

Geometry of the Right Ventricular Outflow Tract - Clinical Significance in Electrophysiological Procedures

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Abstract : The geometry of RVOT is extremely complicated. It is an irregular block with an ellipsoidal cross-section, whose dimensions decrease toward the pulmonary valve and measure 33.82 (IQR 30,51-39,36), 28.82 (IQR 26,11-32,22), $27.95 \pm 4,11$ for width [mm] and $33.41 \pm 6,14$, $26.99 \pm 4,41$, $26.91 \pm 4,00$ [mm] for depth, in the basal, middle and subpulmonary parts, respectively. In a sagittal section view, the RVOT heads upward and slightly backward. Its anterior perimeter has an average length of 41.96 mm and inclines to the transverse plane at an angle of 50.77° (IQR $46,53^\circ$ - $58,70^\circ$). In the posterior region, the RVOT is shorter (18.17mm) and flexes anteriorly. Therefore, the slope of the upper part of the rear wall to the transverse plane is an acute angle (open toward the rear) of $44,58^\circ$ (IQR $37,30^\circ$ - $51,25^\circ$), while in the lower part it is an angle close to a right angle of $94,30^\circ \pm 15,44^\circ$. In addition, the thickness of the RVOT wall in the diastolic phase, at the posterior perimeter at the base, in the middle of the length and subpulmonary measure $3,80 \text{ mm} \pm 0,88 \text{ mm}$, $3,56 \text{ mm} \pm 0,73 \text{ mm}$, $3,56 \text{ mm} \pm 0,65 \text{ mm}$, respectively. In frontal cross-section, the RVOT rises on the interventricular septum, which makes it possible to distinguish the septal and supraseptal parts on its left periphery. The angles (facing the vertices to the right) of the inclination of these parts to the transverse plane are 75.5° (IQR $66,44^\circ$ - $81,11^\circ$) and 107.01° (IQR $99,09^\circ$ - $115,23^\circ$), respectively, which allows us to conclude that the direction of the RVOT long axis changes from left to right. The above analysis shows that there is no single RVOT axis. Two axes can be distinguished, the one for the upper RVOT being more backward and leftward. The aforementioned forward deflection of the posterior wall and the RVOT's elevation over the interventricular septum, suggest that access to the subpulmonary region may be difficult. It should be emphasized that this area is often the target for ablation of ventricular arrhythmias. The small thickness of the RVOT posterior wall, with its difficult geometry, may favor its perforation into the pericardium or ascending aorta.

Keywords : angle, geometry, operation access, position, RVOT, shape

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