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CASE REPORTS

ENDOVASCULAR TREATMENT OF RENAL ARTERY OCCLUSION CAUSED BY AORTIC STENTGRAFT MIGRATION*

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Renal function impairment during interventional procedures became a real clinical problem. Contrast related nephropathy is the most common cause of renal failure, however, the procedure-related technical troubles may cause unexpected renal dysfunction.Technical failure of EVAR resulting in acute renal dysfunction is presented. The postprocedural occlusion of the right renal artery was treated in chimney technique. Early reintervention allowed the kidney preservation and renal function restoration.

It is impossible to avoid all the complications following treatment of aortic aneurysm, but they can be anticipated and comprehensively treated in collaboration with other specialists.

Key words: abdominal aortic aneurysm, renal function, aortic stentgraft migration, endovascular treatment complication, chimney technique

Endovascular abdominal aortic aneurysm repair appears to be safer than traditional surgery, especially in high-risk patients with pre-existing severe neurological, cardiovascular, pulmonary or renal dysfunctions (1-6). One of the major complications of EVAR are proximal type I endoleaks and graft migration. The causes of stent graft displacement are not well known. Most publications suggest that the main reason is angulated neck (> 60) or/and an aneurysmal neck length below 15 mm, which makes the proximal graft fixation hemostatically insecure (7).

Many authors highlight the deterioration of renal function following EVAR (8-11). Main causes of renal impairment include: contrast induced nephropathy, renal artery occlusion by a clot formation or coverage of the additional renal artery by a stent graft. Some authors even treat open repair as a safer issue for the kidneys in comparison to EVAR (12).

eGFR seems to be a more sensitive predictor of the outcome following EVAR than serum creatinine alone (13, 14). Serum creatinine depends on many factors such as age, muscle mass, gender, and medication use. It may be normal even in the presence of significantly impaired kidney function (15, 16).

We present a case of treatment of renal insufficiency caused by an aortic stent graft migration.

CASE REPORT

A 66-year-old male with penetrating atherosclerotic ulcers of the left common iliac artery was referred to the Department of Vas-

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cular Surgery. Physical examination demonstrated a stabbing, suffocating pain along the spine and in the abdomen. The patient was diagnosed with arterial hypertension 5 years before, but there was no history of treatment. The patient showed normal renal function. Angio-CT scan confirmed the penetrating atherosclerotic ulcers of the infrarenal aorta with infrarenal aortic angulation of 105°. Coexisting aneurysm of the right common iliac artery was confirmed, with a diameter of 2.4 cm (right) and penetrating atherosclerotic ulcers of the left iliac common artery with a diameter of 18x32 mm. The lesion was modeled on osteophyte of L5 vertebra. Both the renal arteries were patent, and there was symmetry of contrast medium saturation in both kidneys. From the point of view of emergency, safety and accessibility of vascular grafts, EVAR was found the most appropriate and safest way of treatment. The procedure was performed under spinal aesthesia.

The abdominal stent graft implantation was performed from bifemoral approach, and the right and left common femoral arteries were also exposed in a surgical way. The graft (Zenith flex CooK) was introduced through the right femoral artery, into the abdominal aorta, and positioned below the renal arteries. Despite the proper device deployment, the "jump" of the graft was observed during the implantation. Digital subtraction angiography (DSA) was performed to examine the location and sealing of the prosthesis. Intraoperative angiogram showed that the stent graft straightened the abdominal aorta and covered in 50% the orifice of the right renal artery. The stenosis was assessed by the operator as no flow limiting and left without intervention.

One day after EVAR, laboratory tests showed an increase in serum creatinine level and BUN values which were 150 μmol / L and 6.4 mmol /L). The results were repeated the next day, serum creatinine level and BUN were as follows: 181 μmol/L and 8 mmol/L respectively. eGFR on admission was 110.75 mL/min/1.73 m^2. One day after EVAR, GFR was 43 mL/min/1.73 m^2 and the next day it decreased to the level of 35.71 mL/min/1.73 m^2.

