ENDOVASCULAR TREATMENT OF DISTAL AORTIC ARCH ANEURYSM

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Abstract

In recent years there have been important progress in vascular surgery due to the appearance of endoluminal techniques. Researchers and clinicians have developed new concepts for treatment of descending aorta lesions and devices through which these theories can be put into practice. The introduction of endovascular techniques allow treatment of the descending thoracic aorta diseases in a manner much faster and less traumatic (open surgical trauma) thus being a benefit for the surgeon as well as for the patient. Based on this concept I present the following case, ideal for endovascular treatment, trying to emphasize the importance of fully exploring and establishing all the steps of the intervention preoperatively. The procedure was performed in B.A.Z. County Hospital Miskolc, Hungary. The success of endoluminal techniques (TEVAR) is directly related to preoperative imaging with highest precision. Based on the information obtain after imaging, measurements of aorta and the lesions are made and endoluminal prosthesis is chosen accordingly. If these details are not analyzed properly, therapeutic success will be compromised.

Key words: thoracic aneurysm, stentgraft, landing zone, hybrid approach, endoleak.

INTRODUCTION

In this case report we present an 85 years old patient with aneurysm of the descending thoracic aorta who was treated by tubular aortic endograft implanted at the proximal part of the descending thoracic aorta.

MATERIAL AND METHODS

An 85 years old male patient with medical history of essential hypertension for 25 years under antihypertensive medication, came with pain in interscapulo-vertebral region, with sudden onset about 1 month ago and swallowing disorders about a week ago.

The patient is known for hypertensive cardiovascular disease, COPD, chronic smoker, duodenal ulcer operated 33 years ago, right direct inguinal herniorraphy 11 years ago, hemorrhoidal disease treated conservatively, chronic venous insufficiency of the lower limbs, chronic peripheral artery occlusive disease PAOD with Leriche-Fontaine grade IIA.

Clinical and laboratory examinations showed no significant changes. PA chest radiograph revealed prominent aortic knob, pronounced bilateral hill and basal pulmonary circulation.

On ECG we observe left ventricular hypertrophy. Evaluation of cardiac ultrasound reveals no significant changes of heart, LV ejection fraction 45% without contractility disorders, secondary LV hypertrophy due to hypertension, aortic valve with calcification, maximum transaortic gradient 30 mmHg, regurgitation grade I. Ascending aorta without dilatation or sign of dissection.

Indication for vascular examination of the thoracic aorta is supported by clinical symptoms. CT scan of the thorax with contrast shows aneurysmal dilatation of the aorta distal to the left subclavian artery emergence (fig.1).

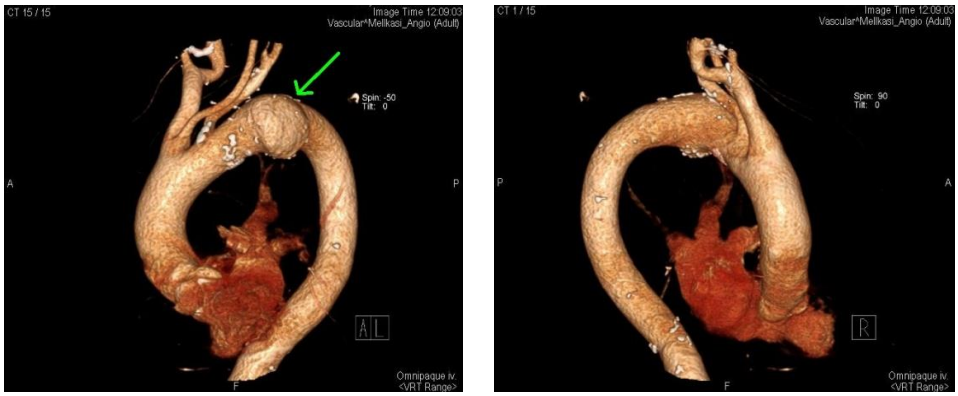

Fig.1 Angio-CT: ascending aorta, aortic arch
and descending aorta, 3D reconstruction. Saccular aneurysmal dilatation.

