Renal autotransplantation results in pain resolution after left renal vein transposition

Natalie M. Bath, MD,[a] Talal Al-Qaoud, MD, FRCSC,[b,c] Daniel H. Williams, MD,[d] Hans W. Sollinger, MD, PhD, DrHC,[b] *and* Robert R. Redfield III, MD,[b] *Madison, Wisc; and Baltimore, Md*

ABSTRACT

Left renal vein transposition is often the preferred treatment of nutcracker syndrome. However, pain returns in some patients despite surgery. One solution to this problem is renal autotransplantation. Here we report our initial results of renal autotransplantation in patients with persistent flank pain despite a previous left renal vein transposition. We used the University of Wisconsin loin pain hematuria syndrome test as a diagnostic maneuver to determine who may benefit from renal autotransplantation; this procedure subsequently resulted in complete pain resolution in all three patients. All patients underwent successful renal autotransplantation and remain pain free. These cases support the test as a diagnostic maneuver to determine which patients may benefit from renal autotransplantation. (J Vasc Surg: Venous and Lym Dis 2019;7:739-41.)

Keywords: Autotransplantation; Renal vein transposition; Nutcracker syndrome; Loin pain hematuria syndrome

Loin pain hematuria syndrome (LPHS) is a rare clinical entity with a low estimated prevalence of 0.012%.[1] Patients typically present with severe loin pain that radiates to the abdomen, medial thigh, or groin.[2-4] This pain is often debilitating to the point that patients require narcotics for pain control. Patients may also experience hematuria. Type 1 LPHS results from disease such as kidney stones or nutcracker syndrome (NCS); type 2 LPHS describes a syndrome in which there is no identifiable cause. It is our estimation from our population of patients that the cause of LPHS in 40% of patients may be NCS.

NCS results from left renal vein (LRV) compression as it passes between the aorta and superior mesenteric artery (SMA).[5,6] LRV compression can result in venous hypertension and the development of varices in the renal pelvis, which subsequently can be manifested as hematuria, orthostatic proteinuria, and flank pain.[7,8] Other symptoms include left-sided varicocele in male patients, pelvic congestion syndrome in female patients, and chronic fatigue.[9] Duplex ultrasound, computed tomography, and magnetic resonance imaging are modalities that can be used for diagnosis of NCS. Imaging will reveal LRV narrowing at the aortomesenteric portion, angle between the SMA and aorta <41 degrees (normal SMA-aorta angle is 90 degrees), and collateral veins around the renal hilum.[8,10]

These patients often experience debilitating pain and require operative intervention. Open and endovascular surgical options including LRV transposition, SMA transposition, renal autotransplantation, transluminal balloon angioplasty and stenting, nephropexy, and gonadal-caval bypass are used.[11-15] The most frequently used and effective option for NCS is LRV transposition, in which the LRV is divided at the level of the inferior vena cava and reanastomosed to the inferior vena cava at a level distal to the SMA.[8,16,17] Numerous case series have reported long-term outcomes of LRV transposition to be good or excellent in as many as 80% of patients.[9,18] However, some patients have persistent flank pain despite a patent vein. Here we present three cases in which renal autotransplantation resulted in pain resolution after LRV transposition. All patients agreed to publication of case details.

The University of Wisconsin (UW)-LPHS test has been developed to determine which patients with LPHS may benefit from renal autotransplantation. The UW-LPHS test is often performed under deep sedation or general endotracheal anesthesia because of the hypersensitivity of most patients. Cystoscopy is performed, and the bladder is carefully evaluated to rule out any other abnormalities. The ureteral orifice of the painful side is cannulated with a balloon-tipped catheter, and retrograde ureterography is performed using contrast material to assess anatomy. The catheter is then advanced to the kidney, and bupivacaine is instilled with the balloon inflated to prevent efflux. Bupivacaine is left to dwell for 5 minutes, after which the balloon is deflated and the catheter and cystoscope are removed. The patients are not given any additional analgesics. Pain is

From the Department of Surgery,[a] Division of Transplant Surgery,[b] and Department of Urology,[d] University of Wisconsin School of Medicine and Public Health, Madison; and the Division of Transplant Surgery, University of Maryland, Baltimore.[c]

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Correspondence: Hans W. Sollinger, MD, PhD, DrHC, University of Wisconsin School of Medicine and Public Health, H4/778, 600 Highland Ave, Madison, WI 53792 (e-mail: hans@surgery.wisc.edu).

