

# Development of a Biventricular Coordinate System with Representation of an Anatomically Detailed Base

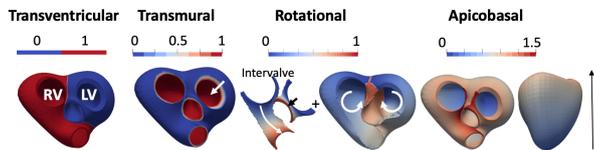
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Ventricular coordinate systems are an established tool to describe the local position in the heart. However, current coordinate systems assume a flat base that omits the outflow tracts and valve annuli or require the coordinates to be assigned manually. The goal of this study is to create a tool that automatically defines the intervalvular regions of the anatomically detailed ventricular base and defines the local position within these regions.

We extended the previously developed “Consistent Biventricular Coordinate System” (Cobiveco), which assigns transventricular, transmural, rotational, and apicobasal coordinates to describe the local position in the heart (Figure). The transventricular and transmural coordinates were assigned as previously described. To assign apicobasal and rotational coordinates, the intervalvular region was first separated from the rest of the ventricles.

For each ventricle, a vector connecting the center of the inflow and outflow valve planes was defined. The resulting vector is then rotated +80 and -80 degrees around the valve plane normal to identify two points on the valve annulus. The two points on all four valves annuli are then used to calculate the shortest



paths between the inflow and outflow valves. The paths were then used to define the borders of the intervalvular region in each ventricle. The apicobasal coordinate was scaled to have values from 0 to 1 within the ventricular regions, while having values of 1 to 1.5 within the intervalvular regions (Figure). Preliminary tests were performed on human biventricular meshes. First results show a mean two-way mapping error of 0.1003 mm +/- 0.4755 mm and 0.4659 mm +/- 1.9859 mm in the ventricular and bridge regions, respectively.

We were able to create a ventricular coordinate system that takes into account the valve planes. This tool automatically defines the intervalvular regions allowing for evaluation of data in the base regions of the heart.