Cardiac magnetic resonance imaging assessment of atrial remodelling and cardiac function before and after left atrial ablation for long-standing persistent atrial fibrillation

Evangelia Nyktari, Cemil Izgi, Shouvik Haldar, Rick Wage, Jenny Keegan, Tom Wong, Raad Mohiaddin
CMR Unit Royal Brompton & Harefield NHS Foundation Trust, Imperial College London

Introduction

Atrial fibrillation (AF) is characterized by loss of electromechanical function leading to left atrial (LA) remodeling, particularly in long-standing persistent AF (LSPAF). Atrial remodeling is most accurately estimated by measuring atrial volumes. Cardiovascular magnetic resonance (CMR) is the gold standard technique for measurement of ventricular and atrial dimensions and function. The purpose of this study was to assess cardiac volumes and function in LSPAF patients who have been restored to sinus rhythm (SR) by ablation.

Methods

45 consecutive patients (mean age 64.4±10.8 years, 30males) with LSPAF underwent LA ablation via either thoracoscopic surgical (n=21) or percutaneous (n=24) approach. A Siemens MRI scanner (Avanto, 1.5T) was used to analyze atrial and ventricular volumes at baseline and at 3 months post- ablation. 12 patients were excluded due to limited CMR data in the follow-up (2 received non MRI conditional pacemakers, 7 had dyspnea, 1 was lost, 1 was claustrophobic and 1 was excluded due to CABG).

Biplane area-length method was used to measure LA maximum (maxV) and minimum (minV) volumes from the VLA and HLA views acquired using a breath-hold ECG-gated steady state free precision cine sequence (SSFP).

Ventricular volumes were calculated from contiguous short-axis cines from the atrioventricular ring to the apex. All volumes were indexed for BSA.

Atrial function was expressed by ejection fraction (max-min volume/max volume x 100%).

A 7-day cardiac event recorder was used to determine rhythm status at 3 months.

Figure 1 Three-dimensional electro-anatomical map of the left atrium viewed from the posterior aspect, showing ablated areas (in yellow) encircling the pulmonary veins.

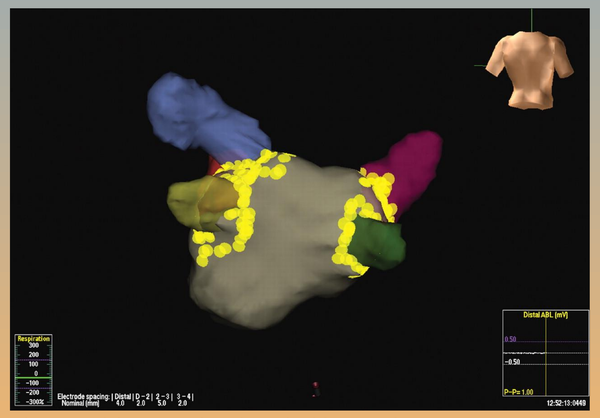
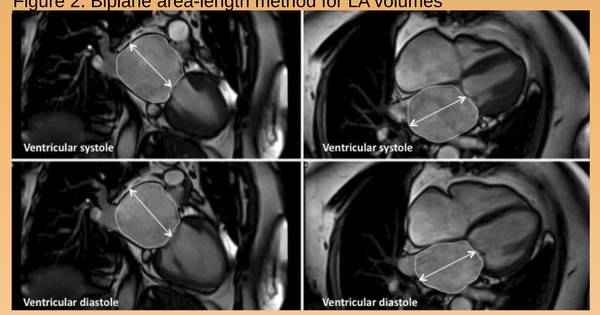


Figure 2. Biplane area-length method for LA volumes



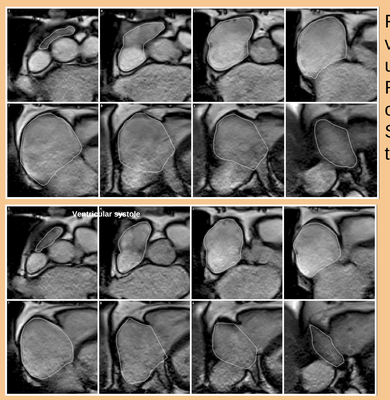


Figure 3. Multislice volumetric method using manual tracing of RA endocardial borders over several transaxial SSFP slices covering the entire RA

Results

At 3 months post LA ablation SR was documented in 23 of 33 patients (69.6%). This group demonstrated a significant reduction in indexed LA maxV (imaxV baseline 52.9±17.4 ml, 3 months 46.1±14.4 ml, p=0.01,) and a significant improvement in the LA EF and LV EF 3 months post ablation (baseline LAEF 20.9±9.6%, 3months 29±11%, p=0.02, baseline LV EF 58.3±10.6%, 3months 64.8±7.1, p=0.005).

Patients with AF recurrence at 3 months, showed no statistically significant change in both LA EF and LV EF. However, there was a significant reduction of the indexed LA maxV (imaxV baseline 64±10.3 ml, 3 months 55.4±13.6 ml, p=<0.05).

Conclusions

LA ablation is associated with a significant reduction in LA volume size even in LSPAF. Our data show that this reduction in volume is associated with a significant improvement of LVSEF in those who attain SR, the mechanism of which is likely to represent restoration of LA function.

Disclosures

Authors have no relevant disclosures