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Virtual Dissection by Polarised Light Imaging of The Deep Ventriculo-Indibular Fold in Normal and Malformed Hearts

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Introduction

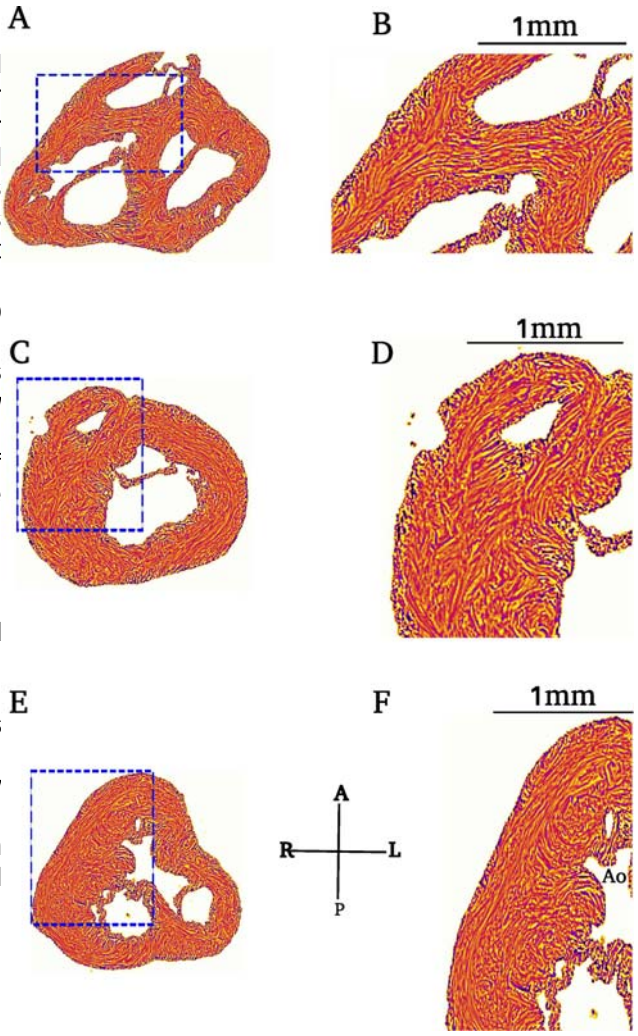
The anatomic structure located between the inflow tract and the semi-lunar valve of the right ventricle "l'éperon de Wolf" or ventriculo-infundibular fold (VIF) has received much attention. Until now description of this specific landmark of the right ventricle relies essentially on visualization after right ventricular opening or sequential sectioning, that are disruptive methods making difficult to establish the connexity of the ventricular fold with the other parietal and septal components of the supraventricular crest. New developments of Polarized light imaging (PLI) with half sphere definition of the orientation of myocardial cells make possible to study the deep anatomy of VIF in three dimensions in normal and malformed hearts.

Methods

8 normal hearts and 9 malformed hearts (atrio-ventricular septal defect (AVSD); tetralogy of Fallot(TOF)) were studied by PLI. In each voxel of the ventricular mass (90×90×500 mm^3), the principal orientation segment was automatically and unambiguously extracted. The Line Integral Convolution (LIC) is used to help streamline visualisation, then the virtual dissection in three-dimensional dimension (3D) were exploited with ImageJ Software.

Result

The Figure 1 showed the principal orientation of the VIF viewed in axial plan section.



A: Normal heart of 12 weeks of age; B: Zoom of selected square in A to show the VIF. myocardial cells are located transversely from parietal band to inter-ventricular septum.

C: Fetal heart of 22 week of gestational age with AVSD. D: Zoom of selected square in C. Myocardial cells of the VIF are placed obliquely in axial sections from parietal band to conal septum.

E. Neonatal heart of TOF, F: Zoom of selected square in E. Due to the overriding aorta, the VIF is hypoplasic and maintains the continuity with the outlet septum.

Conclusion

In the first time, we used PLI to describe the myocardial pattern in the deep of VIF. The organisation of myocardial cells in the VIF changes with different malformations. Complete AVSD and cono-truncal malformations disrupt the deep VIF in specific manner. This description completes description relying classically on superficial analysis of the relationships between the VIF and the septomarginal trabeculation.