

# Fibrosis and Epicardial Adipose Tissue Impair Left Atrial Function in Patients with Atrial Fibrillation



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## Introduction

Left atrial (LA) fibrosis and enlargement are hallmarks of structural remodeling that contribute to atrial fibrillation (AF) pathophysiology. Epicardial adipose tissue (EAT) is increasingly recognized as a promoter of AF through electrical remodeling in the atria. Cardiac magnetic resonance (CMR) feature tracking has higher spatial resolution and better ability to define the endocardial border, overcoming the challenges related to speckle tracking echocardiography.

Objectives:

- We aimed to assess the association of LA fibrosis and EAT with LA function and compliance using CMR imaging in patients with AF.

## Methods

- We analyzed 101 AF patients' CMR images before their first catheter ablation.
- Feature tracking was applied to assess global longitudinal reservoir, conduit, and contractile strain (GLRS, GLCdS, and GLCtS, respectively) (Figure 1). LA emptying fraction, LA volume index, and LA sphericity index were measured using the Cine sequences. All CMR images were acquired in sinus rhythm.
- LA fibrosis was assessed using LGE CMR and LA EAT was assessed using the novel fat-water separation Dixon sequence (Figure 2).

## Results

LA fibrosis was negatively associated with global longitudinal strain (Figure 3A). Out of the different sections of the LA, fibrosis in the posterior and lateral walls was most correlated with GLRS ( $R=-0.32$ ,  $p=0.001$ , and  $R=-0.33$ ,  $p=0.001$  respectively) (Figure 4). LA EAT was negatively correlated with GLCdS ( $R=-0.45$ ,  $p<0.001$ ) (Figure 5). LA fibrosis was negatively correlated with LA emptying fraction but LA EAT was not ( $R=-0.27$ ,  $p=0.007$ , and  $R=-0.22$ ,  $p=0.1$ , respectively). LA volume index correlated negatively with GLRS ( $R=-0.37$ ,  $p<0.001$ ) (Figure 6).

