Histological and Biochemical Characteristics in Right Atrium vs. Left Atrium in Patients with Valvular Atrial Fibrillation

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Background: It has been known that dominant drivers of atrial fibrillation (AF) exist on left atrium (LA), but the arrhythmogenic foci of ectopic atrial tachycardia commonly exit on right atrium (RA). Therefore, we compared the histologic and biochemical characteristics of LA and RA by analyzing atrial tissues from the patients with valvular AF.

Methods and Results: We analyzed immunohistochemical staining of LA appendage tissues and RA appendage tissues taken from 20 patients with valvular AF. The degree of myocardial fibrosis (Sirius-red stain), thickness of subendocardial smooth muscle (SSm) layer (α-SMA stain), and expression of mRNA for multiple biomarkers were quantified.

Results: 1. Atrial fibrosis was significantly higher in LA tissues (36.48±12.22% vs. 29.38±9.90%, p<0.0304), and thickness of SSm layer (0.16±0.17mm vs. 0.01±0.01mm, p<0.0002) was significantly greater than those in RA tissues. 2. In tissue of LA, relative NCX mRNA expression level was significantly higher (0.012±0.012 vs. 0.005±0.005, p<0.0165), but relative HCN4 mRNA expression level was significantly lower (0.011±0.010 vs. 0.024±0.013, p<0.0123) than those RA tissue.

Conclusion: The amount of matrix fibrosis and thickness of SSm layer were greater in LA tissue than in RA tissue. In contrast NCX expression, which is related with triggered activity, was higher in LA, automaticity related HCN4 expression was higher in RA.

Keywords: atrial fibrillation, subendocardial smooth muscle layer, HCN4