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# POST EVAR ENDOVASCULAR REVISION OF LATE ONSET STENT GRAFT COLLAPSE DUE TO TYPE 1 ENDOLEAK IN A COMPLICATED CASE WITH LEFT LIMB OCCLUSION AND SOLITARY KIDNEY

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**Type 1 endoleak is one of the most frequent complication usually seen at the initial phase of EVAR procedure. Balloon dilatation is mostly used to oversize the proximal or the distal part of the orifice to stabilize the attachment of the graft stent to the aortic wall.**

**Late onset of type 1 endoleak with graft stents may cause severe lumen compression of the stent and aneurysm enlargement which might cause a serious problem especially in a patient whose graft stents left iliac branch is thrombosed and the left leg is supplied by the bypass graft from right CFA.**

**Although operation was advised by the endovascular specialists the procedure was done in our hospital as the patient preferred the endovascular method instead of open surgery.**

**Key-word: Aorta, stenosis or occlusion.**

Endoleak was first defined by as persistent blood flow outside the graft and within the aneurysm sac. Endoleak has been classified according to the source of perigraft flow into four groups (1-3):

- Type I Proximal or distal graft attachment site leaks,
- Type II Retrograde flow into the aneurysm sac from aortic side branches such as lumbar arteries or the inferior mesenteric artery,
- Type III Caused by a defect in the graft either due to fabric disruption or disconnection of a modular overlap,
- Type IV Graft wall porosity.

The most serious endoleaks are type I and III which are associated with aneurysm enlargement and rupture. Secondary intervention to correct these endoleaks is almost always necessary. Whilst rupture has been reported with type II endoleaks, these are considered to have a more benign course and a conservative approach to management is taken unless there is evidence of continuing sac enlargement.

Stent-grafts are subjected to distraction forces in vivo due to the pulsatile blood flow. These distraction forces act longitudinally and challenge the graft fixation and overlap zones. The stent-graft resists these forces due to its fixation mechanisms which include the radial force of the sealing stent and the barbs which engage the aortic wall. The distraction force is dependent on the patient's blood pressure and the cross-sectional area reduction between the proximal/aortic and distal/iliac sealing stents (4). Failure of fixation will lead to migration or modular disconnection with late type I or type III endoleak and risk of aortic rupture. Graft limb distortion with subsequent thrombosis can also occur secondary to migration. The detection of migration during post-operative surveillance is important as it usually leads to preventive intervention to prevent graft failure.

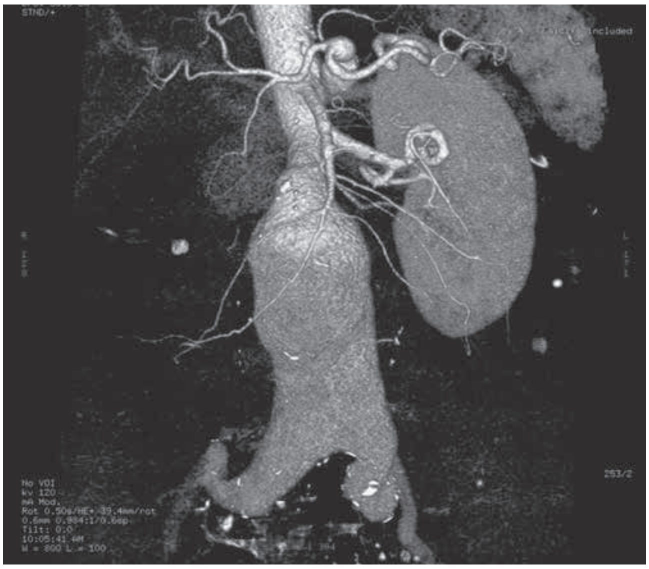

*Fig. 1.* — 3D volume rendering reconstructed CT scan showing infrarenal abdominal aortic aneurysm extending to the iliac arteries. Right kidney is operated and there is compensating hypertrophy of the left kidney. Note the coeliac artery aneurysm.

Wireform fractures have been reported in most stent-grafts. The fracture may lead to diminished stent strength and loss of radial force which can result in migration. Additionally the jagged ends of the fractured metal may cause tears in the fabric and subsequent endoleak. These fractures are best seen on plain abdominal radiographs.

