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COMPUTER-AIDED RECOGNITION OF THE FOSSA OVALIS IN CARDIAC CT DATASETS

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Introduction: Access to the left atrium (LA) of the heart is required for several cardiac interventions, such as ablation for atrial fibrillation or paravalvular leak closure, with more than 9 million of procedures performed annually only in Europe. Traditionally, a catheter, guided by fluoroscopy and ultrasounds, is inserted into the right atrium (RA) in order to puncture the interatrial septum and, therefore, reach the LA. However the puncture site should be at the thinnest region of the septum, termed fossa ovalis (FO), which it is not easily detected by the traditional image-modalities.

Aim: In this work we intend to detect the FO position in computed-tomography (CT). Note that since the CT is used in a planning step, this study is a first attempt to develop an integrated interventional planning to assist the physician in this procedure.

Methods: A semi-automatic strategy was applied for segmentation of the LA and RA and, thus, delineation of the interatrial septum. A two-steps technique was applied: 1) definition of one seed in each atria; 2) automatic segmentation of the two atria through a region-growing method with shape prior1. Finally, the FO site is estimated as the shortest-path between the two segmented structures.

Results: The proposed framework was validated in 5 CT datasets. We visually compare the estimated FO's with the real ones, being correctly detected in all the situations. Furthermore, we compute the distance between the estimated site and the center of FO, where an error of 1.65 ± 0.44 mm was found.

Conclusions: The pre-procedural planning through CT datasets can be used to accurately estimate the FO site and, therefore, easily detect the puncture position. In future work, we intend to improve the suggested framework through an automatic technique for segmentation of LA and RA in CT and ultrasound images.

Reference

[1] Zhu et al. "Automatic segmentation of the left atrium from MRI images using salient feature and contour evolution", EMBC 2012.