The natural history of thoracic aortic aneurysms is an enlargement of the aorta over time until an acute tear in the intimal layer leads to an aortic dissection, which is associated with a high degree of morbidity, mortality, and medical expenditure. Preventing premature deaths requires identification of individuals at risk for aortic dissection and performance of timely medical treatment, in many cases elective surgical repair of aneurysms. The major risk factors for aortic dissections are hypertension and underlying genetic variations. In this presentation, I will review the progress of Medical Genetic research in our group, which aims to identify genomic variants that predispose individuals to familial or sporadic thoracic aortic aneurysm and dissection.