## Case report

Sixty-seven years old male patient with Type 2 DM, hypertension, had infrarenal fusiform abdominal aortic aneurysm (Fig. 1) and treated with EVAR method using ANACONDA greft stent (Terumo inc Japan) one year ago. After the first EVAR application the left iliac artery stent branch

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*Fig. 2.* — Axial CT scan. Type 1 endoleak compressing the right limb of the graft stent. Left limb is occluded.

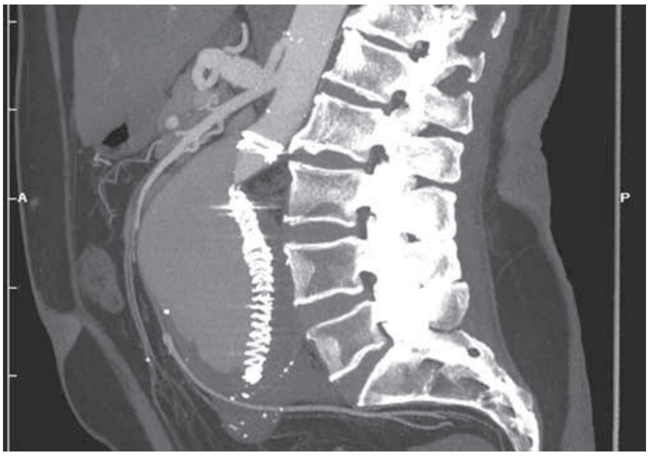

*Fig. 4.* — Extension of the right limb of the graft stent in the sagittal reconstructed scan.

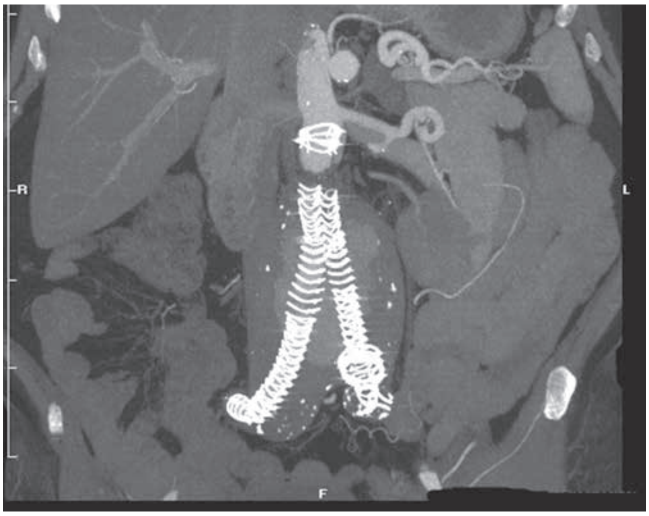

*Fig. 3.* — Coronal MIP reconstruction displays compression of the right limb of the graft stent; left limb is occluded. Hypoperfusion of the lower pole of the left kidney is also seen.

was thrombosed and the patient had to have by pass surgery from right external iliac artery to the left common femoral artery for the salvage of the left leg. The by pass graft was working well and the left lower extremity flow was normal after the procedure and follow up Doppler scans. No endoleak was found on the control scans. Right kidney was operated 5 years ago and the left renal orifice was 2 cm above the first aortic graft stent proximal orifice.

One year later the patient was complaining of both limb pain on exercise. Abdominal dynamic CT scan was done to evaluate the patency of the stent and the diameter of the aortic aneurysm (Fig. 2). On MDCT scan Type 1 endoleak was noted at the abdominal aortic aneurysm anteriorly compressing the native aortic stent and the bifucation stents towards the aortic posterior wall . The aortic and iliac patent lumen size was diminished due to the recanalised aortic aneurysm (Fig. 3, 4). The patient also had right groin infection ongoing from the previous stenting procedure. The patient was proposed surgery for the revision of the aortic aneurysm but the patient chose to have the interventional approach.

The patient was taken to the angiography room after the blood tests revealing that the blood urea and creatinine results were normal. Left axillary puncture is done first to understand if it is possible to pass through the compressed aortic graft segment to the right iliac artery. When it was noted that hydrophilic exchange guidewire proceeds to the right iliac artery, pigtail catheter was placed to the compressed stent lumen. Then a stiff guidewire was proceeded to the left renal artery proximal segment before its bifurcation to prepare the renal artery for the chimney stenting method (5).

