Percutaneous Transluminal Angioplasty Of A Renal Artery Stenosis Of A Pelvic Kidney With Multiple Vascular Supply

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Citation

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Abstract

Stenosis of the renal artery can cause arterial hypertension. Frequently, multiple supply of the kidneys with vessels of small diameters is present. However, it is unclear whether stenosis of these vessels that feed only small parts of the kidney parenchyma can induce hypertension. A case is presented in which percutaneous transluminal angioplasty of a vessel stenosis of a kidney with multiple feeders followed by stent implantation improved the arterial hypertension and made it possible to reduce blood pressure medication.

INTRODUCTION

Renal artery stenosis (RAS) is a common cause of arterial hypertension with a prevalence of 1 % and can lead to progressive renal failure. Besides surgical revascularisation percutaneous transluminal angioplasty (PTA) is an established method in the therapy of RAS and today method of first choice. Current studies often compare PTA with pure medical therapy in a randomized manner. The most recent publications indicate that stent implantation in cases of calcified ostial stenosis produces significantly improved primary as well as follow-up results [1]

Multiple renal arteries occur unilaterally in about one third of patients, whereas they occur on both sides in approximately 12% of patients. Multiple arteries feeding the renal hilus usually have equal diameters, whereas pole arteries have smaller calibers. Thus, the important questions arise whether stenosis of an artery with a small lumen or an aberrant pole artery is related to an existing hypertension and, secondly, whether the patient may benefit from a PTA treatment.

CASE REPORT

A 59-year-old patient with known arterial hypertension developed an acute worsening with strongly varying blood pressure values and was sent to the hospital for diagnostic examinations and a check of his medication. The anti-hypertensive therapy consisted of a 5-fold combination of pharmaceuticals (80 mg valsartan, 12.5 mg hydrochlorothiazide, 8 mg doxazosin, 100 mg metoprolol, and 10 mg amlodipine). Hypertrophy of the left ventricle was diagnosed with echocardiography. With the prescribed medication the 24 hour blood pressure profile revealed values of 144/94 mm Hg during the day and 145/94 mm Hg during the night. Thus, the normal physiological day-and-night rhythm was completely suppressed.

Digital subtraction angiography (DSA) of the renal arteries revealed inconspicuous findings of the kidney on the left side. On the right side a pelvic kidney was seen with a 4-fold vessel supply with two vessels originating from the Arteria iliaca communis dextra and sinistra, respectively, as well as two vessels originating from the Arteria iliaca interna dextra (Figure 1a).

The arterial feeder originating from the A. iliaca interna dextra showed a high-grade ostial stenosis. This vessel supplied approximately 25 % of the pelvic kidney. The selective catheterisation from the ipsilateral side was only possible with a 4-F-Sidewinder catheter (Figure 1b).

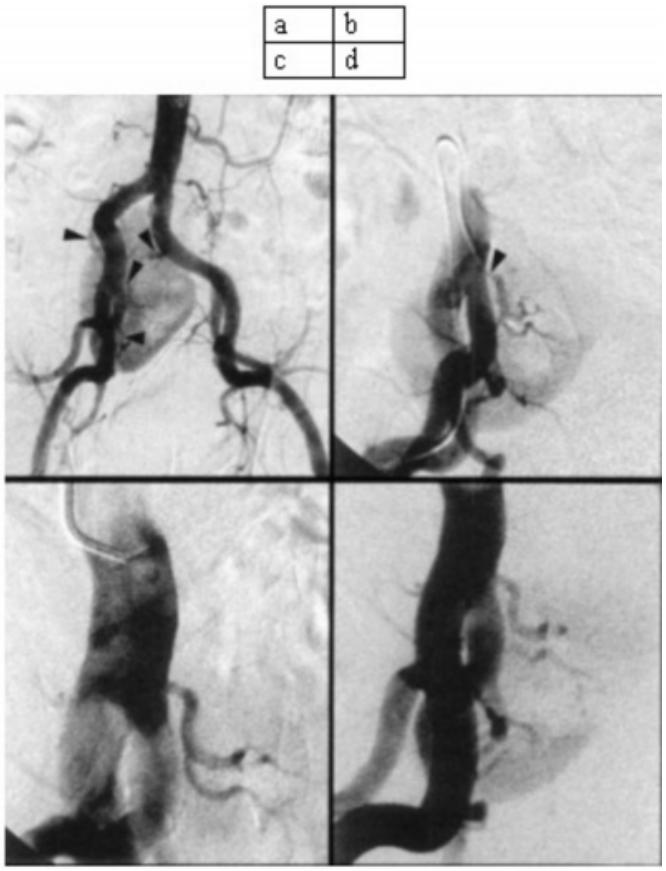
Treatment with PTA was decided under interdisciplinary agreement and was performed in a second session in cross-over technique. This access seemed practicable due to the medially running course of the stenotic vessel. PTA of the stenosis was successfully carried out with a balloon catheter with diameter of 3 mm and length of 2 cm and resulted in a very good dilatation of the vessel (Figure 1c).