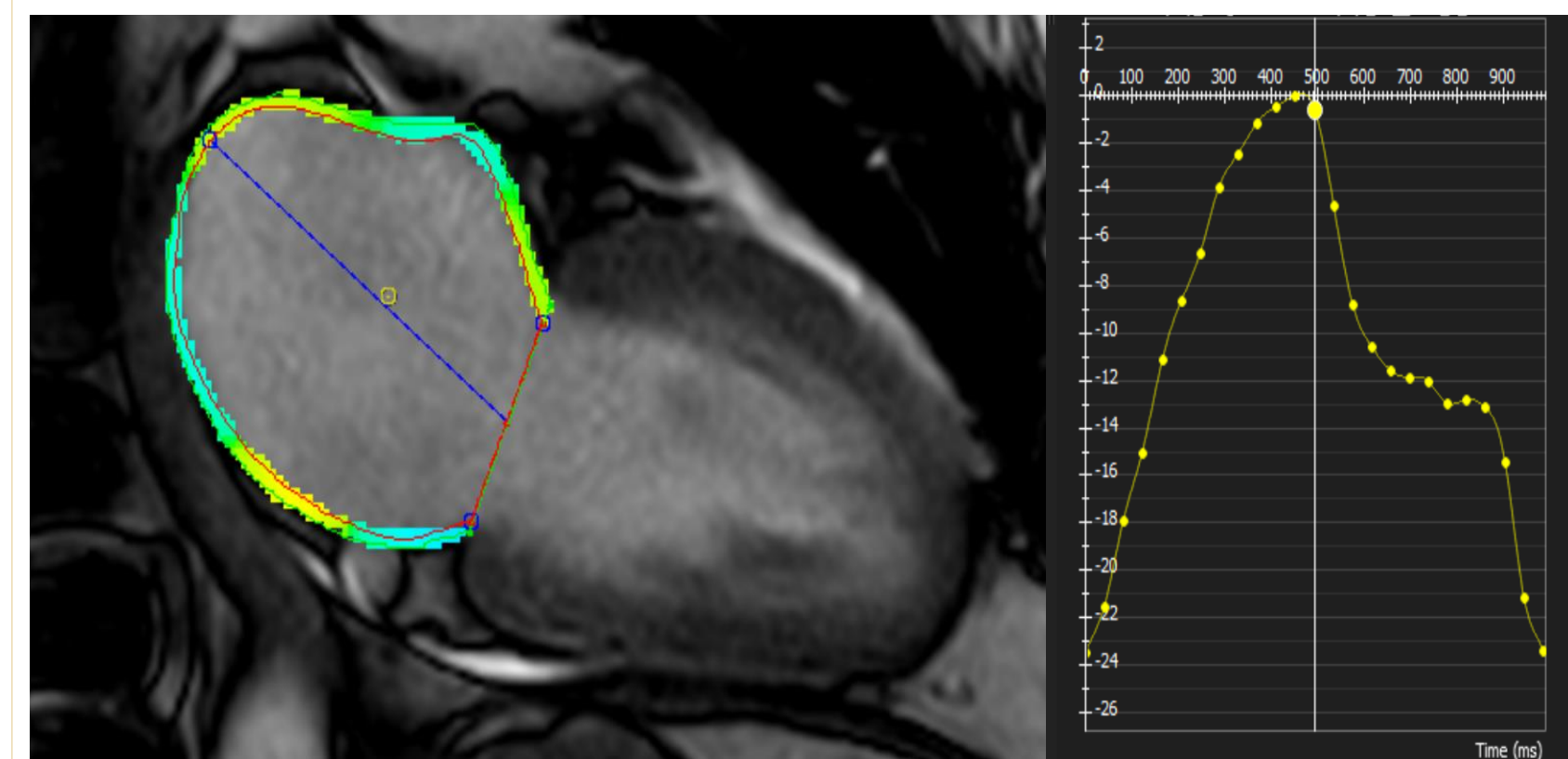


Figure 1. Left atrial strain measurement by CMR feature tracking, and global longitudinal strain curve.

Sex, male	61%
Age, years	62 ± 11
LA volume index, mL/m <sup>2</sup>	45.16 [36.64, 56.5]
LA fibrosis, %	15.5 [9.6, 19]
LA EAT volume, mL	28.48 [19.14, 34.39]
LA sphericity index, %	54.09 [46.44, 64.58]
GLRS	17.4 [14.95, 20.1]
GLCdS	9.2 [6.75, 12]
GLCtS	8.1 [6.5, 9.8]

