A simplified surgical approach for left ovarian vein transposition for the treatment of pelvic venous disease from nutcracker syndrome

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ABSTRACT

Nutcracker syndrome is becoming increasingly recognized as a cause of chronic pelvic pain. Several treatment options have been used, including renal vein or ovarian vein transposition to the more distal inferior vena cava and renal vein stenting. Concerned about the major scope of the surgical procedures as well as the implantation of a foreign body that must function for six to seven decades, we undertook to develop an all autogenous simpler surgical solution for the treatment of nutcracker syndrome. In 2013, we began performing left ovarian vein transposition to the left iliac vein. In our initial report, we used a minimally invasive robotic approach. For the past several years, we have used a simplified open approach to left ovarian vein transposition that takes advantage of the fact that the left ovarian vein naturally courses over the iliac vein. We have found this surgical treatment of nutcracker syndrome provides excellent relief from the associated symptoms. (J Vasc Surg Cases Innov Tech 2021;7:411-4.)

Keywords: Nutcracker syndrome; Chronic pelvic pain; Ovarian vein

Nutcracker syndrome represents the constellation of symptoms associated with compression of the left renal vein most commonly between the superior mesenteric artery and the aorta. Initially, the symptoms of left flank pain and intermittent hematuria are manifestations of increased renal parenchymal venous pressures. As collateral veins, especially the left ovarian vein, carry more of the renal venous outflow and the parenchymal pressures drop, the symptoms of nutcracker syndrome shift to the pelvis owing to ovarian vein reflux into pelvic varicosities of the small pampiniform venous plexus of the left ovary and the perimetrial veins of the uterus. Patients begin to experience chronic pelvic heaviness and pain, dyspareunia, and worsening menses, which adversely affect quality of life.[1,2] In 2013, we became disenchanted with renal vein transposition for the surgical treatment of nutcracker syndrome because of the large scope of the procedure, the difficulty in obtaining an appropriate length of the renal vein without a saphenous vein extension, narrowing of the inferior vena cava, and the risk of delayed anastomotic stenosis.[3]

However, we remained concerned about renal vein stent placement because of the associated complications and the unknown performance of the stents over the potential 80 years of life anticipated for the recipients.[4-6] We, therefore, sought to develop a smaller procedure providing an all autogenous solution for the treatment of those whose quality of life was adversely affected by the symptoms of nutcracker syndrome. To that end, we developed the procedure of left ovarian vein transposition to the left iliac vein.[7] In our initial report, this procedure was done using a robotic minimally invasive technique for isolation and mobilization of the left ovarian vein. Since that time, we have eliminated the use of minimally invasive robotic approach and have refined the procedure so that it is simple and direct and provides excellent relief for patients.

PREOPERATIVE EVALUATION

Patients with symptoms and signs of nutcracker syndrome undergo complete pelvic tilt-table venography, which visualizes the right and left renal veins, the entire length of the left ovarian vein, the right ovarian vein, and the common, external, and internal iliac veins with Intravascular ultrasound measurements of the left renal vein and the left common iliac vein diameters (Table). The patients also undergo computed tomography (CT) venography of the abdomen and pelvis to confirm the pattern of left renal vein compression and measure the diameter of the left ovarian at the maximal and minimal diameters. Patient selection is based on patient history and the findings of CT venogram of the abdomen, as well as the tilt table venogram. intravascular ultrasound examination is used as a confirmatory test, but is not used as a major diagnostic study.

The most important characteristic we seek on venography is the violation of three major principles of venous

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Table. Patient selection criteria for left ovarian vein transposition

Patient history
Symptoms of chronic pelvic pain with a history of left flank pain
CT venogram
>70% compression of the left renal vein as measured by the largest diameter evident between the SMA and the aorta compared to the largest diameter of the renal vein near the renal hilum
A left ovarian vein of >5 mm in diameter at the level of the left common iliac vein
Complete pelvic venography
Rapid reflux of contrast into the left ovarian vein without balloon occlusion of the proximal renal vein
Reflux from the ovarian vein into smaller pelvic collateral veins in the pelvis suggesting a driving pressure
Venous outflow of renal vein reflux through nonanatomic collateral beds (commonly the right ovarian or internal iliac veins)
IVUS confirming compression of the left renal vein of >50% and the absence of compression of the left common iliac vein with less than 30% compression

CT, Computed tomography; *IVUS,* intravascular ultrasound; *SMA,* superior mesenteric artery.

physiology: caudad flow from the left renal vein (reflux), flow from larger diameter veins into smaller diameter veins, and venous drainage through nonanatomic venous pathways, including the right ovarian and right internal iliac veins. If there are no segments of the left ovarian vein that are less than 6 mm in diameter and no evidence of hemodynamically significant left common iliac vein compression, the patient is considered a candidate for left ovarian vein transposition. The patient is offered this procedure after a presentation of all current treatments for nutcracker syndrome and informed consent is obtained.

