Nutcracker Syndrome: It Exists And We Should Treat It

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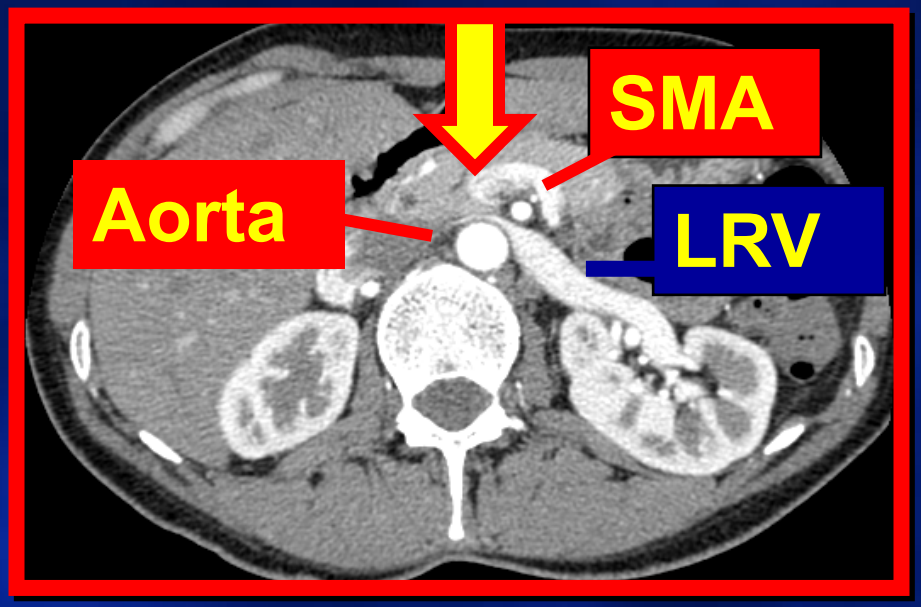
MAYO CLINIC

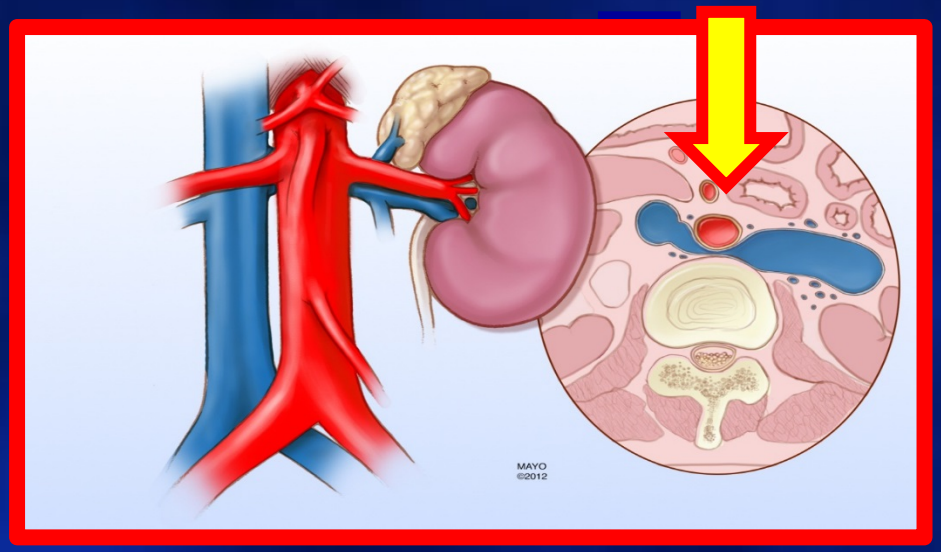
No Conflict of Interest

Nutcracker Syndrome

(Symptomatic Renal Vein Compression)