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assessed before discharge after the procedure, later in the evening by telephone, and in clinic the following day. Patients who have pain relief for at least 12 hours after the test and have no other anatomic abnormalities are considered to have a positive test result and are likely to benefit from renal autotransplantation.[19]

CASE REPORT

Case 887. This patient is a 42-year-old woman whose loin pain began several years before presentation at our institution. She initially was diagnosed with NCS and underwent LRV transposition in 2017. She experienced pain relief for 2 months postoperatively; however, her symptoms returned and progressively worsened. She presented to our institution 4 months after her initial operation with constant left flank pain, suprapubic pain, and intermittent epigastric pain associated with nausea. Before transplantation, the patient had a widely patent LRV. Although she was previously employed, her severe pain forced her to remain in bed for several days at a time, and she ultimately lost her job. She required oxycodone 5 mg every 8 hours as needed and tramadol 50 mg every 4 hours as needed for pain control. The UW-LPHS test was performed to determine whether LPHS was in fact contributing to her pain.[19] Twenty-four hours after the UW-LPHS test, she reported that she was completely pain free. She ultimately underwent left nephrectomy and renal autotransplantation. The patient recovered without complication and remains pain free 9 months after autotransplantation.

Case 672. This patient is a 19-year-old woman previously diagnosed with NCS after years of loin pain. Because of her pain severity, she subsequently underwent LRV bypass twice; both bypasses failed because of venous thrombosis. After her failed bypasses, she underwent left nephrectomy and remained pain free for approximately 1 year. She presented to our institution because of the return of symptoms in her right loin. Her past medical history was significant for kidney stones, May-Thurner syndrome, and factor V Leiden deficiency. The patient required a significant amount of narcotics and expressed that she "could not continue to live with this pain." On clinical evaluation, LPHS was found to be a contributing factor to her chronic loin pain. She underwent right renal autotransplantation with total ureterectomy. She remains pain free and off narcotics 23 months after surgery and is employed as an operating room technologist.

Case 866. This patient is a 19-year-old woman who presented with hematuria, nausea, severe abdominal pain, and weight loss requiring enteral tube feeds; after extensive workup, she was diagnosed with NCS. She underwent renal vein transposition 1 year after the initial development of symptoms. Despite renal vein transposition and dietary modification, her pain continued to worsen. Repeated imaging indicated that her renal vein remained patent (Fig). Despite receiving oxycodone 5 mg every 6 hours for pain control, she remained primarily bedridden because of her loin pain. She underwent the UW-LPHS test and experienced complete resolution of her pain. She subsequently underwent left nephrectomy and renal autotransplantation. She is 6 months post autotransplantation, and her chronic pain is completely resolved; she has been able to resume a normal life.

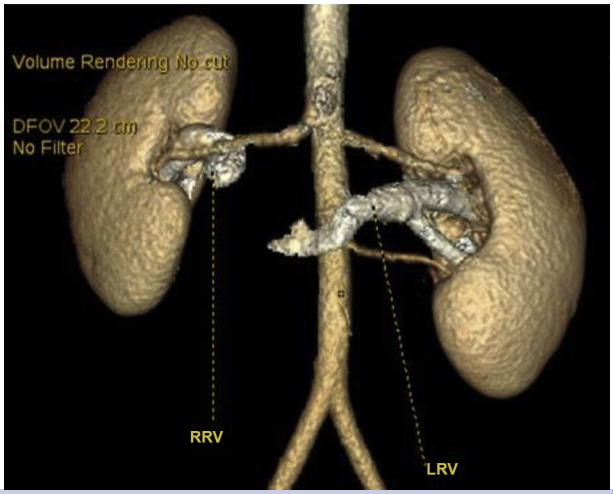

Fig. Preoperative imaging demonstrating patent left renal vein (*LRV*). Three-dimensional reconstruction performed before the patient's renal autotransplantation shows that the LRV is patent; however, the patient continued to experience severe loin pain. *RRV,* Right renal vein.

