

Estimation of Right Ventricular Volume, Quantitative Assessment of Wall Motion and Trabeculae Mass in Arrhythmogenic Right Ventricular Dysplasia

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Cardiac MRI allows a complete overview of right ventricle(RV),it provides an anatomic,functional and morphologic approach in diagnosing arrhythmogenic right ventricular dysplasia(ARVD).The aim of this study was to gain a wide perspective of the ARVD by working out algorithms based on level-set theory.In this work we developed a semi-automatic procedure to assess the RV volumes and to quantify RV wall motion,moreover,with the increased visible details in a single MR image,a manual method to evaluate the trabeculae mass was performed.Volume estimations were executed by detecting endocardial contours with algorithm based on level-set technique.The semi-automatic procedure was applied to calculate both end-diastole volume(EDV) and end-systole volum(ESV), featuring the absence of geometric assumptions for a complex crescent-shaped as RV.RV Wall Motion,which is usually assessed by qualitative impression,was performed by sectoring the superimposition of end-diastolic(ED) and end-systolic(ES) frames,for each two-chamber view levels,that is Basal,Mid-Level and Apex.The contours were taken semi-automatically with an algorithm based on level-set technique,while the quantitative data were automatically calculated during the process by counting the spacing between ED and ES contours.The attempt of assessing trabeculae mass was carried out using a manual procedure to segment all the visible black parts inside the RV cavity,for each ED image.We applied these three tools to 6 normal subjects and 6 subjects with ARVD.A good agreement between our method and the standard manual method as reference came out from volume estimations,specifically for EDV estimations resulted $y=0.92x+6.56$ ($r=0.92$ $p<0.001$), while for ESV estimations resulted $y=0.91x+7.09$ ($r=0.91$ $p<0.001$). Wall Motion results showed a significant reduction of RV segmental function in patients with ARVD,Inferior Wall was the most involved with more than 80% reduction ($p<0.001$) compared with normal subjects,while RV outflow tract(RVOT) was the least involved with less than 50% reduction($p<0.001$) as regards normal subjects.A repeatability test was executed on trabeculae mass assessment, which showed an high intra observer correlation between the measures,in fact the results were significant at 95% of the cases.