

One should consider measuring the aortic root from sinus to sinus, and the largest diameter measured should be considered as a reference value.	Ila	C	-
Assessment of the risk of radiation exposure is recommended, especially in younger adults and in those undergoing repetitive imaging.	I	C	-
For CT or MRI techniques involving the entire aorta, it is recommended that motion artefacts of the ascending aorta be minimized and that the entire aorta should be acquired in a single data set.	I	C	-

^aClass of recommendation.

^bLevel of evidence.

^cReferences.

CTA: computed tomography angiography; MRI: magnetic resonance imaging; TTE: transthoracic echocardiography.

Diagnostic work-up for acute aortic syndromes

The diagnostic work-up to confirm or to rule out AD is highly dependent on the a priori risk of this condition, which can be stratified into 3 groups of variables using the Aortic Dissection Detection Risk Score: predisposing factors (e.g. Marfan syndrome), pain characteristics (e.g. chest, back or abdominal pain) and high-risk clinical examination features (perfusion deficit, new aortic insufficiency murmur). The risk score can easily be accessed online (<https://www.mdcalc.com/calc/4060/aortic-dissection-detection-risk-score-add-rs>). However, beyond this clinical risk score, a constellation of first-line simple examinations, including the electrocardiogram (ECG), the chest X-ray, TTE and biomarkers, is performed primarily in patients with chest pain in the emergency room and can be useful to rule out alternative diagnoses (e.g. myocardial infarction or pericarditis) or even, in the case of TTE, point to the diagnosis of AD by detecting an aortic intimal flap, aortic wall thickening and/or dilatation, major aortic valve regurgitation with or without cusp prolapse, as well as pericardial effusion [168, 169]. Especially when inconclusive, TTE can be finished by looking at the abdominal aorta, which may be helpful to detect a flap not visualized at the thoracic level. A CT scan of the entire aorta is the mainstay imaging technique for confirmation, except when the patient is highly unstable and intubated. Transoesophageal echocardiography (TOE) can be a reasonable alternative for patients under sedation in the intensive care unit (ICU) to make the diagnosis if TTE is inconclusive. Otherwise, TOE can be performed in the operating room for type-A aortic dissection because it is useful to complete the information provided by TTE+CT.

Clinical risk assessment

Risk stratification of patients is crucial for identifying appropriate candidates for specific aortic procedures. The risk constellation and case mix are no less heterogeneous in patients with AD than in the cardiac surgical populations. Recently, the European Society of Cardiology published an excellent outline (endorsed by the European Society of Anaesthesiology and Intensive Care)

on the cardiovascular assessment and management of patients who undergo noncardiac surgery [170]. Others have documented the importance of tailored anaesthesia and haemodynamic monitoring for noncardiac surgery in patients with valvular disease [171]. Several risk scores are available as shown previously (Chapter on 'Nomenclature and risk stratification'). But an important limitation of the available scores is their inability to determine futility of care. Unfortunately, there is to date no standardized and objective definition for surgical unfitness [159]. Evaluation by experienced surgeons and multidisciplinary aortic teams may be an important way to avoid arbitrary denial of surgery to patients who may benefit from an operation. Of note, invasive therapeutic options should be weighted individually in each patient. Hence, general health status, life expectancy and frailty have to be assessed and form the basis for offering invasive treatment.

Frailty is one of the most important elements not routinely included in risk models. Grip strength and gait speed can be captured in the overall functional status assessment. Age, body mass index, preoperative anaemia and hypoalbuminemia have also been recognized as indicators of frailty [160]. Daily activities and weight (loss) could provide additional information about the overall health of the patient [172–174]. Sarcopenia, identified through psoas muscle mass measurement by preoperative CT imaging, has been proposed as a possible objective measure for frailty assessment [161]. Assessing baseline neurologic function is important for the initial risk stratification, and systemic cognitive assessment by experts should be part of the evaluation. A prior stroke could contribute to frailty and therefore should be added to the frailty index used to assess the patient's ability to perform independent daily activities. A previous stroke can contribute significantly to neurologic morbidity [175].

A preoperative workup that includes pulmonary function tests may be beneficial, and blood work (including kidney and liver function tests) is necessary for patients undergoing any elective aortic procedure [175]. Peripheral vascular disease and prior intervention, including radiation therapy, are important determinants of clinical outcome. Coronary artery disease and cardiac function are crucial in patients who undergo elective cardiac and aortic interventions. An invasive coronary angiogram is recommended in patients with known coronary artery disease, whereas non-invasive testing, such as cardiac CT, may be sufficient in selected patients without symptoms of coronary artery disease [175].

The overall frailty and geriatric risk burden include cognitive, social, functional and nutritional status. These variables should be considered for stratification of surgical risk, particularly in elderly patients.

What to look for to reduce the risk of neurologic complications

Initial imaging plays a crucial role both in assessing the extent and morphologic expression of the respective AD and in decision-making and planning of the most suitable treatment option when indicated.

The focus is not only on the respective aortic pathology but also on the anatomy of the supra-aortic vessels including the cerebral supply of the circle of Willis and on its structure or variations. In addition, the assessment of the spinal cord perfusion is of enormous importance. Evaluation of both is essential before