Being a saccular aneurysm we have to judge between endoluminal or classic surgery treatment. Patient age, associated health condition, and type of anesthesia favors endoluminal intervention and endograft implantation. We obtain the patient's informed consent for this procedure.

To perform this procedure, we need accurate information about the surgical approach and lesion morphology.

Femoral approach is chosen and for a proper advancement of the endograft to the desired location we need a "friendly" common femoral artery, external iliac, common iliac, abdominal aorta and distal thoracic aorta. A troublesome tortuosity or angulation makes it impossible to continue the procedure. Once these conditions are satisfied we proceed to the next step, which is evaluation of the lesion’s parameters.

These measurements will determine the key to success for this procedure. For a proper selection of endoprosthesis we must know with precision the maximum diameter of the landing zone proximal to the stent graft, exact diameter of the aorta at the proximal landing zone, lenth of the

lesion, angulation of the lesion and diameter of the distal aorta from the lesion and the emergence of any major arteries whose ostium could be covered by stentgraft. For this there are special software.

Landing areas represent the unaffected portion of the aorta where the endoprosthesis will be fixed and in case of a complete success blood flow will not be allowed outside the lumen of the stent graft. Length of this portion should be over 15mm, but depends on the type of prosthesis used. Each stent graft has there own "strong point" and they are indicated by the manufacturer. For cases where the "landing zone" do not have the appropriate length there are several options (fig.2).

The first and most simple in this case is to use a stent graft with proximal fixation uncovered. Thus the prosthesis can be expanded over the ostium of the left subclavian artery, without inducing any degree of ischemia.

The second solution would be a hybrid approach, surgical and interventional by "debranching". Left subclavian artery is surgically disinserted and reimplanted by latero-terminal anastomosis of the left common carotid artery. After this process the stent is positioned over its native ostium.

It is also possible to introduce the stent over the ostium of left subclavian artery in a retrograde fashion from the left vertebral artery, situation met in case of occlusion of the ostium or proximal segment of the left subclavian artery. In case of circulatory decompensation in the vertebrobasilar system, vertebral steal syndrome occurs. In rare cases, this procedure may induce TIA or stroke in the vertebrobasilar territory or a syndrome of acute ischemia in the left upper limb

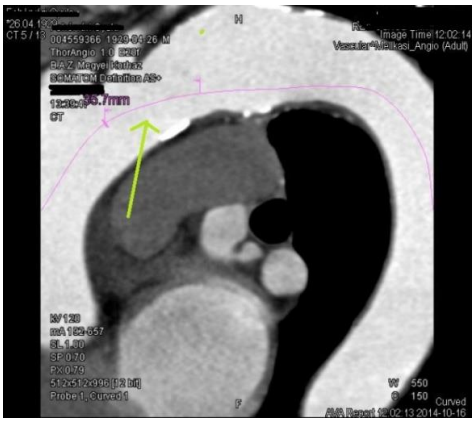

Fig. 2 „Landing zone" distal to the emergence of left subclavian artery

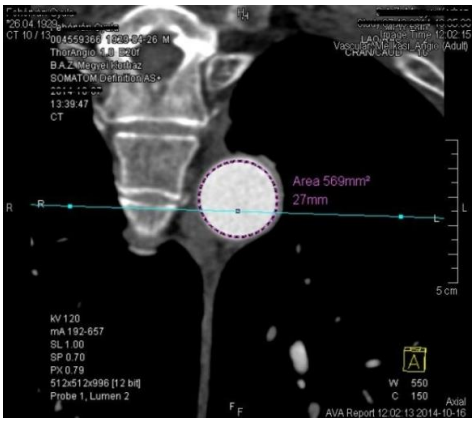

Fig. 3 Diameter of proximal aorta

Proximal aortic diameter measurement is made in the sagittal plane so that we have a rectangular incidence on the portion where the stent graft will expand (fig. 3). The proximal diameter of the stent graft will be oversized by 10-20% compare to the diameter of the vessel for a better alightment with the aortic wall, without inducing any rupture. Such alightment prevent, on one hand, the persistent coommunication between proximal aortic lumen and aneurysmal sac (beside the stent graft Endoleak type 1A). On the other hand it prevents distal slipping by securing more efficiently using adherent devices for stent graft in the vessel.

