Abstract  A thoraco-abdominal aortic aneurysm is defined by dilatation of the aorta to a diameter that is at least 50% greater than the expected normal diameter at the diaphragmatic hiatus, with varying degrees of thoracic and abdominal extension. Because thoraco-abdominal aortic diameter varies from its most proximal section (just distal to the left subclavian artery) to its most distal section (which includes varying sections of the abdominal aorta), one must assess aortic diameter relative to nearby healthy sections of aortic tissue while accounting for the effects of age, sex, and body size. Thoraco-abdominal aortic aneurysms should be interpreted in the context of their causes, the two most common of which are medial degeneration and aortic dissection. Aneurysms caused by aortic dissection can be further classified in terms of the extent of aortic involvement, acuity, and type of aortic wall disruption. For more than three decades, thoraco-abdominal aortic aneurysm repairs have been classified according to the extent of aortic replacement; the Crawford classification system facilitates risk stratification, helps surgeons plan the surgical approach and select protective adjuncts, and facilitates standardized reporting of results.

Keywords  Aortic aneurysm, thoracic • Aortic aneurysm, abdominal • Classification • Aortic dissection

2.1 Definition of Thoraco-Abdominal Aortic Aneurysm

A thoraco-abdominal aortic aneurysm (TAAA) is defined as dilatation of the aorta to a diameter at least 50% greater than the expected normal aortic diameter at the diaphragmatic hiatus, with varying degrees of thoracic and abdominal extension [1]. Normal aortic diameters vary with anatomic level and the individual’s age, sex, and body surface area. For example, at the level of the mid-descending thoracic aorta, the average diameter is 2.8 cm for men and 2.6 cm for women; at the level of the celiac axis, the average diameter is 2.3 cm for men and 2.0 cm for women; and at the level of the infra-renal aorta, the average diameter is 2.0 cm for men and 1.6 cm for women [2].

2.2 Causes of Thoraco-Abdominal Aortic Aneurysm

Thoraco-abdominal aortic aneurysms can be classified in terms of their cause. The most common cause is medial degeneration, which involves loss of smooth muscle cells and fragmentation of elastin fibers.
The second most common cause of TAAA is aortic dissection. Classic aortic dissection arises when a tear through the intima leads to progressive separation within the layers of the aortic media. The torn and weakened aortic wall predisposes patients to aneurysm formation and rupture. The extent of dissection is classified according to which aortic segments are involved; three classification schemes are commonly used in the literature (Fig. 2.1). In the DeBakey classification scheme, DeBakey type I dissections involve the ascending aorta, transverse aortic arch, descending thoracic aorta and, often, the abdominal aorta. DeBakey type II dissections involve only the ascending aorta. DeBakey type III dissections originate in the descending thoracic aorta and are subdivided into types IIIa and IIIb according to whether the dissection extends into the abdominal aorta. The Stanford classification scheme categorizes dissections into two groups according to whether the ascending aorta is involved. Dissections that involve the ascending aorta are classified as Stanford type A, whereas those that spare the ascending aorta are labeled Stanford type B. A limitation of the Stanford classification system is that it lumps patients with DeBakey types I and II dissections together into a single group, despite the fact that their treatments (beyond the initial need for emergency ascending aortic repair) and clinical histories are vastly different. For example, DeBakey type II dissections never cause TAAA, whereas DeBakey type I dissections often do. Finally, some authors use the scheme proposed by Borst, which simply labels dissections in anatomic terms that are based on which segment of the aorta is involved [3].

Dissections are also classified according to the time elapsed since the initial tear. Dissections are considered acute within the first 14 days after the initial tear; after 14 days, dissections are considered chronic. Although obviously arbitrary, the 14-day