

Proposal for bail-out procedures - Vascular thoracic Uncovered stent-graft in the treatment for residual patent false lumen after surgical repair for acute type A aortic dissection

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Abstract

Patent false lumen after surgery for acute type A aortic dissection (AAAD) influences the outcome with increased risk of aortic rupture and visceral malperfusion. We report a case of a patient previously operated on for aortic valve repair and replacement of the ascending aorta because of AAAD, presenting at follow-up with a retrograde dissection in aortic arch, persistent patent false lumen and significant aortic enlargement. An extensive (arch and thoraco-abdominal aorta) successful repair was performed using uncovered stent grafts. We welcome discussion on the real indication of this alternative approach and advantages and disadvantages on mid-/long-term follow-up.

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Keywords: Aortic dissection; False lumen; Uncovered stent-graft

1. Introduction

We report the endovascular approach using uncovered stent-grafts in the treatment of distal patent false lumen causing aortic enlargement three years after surgical repair for acute type A aortic dissection (AAAD).

2. Clinical summary

In May 2007, a 56-year-old male was admitted to our University Hospital due to acute onset chest pain. Computed tomography (CT) demonstrated type A aortic dissection with an initial intimal tear in the ascending aorta and the presence of a false lumen involving the arch, thoraco-abdominal aorta and left common iliac artery. A transthoracic echocardiography also showed moderate aortic valve regurgitation so an emergency operation was performed establishing cardiopulmonary bypass by using the right axillary artery, circulatory arrest and antegrade selective cerebral perfusion. As Sakaguchi et al. [1] our surgical strategy in the treatment for AAAD was to eliminate the primary intimal tear so in this case ascending aortic replacement and subcommissural aortic valve repair were performed. No primary entry in the arch and/or proximal descending aorta were found. At six-month and one year follow-up the CT-scan showed no aortic enlargement but showed persistent patent false lumen involving descending and abdominal aorta. In January 2010, a repeated CT demonstrated the presence of a dissected arch probably

due to retrograde dissection up to distal anastomosis of the previous surgical repair, an increase of false lumen diameter (54 mm) at level of arch and the proximal descending aorta and a remarkable reduction of true lumen at the level of the abdominal aorta (Fig. 1a, b). Moreover, other intimal tears in the descending and supra-renal abdominal aorta were revealed. According to the surgical risk strictly related to a redo-operation involving the arch and thoraco-abdominal aorta a minimally-invasive approach was preferred using the Djumbodis[®] Dissection System (Saint Come Chirurgie, Marseille, France). We used the right common femoral artery as vascular access bearing in mind the presence of a dissected left common iliac artery so a complete endovascular repair of the arch and the remaining aorta within the origin of the renal arteries was performed positioning four uncovered stent-grafts. Control aortography showed a significant increase of the true lumen without any complications and optimal cerebral and visceral perfusion. The patient was discharged without any complication and a control CT demonstrated the remodelling of the entire aorta, the reduction in the false lumen diameter with its complete obliteration except for the distal aorta below the renal arteries (Fig. 2).

3. Comment

AAAD is one of most serious cardiovascular diseases with a high hospital mortality rate [2] so immediate survival must be considered as the most important goal of surgical repair. However, the presence of aneurysmal dilatation of the distal aorta together with persistent false lumen may

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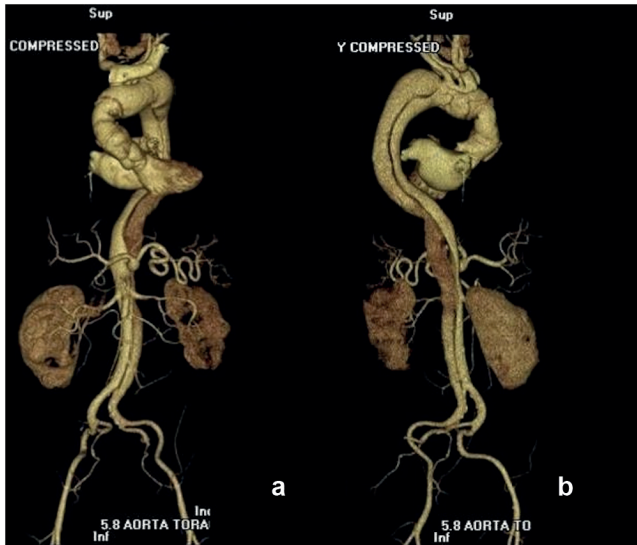


Fig. 1. 3-D reconstruction of preoperative computed tomography showing extensive (aortic arch and thoraco-abdominal aorta) and enlarged residual false lumen after replacement of the ascending aorta for acute type A aortic dissection. (a) Anterior view. (b) Posterior view.

