Background: Hypertension is known to develop atrial hypertrophy and fibrosis leading to atrial fibrillation. In the ventricle, signaling through the mammalian target of rapamycin (mTOR) pathway has emerged as an important regulator for hypertrophy. However, little is known in the atrium.

Methods: Hearts of 10-week-old (10W) and 24W spontaneously hypertensive rats (SHRs; n=6 respectively) and age-matched Wister-Kyoto rats (WKYs; n=6 respectively) were subjected to Western blotting and immunohistochemistry. We examined the phosphorylation rate of mTOR and its downstream translational signaling intermediate, 70kDa ribosomal protein S6 kinase (S6K) in atria.

Results: Systolic blood pressure increased significantly in SHRs versus WKYs (10W-SHRs; 165±10, 10W-WKYs; 119±5 mmHg, P<0.001: 24W-SHRs; 177±14, 24W-WKYs; 141±12 mmHg, P<0.001) along with heart/body ratio (10W-SHRs; 4.1±0.3, 10W-WKYs; 3.3±0.4 mg/g, P<0.001: 24W-SHRs; 4.1±0.3, 24W-WKYs; 2.9±0.7 mg/g, P<0.01). Phosphorylation status of mTOR (129±10 vs 100±19 AU; P<0.01) and S6K (177±43 vs 100±33 AU; P<0.01) significantly increased in 10W-SHRs versus 10W-WKYs in LA, but not in RA and also in 24W-rats. Immunohistochemistry revealed that non-cardiomyocytes including endothelial/endocardial cells and immunocytes were responsible for the increased phosphorylation of S6K in 10W-SHRs.

Discussion: These data show that mTOR regulates especially the early stage of atrial hypertrophy with hypertension, where non-cardiomyocytes are involved. Further studies into these signaling processes would clarify the unknown pathophysiology of atrial hypertrophy.

Keywords: mTOR, AF, LA