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A Curious Case of Hypertensive Emergency and Acute Kidney Injury

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Abstract

A 75-year-old female with history of a prior right renal artery stent (coronary bare metal stent, duration 3 years), stage IV CKD (baseline serum creatinine (Scr) 2.1-2.3 mg/dL (eGFR 20-23 ml/min/1.73 m^2)), diastolic heart failure, and hypertension. She had multiple hospital admissions for acute decompensated heart failure, now presenting with worsening dyspnea, increased oxygen requirements of 4 L oxygen via nasal canula, increased from baseline 2 L. Despite treatment with up to nine anti-hypertensive medications, her systolic BP remained 180-200 mmHg. Her Scr also increased to 3.92. Work-up showed normal kidney sizes and urine protein/creatinine ratio 1.26 g/g. Renal artery duplex revealed right renal artery peak systolic velocity 267 cm/sec, renal-to-aortic ratio 2.68, and resistive index 0.7-0.9, suggestive of right renal artery re-stenosis and some intrinsic damage. Due to progressive volume overload and worsening respiratory status, she required temporary hemodialysis. As her volume status improved, she underwent CO_2 angiogram and was found to have 90% diffuse in-stent restenosis with marked deformity of the previous stent. She underwent re-stenting of the right renal artery with a proprietary FDA-approved Herculink Elite® renal stent with only 8 ml of contrast. Immediately post-intervention, her BP dramatically improved and after two months, hemodialysis was stopped, (new baseline SCr 1.5-1.9) and she only required two BP medications.

Keywords: Hemodialysis • Hypertension • Heart failure

Introduction

Renal ultrasound should be considered in the work up of patients with hypertensive emergency and history of renal stent due to the risk of restenosis, with prompt follow up with angiography. Appropriate FDA approved stents with appropriate diameters and lengths in the renal position is recommended, as placement of coronary stents in the renal position might have a higher incidence of structural failure and re-stenosis.

Case Report

A 75-year-old female with an extensive medical history which included Heart Failure with preserved Ejection Fraction (HFpEF), Coronary Artery Disease (CAD), CKD stage 4 (baseline serum creatinine (Scr) 2.1-2.3 mg/dL (eGFR 20-23 ml/min/1.73 m^2), hypertension, hyperlipidemia and atherosclerotic Renal Artery Stenosis (aRAS), with placement of a right renal artery bare metal stent in 2016. Recent hospital admission for decompensated heart failure, with severe volume overload and chronic diverticulitis. Now readmitted with worsening dyspnea, increased oxygen requirements from her baseline of 2 L of oxygen via nasal cannula now up to 4 L. She expressed compliance with home dose of diuretics, 80 mg twice daily of furosemide. At presentation in the ED, Blood pressure was severely elevated at 220/80 mmHg with elevated BNP-1465, elevated creatinine of 2.7 and proteinuria with Urine Protein/Creatinine-2 g/g. CXR was suggestive of bilateral pulmonary edema. Diagnosis of hypertensive emergency and acute pulmonary edema was made, and she was started on nitroglycerin and IV furosemide. However, over the course of hospital stay, despite treatment with up to nine anti-hypertensive medications, her systolic BP remained 180-200 mmHg (Figure 1). Renal function declined and intermittent Hemodialysis started for management of volume overload. Further evaluation with renal artery duplex right renal artery peak systolic velocity 267 cm/sec, renal-to-aortic ratio 2.68, and resistive index 0.7-0.9, suggestive of right renal artery re-stenosis and some intrinsic damage. Left renal artery velocities also elevated. Both kidney sizes were within normal limits. 6 days after initiation of intermittent hemodialysis, she underwent CO_2 angiogram and was found to have 90% diffuse in-stent restenosis with marked deformity of the previous stent (Figure 2). She underwent re-stenting of the right renal artery with a proprietary FDA-approved Herculink Elite® renal stent with only 8 ml of contrast. Despite successful intervention, there was poor renal parenchymal blush at the beginning and conclusion of the case indicating significant renal parenchymal disease. left renal angiogram and interrogation with pressure wire showed no significant left renal artery stenosis. Post discharge, her blood pressures improved significantly, previously requiring up to 9 blood, BP was now at goal off medications. She was on outpatient iHD for 3 more weeks after discharge, subsequently kidney function improved, and she is no longer dialysis dependent (Table 1).

