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Endovascular treatment of chronic type A dissection

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Abstract

Type A aortic dissection is usually treated with standard surgery, requiring cardiopulmonary bypass and sometimes deep hypothermia. Besides the well-established procedure, mortality and complications are considerable. Using the knowledge and lessons learned from the endovascular treatment of descending aortic diseases, emerging reports describe new approaches to the condition, using endovascular stent-grafts. This report describes an endovascular treatment of a chronic type A aortic dissection without cardiopulmonary bypass and avoiding thoracotomy.

Key Words: Endovascular; Aortic dissection; Stent-graft

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1. Introduction

Type A aortic dissections are a high mortality condition. Chronic evolution is not as frequent as acute ones, especially because most of the patients die in the acute phase.

In this phase the treatment of this condition depends on several factors such as: aortic diameter and the presence of aortic insufficiency.

Surgical correction is well established but still demands the use of cardiopulmonary bypass and, in selected cases, deep hypothermia. Many techniques are described in order to preserve the aortic valve and coronary ostia. Nowadays, these approaches are performed with a relatively small mortality.

In the last few years, the endovascular treatment of descending thoracic aorta diseases has evolved, creating a new perspective, alternative to conventional surgical treatment, in selected individuals, especially those with significant co-morbidities and imposing a high risk for conventional procedures [1, 2].

The treatment of the ascending aorta on the other hand is a challenge, due to anatomical characteristics and proximity of coronary ostia and arch branches. Besides that, some reports are emerging describing isolated endovascular treatment cases of acute type A dissection [3–5].

This report presents a case of endovascular treatment of chronic type A aortic dissection in a high-risk patient.

2. Case report

A 63-year-old male with chronic renal insufficiency was referred to our unit after a routine coronary angiography for renal transplantation.

The exam showed a localized type A chronic dissection. The entrance orifice was small and well localized, midway between the sino-tubular junction and the brachiocephalic trunk. The false lumen was large, reaching 10 cm and limited to the ascending aorta. No distal aortic branches were dissected. The CT-scan confirmed the diagnosis. The false lumen was widely patent. True lumen measure: 32 mm. False lumen: 95 mm. Distal and proximal landing zones were similar (Fig. 1).

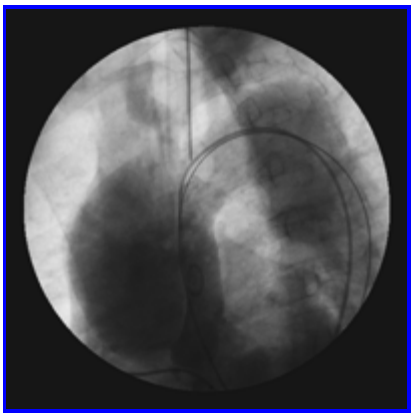

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Fig. 1. Aortography showing type A dissection with a large false lumen.

The patient had multiple co-morbidities: severe CPOD, previous stroke, chronic renal insufficiency, hypertension and diabetes.

Due to the favorable anatomical condition and the high surgical risk for conventional approach the patient consented to undergo an endovascular treatment. A custom-made stent-graft was tailored.

Under general anesthesia, a custom-made stent-graft (Braile Biomedical), measuring 38x155 mm (20% oversize), with a distal non-covered segment to avoid covering the brachiocephalic artery, was advanced to the ascending aorta through the right femoral artery under fluoroscopic guidance. An angiogram was performed and confirmed no distal re-entry tears and the limited false lumen. Before deploying the device, the patient was paced at 200 bpm using an endocardial temporary pacemaker through the femoral vein.

Just after the deployment we noted an acute aortic insufficiency, due to stent interference on the aortic

valve apparatus, leading the patient to a short term of cardiac arrest. An endovascular balloon was used to apply traction in the prosthesis to the brachiocephalic trunk. After that the patient recovered sinus rhythm.

Final aortography showed no aortic insufficiency, no coronary ostia occlusion and no endovascular leak with complete occlusion of the entrance orifice (Fig. 2).

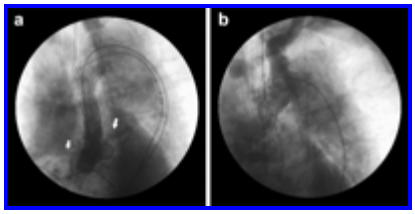

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Fig. 2. (a) Aortography showing stent-graft positioned. No aortic insufficiency or coronary occlusion are evidenced (arrow). (b) Aortography showing no aortic branches occlusion.

The patient returned to the intensive care unit for three days, mainly for blood pressure control. The neurological status was perfect after the procedure. In the regular ward, the patient developed acute cardiac insufficiency due to a new aortic regurgitation, probably caused by further prosthesis migration, leading to a new cardiac arrest and death.

3. Discussion

In patients with advanced age, multiple co-morbidities and previous surgical thoracic procedures the conventional surgical treatment of the chronic aortic dissection type A imposes a significant risk with high peri-operative mortality, despite the center's experience.

Endovascular treatment of descending and abdominal aortic diseases has emerged as a safe alternative to the conventional approach with consistent results and acceptable mortality, especially in selected individuals [6].

In the ascending aorta initial reports are emerging with diverse results. The ascending aorta imposes a technical challenge due to the proximity of important structures such as coronary ostia, brachiocephalic trunk and the aortic valve. The infinity variations of dissection anatomy in the ascending aorta is another obstacle. In this scenario, custom-made prostheses are needed in order to provide a safe and perfect landing zone. Only limited entrance orifices and not too big true lumens seem to be adequate for the procedure [3–5].

Individual technical skills are required in order to provide a correct deployment and a learning curve exists.

Besides that, the long-term durability of this approach is uncertain in contrast with the well-known conventional one.

In this report, we presented a catastrophic endpoint in the endovascular treatment of chronic type A aortic dissection, with multiple surgical pitfalls being recognized. The initial objective was to stabilize the entire ascending aorta, due to the high risk of rupture of the large false lumen, not only to close the entry tear.

The reported complications could be avoided if the device was deployed slightly more distal, using the non-covered segment to protect the brachiocephalic trunk ostia. The device migration is another major question. The correct oversize choice is still under debate as the balloon needs to accomplish full stent expansion, especially in the ascending aorta due to its proximity to major structures. This reinforces mandatory follow-up by CT-scan or MRI.

Certainly the minimal invasiveness fashion of the procedure is of clinical benefit, avoiding sternotomy, cardiopulmonary bypass and deep hypothermia. Further studies and surgical investigation is required in order to provide a safer procedure. The gold-standard treatment for acute and chronic aortic dissections is still performed through classic procedures.

Broader application of this technique will provide the necessary knowledge to evolve the procedure.

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4. Conclusion

In conclusion, the endovascular treatment of type A dissection is a promising therapeutic strategy for high-risk patients. The correct patient selection and the perfect stent-graft design are not well established.

Further investigations and development of improved stent-grafts and catheters will be able to demonstrate the adequate role of this alternative approach and provide real clinical benefit to this population.

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