Subsequently, a postoperative angioCT of renal arteries was performed. CT scans confirmed that the stent-graft straightened the abdominal aorta and made a subtotal occlusion of the orifice of the right renal artery with persistent patency. Asymmetry of saturation of contrast medium in the right kidney was confirmed, with signs of the renal ischemia. A decision on intervention was made. The left brachial artery was punctured. The arteriography showed that the right renal artery was catheterized through the uncovered part of the graft and stented with Omnilink Elite 5x2.9 mm stent. The flow into the right renal artery was restored with normal renal perfusion to both kidneys (fig. 1).

Next day after the renal stent implantation the serum creatinine and BUN levels were 169 μmol/L and 7 mmol/L respectively, and at the discharge 154 μmol/L and 7 mmol/L respectively. GFR post stenting was 37.9 mL/min/1.73 m^2 and 42 mL/min/1.73 m^2 on the discharge day.

One month after the procedure, CT showed patent renal stents and the stent graft without endoleaks, with complete exclusion of the aneurysm and ulcers. Serum creatinine and BUN levels were 113 μmol/L and 7 mmol/L respectively, and eGFR was 60.31 mL/min/1.73 m^2.

DISCUSSION

In recent 20 years, the number of abdominal stent graft procedures has significantly increased. In randomized trials it has been shown EVAR may become a generally accepted alternative to open surgery for selected patients and it contributes to reducing both morbidity and mortality (1,2,16). Normal renal function is a major factor determining the outcome of stent graft implantation. The etiology of renal dysfunction after EVAR may be multifactorial. Age over 70 years, the contrast used during the implantation of the graft and the control CT, lower limb ischemia, emboli, suprarenal endograft fixation may increase the risk of renal infarction while the long term effect on renal function is unknown (17).

Accidental partial coverage of renal arteries is one of most unwanted complications following EVAR. Hobo et al. (18) and Schermerhorn et.al (19) in their research involving 54,005 EVAR patients and 4 to 8 years of follow-up did not document covering a renal artery by a stent graft. Inadvertent stent graft placement with partial or total coverage of one or both renal arteries occurs in less than 5% of cases