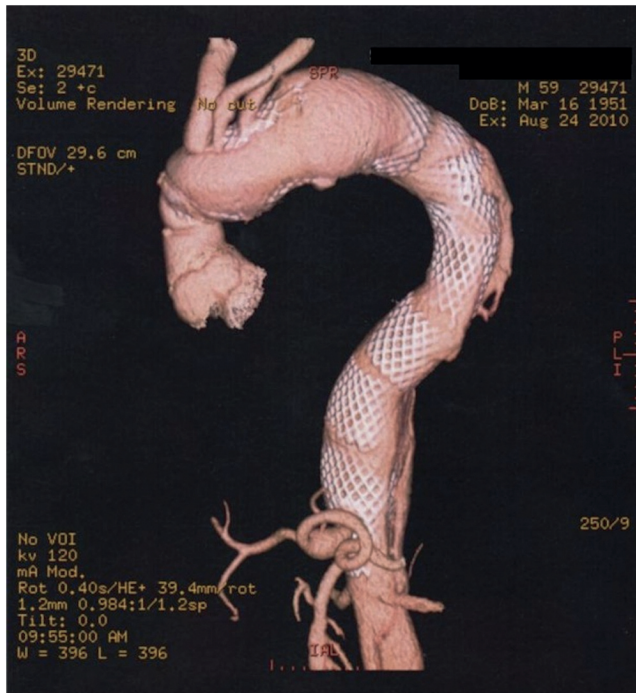


Fig. 2. Arch and thoraco-abdominal aortic repair using four uncovered stent-grafts: complete disappearance of the false lumen.

require reoperation. The fate of persistent false lumen has not been completely studied but significantly influences mid- and long-term outcomes with aortic enlargement [3] and influences increased risk of aortic rupture [4]. An interesting paper published in 1989 by Yamaguchi and colleagues [5] demonstrated that the incidence of persistent false lumen after surgical treatment for AAAD remains

high (between 75% and 100%) so circulatory arrest and ‘open-distal’ anastomosis are mandatory to reveal the presence of an intimal tear in the aortic arch and/or proximal descending aorta. Distal reoperations may be performed using a hybrid approach with surgical transposition of the supra-aortic trunks and subsequent endovascular treatment using conventional covered stent-grafts. The results presented by this procedure are encouraging in terms of mortality, incidence of paraplegia and follow-up [4, 6] compared with open surgery alone (mortality rate 5–26%, paraplegia rate 7–36%) [7]. The Djumbodis® Dissection System consists of an uncovered steel stent mounted on a compliant balloon which is inflated to adapt the stent to the aortic wall and to coapt aortic layers. In 2002, Roux and coworkers reported the first two implants of this device during open surgical treatment of AAAD [8], positioning Djumbodis stent during conventional ascending aortic replacement thus avoiding surgical repair of arch and proximal descending aorta using a relatively reproducible technique. More recently, this stent-graft has been introduced in a minimally-invasive fashion with its placement via open transfemoral access as a typical endovascular treatment. In our case, we recognized the following advantages: 1. avoidance of surgical risk related to sternal re-entry to perform arch ‘debranching’; 2. guarantee of obtaining optimal cerebral and visceral perfusion; 3. true lumen restoration and, consequently, 4. reduction of false lumen diameter and its exclusion and obliteration. The control CT showed adequate adaptation of the stent to the arch shape and isthmus curvature and no altered perfusion of the carotid arteries and visceral arteries as superior mesenteric, celiac trunk and renal vessels. It is obvious that this procedure lays itself open to criticisms related to the low percentage of cases performed and to many adverse effects described with this device. However, we believe that the reduced risks in terms of mortality and morbidity of an open or hybrid approach in patients previously undergoing surgical repair for AAAD together with the unquestionable resolution of patent false lumen and consequent severe aortic enlargement must be considered as a reasonable fact in a profitable scientific discussion. In conclusion, we consider an uncovered stent-graft placement a valid option in the treatment for residual patent false lumen and aortic enlargement after surgical repair for AAAD. Moreover, a significant number of treated cases and a mid-term follow-up to analyze the real efficacy of this procedure are mandatory.