Table 1. Baseline characteristics of the study cohort

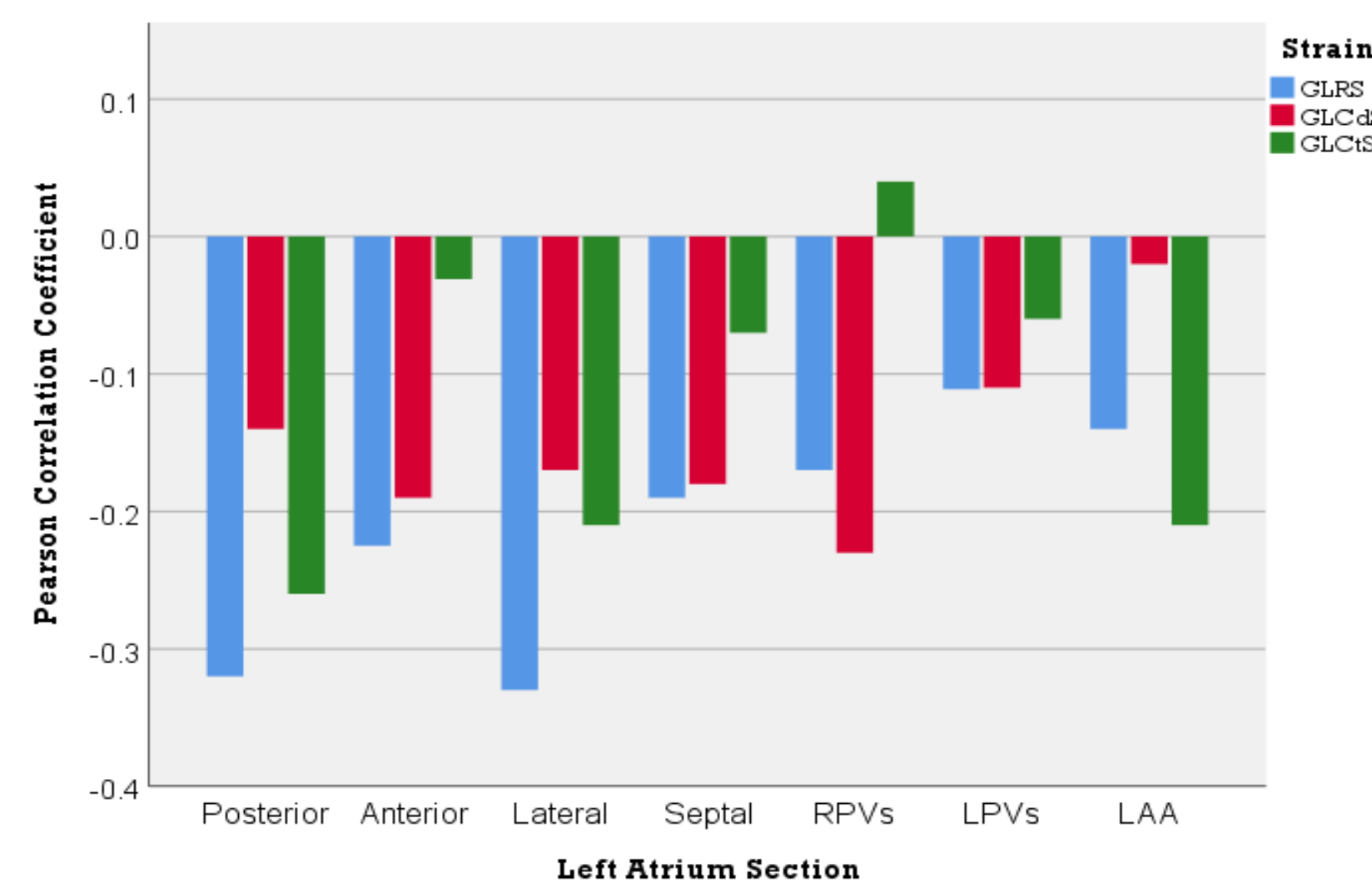


Figure 4. Clustered bar chart showing the correlation between the fibrosis percentage in different atrial sections and global longitudinal reservoir, conduit, and contractile strain