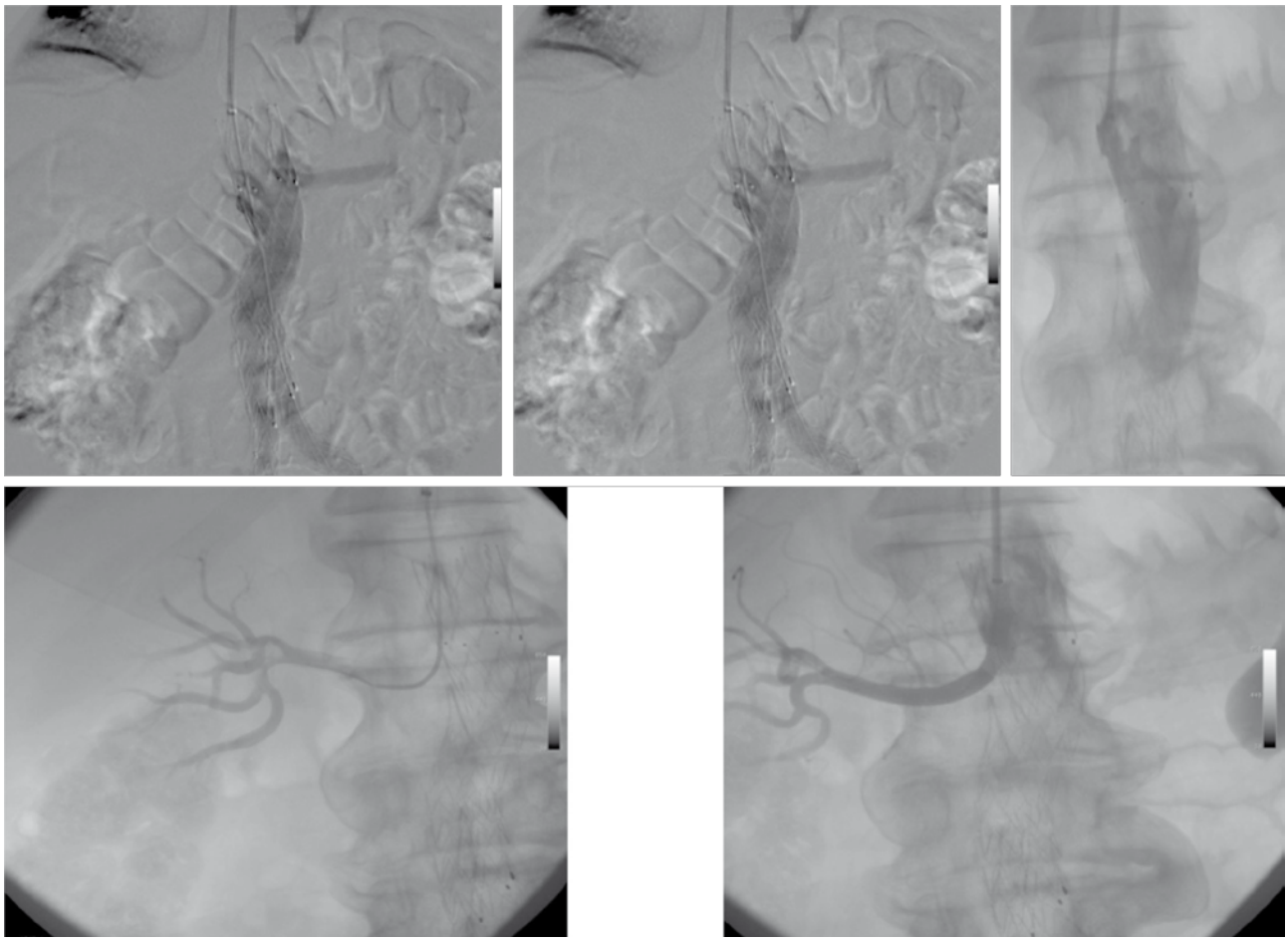

Fig. 1. Reopening of right renal artery from left brachial approach

(20). In some cases renal artery occlusion can be unrecognized during EVAR, becoming symptomatic after some time. For this reason, post-procedural imaging and evaluation of renal biochemical markers are crucial after EVAR. Within a few hours of total occlusion of renal artery, a collateral circulation is developed. This collateral renal perfusion can be sufficient to spontaneously reverse renal failure. There are many endovascular procedures used for salvage of blood flow in renal arteries after stent graft migration (21, 22). One of the most popular is the chimney (snorkel) technique. It involves implantation of the stent into the renal artery through the mesh of stent graft to obtain proper blood flow to the kidney. Our patient underwent a successful revascularization of the right renal artery with stent implantation by the chimney technique that resulted in corrected blood supply to the kidneys, restoring their normal function.

EGFR is a more sensitive indicator of renal dysfunction than serum creatinine. A decrease in eGFR of at least 20% is presumed normal post-EVAR, irrespective of absolute serum creatinine levels. To diagnose the procedure-related renal insufficiency, the increase in serum creatinine should be more than 20% (9) or up to 30% (23). Some authors suggest that an increase in serum creatinine of 30% combined with the absolute level of creatinine 2 mg/dL (20) or 0.5 mg/dL or a 20% decline in eGFR is imperative for a diagnosis (10). In our patient we observed an increase in serum creatinine of 25.5% and a decrease in eGFR of 34.5%.

Our case report shows successful treatment of the right renal artery occlusion caused by stent graft migration, using the chimney technique. Post-procedural DSA and CTA show the proper stent position, correct blood flow in the right renal artery and normal perfusion in the right kidney. Laboratory tests confirm the decrease in the levels of serum creatinine and urea, and the increase in the eGFR level to the mean values.

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