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eComment: Endovascular treatment of chronic aortic dissection: is an uncovered stent the way to go?

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We read with great interest the case report by Mastroroberto et al. [1], describing the use of the Djumbodis® device for treating a dissecting aneurysm of the aortic arch.

The Djumbodis® stent is uncovered and has to be balloon-inflated in order to reach the needed size, with a maximal diameter of 45 mm.

It has been clearly demonstrated in several studies that aneurysmal dilation following aortic dissection is essentially due to dilation of the elastin poor false lumen wall, and that the elastin rich true lumen wall dilates to a much lower degree [2, 3]. On the other hand, the goal of endovascular treatment of dissecting aneurysms is to exclude the false lumen wall from the parietal pressure exerted upon it by the blood flow, and obliterate any intimal tear present. If endovascular treatment is the way to go, then this could only be achieved through the use of a covered endoprosthesis.

In the authors' case, the CT-scan images do not show a significant dilation of the descending thoracic aorta, and therefore the Djumbodis® stent deployed inside the true lumen could actually expand the true lumen wall until it reaches the outer false lumen wall. The preferential blood flow that is redirected into the true lumen might relieve the pressure exerted upon the false lumen outer wall, and therefore promote its thrombosis, although this has yet to be proven.

As for the aortic arch, the CT-scan shows it is dilated to 54 mm. An intimal tear is most probably present at this level allowing the blood flow to circulate. As we know, the Djumbodis® maximal diameter is 45 mm, it is therefore hard to assume that the uncovered Djumbodis® stent would enable complete obliteration of the false lumen and of the eventual intimal tear present at this level. On the other hand, being uncovered, the stent would not eliminate the parietal tension exerted upon the fragile wall it is expanded into, thus the risk of further dilation and eventual rupture remains. Furthermore, lus et al. [4] have recently shown that during surgical repair of acute ascending aortic dissection, the Djumbodis® device deployed intraoperatively in an antegrade fashion has failed to limit the evolution of the dissection and dilation of the residual aorta.

Finally, it should be noted that in case the uncovered stent fails to limit the progression of aortic arch dilation, its presence inside the aortic arch lumen would render reoperation for aortic arch de-branching more challenging.

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eResponse: Re: Endovascular treatment of chronic aortic dissection: is an uncovered stent the way to go?

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I would like to thank Ziad M. Khabbaz for his eComment [1] on our paper on the treatment of chronic aortic dissection using uncovered stent graft [2]. Although the criticism presented must be considered justifiable and turned towards increasing the value of scientific knowledge, I believe that objective considerations are mandatory, however:

1. In our patient the primary indication to treat residual false lumen was strictly related to the enlarged aortic arch diameter and proximal descending thoracic aorta as reported in the clinical summary of the paper [2], and we have not reported any significant dilation of the descending aorta as indicated in the eComment [1]. The images presented confirm this statement showing arch diameter of 54 mm and significant reduction of the true lumen at the level of the abdominal aorta.

2. It is true that the Djumbodis® uncovered stent-graft has to be balloon-inflated in order to reach the needed size, with a maximal diameter of 45 mm, but in our case a prompt and accurate analysis with the engineers of the system provided the necessary approval to implant the device.

3. I have read the paper by lus and coworkers [3] and I have just a simple consideration: the configuration of the Djumbodis® system is correctly performed on a 'working aorta' whereas all implants as complement of a surgical procedure have been carried out on an 'empty aorta' so probably invalidating the mid- and long-term results regarding the fate of residual false lumen.

Finally I would like to stress that uncovered stent-graft implantation must not be considered the correct way to treat chronic aortic dissection but a valid option available to all surgeons involved in these challenging cases.

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