Surgical procedure. The patient is placed in a 45° right lateral decubitus using a beanbag. In this position, the bowel falls away from the left lateral pelvic wall. The field is draped with the lower edge of the drape at the pubis symphysis and the left lateral draped just beyond the anterior superior iliac spine. The incision begins in the midline midway between the umbilicus and the pubis or slightly higher depending upon whether the ovarian vein crosses the common or external iliac vein (Fig 1). It is carried across the rectus sheath and then upward along the lateral aspect of the sheath toward the anterior superior iliac spine. The length of the incision is generally about 8 cm. The rectus sheath is opened from the midline to the lateral border of the sheath transversely and then superiorly the length of the incision. The exposed rectus muscle is mobilized with its blood supply, is rotated medially, and retracted to expose the posterior sheath, which is divided the length of the incision. No muscle is cut. The preperitoneal fat is gently swept aside to expose the peritoneum. The peritoneum is followed into the left lower quadrant and retracted medially with the ureter until the common iliac artery and vein are clearly visible within the field. The ovarian vein is often attached to the peritoneum alongside the ureter and must be gently freed. It is only necessary to

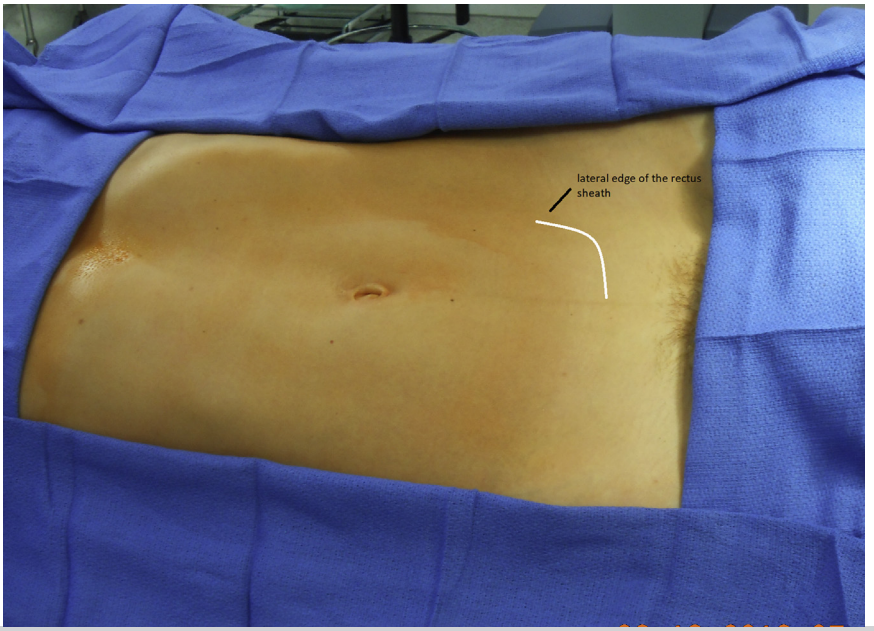

Fig 1. Patient positioning. The patient is placed in a 45° right lateral decubitus position to enable the bowel to fall away from the left lateral pelvic wall and permit easy exposure of the left iliac veins.

mobilize 4 to 5 cm of the vein so that it drops onto the iliac vein. The medial aspect of the common or external iliac vein is sufficiently exposed to permit the secure placement of a side-biting clamp. The patient is then given 5000 U of heparin. The distal ovarian vein and any large varicose veins within the field are ligated. A Yasargil clip is used to occlude the ovarian vein, which is thin walled. The vein is divided. The common iliac vein is then clamped and a 1.5 cm venotomy is made. A small button may be removed. The end of the left ovarian vein is appropriately spatulated and sewn in end-to-side fashion with 6-0 Prolene continuously along the lateral wall and interrupted on the medial wall. Upon completion of the anastomosis, flow is restored (Fig 2).

The rectus sheath, subcutaneous tissues and skin are closed with running monofilament absorbable sutures. Patients are fully anticoagulated for 3 months and then maintained on clopidogrel.[8] They are followed with CT venography (Fig 3).

DISCUSSION

Nutcracker syndrome is a quality-of-life issue that can cause left flank initially and pelvic pain subsequently, worsening of menses, dyspareunia, and pelvic aching that interferes with daily life.[1,2] It is increasingly recognized as a treatable cause of chronic pelvic pain. Treatments include the classic surgical procedure of left renal vein transposition onto the inferior vena cava, stent placement into the left renal vein, and ovarian vein transposition to the inferior vena cava.[3,4,9] Each of these procedures is associated with both short- and long-term risks. Left renal vein transposition is a significant undertaking that may require harvesting the great saphenous vein to lengthen the renal vein for its reattachment to the inferior vena cava, requires a transabdominal approach, and carries a subsequent risk of adhesion formation, as well as the possibility of restenosis.[3] Renal vein stents are effective, but have the associated risks of dislodgement of the stent with displacement into the heart or pulmonary vasculature and the unknown very long term patency for this young patient population.[4,5]

In patients with nutcracker syndrome, the left ovarian vein reflux provides venous outflow, carrying renal blood to the pelvis, returning to the heart via the right iliac or ovarian vein. When this flow pattern has been established, the patient has minimal left flank pain, but increasing left pelvic pain. The ovarian vein reflux is frequently the path of renal outflow, capable of carrying a sufficient amount of renal venous outflow to

