JET pathway recommends the early ordering of amiodarone as soon as JET is diagnosed. There is a limited observation time between diagnosis and starting the amiodarone infusion. Regular reassessments and escalation of dose is recommended.

Amiodarone

Amiodarone is the drug of choice for JET[1-4]. Early initiation of amiodarone results in quicker time to heart rate control and shorter length of mechanical ventilation. Given amiodarone's long half-life, bolus administration prior to starting a continuous infusion is recommended[1]. Bolus amiodarone has been linked to increased cardiovascular instability[4,5] due to binding of calcium, thus adequate calcium levels prior to administration are required. Other measures such as decreasing agitation, decreasing inotrope usage and mild hypothermia have also been reported to be useful adjuncts in the treatment of JET[6,7].

Rationale

The JET pathway will standardize care between multiple ICU providers. It will focus on decreasing time to definitive JET treatment with clear medication doses and reassessment times. Decreased time to medication has been shown to decrease time to heart rate control. Initially our time to amiodarone dosing was 1.2 hours which decreased to 0.5 hours. Time to heart rate control (heart rate < 165) was 11.1 hours which decreased to 4.3 hours with the first version of the pathway. Our goal is to decreased time to heart rate control by a further 50%.

The pathway will also limit the use of hypothermia, which is associated with increased sedation/paralytic need and thus longer time on mechanical ventilation. 37% of patients had a lowest temperature ≤34°. Based on our baseline data, patients that undergo standard hypothermia (≤ 35° C) spend 12 days on the ventilator compared to 9 days for patients that undergo mild hypothermia (35-36°). Restriction of hypothermia could lead to increased length of JET, but by starting amiodarone early, we hope to limit that effect.

The pathway will increase the use of the antiarrhythmic medication amiodarone, which has the potential to lengthen some ICU stays if the patient would have improved without the treatment. Amiodarone can potential increase hemodynamic instability. 42% of patients had an increase in vasoactive support during JET prior to the pathway.

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Metrics

1. Outcome measure: Reduce the time to heart rate < 165 to 2 hours or less from first amiodarone bolus by July 2023.
2. Outcome measure: Maintain mechanical ventilation time to ≤ 5 days by July 2023.
3. Process measure: Maintain time from order to start of amiodarone bolus to ≤ 0.5 hours by July 2023
4. Process measure: Maintain incidence of hypothermia (<35°C) ≤35% of patients with JET by July 2023.
5. Balancing measure: Monitor for increased vasopressor support (excluding calcium chloride infusions) after the start of amiodarone (bolus or infusion).

Team Members

Champion: Laura Ortmann, MD - Director of Cardiac Critical Care
Members:

- Jeffrey Robinson, MD - Cardiac Electrophysiologist
- Justin Parsley, DNP, RN, CCRN-K – Cardiac Care Unit Educator
- Mary Jo White, PharmD – Intensive Care Pharmacist
- Kelsey Spackler, DNP, APRN, CPNP-AC/PC – Supervisor, Clinical Effectiveness
- Abby Vipond, MSN, APRN, FNP-C – Clinical Effectiveness Project Manager

Evidence

1. Haas N, Campausen C. Impact of early and standardized treatment with amiodarone on therapeutic success and outcome in pediatric patients with postoperative tachyarrhythmias. *J Thorac Cardiovasc Surg* 2008; 136:1215-1222.
2. Kendrick J, Macready J, Kissoon N. Amiodarone treatment of junctional ectopic tachycardia in a neonate receiving extracorporeal membrane oxygenation. *Ann Pharmacother* 2006; 40:1872-1875.
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4. Etenmann A, Michel M, Herberg U et al. Management of postopetive junction ectopic tachycardia in pediatric patients. *Eur J Pediatr* 2017;176:1217-1226.
5. Maghrabi K, Uzun O, Kirsh J, et al. Cardiovascular collapse with intravenous amiodarone in children: a multi-center retrospective cohort study. *Pediatr Cardiol* 2019; 40:925-933.
6. Pfammatter J, Paul T, Ziemer G, Kallfelz H. Successful management of junctional tachycardia by hypothermia after cardiac operation in infants. *Ann Thorac Surg* 1995; 60:556-560.
7. Walsh E, Saul J, Sholler G, Triedman J, Jonas R, Mayer J, Wessel D. Evaluation of a staged protocol for rapid automatic junctional tachycardia after operation for congenital heart disease. *J Am Coll Cardiol* 1997; 29:1046-1053