Does reversal of flow in the fetal aortic arch in second trimester aortic stenosis predict hypoplastic left heart syndrome?

Kovacevic A. (1,2), Öhman A.(3), Tulzer G.(4), Herberg U.(5), Dangel J.(6), Bartrons J.(7), Carvalho J.S.(1,8), Fesslova V.(9), Jicinska H.(10), Sarkola T.(11), Toler A.J.(12), Mellander M.(13), Gardiner H.M.(1,14,15)

Department of Paediatric and Congenital Cardiology, Royal Brompton and Harefield Hospital, NHS Foundation Trust, London, UK (1); Department of Paediatric and Congenital Cardiology, University of Heidelberg, Heidelberg, Germany (2); Department of Women’s and Children’s Health, Uppsala University, Sweden (3); Department of Paediatric Cardiology, Children’s Heart Centre, Linz, Austria (4); Department of Paediatric Cardiology, University Hospital Bonn, Germany (5); Perinatal Cardiology Clinic, 2nd Department of Obstetrics and Gynecology, Medical University of Warsaw, Poland (6); Department of Paediatric Cardiology, Hospital Clinic, Sant Johan de Deu, Barcelona, Spain (7); Fetal Medicine Unit, St. George’s Hospital NHS Trust, London UK (8); Center of Fetal Cardiology, Policlinico San Donato IRCSS, Milan Italy (9); University Hospital and Masaryk University Brno, Czech Republic (10); Children’s Hospital, University of Helsinki and Helsinki University Central Hospital, Helsinki, Finland (11); Department of Data Analytics, Southern New Hampshire University, Manchester, New Hampshire, USA (12); Department of Paediatric Cardiology, Queen Silva Children’s Hospital, Sahlgrenska University Hospital, Gothenburg, Sweden (13); Department of Reproductive Biology, Division of Cancer, Faculty of Medicine, Imperial College London at Queen Charlotte’s and Chelsea Hospital (14); The Fetal Center, Children’s Memorial Hermann Hospital, University of Texas, Houston, TX, USA (15)

Introduction: Fetal aortic valvuloplasty (FV) has been proposed as an effective therapy to prevent progression from aortic stenosis to hypoplastic left heart syndrome (HLHS). Reversal of aortic arch flow in second trimester is thought predictive of HLHS without FV. We hypothesized that reversed arch flow does not predict HLHS.

Methods: In a retrospective multicenter and multinational study (2005-2012) 214 fetuses with aortic stenosis were enrolled into a hybrid case-control and repeated samples cohort. Liveborn surgical candidates undergoing FV or without FV (natural history, NH) were matched for between +/- one Z-score for mitral valve (MV) and aortic valve (AoV) diameters, left ventricular inlet length (LV) and retrograde arch flow at 23 +/- 3 gestational weeks, producing best match cohorts for each. Outcome measures were survival with biventricular circulation (BV) at four years. We analysed outcomes using Cox proportional hazards regressions and Kaplan Meier curves.

Results: FV was performed in 67/214, technically successful in 59 (88.0%). FV-related deaths occurred in 7/67 (10.4%). Overall 151/214 (71%) were live-born, including unknown outcomes in 5 and no surgery in 16. Kaplan Meier curves show no significant difference in survival and in BV for case-control groups matched for retrograde arch flow and mitral valve, aortic valve or left ventricle inlet length Z-scores at 4 years after birth (Fig. 1 a-c).

Conclusions: The results from this multicenter study, matching for similar morphology and reversed arch flow in second trimester, showed that those with and without FV had similar BV outcomes and failed to show that reversed arch flow predicts HLHS.
Fig. 1 a-c: Kaplan Meier curves showing no significant difference in survival and BV for case control groups (FV=Fetal aortic valvuloplasty, NH=Natural history, matched for +/- one Z-score for MV, AoV, LV inlet Z-scores and retrograde aortic arch flow at 23 +/- 3 gestational weeks at 4 years after birth).