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Treatment of atheromatous renal artery in-stent restenosis in 51 patients

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Renal artery stenosis;
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Endoprosthesis;
Stent;
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Abstract
Objective: To evaluate our treatment of renal artery in-stent restenosis.
Patients and methods: Monocentric retrospective study of 53 cases of restenosis and two occlusions in 51 patients detected via systematic follow-up with imaging (72.5%) and/or deterioration of kidney function (5.9%) and/or blood pressure failure (54.9%), 15.7 months (5—121) after implantation, giving rise to 49 recalibrations via a balloon and five additional stentings. Analysis of the technical results, the effects on blood pressure and kidney function after repeated revascularizations.
Results: Secondary permeability of 38 arteries (63.2%) after 12.4 months (3—64) with 14 second restenoses; 33.3% after redilation with a balloon, 60% after renewed stenting, more common in smokers ($P = 0.02$), in case of peripheral arterial disease ($P = 0.02$), ostial location ($P = 0.049$) and kidney function impairment at the time of diagnosis of the restenosis ($P = 0.012$). After 12.7 months (3—64) post-revascularization, kidney function was improved in 30% of patients and stabilised in 50% of patients. Treatment of second restenoses: one failure (7.1%), nine dilations with a balloon, three cutting balloon, one second stent. Treatment of third restenoses: 71.4% treated with a balloon (2), cutting balloon (2) or coated stent (DES) (1); then permeability at a later point in time: 50%.
Conclusion: The treatment of repeated restenoses with conventional techniques is of imperfect efficacy, and currently remains un-codified.

Dilation using a balloon in addition to the use of an endoprosthesis has become the reference treatment for renal artery stenosis (RAS) of the atheromatous type (ARAS). The clinical situations, diagnostic methods and treatments for this disease, which have been well codified [1—3] up to now, could still change [4], taking into account recent,

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less convincing results regarding the real clinical benefit, without however avoiding methodological criticism [5].

Restenosis after angioplasty is one of the major limits of these percutaneous revascularization techniques. Stenting has not resolved this problem. In the meta-analysis by Leertouwer et al. [6], the restenosis rate was 26% after use of a simple balloon and 17% after stenting. In the ISLES meta-analysis, the restenosis rate after stenting was estimated to be 16%, generally occurring after 6 to 12 months [7]. There is no consensus on the measures to be taken with regard to these in-stent restenoses of the renal arteries (RAs).

In this article, we present the summary of our experience with this situation, by retrospectively studying a series of 51 consecutive patients treated in our centre.

Patients and methods

Fifty-one consecutive patients had percutaneous atheromatous renal artery in-stent restenosis (ARAIR) in our centre from November 2002 to March 2007.

These patients included 25 men and 26 women with a mean age of 68.4 years (45—83). Four patients were treated for bilateral ARAIR at the same time. Therefore, 55 procedures concerning 53 in-stent restenoses and two in-stent occlusions were studied. One male patient had both polar RA in-stent restenosis and homolateral principal ARAS, which benefited from primary stenting. Finally, one female patient had an occlusion of the RA that was contralateral to the ARAIR, which was not treated. The benefit/risk ratio was considered to be low.

There were 40 single RAs and 15 kidneys perfused by multiple RAs. In these cases, the restenosed stented RA was thus either a principal RA [13] or a polar RA [2].

The initial RAS was in an ostial location in 87% of cases and non ostial in 13% (seven stents); the two occluded stents were in an ostial location. The model, diameter and length of the stents in question are presented in Table 1.

In 37 patients, the ARAIR diagnosis was established via a systematic control of the permeability of the stent that was scheduled by our team, theoretically 6 months after implantation by Doppler sonography and/or angiography scan of the RAs after a mean of 7 months with extreme values of 5 and 11 months. The mean time between the initial stenting and the treatment of the ARAIR was 15.7 months with extreme values of 5 and 121 months. We could differentiate two groups among these 37 patients: for 17 of them, blood pressure control was not satisfactory despite the medical treatment; for two of them, there was isolated deterioration of kidney function, while for 18 patients, the blood pressure and kidney function status were considered acceptable.

For the other 14 patients, the diagnosis of ARAIR was made a long period of time after the initial stenting, i.e. after a mean of 39 months (maximum of 121, minimum of 11), though these patients had poor blood pressure control [11], isolated deterioration of kidney function [1], or the combination of blood pressure and kidney function disturbances in two of them.

Our criteria for in-stent restenosis were as follows:

- on the Doppler sonography, a systolic velocity peak of more than 250 cm/s with an aortal-renal ratio of more than 4;
- on the angiography scan, a reduction in calibre of more than 50%.

All of these ARAIRs were confirmed by arteriography as per the usual criteria: a reduction in the diameter of the in-stent lumen of 50% or more [1,8].

All of these in-stent revascularizations were carried out using the coaxial angioplasty technique. We generally began with a dilation using a simple balloon, using a balloon with the same diameter or possibly a diameter that was one millimetre wider than that of the balloon used during the initial implantation of the stent. If necessary, we could complete the procedure with the implantation of a second bare stent, inside the first stent or right downstream from it. At the time of inclusion in this series, we only had coated stents within the framework of the GREAT protocol [9,10]. The patient who had an implantation of the coated stent was included in this protocol. The nominal diameter of this stent (Palmaz Blue, Cordis, coated with Sirolimus) was the same as the diameter of the bare stent that was already in place. Finally, cutting balloons (Boston Scientific, Donegal, Republic of Ireland) were used. In this case, there was no pre-dilation using a simple balloon, and the diameter of the cutting balloon was 1 mm less than that of the stents that were initially implanted.

During the procedure, anti-coagulation (1000 to 3000 units) with Heparin was injected in situ. Afterwards, non-fractionated heparin was administered via a pump for 48 hours, while a simple platelet anti-aggregant was continued (acetylsalicylic acid, 125 mg per day, or Clopidogrel, 75 mg per day).

Technical success was defined angiographically as the absence of residual stenosis of more than 30%. The complications were defined by applying the Rundback criteria [1]. A systematic control was scheduled 6 months after in-stent revascularization for morphological (permeability of the stent), clinical (blood pressure, kidney function) and laboratory test evaluation.

The clinical results (blood pressure and kidney function) were analysed using the reference criteria [1,8].

The statistical analysis used the Chi^2 test for quantitative variables. When the theoretical number of patients was less than 5, a Fisher's exact test was used. For qualitative variables, we used the Student's *t* test.

Results

During the treatment of the first ARAIRs, there was one technical failure (1.8%) and there were two complications: two cases of acute oedema of the lungs (3.6%) after the procedure, the course of which was rapidly favourable under suitable medical treatment, with no impact on the permeability of the stent. There was no mortality within the first 30 days.

Forty-nine recalibrations with a simple balloon (89.1%) were carried out with success, including one occluded stent, which was re-canalised. The implantation of an additional stent was necessary five times (three stents mounted on a small balloon and two self-expandable stents).

In four cases, a stent was implanted within the stent, including in one case to ensure the re-canalisation of an