



Therapeutic hypothermia and cardiac intervention after cardiac arrest in pregnancy with underlying maternal arrhythmia: A case report

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ABSTRACT

There are few case reports of utilization of therapeutic hypothermia during pregnancy, and most report successful maternal and fetal outcomes. There is no available evidence that supports withholding therapeutic hypothermia in these patients. There are no long-term data on neonatal outcomes. We report the case of a 28-year-old pregnant patient with long QT syndrome who experienced multiple cardiac arrests during the second trimester and underwent therapeutic hypothermia, cardiac ablation, transvenous pacemaker placement, and placement of an implantable cardioverter defibrillator (ICD). She subsequently delivered a viable infant at term. The evidence seems to support the use of hypothermia during pregnancy, but patients should be counseled about the unknown maternal and fetal risks and long-term neonatal outcomes. Decisions to utilize therapeutic hypothermia should be made on an individual basis.

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1. Introduction

Cardiac arrest is infrequently encountered during pregnancy; the incidence is approximately 1 in 20,000 [1]. There is a paucity of literature regarding the appropriate management of gravid patients who experience cardiac arrest. Only three cases with favorable outcomes for both mother and neonate have been reported [2–4]. Therapeutic hypothermia has been shown to improve neurologic recovery and mortality rates after cardiac arrest, and it is now the standard of care following return of spontaneous circulation (ROSC) [5]. In the past, pregnancy was considered a contraindication to therapeutic hypothermia in clinical trials; however, there is no evidence to support withholding therapeutic hypothermia in these patients [6].

2. Case

We present the case of a 28-year-old Caucasian primigravida with a history of arrhythmia who presented during the second trimester as a transfer from an outside facility after she was found unresponsive in bed. Cardiopulmonary resuscitation (CPR) was initiated immediately and continued until paramedics arrived, and ROSC occurred following defibrillation performed on the way to the hospital. She was intubated, sedated and transported to a tertiary-care facility, where she was placed on a cooling protocol in the intensive-care unit (ICU).

On initial assessment, troponins were elevated and an echocardiogram revealed global hypokinesia with an ejection fraction (EF) of 20%. Electrolytes were noted to be normal. During subsequent rewarming on hospital day 2, she again arrested after developing torsades de pointes and ventricular tachycardia (V-tach). She was noted to have QTc prolongation and a transcutaneous pacemaker was placed. She was started on metoprolol with plans for placement of an implantable cardioverter defibrillator (ICD) after stabilization. Her EF continued to improve; however, on hospital day 5 she again arrested after sustained V-tach and ventricular fibrillation (V-fib). After resuscitation, a temporary transvenous pacemaker was placed without complication. Metoprolol was transitioned to nadolol for improved long-term rhythm control.

Subsequently, a focal automatic ventricular tachycardia arising from the right ventricular posterior septal wall was noted, and this was successfully ablated without fluoroscopy without complication. The following day a dual-chamber ICD was placed without complication. Fetal assessment remained reassuring throughout.

It was later discovered that the patient had a cardiac arrhythmia diagnosed the previous year, during a dilation and curettage. She had been started on an antiarrhythmic medication but had self-discontinued the medication shortly after initiation. Further review of records revealed QTc prolongation on an EKG from 19 years prior. Genetic testing was performed and was diagnostic for KCNH2 (HERG) mutation pathologic for long QT syndrome type 2. After genetic testing results were obtained, she was discharged home on nadolol for rhythm control.

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The patient was followed closely by cardiology for the remainder of her pregnancy. Cardiology agreed with plans for a vaginal delivery in the cardiac ICU with cesarean delivery reserved for the usual obstetric indications. She was also followed closely by maternal-fetal medicine for the remainder of her pregnancy and was counseled regarding the unknown fetal risks associated with maternal cardiac arrest and subsequent cooling/rewarming. Follow-up fetal assessments remained reassuring.

The patient underwent induction of labor at 39 weeks in the cardiac ICU. She remained on continuous cardiac telemetry and QTc-prolonging medications were avoided. Induction of labor and vaginal delivery were without complication. She delivered a viable male infant weighing 2725 g with Apgar scores of 8 and 9 at 1 and 5 min, respectively. She experienced no complications throughout the hospitalization and was discharged to home on postpartum day 2.

An EKG performed on the infant was notable for a prolonged QTc. Genetic testing returned positive for the KCNH2 (HERG) mutation pathologic for long QT syndrome type 2. He was evaluated by cardiology at 6 weeks of age. Cardiology recommended expectant management with yearly follow-up. No other abnormalities were identified. The infant continued to do well. At last follow-up appointment, at 6 months of life, the infant was noted to be meeting all developmental milestones and no neurodevelopmental abnormalities were identified.

