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Endovascular treatment of thoracic aortic diseases: Follow-up and complications with multi-detector computed tomography angiography

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Abstract

Endovascular procedures with placement of stent-graft has become an accepted alternative to traditional open surgery for treatment of descending thoracic aortic aneurysms, ulcers, post-traumatic rupture, or complications of type-B dissection, due to significant reduction in perioperative mortality, rate of complications and length of hospitalization. Moreover, increasing operator experience and continuous advances in stent-graft technology are making treatment of a wider range of cases possible with redefinition of guidelines for endovascular stent-graft. The feasibility of endovascular stent-graft is mainly dependent on anatomic factors which represent the important predictors of the success of this procedure as well as on strictly follow-up in order to obtain early detection and treatment of eventual complications.

Multi-detector CT-angiography is a fast, safe, and minimally invasive imaging technique that represents the standard of reference in the follow-up of patients who have undergone endovascular stent-graft, as it is effective and specific in the detection of procedure-correlated complications.

The purpose of this article is to give a brief review of those techniques most commonly used for endovascular treatment of thoracic aortic diseases together with a more detailed description of post-procedural complications and their appearance on multi-detector CT-angiography.

Keywords: CT-angiography; Stent-graft; Thoracic aorta; Endovascular treatment

1. Introduction

Despite significant improvement in anaesthetic and surgical techniques and better perioperative care, transthoracic surgery of descending aortic diseases involving thoracotomy and aortic cross-clamping still carries substantial risks of serious complications, with a 30-day mortality of 5–15% in elective cases and up to 50% in emergency situations. The incidence rate of spinal chord ischemia is also significant and has been reported to be as high as 10% [1–4].

In recent years, endovascular procedures with placement of stent-graft (EVG) has become an accepted alternative to traditional open surgery for treatment of descending thoracic aortic aneurysms, ulcers, post-traumatic rupture, or complications of type-B dissection, due to significant reduction in perioperative mortality, rate of complications, and length of hospitalization [5–8]. Moreover, increasing operator experience and continuous advances of stent-graft technology are making treatment of a wider range of cases possible with redefinition of guidelines for EVG. For example, lesions of the mid aortic arch can now benefit from an endovascular approach whereas a hybrid procedure, combining both an endovascular and a surgical approach, can be used for treatment of diseases involving the ascending aorta and/or the aortic arch [9–14].

The success of an endovascular treatment, based on lesion exclusion without intra- and post-treatment complications, is strictly related to an accurate selection of patients as well as a strict surveillance of them in order to determine the long-term performance of these devices. The standard of reference in the evaluation of patients who had undergone EVG is represented by multi-detector CT-angiography (CTA), due to its diffusion, non-invasiveness, and efficacy in the early detection of procedure-related complications [3,15,16]. Due to the increas-

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ing number of patients treated with EVG, it is mandatory that not only the dedicated vascular/interventional radiologist but every radiologist is familiar with EVG procedures and the full gamut of possible related complications in order to allow a timely and correct diagnosis on multi-detector row CT axial and 3D images.

In this article we will briefly review those techniques most commonly used for endovascular treatment of thoracic aortic diseases together with a more detailed description of post-procedural complications and their appearance on CTA.

2. Endovascular techniques

Aortic stent-graft is a device composed of a metallic skeleton and a covering membrane of polytetrafluoroethylene or polyester, that is endoluminally positioned with the insertion of

