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Laparoscopic Kidney Denervation for Refractory Loin Pain: Can We Predict Outcomes?

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ABSTRACT

A 19-year-old female patient presented refractory disabling loin pain associated with mild kidney atrophy (split renal function of 33%). Investigation revealed elevated serum renin level; a therapeutic test with oral renin inhibitor was tried, obtaining important pain control. Aiming to resolve the symptom while preserving the patient kidney and attributing the pain mechanism to be associated with the abnormal renin production, a laparoscopic kidney denervation was performed with no complications and complete pain resolution.

Introduction

Renal denervation was first described in 1989 to treat loin pain hematuria syndrome.[1] Before the development of minimally invasive procedures, such surgery was performed with broad incisions. In that scenario, pain relief was achieved in a minority of the patients.[2] Nevertheless, with proper case selection and performing laparoscopic surgery, better outcomes and quicker convalescence might be achieved.

Case presentation

A female patient with 19 year-old presented disabling and localized right loin pain that started 2 years before. Intensity progressively increased. Hematuria was never manifested. She had prior medical history of high-grade urine VUR to the right kidney, which was treated at the age of 12 years, with an injection of a bulking agent at the right ureter meatus. By that time she presented repeated UTI and loin pain was absent. Control exams showed complete resolution of the VUR and the patient no longer had UTI. At the latest presentation, serum creatinine was 0.9 and urine was aseptic. During investigation elevated serum renin was noted (renin = 22 ng/ml/h; n = 2.4–6.0 ng/ml/h), despite she didn't exhibit blood hypertension. A contrast CT revealed inexistence of hydronephrosis, habitual renal vascularization and a topic right kidney with diminished parenchyma (Fig. 1). Tc-99m-DTPA renogram and voiding cistography evidenced respectively no urinary tract obstruction and no VUR. Right split renal function was 33%. Oral analgesics (non-opioid and opioid) associated with gabapentin provided symptoms relief, however the pain was still disabling. After exclusion of the differential diagnosis and because of the abnormal renin level, it was hypothesized that the pain mechanism was associated with renin secretion. Aliskiren (renin inhibitor) oral intake was started at the dose of 150 mg daily, achieving relevant pain reduction. Exhibiting good response to renin inhibitor and because of the intense refractory pain with considerable split renal function, a right kidney laparoscopic denervation was performed.

Surgery was done in 120 minutes with four laparoscopic ports (three 5 mm ports; one 11 mm port). Lateral and posterior perinephric fat was incised and the hilum was skeletonized (Figs. 2 and 3). Upper pole and peri-ureteral fat was maintained respectively to avoid kidney rotation/ptosis and to preserve ureteral vascularization. There was no intra and post-operative complications and the patient remained hospitalized for three days after the procedure. With a follow-up of one-year, the pain was completely resolved and a control Tc-99m-DTPA renogram evidenced stable

Abbreviations: VUR, vesico-ureteral reflux; UTI, urinary tract infection; CT, computed tomography; ADPKD, autosomal dominant polycystic kidney disease.

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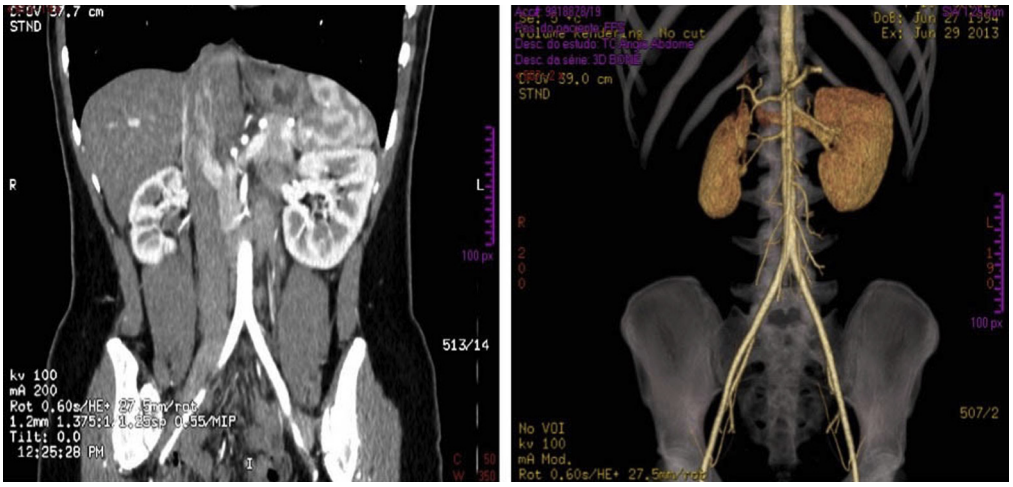

Figure 1. Pre-operative TC revealing the right kidney with diminished parenchyma.

split renal function. Likewise, a control ultrasound was normal. Serum renin level six months after surgery was 1.15 ng/ml/h (n = 0.25–5.82 ng/ml/h).