Two days after the PTA the blood pressure was reduced and the 24 hour blood pressure profile yielded values of 124/84

mm Hg during the day and 114/73 mm Hg during the night. The patient was medicated with a reduced triple combination of 8 mg doxazosin, 75 mg metoprolol, and 20 mg amlodipine.

Figure 1

Figure 1: a) Overview of the four vessels supplying the pelvic kidney. The stenotic artery is indicated by the arrowhead. b) Selective DSA of the renal artery stenosis. c) Renal artery after balloon dilatation d) Renal artery after stent implantatio



Six weeks later angiography had to be repeated due to an again rising blood pressure. The renal vessel with an original diameter of 2.5 to 3 mm showed a small irregularity of the contour as well as a slight constriction in the a.-p. projection. Because of the rising blood pressure stent implantation was decided and a stent with 2.5 mm diameter and 9 mm length was placed into the stenotic vessel with 1 mm overlap in the pelvic artery. A slight notch in the vicinity of the upper vessel junction could not be completely adjusted during dilatation. The control investigation after 3 ½ months showed a persisting reduction of the blood pressure during the night under continuing triple medication with 8 mg doxazosin, 100 mg metoprolol, and 10 mg amlodipin (151/88 mm Hg during the day and 127/78 mm Hg during the night). Nine months after the initial PTA blood pressure values of 130-145/80-90 mm Hg were measured in the out-patient department. However, metoprolol had to be exchanged with carvedilol and moxonidine because of a pulmonary obstruction.

DISCUSSION

There exists no certain knowledge about the clinical relevance of a PTA in the case of a kidney which is supplied by multiple arterial feeders or in the case of arteries with small calibers. The question arises whether and to which extent an arterial vessel, which feeds only a fraction of the kidney parenchyma, can cause arterial hypertension. Furthermore, it is also unclear whether balloon dilatation leads to acceptable patency rates in vessels with diameters smaller than 4 mm (e.g., also pole arteries), especially when considering the possibility of a hemodynamically relevant constriction due to hyperplasia of the intima after stent implantation.

Because small aberrant or accessory renal arteries are frequently present the interventional radiologist is repeatedly faced with the problem to decide whether a stenosis should be dilated or not. On the one hand, the well known high failure rate of a peripheral PTA of vessels with small diameters, the known complications and the unpredictable reduction of the blood pressure following a renal artery PTA are certainly drawbacks speaking against the performance of such an intervention. On the other hand, however, the present case not only demonstrates exemplarily the technical success of the PTA, which is reported to be successful in 24 % to 100% of cases [2], but also demonstrates the prompt functional response which makes it possible to reduce a 5–fold medication to a 3–fold medication for blood pressure reduction. Based on an analysis of the literature, Ramsay et al. [3] found a mean cure rate of 19% and an improvement rate of 52% of hypertension after renal PTA. Elastic recoil, restenosis and dissections are indications for a stent implantation [4]. A detailed analysis comparing stent implantations (14 studies) vs. PTA (10 studies) revealed not only a higher technical success and a lower restenosis rate but also higher cure and improvement rate of hypertension after stent placement [5].

In the present case an ostial plaque was still demonstrable after stent insertion, which made it necessary to perform a subsequent dilatation. This plaque was possibly responsible for the sub-acute degradation of the blood pressure after the initial renal PTA alone but is now held in position at the

edge by the stent. However, up to 1/3 of patients can show an arising of blood pressure without renewed restenosis [6]. Most patients have an improvement or at least stabilization of renal function [7], whereas in cases with longer persisting and adjusted blood pressure no improvement is frequently observed after PTA. In our case the observed blood pressure reduction was moderate. If an intervention such as renal PTA is planned, care should be taken prior to the performance of the procedure that suitable stents with small diameters are available in cases of elastic recoil or dissection.

Unfortunately, there is not a huge selection of available stents to choose from. To the best of the authors' knowledge only one company offers small stents for peripheral arteries with a diameter of at least 3 mm; whereas smaller sizes are not available at all. In such situations one has to resort to cardiovascular stents.

CONCLUSION

The present case clearly demonstrates that performing renal PTA in one of multiple kidney arteries can improve hypertension. Further long-term follow-up might correspond to that the other patients after renal PTA. Because the clinical success is highly dependent on the primary patient selection with their specific symptoms, the decision to perform a PTA and, if necessary, a stent implantation should always be made in interdisciplinary collaboration and mutual agreement among nephrologists, radiologists and, if necessary, vascular surgeons, particularly in similar cases like the one presented.

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