Case Report

Bilateral renal artery stenosis treated with drug-eluting balloon angioplasty in unique treatment

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Abstract

Renal artery stenosis commonly manifests with hypertension refractory to medical treatment. We report a case of renal artery stenosis occurring in a 19-year-old female patient who presented with extremely high blood pressure and bilateral renal stenosis at the duplex ultrasound. Renal angiography confirmed the bilateral and irregular stenosis due to fibromuscular dysplasia, associated to extent collaterals suppling the poststenotic right renal artery. Therefore, angioplasty with drug-eluting balloon was performed in order to obtain a good vessel patency and to improve patency in the long term follow-up. After the endovascular treatment the blood pressure improved markedly, maintaining this result at 12 months follow-up at clinical examination and duplex ultrasound.

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Introduction

Renal artery stenosis is often associated with hypertension and renal insufficiency in the majority of cases with severe or malignant hypertension [1,2]. The hypertension mechanism is based on “renin-angiotensin-aldosterone system” activation. Among young patients affected by renovascular hypertension, fibromuscular dysplasia (FMD) represents the cause in 35%-50% of the children and 5%-10% of the adults (<60 years old) [2,3]. Percutaneous transluminal renal angi-
plasty has been the gold standard treatment for renal FMD and it represents the most widely accepted first line treatment in order to improve or even cure hypertension [3,4]. In medical literature, primary patency values of the treated artery range among 41% and 93% in long term follow-up [3-6]. In order to improve clinical condition and to obtain a good long-term result, we decided to perform a bilateral angioplasty with drug-eluting balloon in a young female patient affected by refractory hypertension.

Case report

A 19 year old woman came to our emergency room with dizziness, facial paresthesia, and high blood pressure (210/120 mmHg). The medical treatment administered at home was doxazosine 8 mg per day and manidipine 20 mg per day. In the emergency room, after an intravenous bolus injection

Fig. 1 – The aortography confirmed the presence of bilateral renal artery stenosis (A). The right renal artery was supplied by multiple collateral vessels feeding from the closed lumbar artery and from dilated pelvic vessels from inferior accessory renal artery (B, C). Angioplasty with 5 mm drug-eluting balloon was performed with excellent angiographic result (D-F). Angioplasty with analogous drug-eluting balloon of the left renal artery and angiographic result (G-I).
of 20 mg furosemide, we observed a slight arterial blood decrease (190/110 mmHg) associated with clinical symptoms improvement.

The renal arteries duplex ultrasound showed an increased peak systolic velocity associated with low resistive index evaluated in the distal parenchymal vessels. The upper abdomen CT angiography confirmed the renal arteries bilateral stenosis and detected a diffuse enhancement area at the middle third of the right renal artery. We decided to perform an angiography to confirm the diagnosis and to treat the renal stenosis. A written consent was therefore expressed by the patient. The diagnostic angiography reported the bilateral significant stenosis associated with the presence of extended collateral vessels supplying the distal right renal artery branching from L1 lumbar arteries and dilated pelvic branches from the renal inferior polar artery.

Based on severe clinical symptoms, we opted to perform a bilateral percutaneous trans-luminal angioplasty with a 4 × 20 mm Ultrasoft monorail balloon (Boston Scientific, Natick, US) and afterwards with a 5 × 20 mm Elutax drug-eluting balloon (Aachen Resonance GhMB; Vilnius, Lithuania) inflated for 60 seconds and slowly deflated in order to reduce artery dissection risk. No complications were observed. In the following few hours after the procedure, we registered a rapid decrease of the blood pressure (140/90 mmHg) associated with asthenia and dizziness; the arterial blood pressure was at normal average after a week. The previous medical treatment was interrupted due to the new blood pressure balance. After 1 month manidipine (10 mg) was reintroduced (Fig. 1).

The duplex ultrasound follow-up at 12 months confirmed the bilateral absence of renal arteries stenosis, normal peak systolic velocity, increased resistive index from 0.48 to 0.55,
and the arterial blood pressure corresponded to 110/80 mmHg (Fig. 2).

**Discussion**

Epidemiologic studies have confirmed that hemodynamically significant stenotic lesion of the renal artery is the most common cause of secondary hypertension refractory to medical therapy with incidence estimated to be 1%-3% in the general population. In that population, FMD can affect up to 0.5%, therefore, it is considered the most common cause for secondary hypertension in children and young adults.

Thatipelli et al. reported excellent technical success rate in 28 patients, however the mean issue concerns the clinical results in a long follow-up period, both in young patients, who represent the majority of the population affected by FMD, and in older population [5].

Some experts believe that the use of cutting balloons for angioplasty should represent a valid alternative to angioplasty alone in recurrent or resistant FMD lesions, namely after failure of conventional balloon therapy, secondary to recoil, or in cases of significant residual stenosis. The longitudinal blades “cut” the muscular layer reducing elastic recoil and improving technical result and long-term patency. However rupture of the renal artery can happen, leading to possible devastating complications [3,4,6]. In our daily practice, we avoid cutting balloons for renal artery angioplasty and prefer to perform angioplasty with an overestimated balloon in case of severe elastic recoil. In this particular case, we obtained a good vessel lumen with a predilation using a monorail balloon and after a prolonged angioplasty with a drug-eluting balloon. Our target was to restore an optimal vessel patency in order to obtain immediate control of the blood pressure and to reduce the clinical symptoms. Moreover, we used a drug-eluting balloon of 5 mm of diameter to spread a conspicuous amount of paclitaxel in the intimal and media layers after barotraumas and intimal microfissurations in order to reduce the muscular cell proliferation and improve long term clinical outcome. Numerous extra- and intrarenal collateral vessels were observed in the right renal artery and this condition, associated with clinical symptoms, led us to treat the bilateral stenosis in one single procedure [7]. A 6-month antiplatelet therapy was proposed by Mousa et al., however, no clinical data were reported on the follow-up improvement. A 3-month administration of aspirin (100 mg per day) was pursued in this case in relation to the bilateral angioplasty treatment [3]. As widely reported in medical literature, a good clinical outcome was observed in 40%-90% of treated patients. We opted for a drug-eluting balloon trying to increase the clinical outcome using this device as in coronary arteries. According to our knowledge, this is the first documented use of drug-eluting balloon in “de novo,” probable FMD lesions of the renal artery. Further studies with large sample size must be performed to prove its usefulness.

**Conclusion**

Percutaneous transluminal renal angioplasty has been the gold standard treatment for renal FMD. We propose angioplasty with a drug-eluting balloon as a safe and effective alternative treatment in young patients affected by renovascular hypertension, considering that FMD is the most common cause of renal artery stenosis in this population. Further studies with large sample size must be performed to prove its usefulness.

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