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Meeting abstract

2100 Correlation of left atrial scar due to pulmonary vein ablation with recorded ablation sites

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Introduction

Radiofrequency (RF) pulmonary vein (PV) ablation (also known as PV isolation) is a catheter-based treatment for atrial fibrillation. The end-point of the RF ablation procedure at our institution is complete electrical block between the left atrium (LA) and the PV ostia. Some groups use an anatomically-guided ring of ablations around the PVs and LA as a surrogate end-point. At our institution, the CARTOMERGE system(Biosense-Webster, Diamond Bar, CA) is used to create a 3D map of the surface of the LA and PVs during the procedures. The map is then registered to previously acquired CT or MRI images and the resulting fused image is used to guide during the ablation procedure. During the procedure, points representing the LA surface and each RF ablation are recorded into CARTO data files. After the procedure, the scar generated by RF ablation [1] can be imaged using high spatial resolution delayed enhancement (DE) cardiovascular MR (CMR) [2]. In order to understand the relationship between the ablations performed and the scar pattern that results, we sought to develop a technique for fusing the CARTO data with the scar data from the MRI scan.

Methods

MR angiograms and delayed enhancement images of the LA were obtained 30–60 days post ablation, along with CARTO data files from the procedure. The scar was segmented from the DE images and registered with the angiographic data. The angiogram was then segmented to remove the aorta and the pulmonary arteries, since these structures obscure the visualization of the scar on the surface of the left atrium, and also reduce the quality of the registration of the angiogram to the CARTO surface. We have developed a software tool using Kitware's Visual Toolkit (VTK) and Insight Segmentation and Registration Toolkit (ITK) to register and display the data. The recorded ablation locations and LA surface points were fused with the MRA surface, using rigid registration (with the PV ostia as landmarks) followed by iterative closest point algorithm, as previously described [3,4]. Eight patients have been studied to date.

Results

Comparison in one patient of the results of our custom fusion method with CARTOMERGE showed excellent agreement (Figure 1), showing the same relationship between the ablation locations and the PV ostia in both methods. Figure 2 shows the fusion of ablation locations with resulting scar in another patient compared to a CARTO ablation map.

Conclusion

The fusion achieved by our software tool is accurate when compared to vendor-provided methods (Figure 1). Our fusion of this unique data set including the MR angiogram, scar and CARTO data for PV isolation patients provides a tool for understanding the correspondence between each scarred region and the ablation points on

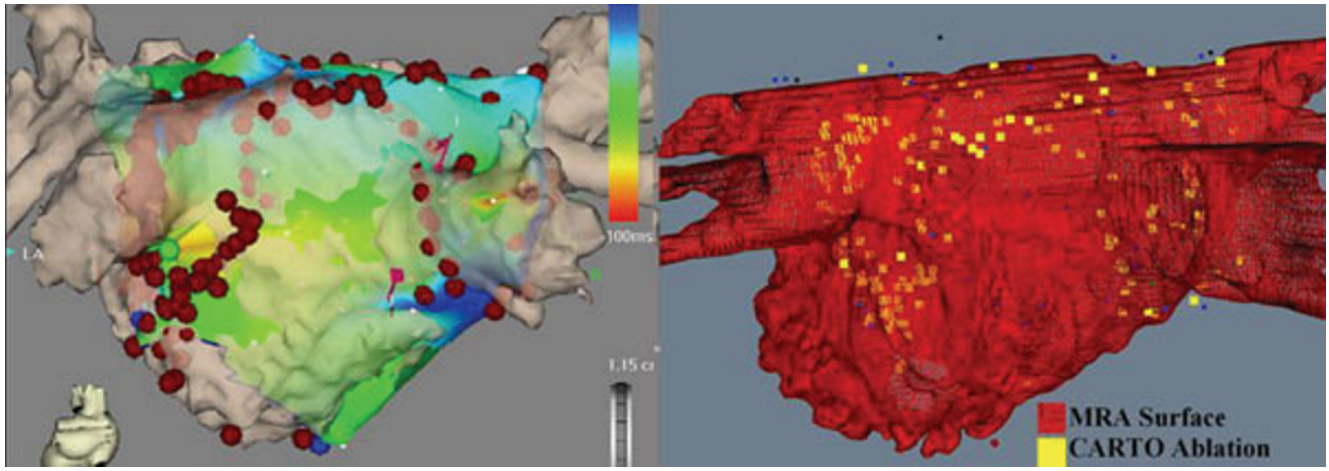

Figure 1
CARTOMERGE representation of ablations and LA surface (left), compared to our custom registration of data (right), showing excellent agreement. Some ablations are located below the LA surface.

CARTO. Future work will relate clinical success of the ablation procedure to the extent of agreement between scarred locations and CARTO ablation locations.

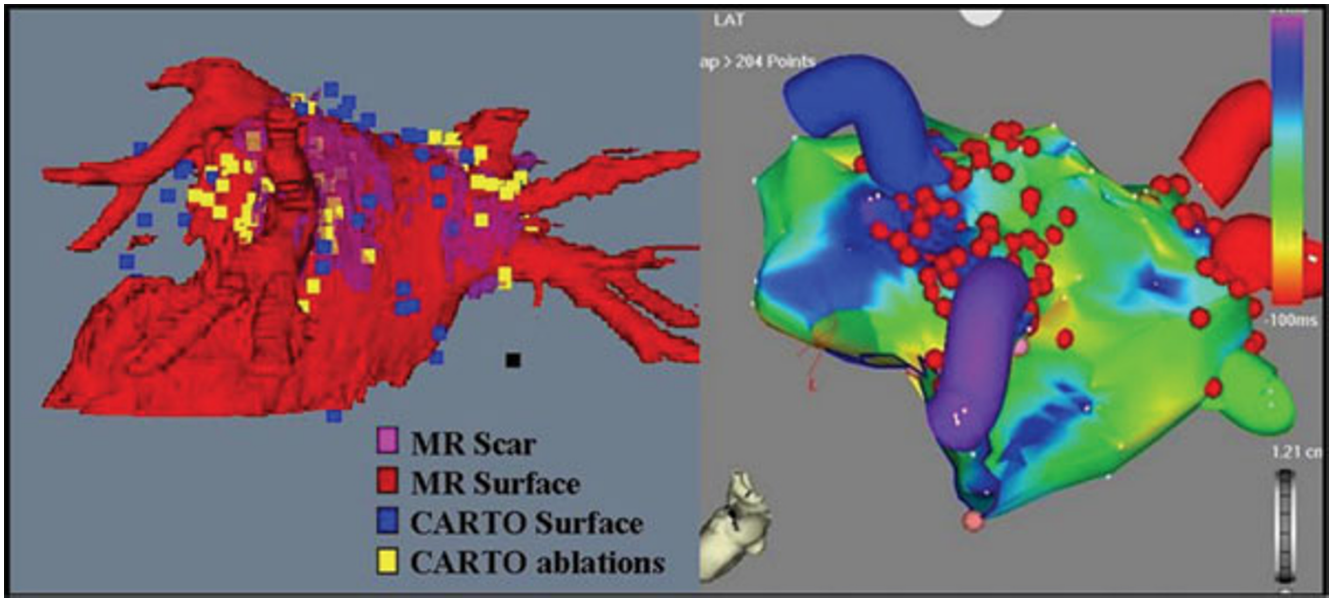

Figure 2
Fusion of MR angiogram, scar and CARTO data, compared to CARTO representation.

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