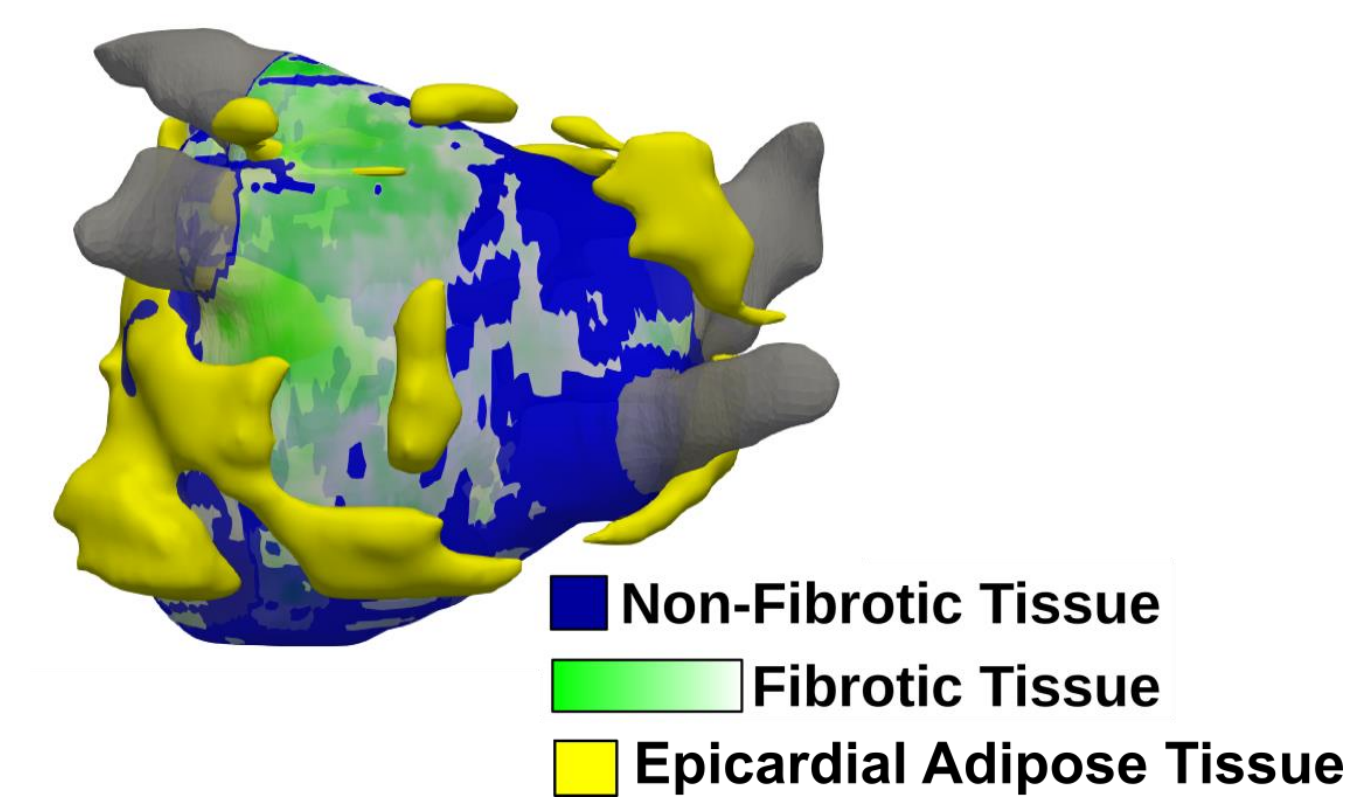


Figure 2. 3D model showing the distribution of fibrotic remodeling and epicardial adipose tissue around the left atrial wall

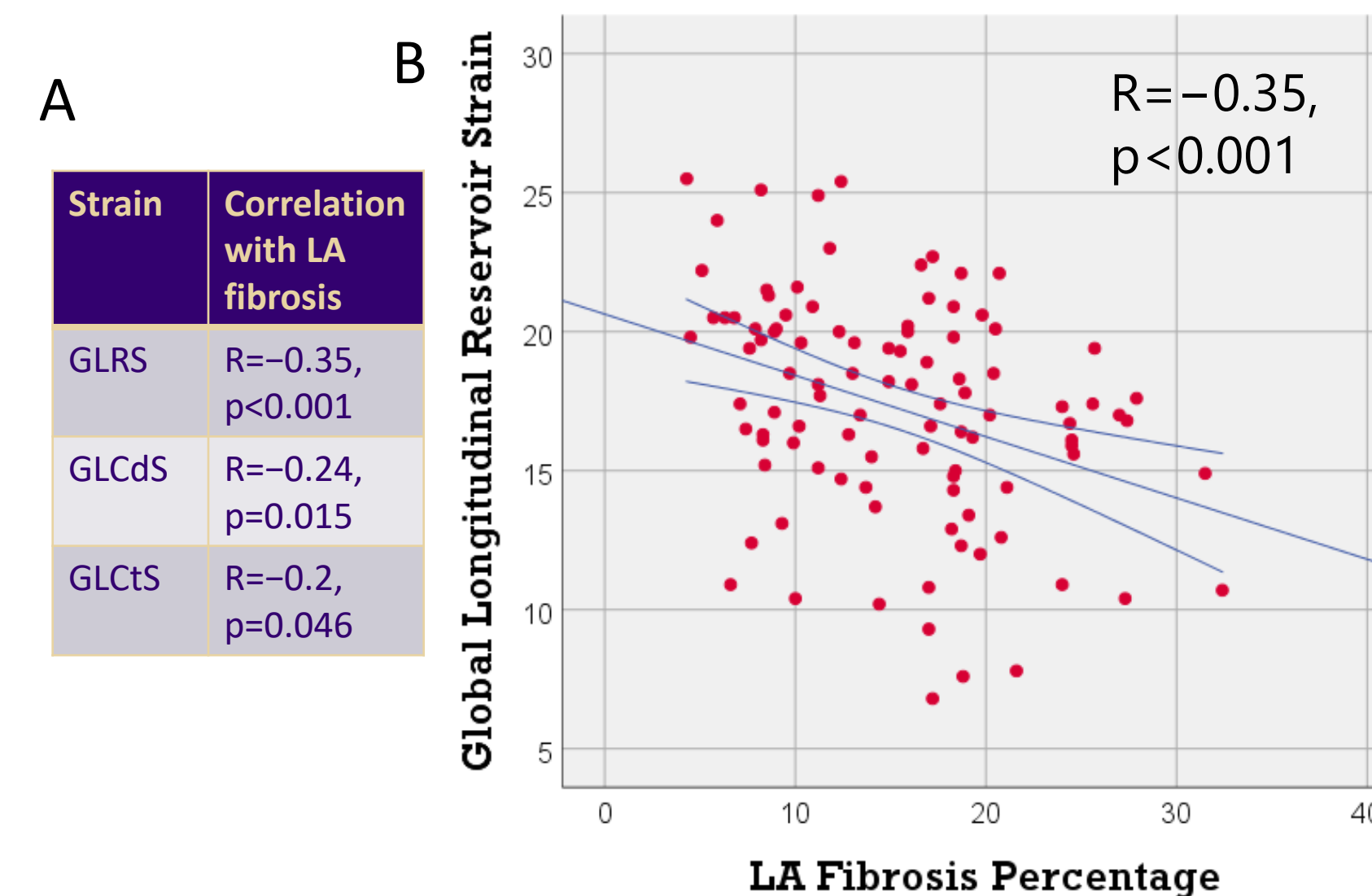


Figure 3. A) Table showing the correlation between LA fibrosis and the 3 components of global longitudinal strain. B) Scatter plot showing the association of LA fibrosis with GLRS.