As the right iliac artery stent was also collapsed a 11mm diameter wall stent was placed in the graft stents lumen to both prevent graft migration while pushing the stiff body of the instrument carrying the cuff and to increase the tension force to push the compressed graft stent to the iliac walls (Fig. 5).

A stent cuff was planned to extend at the top of the initial stent to overcome the type 1 endoleak and to sustain the flow of the aortic stent graft. In case of the risk of obliterating the left renal artery orifice while opening the cuff, and that it might be difficult afterwards to place a stent in position, a 4 cm graft stent is placed to the renal artery with 2/3 of the stent segment extending to the suprarenal aortic segment. Then Anaconda's fish mouth type cuff is placed at the distal part of the previous stent 1/2 of the cuff overlapping the main graft stent and balloon dilatation is made to expand the cuff to fit the main body (Fig. 5).

After the graft stent placed to the renal artery was opened, it was observed that the proximal end extending to the aorta was almost bearing the aortic intimal surface. As its placement would cause trouble in the future balloon dilatation was done to direct the orifice of the proximal part upwards to be parallel to the


*Fig. 5.* — Angiography cuff extension is inserted to the proximal of the graft stent. By chimney method, graft stent is placed to the left renal artery extending to the abdominal aorta. Wall stent is inserted to the compressed right limb.

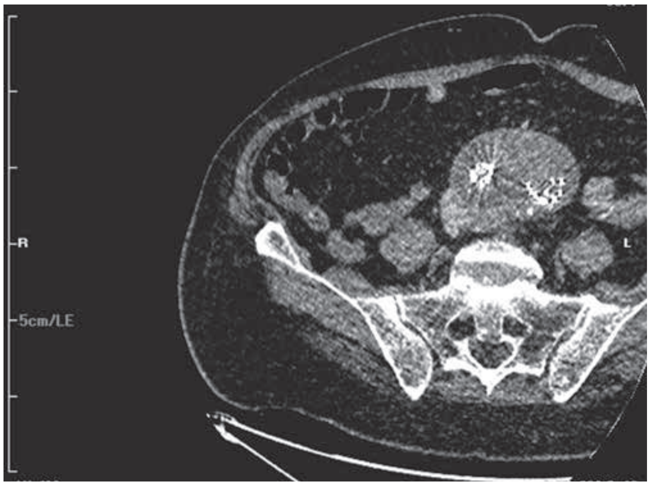


*Fig. 6.* — Control CT scan after the second intervention

aortic wall instead of leaning it. But the result was not as efficient as it was expected still carrying the risk of occlusion or diminished flow in future. So an additional wall stent was opened inside the graft stent shaped upwards parallel the aortic wall to direct the inflow to the renal artery (Fig. 5). Control runs were made to check the Type 1 endoleak, left renal artery flow and he right iliofemoral artery flow. There was no endoleak and all the arteries were filling well. Control studies were done in the first, third month with colour Doppler; in the sixth month with the MDCT scans and no relapse was noted (Fig. 6).

## Discussion

At wide neck infrarenal aortic aneurysms, the possibility of endoleak is increasing as the aneurysm neck-renal artery orifice distance decreases, as the angiographer is trying to place the aortic graft as stable as he can. On the other hand if the endoleak occurs after a while the procedure is completed it becomes more difficult to place the cuff at the top of the initial graft stent. The main problem is the stent free aortic segment is usually wider and as you want to stabilize the cuff extending upwards there is a risk of cuffs displacement, as the Anaconda' s opening is like a fish mouth in time its opening as a ring rises the question whether it will obliterate the renal arteries orifice. In that case we are obliged to use the chimney method to guarantee the nearest and the only renal artery.

Although the compressed aortic graft from the anterior endoleak sac seems like to have very less luminal contrast flow in MDCT, the flexible texture of the graft stents makes it easier to pass a new cuff through it. But there is a risk of aortic grafts iliac limb displacement when passing the cuff through the iliac route, opening a more stable and stiff wall stent should be considered.

There are new types of aortic graft stents which decrease the groin complications as they can be placed by direct puncture without surgically opening the puncture site (6).

They also have the advantage that they could be placed at very short necks below the infrarenal aneurysm free aortic segments compressing the aortic wall with silicone fillings found at the proximal segments of the graft stents (6,7).

The new technologies early results show that the endoleak complications and migration of the proximal part of the stent will lessen soon, which are the disadvantages of the method which also rises the cost expenses of the method (8).

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