Rapid Ventricular Override Pacing to Facilitate Embolization of Vein of Galen Type Malformations

Aaron Hockley BS, MD
Mohammed A Almekhlafi, MD, MSc, FRCPC; Abhay K Lodha, MBBS, MD, DM, MSc; Robin Clegg, MD FRCPC; Jeremy Luntley, MBBS, FRCA; Muneer Eesa, MD; John H Wong, MD, MSc, FRCSC
University of Calgary

Introduction
Vein of Galen aneurysmal malformations (VGAM) are common neonatal cerebrovascular malformations. These lesions have a grim natural history if left untreated. Current first line treatment for suitable patients is endovascular obliteration of the fistulous connection, thereby ameliorating the arteriovenous shunt and increasing end organ perfusion. The high flow nature of these shunts presents an obstacle in the safe and accurate delivery of liquid embolic agents and detachable coils, as distal embolization is a constant risk.

Learning Objectives
The objective is to demonstrate and describe the novel technique of ventricular overdrive pacing to aid in accurate embolization of high flow lesions, in this case Vein of Galen malformations.

Methods
Retrospective of review of the prospectively maintained Alberta Comprehensive Outcomes Research in Neurosciences (ACORN) database; search for override pacing in vein of galen malformation cases.

Results
Three embolization sessions were performed on two infants who presented with heart failure secondary to high outflow malformations. The first patient underwent intervention at 8 days of life, while the second patient underwent two procedures, the first at 10 days, the second at 8 months of age. In all procedures, high concentration n-butyl cyanoacrylate (nBCA) was the embolic agent. Override pacing was successfully achieved in 6 of 8 pacing attempts (75%) and facilitated partial embolization during the three procedures. Ventricular fibrillation occurred twice and was successfully reversed with defibrillation on both occasions. Patient-2 stabilized following staged embolization while patient-1 failed to improve and passed away six days following the procedure.

Conclusions
At experienced centers, and with a multidisciplinary approach, transvenous cardiac override pacing is a relatively safe technique that can be considered to facilitate embolization in high flow VGAMs.

References
10. Groff MW. Adenosine-induced transient asystole for management of a basilar artery