Postnatal outcome in patients with aortic stenosis undergoing fetal aortic valvuloplasty

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Objective
Critical fetal aortic stenosis (AS) leads to stunted growth of the left ventricle (LV) and progresses to hypoplastic left heart syndrome (HLHS) if left untreated. To preserve the growth potential of the LV, fetal aortic valvuloplasty (FAV) became the treatment of choice at selected centers around the world. Improving fetal hemodynamics results in LV’s potential to become suitable for a postnatal repair, preserving a biventricular circulation (BVC). To this date, however, it is unclear in how many patients undergoing FAV worldwide, a biventricular circulation is ultimately achieved. The goal of this systematic review/meta-analysis is to determine whether there is sufficient clinical evidence to predict postnatal outcome in patients with AS following FAV to provide adequate prenatal counseling for this patient cohort.

Methods
The methodology published by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was applied. A systematic search on peri- and postnatal outcome in patients with AS following FAV was performed using MEDLINE, EMBASE, Web of Science and Cochrane Library. All literature was assessed by reading abstracts, excluding duplicates, and if suitable, full text articles were obtained and included. We reviewed publications from 2000 to 2020 including at least 12 months of follow-up. Review papers, comments, books, editorials and case reports were excluded. The primary endpoint was type of postnatal circulation. Additional assessed outcomes included fetal death, live birth, neonatal death (NND), termination of pregnancy (TOP) and technical success of FAV procedure. The quality of articles was assessed using the Critical Appraisal Skills Programme tool (CASP checklist). To estimate the overall proportion of each endpoint, meta-analysis of proportions was employed using a random-effects model.

Results
An electronic search identified 579 studies, of which seven were considered eligible for analysis. A total of 266 fetuses underwent FAV with a follow-up ranging from 12 months to 13.2 years. There were no maternal deaths and only one FAV related maternal complication. Hydrops was present in 25 (9%) patients. Pooled prevalence of BV and UV among all live-born patients were 46% (95% CI 39.2, 52.4) and 44 %, (95% CI 33.9, 53.8) respectively. Pooled prevalence of each secondary outcome was, technical successful procedures (82%；95% CI 74.3, 87.9), fetal deaths (16%；95% CI 11.2-22.4), TOP (6 %；95% CI 2.0-15.5), live-births (79 %；95% CI 66.5, 87.4), NND (9%；95% CI 4.7, 15.5), comfort care (4%；95% CI 1.9, 8.4), late death (10%；95% CI 3.6, 26.1). Pooled prevalence for BV and UV among live-born patients that underwent technical successful procedures were 52% (95% CI 44.7, 59.1) and 39.8 %, (95% CI 29.7, 50.9), respectively.

Conclusion
Maternal FAV-related complications are rare and the majority of fetuses undergoing FAV are born alive. BVC following successful fetal intervention can be achieved in 52% of live-born patients compared to UVC. In summary, the current available published information can serve for prenatal parental counseling in this patient cohort. However, randomized clinical trials are necessary to address this question.

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