**Introduction**: Electronegative fraction of very-low-density lipoprotein (VLDL-χ) in metabolic syndrome (MetS) exerts cytotoxicity to endothelial cells and atrial myocytes. The role of VLDL-χ in atrial remodeling is unknown. This study was aimed to investigate the association between VLDL-χ and left atrial dilatation.

**Methods**: We evaluated 87 MetS and 81 non-MetS individuals from 23 to 74 year-old (50.6% men) without any overt cardiovascular disease. Blood samples were collected on fasting and on postprandial states (at 0.5-, 1-, 2-, and 4-hour after a unified meal). The VLDL was isolated by ultracentrifuge and the percentile concentration for VLDL-χ (%) was determined by ultra-performance liquid chromatography. The correlations with left atrial diameter (LAD) for variables including VLDL-χ, LDL-C, HDL-C, triglyceride, and glucose, as well as blood pressures were analyzed by multiple linear regression models. Hierarchical linear model was conducted to test the independencies for each specific variable correlation to LAD.

**Result**: The mean LAD was 3.41 ± 0.53 cm in non-MetS and 3.89 ± 0.51 cm in MetS (P< 0.01). The VLDL-χ, BMI, waist, and hip, as well as blood pressures were positively correlated with LAD (all P<0.05) after adjustment for age and gender. None of fasting lipid profiles was associated with LAD. We observed significant interaction between VLDL-χ and blood pressure, waist, and hip. When adjusted for variables of obesity and blood pressure, the 2 hour’s postprandial VLDL-χ (mean 1.30 ± 0.61%) showed a positive correlation with LAD in MetS. Each 1% increment of VLDL-χ was estimated to increase LAD by 0.62 cm.

**Conclusion**: Postprandial VLDL-χ is associated with atrial remodeling. The VLDL-χ may be a therapeutic target to control progress of atrial cardiomyopathy in MetS.