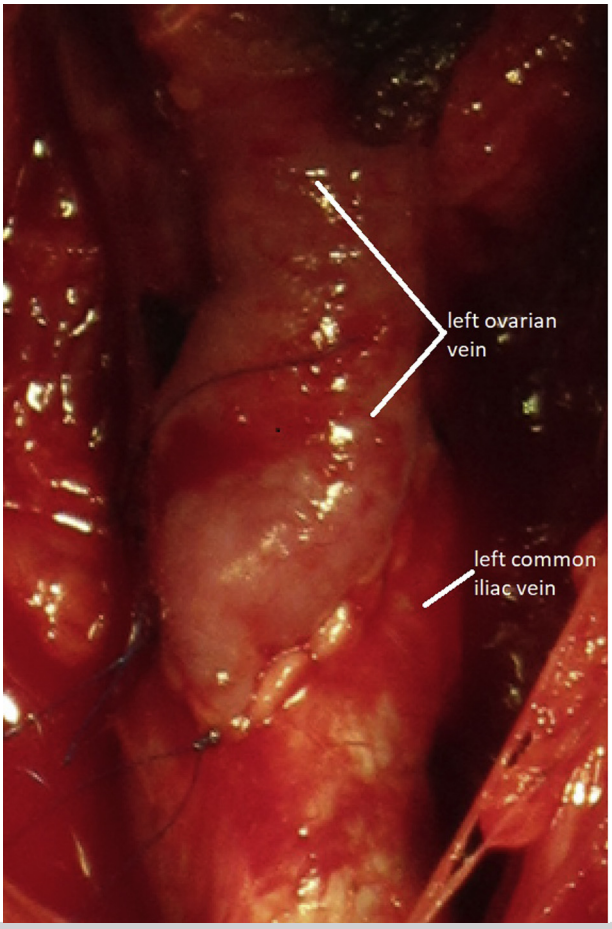

Fig 2. Left ovarian vein to common iliac vein anastomosis. The proximity of the veins permits the construction of a well configured anastomosis.

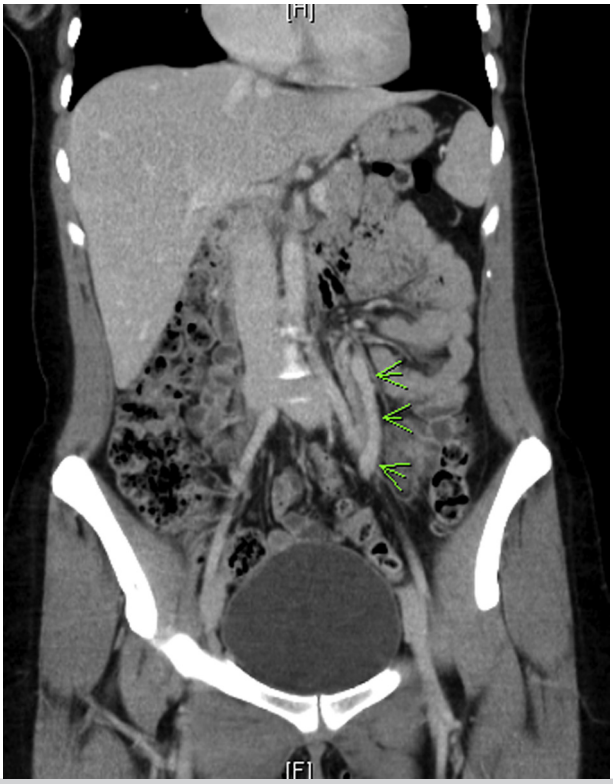

Fig 3. Follow-up computed tomography (CT) venography. The appearance of the left ovarian vein flow at 1 year post left ovarian vein transposition. The left ovarian vein is 8 mm in diameter.

decompress the kidney, decrease renal vein pressures to the level of central venous pressures, and relieve the flank symptoms associated with increased renal vein pressure.[7,10] The decrease in renal vein pressures and in the flow through the pelvic varicosities provides significant symptom relief. Comparing Short Form-36 scores of our patients before and after ovarian vein transposition, there is an improvement in both bodily pain and emotional functioning scores.

The ovarian vein has been used successfully in a variety of configurations.[7,9] Transposition to the inferior vena cava has been used with excellent results. However, this procedure requires entry into the abdomen, exposure of the inferior vena cava, routing the ovarian vein from the lateral retroperitoneum to the inferior vena cava, and the subsequent risk of adhesive small bowel obstruction. Because it is the diameter of the left ovarian vein that governs outflow from the kidney rather than the diameter of vein to which it is sewn, the inferior vena cava offers no advantage over the left common or external iliac vein. The retroperitoneal approach for left renal vein decompression requires minimal manipulation of the ovarian vein, provides access to treatment of the symptomatic pelvic varicose veins, and avoids the subsequent risks of intra-abdominal problems. It provides an alternative for failed renal vein transposition or renal vein stents.[11] Cosmetically, the incision is smaller and less apparent, which is of importance to the many young women affected. Overall, it is a suitable operation for the chronic pain experienced by those with nutcracker syndrome.

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