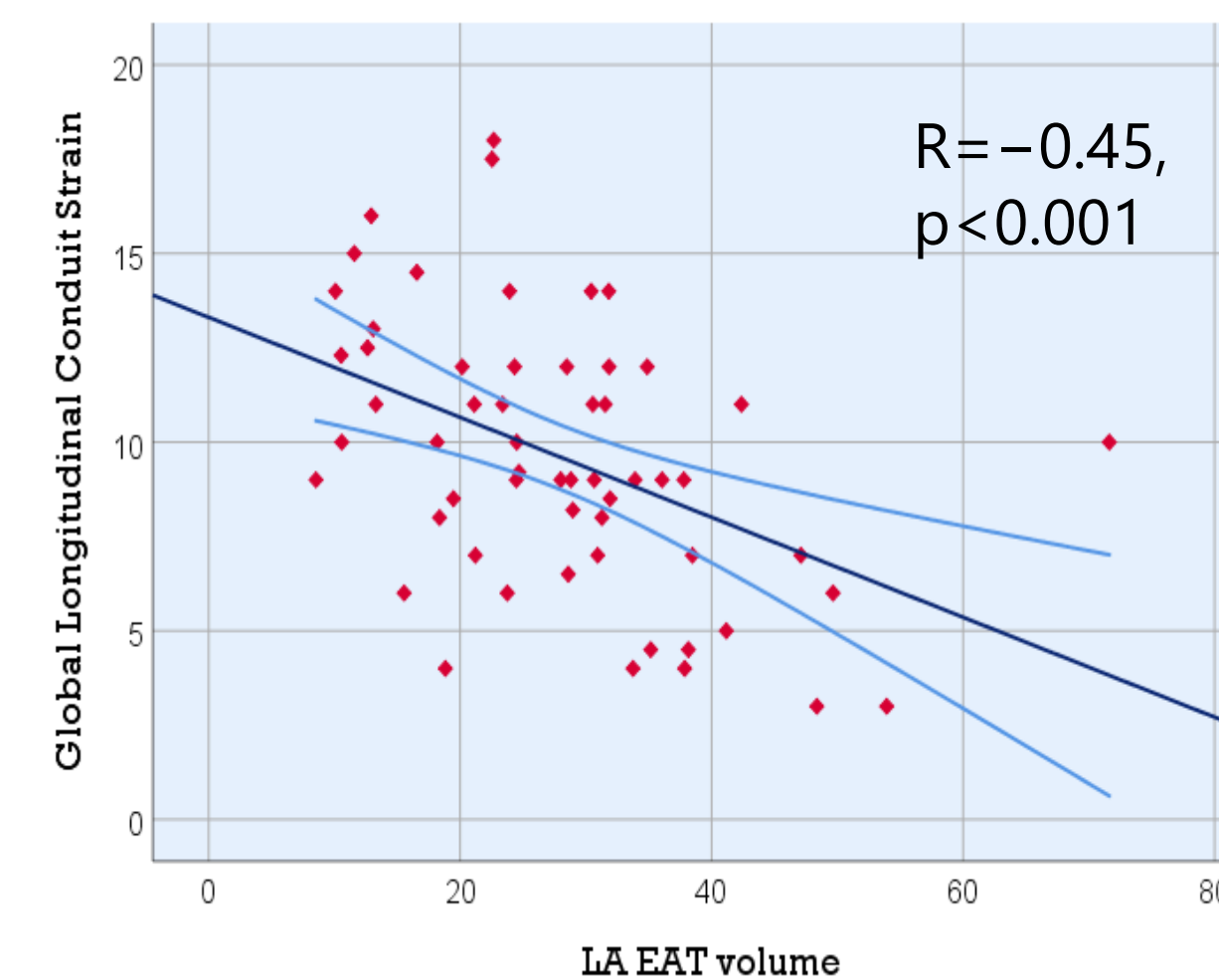


Figure 5. Scatter plot showing the association of LA EAT volume with GLCdS

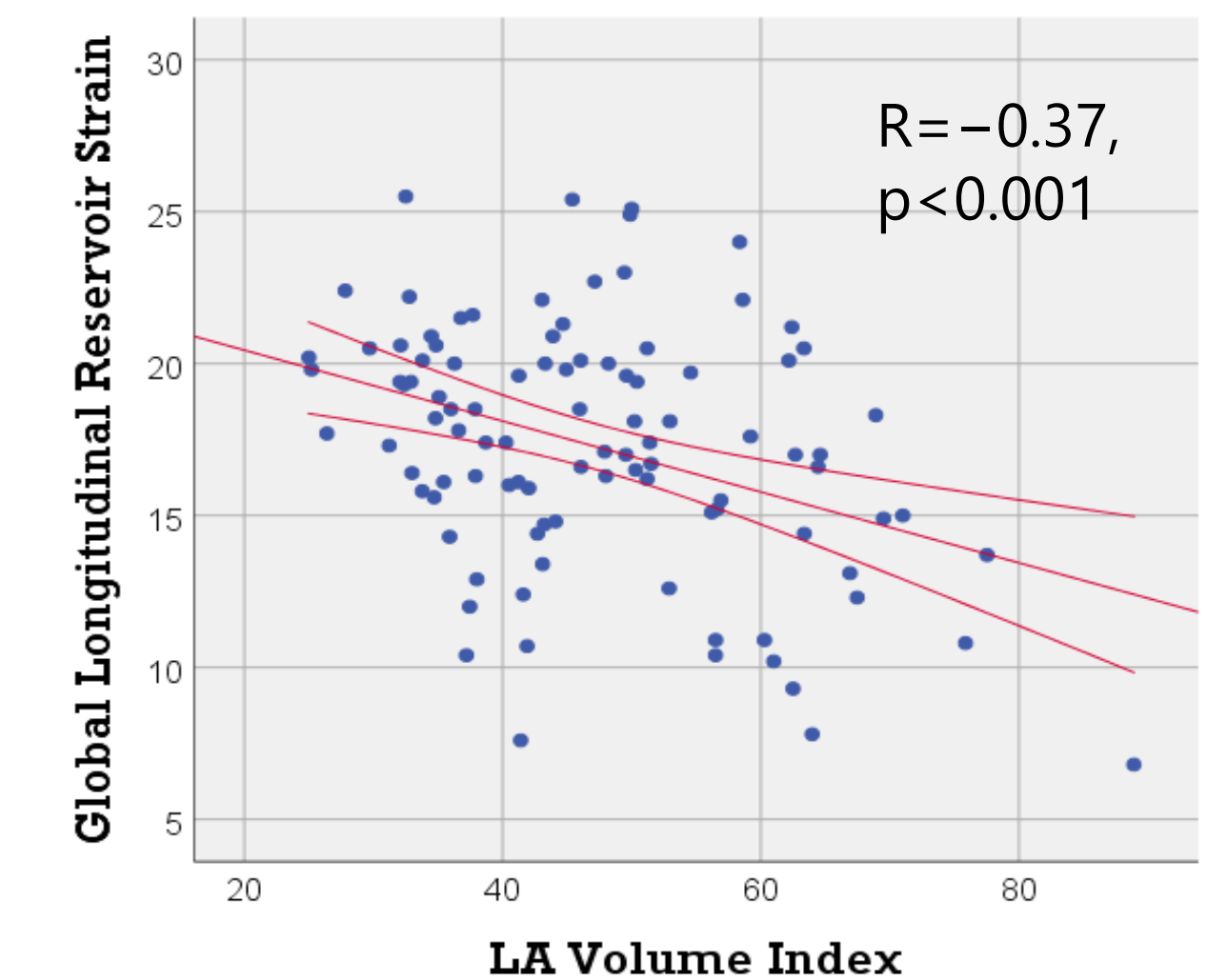


Figure 6. Scatter plot showing the association of LA volume index with GLRS

## Discussion

### Main findings

- > LA fibrosis is negatively correlated with LA strain and function
- > Fibrosis in the posterolateral wall has the most negative impact on LA strain
- > EAT is negatively correlated with LA strain
- > LA volume is negatively correlated with LA strain and function.

## Conclusion

- LA fibrosis and EAT, two important contributors to the AF substrate, are associated with a worsening LA function through strain analysis by CMR. These may play a role in the pathophysiology of thromboembolic stroke associated with AF.