We measure the length of the portion which need stenting and distal aortic diameter (fig.4-5).

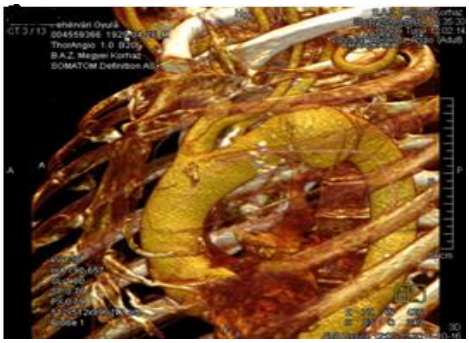

Fig. 4 Measurement of the lesion's length

Fig. 5 Diameter of distal aorta

Based on these data an aortic stent graft implantation procedure is decided "on dimension" in the aneurysm. The procedure is accomplished without complication, without slippage of stent, without postprocedural Endoleak, without thrombosis, stenosis or fracturing of stent graft (fig. 6-7-8).

Fig. 6 Angio-CT with 3D reconstruction

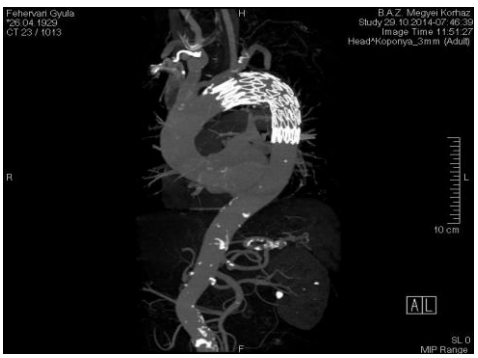

Fig. 7 Stent graft expanded at the lesion

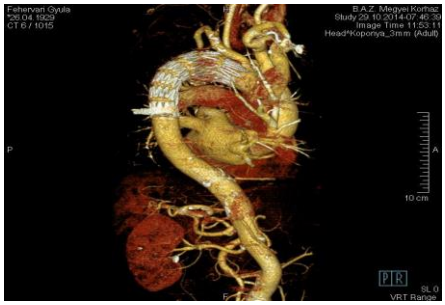

Fig. 8 Angio CT with 3D reconstruction. The ostium of left subclavicular artery visible

RESULTS AND DISCUSSION

Final result is good without peri and postprocedural complications.

The decision regarding the type of intervention is takenis based on the type of lesion and its morphology, associated diseases and patient's desire. Medical teams experience and the presence of adequate facilities are important factors in the decision making of how to deal with aortic lesions.

This case represent a typical situation where open surgery is a major risk and interventional procedure was able to treat the lesion, reducing the possibility of complications (ex. Rupture) and thus improving the patient's quality of life.

CONCLUSION

In recent years development in imaging has led to a higher accuracy in anatomical data. These anatomical data are important for a proper pre-operative planning of the intervention, both in terms of necessary approach and materials. The accuracy of pre-operative imagistic information is a real advantage. The most common aortic disease suitable for endoluminal treatment is aortic aneurysm. The most important parameters needed for the procedure are: anatomic location of the lesions, branches emerging from the affected aortic segment which can be affected by the stent graft, details of the landing zone, the diameter and angulation of the aorta. Absence or inaccuracy of this information will lead to failure of the procedure due to impossible fixation of the stent graft, immediate post-procedure complication and the most undesirable: death.

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