Discussion

This single case favorable result is not enough to state the success of a treatment modality, nevertheless it may provide a new insight to achieve better outcomes for renal denervation. Early series demonstrated unsatisfactory results for this surgical procedure, with success varying from 25–33%.[2,3] The largest cohort to date, which included 25 patients, reported a pain resolution in 25% of the patients.[4] Nevertheless, this study comprehended a variety of urological causes for loin pain what may have produced uneven results. Recently, Casale et al reported pain control on 100% of 12 children that underwent renal denervation, however the loin pain was associated with ADPKD.[4] Contemporary studies comprising chronic loin pain attributed to kidney affections other than ADPKD continues to exhibit poor outcomes, with the highest success rate of 44%.[5] Thus, the question to be made is how to improve renal denervation outcomes.

Several different renal affections might lead to chronic loin pain and strict patient selection might be a paramount. In this way, differential diagnosis that requires specific treatment must be refuted, which includes urinary tract obstruction, chronic UTI, VUR, inflammation due to stones, kidney tumors, vascular anomalies and renal ptosis. Therefore, investigation should comprise contrast CT or magnetic resonance, voiding cystogram and urine culture. The same exams might assist to exclude bone and muscular causes of loin pain. In cases of poor functioning kidney evaluated by renal scintigraphy, total nephrectomy should be considered. Also noteworthy, Lusch et al have demonstrated that renal innervation is spread through the renal hilum.[6] Accordingly meticulous hilar skeletonizing is essential, demanding experienced surgeons to perform the procedure. It should be remembered that renal denervation is the last line of treatment for refractory loin pain of renal origin and before surgical indication other manners of symptoms control must be exhaustively tried.

In the present case, oral analgesics were inefficient. Due to the elevated renin level, we hypothesized that a micro-ischemic event caused by the kidney arteriolar contraction could be the reason for the loin pain. The satisfactory surgical outcome may be explained in two different manners: 1. The renal denervation diminished the renin production and consequently ceased the ischemic mechanism. 2. The renal denervation interrupted the sensorial and sympathetic innervation, extinguishing the pain in addition with a secondary decrease in the renin secretion. Due to the good response of the therapeutic test with oral renin inhibitors, we are prone to believe in the ischemic hypothesis.

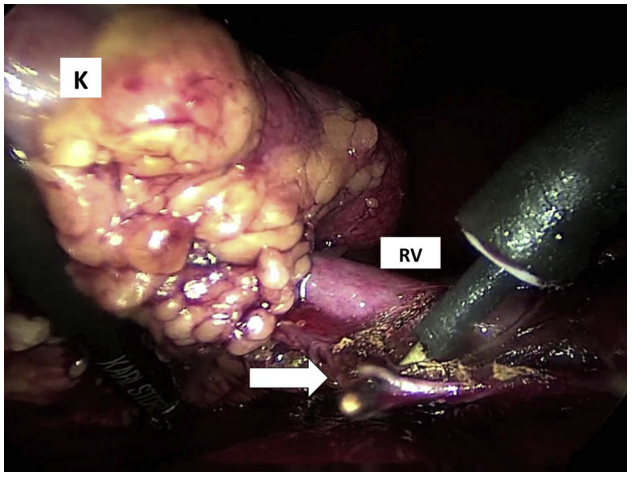

Figure 2. Surgery image of renal denervation. K: Kidney; RV: Renal vein; White arrow: Peri-hilar nerve being cauterized.

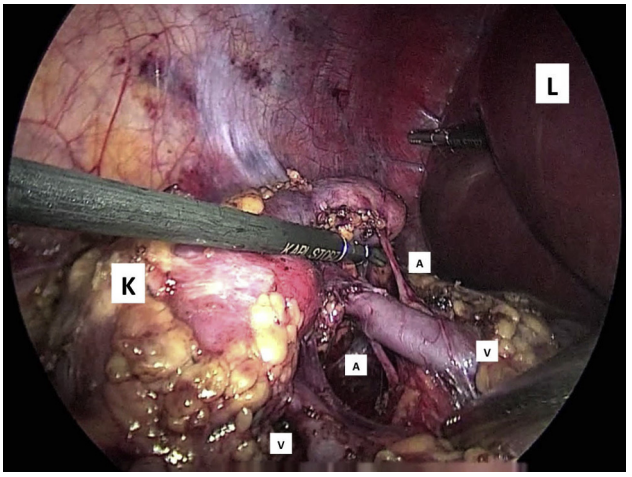

Figure 3. Final aspect of right renal denervation after hilar skeletonizing. K: Kidney; L: Liver; A: Renal artery; V: Renal vein.

Conclusion

Surgical renal denervation is an option of last line treatment for chronic and refractory loin pain due to kidney affections. Despite of the historical unsatisfactory results, a careful case selection might improve outcomes. A mechanism associated with the over-production of renin could be a cause for chronic and refractory loin pain and therefore, a therapeutic test with oral renin inhibitor may predict the success chance of renal denervation.

Conflict of interest

None.

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