

MP4-10

Assessment of linear insertion of atrioventricular valves in fetuses with postmortem cardiac MRI

Blondiaux E. (1), Autret G. (2), Dhombres F. (3), Gonzales M. (3), Clément O. (2), Jouannic J.M. (3), Houyel L. (4).

Service de Radiologie, Hôpital Trousseau – Hôpitaux Universitaires de l'Est Parisien (APHP), Université Pierre et Marie Curie, Paris VI, Paris, France (1); Plateforme Imageries du Vivant, Paris Cardiovascular Research Center, INSERM U970, Université Paris Descartes, Sorbonne Paris Cité, Paris, France (2); Service de médecine fœtale, Hôpital Trousseau – Hôpitaux Universitaires de l'Est Parisien (APHP), Université Pierre et Marie Curie, Paris VI, Paris, France (3); Service de chirurgie des cardiopathies congénitales, Hôpital Marie-Lannelongue, CMR-M3C, Université Paris-Sud, Le Plessis-Robinson, France (4).

Background: Linear insertion of the atrioventricular valves (ILVAV) was described in 2002 by C. Fredouille et al. as an echocardiographic sign in the fetus associated with aneuploidy. These authors raised the hypothesis that LIAVV could represent a minor form of atrioventricular septal defect (AVSD). However, no anatomic or embryologic explanation has been provided yet to confirm this hypothesis. To elucidate the pathological significance of LIAVV, we compared postmortem high-spatial resolution cardiac magnetic resonance imaging (MRI) with foetopathological examination for the visualization of linear insertion of atrioventricular valves (LIAVV) in human fetal hearts. This work will be a preliminary step towards a larger scale study, with as a final aim to confirm or not the belonging of LIAVV to the spectrum of AVSD.

Methods: Two normal hearts, 1 AVSD and 2 LIAVV (ranging from 17 to 34 weeks of gestation) were randomly selected among the fetal heart specimens of the anatomic collection of the French Reference Center for Complex CHD. Postmortem cardiac MRI was performed with a 4.7-T imager. Heart specimens were rinsed and placed in airtight bags filled with 1-2 ml of distilled water. 3D and 2D Turbo-RARE sequences in four-chamber, short axis and left ventricular long-axis planes were performed with a minimal isotropic or in-plane resolution of 156 μ m. MR images were compared to the foetopathological examination. Quantitative analysis included measurement of the distance between the insertion of the medial leaflets of the tricuspid and mitral valves and of the left ventricular inlet/outlet distance ratio.

Results: There was a perfect agreement between MR and foetopathological examination for identification of valves insertion, evaluation of mean mitral valve-tricuspid valve distance (1.63 mm for normal hearts; 0.89 mm in hearts with LIAVV) and evaluation of inlet-outlet distance ratio (>0.9 in normal hearts, < 0.80 in LIAVV, <0.5 in AVSD). Both hearts with LIAVV had a deficiency of the inlet ventricular septum closed by the insertions of a bi-leaflet mitral valve, explaining the lack of offsetting of the AV valves.

Conclusions: Postmortem cardiac MRI provides results similar to foetopathological examination for the assessment of LIAVV without needing specific preparation of the heart.