Discussion

Atherosclerotic Renal Artery Stenosis (aRAS) makes up more than 9 out of every 10 cases of RAS, the rest comprising majorly fibromuscular dysplasia [1,2]. About 30% of aRAS occurs bilaterally [1]. The prevalence of RAS thus increases in the presence of other traditional cardiovascular risk factors such as hypertension.2 Some studies have shown a prevalence of aRAS of up to 40% in populations with comorbid diseases such as CAD and PAD [3]. It is generally accepted that the limitations of the ASTRAL and CORAL trials, include exclusion of sufficient number of participants with more severe, >70% to 80% renal artery stenosis, a population that would have actually benefited from renal artery intervention such as stenting [4,5]. In patients with aRAS Guideline Directed medical Therapy (GDMT) alone may not be appropriate in the following situations; management of malignant hypertension or hypertension with intolerance to medication, preservation of renal function in the presence of bilateral aRAS and progressive CKD or a solitary kidney with aRAS [2-5]. According to ACC/ AHA guidelines, these are at least Class II

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Table 1. Creatinine trend over 4 months.

Days	1	2	3	4	5	6	7	8	9	95	96	97	98	99	100
Ser. creatinine	2.33	2.14	2.13	2.35	2.71	3.10	3.37	3.92	3.83	1.92	1.82	2.01	2.03	2.06	1.82

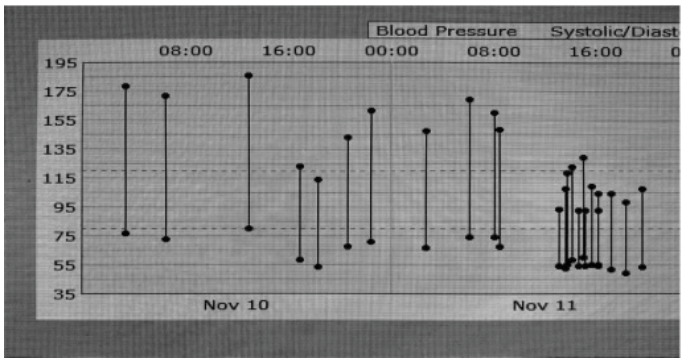

Figure 1. BP trend during hospital stay.

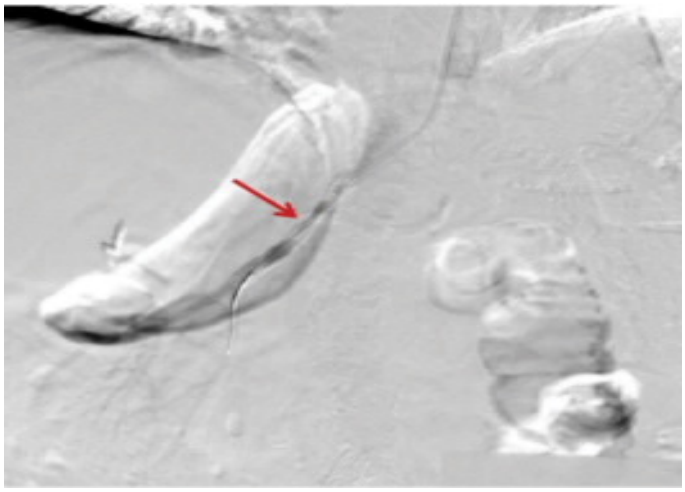

Figure 2. CO_2 Angiogram demonstrating deformed stent.

indications for revascularization, with recurrent CHF or flash pulmonary edema having a Class I level of evidence [4]. Complications related to stent placement include dissection and aortic rupture, with In-Stent Restenosis (ISR) being the most frequently occurring 5 ISR rates range from 3% to 25%, with a higher rate, just over 10%, occurring within the first year [6]. Surprisingly, clinical factors such as age, cigarette smoking, DM and hypertension did not correlate with ISR. The major predictor of ISR was stent diameter, with stents of at least 6mm having lower rates of ISR. Lower ISR rates have also been found with the length of the stent. Stents 15-20 mm long are associated with lower rates, with longer stents potentially having increased ISR rates due to greater likelihood of having stimulated neointimal hyperplasia. The type of stent used was not related, but some studies have shown that Drug Eluting Stents may be associated with lower incidence.

