The Current Optimal Imaging Modality for Evaluating Acute Aortic Syndromes
Frederic Thony, Philippe Otal, Louis Boyer

Contents

28.1 Introduction ........................................ 289
28.2 Imaging of Acute Aortic Dissections ............ 289
28.3 Imaging of Intramural Hematomas ............... 291
28.4 Imaging of Aortic Ulcers .......................... 293
28.5 Conclusion ........................................ 293

28.1 Introduction

Acute aortic syndrome is a new pathological concept [1, 2] that includes several aortic pathologies with a similar clinical profile and evolution. In this syndrome, the acute onset of symptoms denotes a weakness of the aortic wall and consequently, a risk of rupture and other complications. Therefore, diagnostic tools used to investigate these pathologies must be accurate and fast enough for decision-making. The acute aortic syndrome may be related to an aortic ulcer, an intramural hematoma (IMH) or a classic aortic dissection. If the chest X-ray is routinely performed on the admission of patients, its overall sensitivity and specificity is low [3] and the sole interest of this imaging technique is when dealing with a chest pain, to help focus on the thoracic aorta. Thus, the diagnostic approach, the pretherapeutic checkup and the follow-up will be based on transthoracic echocardiography (TTE), transesophageal echocardiography (TEE), multidetector row computed tomography (MD-CT) and MRI. Although angiography was previously considered the standard reference for the diagnosis of aortic diseases, in most cases it has been replaced by noninvasive imaging techniques.

28.2 Imaging of Acute Aortic Dissections

The analysis of the International Registry of Aortic Dissections (IRAD) [4, 5] showed that diagnostic methods currently used for aortic dissection were as follows: CT in 61% of cases, TTE and TEE in 33% of cases, angiography in 4% of cases and MRI in 2% of cases. These figures demonstrate that there is no consensus on the best diagnostic test for aortic dissection and that the choice of the latter depends either on the training of the medico-surgical team in charge of the diagnosis or on the equipment available at a given institution.

But what would be the best diagnostic imaging modality to investigate an aortic dissection? To answer this question we need to define the goals of the diagnosis in acute dissection. Because of the high mortality rate of aortic dissection and the risk involved in aortic surgery, the first aim is to prove the aortic dissection and to classify it as type A or B (Stanford classification) with excellent negative and predictive values. The second aim is diagnostic management as quick as possible in order to reduce the high mortality rate of this pathology during the first hours (1% per hour during the first 48 h [6]). The third aim is an exhaustive evaluation of the aortic dissection. This evaluation includes the extent of the damage to the heart, the localization of entry and reentry sites and the search for blood supply compromise of visceral arteries.

In the literature, the evaluation of the accuracy of the different diagnostic tests varies from one report to another [5, 7–9]. But, because of the rapid evolution of these techniques, none of these evaluations reflect the current performances of imaging modalities. In particular, we do not find in the literature an evaluation of MD-CT in the diagnosis of aortic dissection, yet this new technique has considerably improved the quality of aortic examinations [10–14]: the temporal resolution – less than 500 ms – and cardiac synchronization have dramatically decreased motion artefacts, the spatial resolution is improved and the increase in number of detector rows allows for investigation of the whole aorta in a short examination time. On the other hand, new technical improvements in MRI have increased its reliability and helped to achieve faster examination times [15] and TEE has benefited from multiplanar probes. So far, we can stipulate that the three non-invasive techniques currently used have high and similar accuracy to prove and localize an aortic dissection [5, 16].
In many centers the availability of echocardiography (TTE-TEE) allows a reduction of the time of diagnosis, and is therefore the first and only test performed to indicate surgical treatment [8, 9]. TEE may be performed at the patient’s bedside, or more safely in the operative room under general anesthesia to avoid an increase in blood pressure that may favor an aortic rupture [17]. In other centers, MD-CT is preferred in order to better investigate the extension of the aortic dissection [13]. This diagnostic strategy is chosen when percutaneous treatment is planned for patients before surgery in the case of a visceral malperfusion. The aim of this strategy is to reduce the mortality rate of aortic dissection related to visceral ischemia (20% of aortic dissection with a mortality rate of 30–