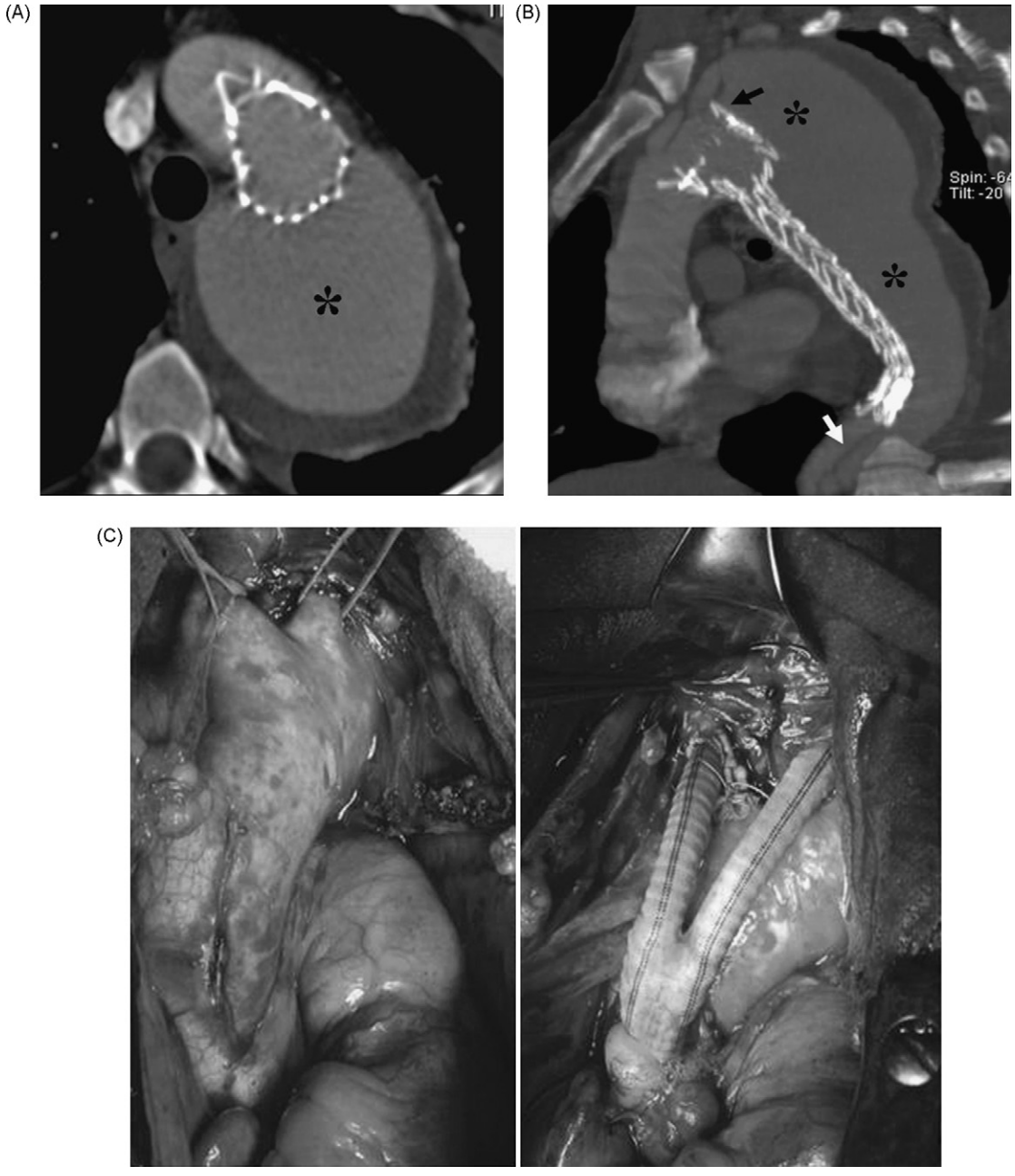

Fig. 1. A 41-year-old man underwent endovascular graft of the descending thoracic aorta for treatment of a post-type-B dissection false lumen aneurysm with concomitant collapsed true lumen. Due to lack of a proximal neck (intimal flap was extended from the ostium of subclavian artery), covered proximal boundary of endovascular graft was placed just below the ostium of left carotid artery, covering the left subclavian artery ostium. (A and B) Follow-up CT images show a caudal migration of the stent-graft (arrow in B) with concomitant reperfusion of the aneurysmatic false lumen (proximal type-I endoleak) (asterisks). (B) MIP-image also depicts partial true lumen/stent-graft collapse. On the basis of CT-findings, aortic cuff was deployed in the ascending aorta with debranching of the arch by performing an ascending aorta–carotid/innonimate artery bypass (C). (D and E) MIP and (F) CPR images, performed 6-months after re-intervention, show patency of the ascending aorta and surgical bypass (arrows in D and E), with re-expansion of the true lumen/stent-graft and complete exclusion by flow of the false lumen (asterisk in D). Reduction in size of the false lumen is also depicted.