In situ introducer sheath dilatation for complex aortic access

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Abstract

Aortic access problems due to diseased or small peripheral vessels are a major issue in endovascular aneurysm repair (EVAR). In the emergency setting, like aortic rupture after blunt trauma, or in patients with a hostile abdomen, a more proximal access to the aorta is not a pleasant perspective. We developed in situ introducer sheath dilatation as a bail-out technique for patients with difficult aortic access under various circumstances including EVAR, intra-aortic balloon pump insertion and cannulation for perfusion. The method described allows to increase the access vessel diameter by 50% (from 6 to 9 mm) or the luminal circumference from 18 to 27 F. We have used this technique in five patients without complication, very much in contrast to the traditionally practiced ‘forced device insertion’. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

With the advent of endovascular aneurysm repair (EVAR), remote access to the aorta from the groin has become a major issue in some patients with diseased or small peripheral vessels. In the Eurostar trial [1], access problems have been identified as one of the main reasons for primary conversion to open surgical repair. Various tricks have been developed to bring relatively stiff covered stent-grafts through a diseased tortuous femoro-iliac access including balloon dilatation, serial dilators, ultra-stiff guidewires, retroperitoneal digital guidance, subclavian-femoral traction wire, etc. In our hands about 10% of the patients undergoing EVAR belong to the category with complex distal access [2,3]. In situ introducer sheath dilatation is the bail-out procedure we developed under such circumstances.

2. Material and methods

Typical circumferences of covered stent-graft systems for EVAR are 18–24 F for the abdominal aorta and 21–28 F for the thoracic aorta (Fig. 1A), which translate into device diameters of 6–9 mm. In theory, a large proportion of the general population should have an adequate access vessel diameter [4]. However, small patients, young patients (traumatic rupture of the aorta: [5]), patients with atheromatous wall changes, patients with elongated, tortuous access vessels, and patients with large aortic diameters close to the aneurysmal lesions requiring even larger covered endoprostheses are prone to complex aortic access.

Under such difficult circumstances we have successfully used in situ introducer sheath dilatation in five patients. For this purpose the covered-stent graft system which cannot be inserted is removed, making sure that the ultra-stiff guidewire stays in place. Over this same guidewire, we introduce a long arterial introducer (Fig. 1B), typically 18 F with a 30-cm sheath and a 40-cm dilator (Ref. 7W5600 by B. Braun Melsungen AG, Melsungen, Germany). Once in place we remove the central mandril and proceed to the in situ introducer sheath dilatation by the means of a vascular balloon dilatation catheter which is selected as a function of the final inner lumen which is necessary. An 8-mm balloon (Ref. 16-505, Boston Scientific Corp., Watertown, MA, USA) allows for an in situ introducer sheath dilatation up to 24 F inner lumen whereas 27 F can be achieved with a 9-mm balloon. The balloon is introduced in the sheath and in situ introducer sheath dilatation is started at its most distal end, immediately proximal to the hemostasis valve (Fig. 1). With each balloon inflation (Fig. 2A), approximately 4 cm of introducer sheath (and access vessel) can be dilated up to the necessary diameter which is predetermined by the balloon diameter selected. Once, the aorta is reached, the completeness of the in situ introducer sheath dilatation is checked by...
pulling back the partially inflated balloon. The hemostasis valve is cut off (blade) after cross-clamping. A 10-mm longitudinal incision is made on the dilated introducer sheath and two hemostats are placed at the resulting angles. The covered stent graft system is passed into the dilated introducer sheath (Fig. 2B).

3. Discussion

In situ introducer sheath dilatation provides smooth access to the aorta even under difficult circumstances. We overlook now more than 150 endovascular aneurysm repair procedures and have used in situ introducer sheath dilatation in five patients without any local or remote complication. As a matter of fact, in all five patients where this approach was selected, the covered stent-graft system could finally be placed at the planned target level of the aorta and was successfully unloaded. No access vessel rupture, access vessel occlusion, or peripheral embolism occurred with this technique. Likewise, after a mean follow-up of 12 ± 4 months there have been no late complications observed in relation to in situ introducer sheath dilatation.

This is in sharp contrast to our previous experience with forced introduction of covered stent graft systems through small access lumens which in few patients produced all types of local vascular complications, including unplanned endarterectomy, access vessel rupture, access vessel occlusion, and eventually failure to pass despite the problems just mentioned.

We do not claim that in situ introducer sheath dilatation for covered stent graft system insertion is harmless and recommend leaving the ultra-stiff guidewire in place for a some time after sheath removal in order to be able to introduce a balloon or covered stent graft in case of internal bleeding. In situ introducer sheath dilatation has the advantage of providing, in addition to the matched luminal size, which is defined by the balloon catheter selected, a smooth inner access surface which allows the covered stent graft system to slide with relative ease up to the aortic level as well as to work against a relatively solid sheath which is much stronger than the diseased arterial wall. The limited experience we have with in situ introducer sheath dilatation for covered stent graft system insertion in patients with complex aortic access suggests that a 50% increase in vessel diameter (6–9 mm) or luminal circumference (18 F dilator inflated to 27 F) is well tolerated.

Hence, in situ introducer sheath dilatation is now our
preferred bail-out procedure for patients undergoing endovascular aneurysm repair despite complex remote access routes. In addition, this technique can be used for intra-aortic balloon insertion, as well as distal cannulation for perfusion.

References


