Characteristics and Outcomes of Ascending Versus Descending Thoracic Aortic Aneurysms

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Thoracic aortic aneurysms (TAs) occur in reproducible patterns, but etiologic factors determining the anatomic distribution of these aneurysms are not well understood. This study sought to gain insight into etiologic differences and clinical outcomes associated with repetitive anatomic distributions of TAs. From 3,247 patients registered in an institutional Thoracic Aortic Center database from July 1992 to August 2013, we identified 844 patients with full aortic dimensional imaging by computerized axial tomography or magnetic resonance imaging scan (mean age 62.8 ± 14 years, 37% women, median follow-up 40 months) with TA diameter >4.0 cm and without evidence of previous aortic dissection. Patient demographic and imaging data were analyzed in 3 groups: isolated ascending thoracic aortic aneurysms (AAs; n = 628), isolated descending TAs (DTAs; n = 130), and combined AA and DTA (mixed thoracic aortic aneurysm, MTA; n = 86). Patients with DTA had more hypertension (82% vs 59%, p <0.001) and a higher burden of atherosclerosis (88% vs 9%, p <0.001) than AA. Conversely, patients with isolated AA were younger (59.5 ± 13.5 vs 71.0 ± 11.8 years, p <0.001) and contained almost every case of overt, genetically triggered TA. Patients with isolated DTA were demographically indistinguishable from patients with MTA. In follow-up, patients with DTA/MTA experienced more aortic events (aortic dissection/rupture) and had higher mortality than patients with isolated AA. In multivariate analysis, aneurysm size (odds ratio 1.1, 95% CI 1.07 to 1.16, p <0.001) and the presence of atherosclerosis (odds ratio 5.7, 95% CI 2.02 to 16.15, p <0.001) independently predicted adverse aortic events. We find that DTA with or without associated AA appears to be a disease more highly associated with atherosclerosis, hypertension, and advanced age. In contrast, isolated AA appears to be a clinically distinct entity with a greater burden of genetically triggered disease. **(Am J Cardiol 2016;117:1683−1690)**

Aneurysms of the aorta occur in repetitive anatomic patterns. Divergent etiologies between anatomic categories of aortic aneurysm have been suggested based on comparison between thoracic aortic aneurysms (TAs) and abdominal aortic aneurysms (AAAs). Over the last century, the ratio of TAs to AAAs in population-based studies has decreased, suggesting separable risk factors.[1,2] Since these initial studies, the divergence of etiologic factors has been more convincingly demonstrated. For example, using a cohort of 341 patients referred for aneurysm surgery, Ito et al[3] elegantly demonstrated a clear enrichment of dyslipidemia, atherosclerosis, and coronary artery disease in patients with AAA versus a combinatorial group of TA. In contrast, differences between aneurysms within the thorax have received less attention. Although expert opinion has held that ascending thoracic aortic aneurysms (AAs) and descending thoracic aortic aneurysms (DTAs) likely have different origins, there has been scant experimental evidence to support these conclusions.[4,5] This study aims to evaluate the differences in patient characteristics and outcomes among 3 groups of patients: those with isolated AAs, those with isolated DTAs, and those with both AA and DTA or mixed thoracic aortic aneurysms (MTA).

Methods

Patients treated in the Thoracic Aortic Center at Massachusetts General Hospital are prospectively registered in our institutional database, which records baseline patient characteristics, aortic interventions, and follow-up outcomes. We identified 3,247 adult patients (age ≥17 years) with TA who were diagnosed from July 1992 to August 2013. We searched for computed tomography (CT) or magnetic resonance imaging (MRI) of the aorta. Aortic diameters

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See page 1689 for disclosure information.