DISCUSSION

Here we present three cases of LPHS. Two of the patients who were diagnosed with NCS underwent successful LRV transposition only to have their pain return soon after operative intervention. These patients were evaluated at our institution and were found to be candidates for renal autotransplantation. Patients who are suitable candidates for autotransplantation include those with severe pain requiring high doses of analgesics for pain control and those for whom extensive nonsurgical therapies have been unsuccessful.[4]

There are several critical steps to performing renal autotransplantation. Through a midline incision, the major vessels are exposed and the vena cava is carefully dissected so that adequate exposure is completed around the renal vein and contralateral renal vessels. After dissection, the kidney and ureter are removed and cooled with preservation solution. The remaining distal ureter is removed to the bladder. The kidney is then placed in the pelvis with the renal artery anastomosed to the right common iliac artery, and the renal vein is anastomosed to the right common iliac vein or distal vena cava. Key to the ability to cure the pain in these cases is to reimplant the ureter and to remove the distal ureter, as was done in all three cases presented here.

After renal autotransplantation, patients have continued to have resolution of loin pain (mean follow-up time, 13 months). One explanation for this phenomenon is that in a subset of patients with NCS, LPHS is also caused by ureteral spasm; thus, LRV transposition does

not fully address the underlying pathophysiologic process. It is now accepted that NCS causes ureteral spasm, which is categorized as secondary LPHS. The patients described here probably had secondary (type I) LPHS as they were all previously diagnosed with NCS at highly experienced centers. The treatment goal for NCS, whether by LRV transposition or other operative techniques, is to reduce LRV hypertension.[9] As demonstrated by radiologic methods, the ureter does not have venous outflow. However, the origin of pain in some patients diagnosed with NCS in reality may be the ureter as seen in LPHS, which is diagnosed with the UW-LPHS test and would not be addressed with LRV transposition. Ureteral spasm in LPHS may be due to the continuous passing of stones. The reason that renal autotransplantation eliminates ureteral spasm is total denervation of the kidney and ureter. In addition, the ureter is reimplanted into the bladder with the distal ureter removed.[20]

Several published case reports offer support to the hypothesis that ureteral spasm is the origin of pain in LPHS patients. Russell et al[21] initially presented a case report in which a male patient with typical symptoms of LPHS was trialed on sildenafil (Cialis). This treatment resulted in a reduction of pain score by several points. Key to this finding is the fact that sildenafil relaxes the smooth muscles of the urogenital system, which subsequently resulted in pain relief in a patient with known LPHS. In our program, we have developed the UW-LPHS test to determine which patients will benefit from renal autotransplantation because of pain due to ureteral spasm. If the patient experiences pain relief, this acts as evidence that the patient will be a good candidate for renal autotransplantation. Moving forward, our goal is to use the UW-LPHS test to determine whether patients have pain secondary to LPHS and to determine whether they may benefit from renal autotransplantation. Thus, if patients with LPHS caused exclusively by NCS are treated with an intervention that aims to treat LRV hypertension, their pain should be relieved with LRV transposition. However, a number of patients with NCS who have undergone successful LRV transposition experience pain recurrence, suggesting that in addition to renal hypertension, the urogenital system is a contributor to the patient's pain. It is important to consider renal autotransplantation a reasonable alternative to LRV transposition in certain cases. We therefore recommend that every patient undergoing treatment of NCS undergo the UW-LPHS test to determine the most appropriate type of operation.

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