A diagnosis of ISR can be made initially with a duplex Ultrasound demonstrating a renal to aortic ratio of > 3.5, however the peak systolic velocity required to make a diagnosis varied from >180 cm/s-300 cm/s. This variability stresses the role of including clinical signs in making a diagnosis or increasing the index of suspicion in making a diagnosis of not only aRAS, but ISR as well. Confirmation of hemodynamic severity can be obtained with invasive lesion assessment such as a Digital Subtraction Angiography (DSA) [7]. However, the use of a CO_2 angiogram has shown utility, as with the index case, in sparing the use of IV iodinated contrasts, especially in patients with renal insufficiency [8,9]. With regards to initial management of RAS studies have shown that Drug eluting stents may be associated with lower incidence of ISR, with Percutaneous Transluminal Angioplasty (PTA) being associated with a higher incidence of ISR [2,5]. However, the optimal management of ISR is more conflicting, as demonstrated by a study which showed a 7-fold increases in ISR with Bare metal stents when compared to PTA.

Conclusion

This case highlights several important points. First, renal ultrasound should be considered in the work up of patients with hypertensive emergency and history of renal stent due to the risk of restenosis, with prompt follow up with an angiography in patients with diagnostic US findings. This case shows that renal function may also be improved if intervention is appropriately timed. The importance of using an appropriate FDA approved stent with appropriate diameters and lengths in the renal position as placement of coronary stents in the renal position might have a higher incidence of structural failure and re-stenosis.

References

1. Mohan I. Van and Bourke Vant. "The Management of Renal Artery Stenosis: An Alternative Interpretation of ASTRAL and CORAL." *Eur J Vasc Endovasc Surg* 49 (2015): 465-473.
2. Michael C. Jundt, Edwin A. Takahashi, William S. Harmsen and Sanjay Misra. "Restenosis Rates After Drug-Eluting Stent Treatment for Stenotic Small-Diameter Renal Arteries." *Cardiovasc Intervent Radiol* 42 (2019): 1293-1301.
3. Rajesh Gupta, Salem Assiri and Christopher J. Cooper. "Renal Artery Stenosis: New Findings from the CORAL Trial." *Curr Cardiol Rep* 19 (2017): 75.
4. Marloe Prince, Jose D. Tafur and Christopher J. White. "When and How Should We Revascularize Patients with Atherosclerotic Renal Artery Stenosis?." *JACC Cardiovasc Interv* 12 (2019): 505-517.
5. Edwin A. Takahashi, Michael A. McKusick, Haraldur Bjarnason and Ameet Piryani, et al. "Treatment of In-Stent Restenosis in Patients with Renal Artery Stenosis." *J Vasc Interv Radiol* 27 (2016): 1657-1662.
6. Claudio Vignali, Irene Bargellini, Michele Lazzereschi and Roberto Cioni, et al. "Predictive Factors of In-Stent Restenosis in Renal Artery Stenting: A Retrospective Analysis." *Cardiovasc Intervent Radiol* 28 (2005): 296-302.
7. Marloe Prince, Aashish Gupta, Tamunoinemi Bob-Manuel and Jose Tafur. "Renal Revascularization in Resistant Hypertension." *Prog Cardiovasc Dis* 63 (2020): 58-63.
8. James G. Caridi, S. William Stavropoulos and Irvin F. Hawkins. "CO_2 Digital Subtraction Angiography for Renal Artery Angioplasty in High-Risk Patients." *Am J Roentgenol* 173 (1999): 1551-1556.
9. Daizo Kawasaki, Kenichi Fujii, Masashi Fukunaga and Nobuhisa Fukuda, et al. "Safety and Efficacy of Carbon Dioxide and Intravascular Ultrasound-Guided Stenting for Renal Artery Stenosis in Patients with Chronic Renal Insufficiency." *Angiol* 66 (2015): 231-236.

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