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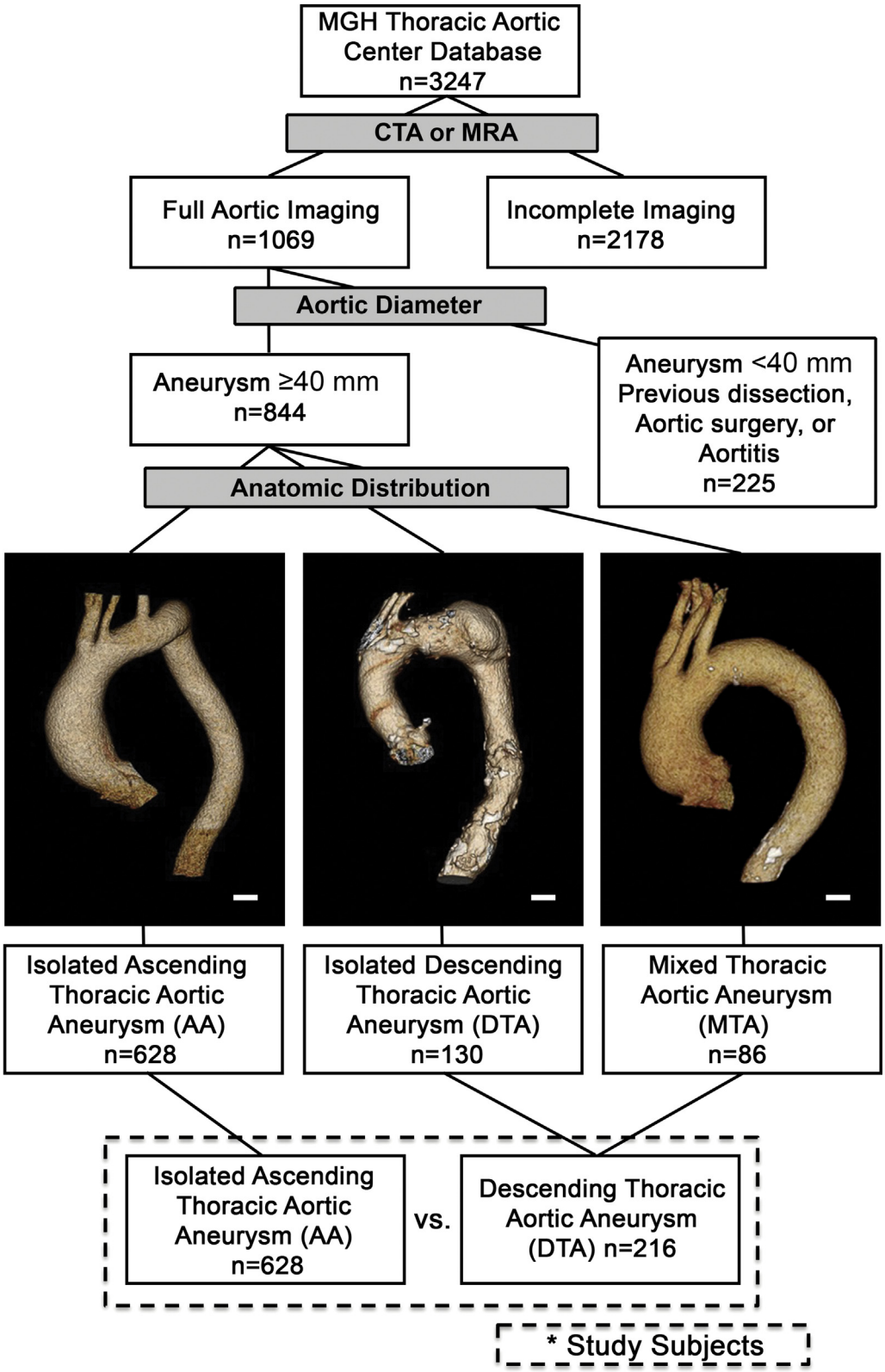

Figure 1. Ascertainment strategy for ascending, descending, and mixed aneurysm cohorts with representative aortic imaging (*white bar* = 2 cm). CTA = computerized axial tomography; MGH = Massachusetts General Hospital; MRA = Magnetic Resonance Angiography.

were measured at ascending, arch, descending thoracic, and thoracoabdominal segments of the aorta. Diameters were recorded for analyses if ≥40 mm. Patients were excluded if they had no thoracic aortic segment with a diameter of ≥40 mm or if there was evidence of preexisting aortic dissection, aortic repair, intramural hematoma, or aortitis.