3. Discussion

We describe the use of therapeutic hypothermia in a pregnancy after multiple cardiac arrests with subsequent cardiac ablation, transvenous pacemaker placement and ICD placement with a successful pregnancy outcome. There are few case reports of therapeutic hypothermia following cardiac arrest in pregnancy. None of the women had experienced multiple cardiac arrests or undergone cardiac ablation or transvenous pacemaker placement.

Arrhythmia is one of the most commonly encountered cardiac complications during pregnancy [7]. While ventricular arrhythmias have been reported during pregnancy in patients with long QT syndrome, they are more common in the postpartum period. This is felt to be secondary to loss of the protective effect of physiologic tachycardia experienced during pregnancy, and subsequent decrease in heart rate and increase in QT interval during the postpartum period. Physiologic stress and changes in sleep in the postpartum period are also thought to contribute [8]. Patients with long QT syndrome who have had symptoms benefit from continuous beta-blocker therapy throughout pregnancy and the postpartum period [9]. Our patient had self-discontinued her antiarrhythmic medication and was not taking any medication when the cardiac arrest occurred. After stabilization during a prolonged hospital course and compliance with antiarrhythmic medication, the patient did not experience any cardiac events during the remainder of her pregnancy or postpartum period. Therefore, patients should be counseled on the importance of adherence to antiarrhythmic medications.

Limited evidence suggests that most fetuses survive therapeutic hypothermia following maternal cardiac arrest. Although no long-term data exist regarding neonatal and childhood neurodevelopment, fetuses appear to remain neurologically intact following therapeutic hypothermia [2–4]. It is important to investigate underlying causes of cardiac arrest, and arrhythmias such as long QT syndrome should be considered. If long QT syndrome is suspected or confirmed, medications known to prolong QTc interval should be avoided. Delivery considerations should be discussed with cardiology.

In the past, pregnancy has been considered a contraindication to therapeutic hypothermia. In previous clinical trials on post-arrest induced hypothermia, pregnant patients have been excluded. According

to the most recent statement from the American Heart Association, “targeted temperature management should be considered on an individual basis” and “if used in pregnancy, targeted temperature management should follow the same current protocol as for the non-pregnant patient” [10].

4. Conclusion

Available evidence seems to support the use of hypothermia during pregnancy, but overall maternal and fetal risks remain uncertain. In a limited number of case reports, therapeutic hypothermia has been shown to be safe and effective in improving mortality rates and neurologic outcomes in pregnant patients and their offspring. Both maternal and fetal risks should be considered and decisions should be made on an individual basis.

Contributors

All authors were either directly involved in the care of this patient and/or assisted in the preparation of the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

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References

- [1] H.T.L. Vanden, Part 12: Cardiac Arrest in Special Situations: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (vol 122, pg S829, 2010), *Circulation* 124 (15) (2011) E405.
- [2] A. Chauhan, et al., The use of therapeutic hypothermia after cardiac arrest in a pregnant patient, *Ann. Emerg. Med.* 60 (6) (2012) 786–789.
- [3] K.N. Oguayo, et al., Successful use of therapeutic hypothermia in a pregnant patient, *Tex. Heart Inst. J.* 42 (4) (2015) 367–371.
- [4] J.C. Rittenberger, et al., Successful outcome utilizing hypothermia after cardiac arrest in pregnancy: a case report, *Crit. Care Med.* 36 (4) (2008) 1354–1356.
- [5] M. Holzer, et al., Mild therapeutic hypothermia to improve the neurologic outcome after cardiac arrest, *N. Engl. J. Med.* 346 (8) (2002) 549–556.
- [6] M.A. Peberdy, Part 9: post-cardiac arrest care: 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care (vol 122, pg S768, 2010), *Circulation* 124 (15) (2011) E403.
- [7] W. Drenthen, et al., Outcome of pregnancy in women with congenital heart disease – a literature review, *J. Am. Coll. Cardiol.* 49 (24) (2007) 2303–2311.
- [8] E.J. Rashba, et al., Influence of pregnancy on the risk for cardiac events in patients with hereditary long QT syndrome, *Circulation* 97 (5) (1998) 451–456.
- [9] V. Regitz-Zagrosek, et al., ESC guidelines on the management of cardiovascular diseases during pregnancy the task force on the management of cardiovascular diseases during pregnancy of the European Society of Cardiology (ESC), *Eur. Heart J.* 32 (24) (2011) 3147–3197.
- [10] F.M. Jeejeebhoy, et al., Cardiac arrest in pregnancy a scientific statement from the American Heart Association, *Circulation* 132 (2015)(18): p. 1747–+.