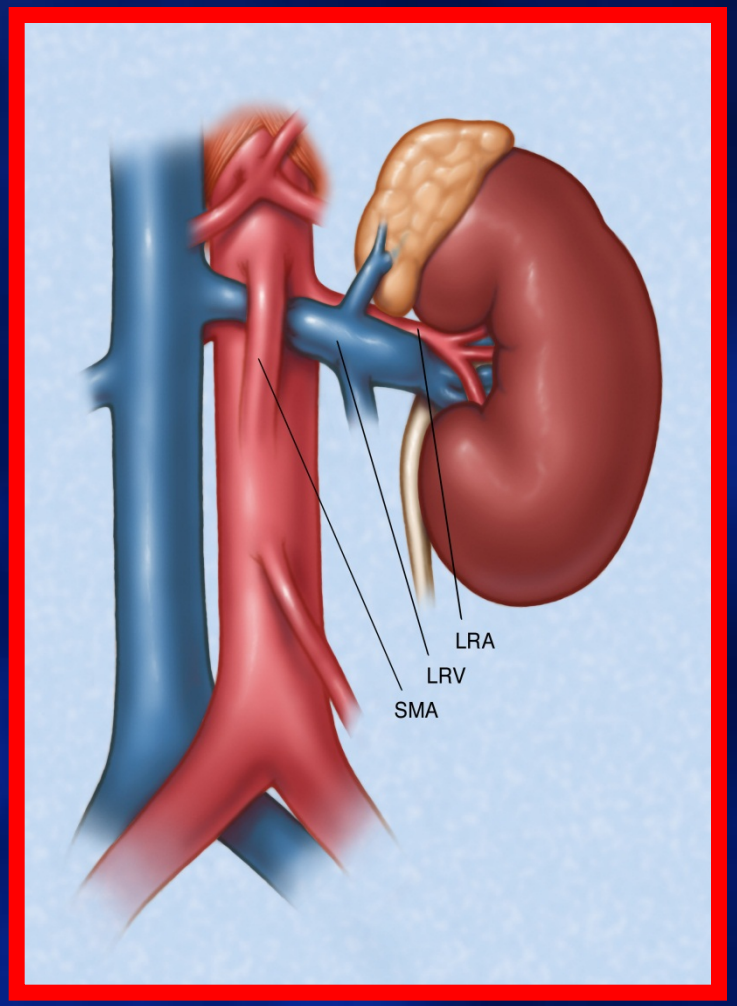


Posterior Nutcracker Syndrome



Nutcracker Syndrome

Clinical Presentation



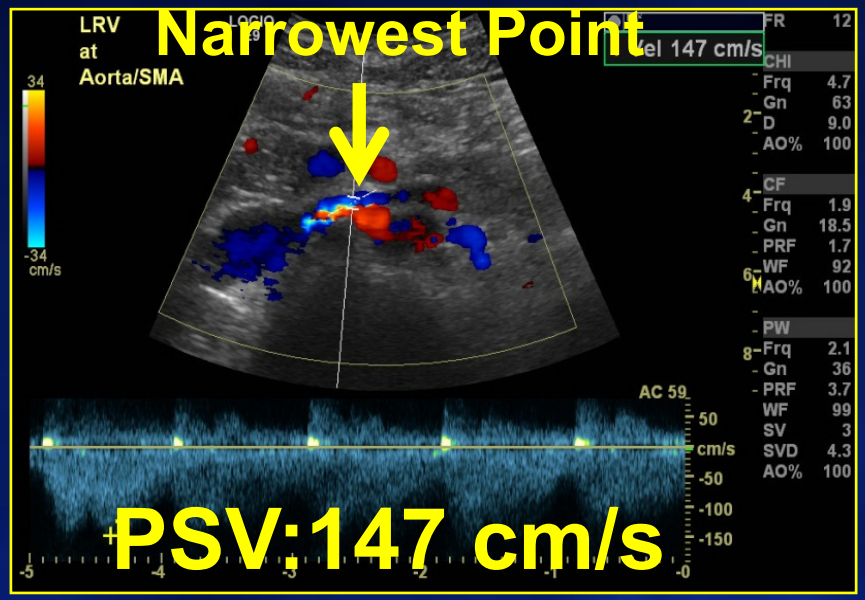
- Young, thin patient
  - Left Flank Pain
  - Hematuria
  - Left Varicocele
- Young or middle aged women
  - Pelvic Congestion Syndrome

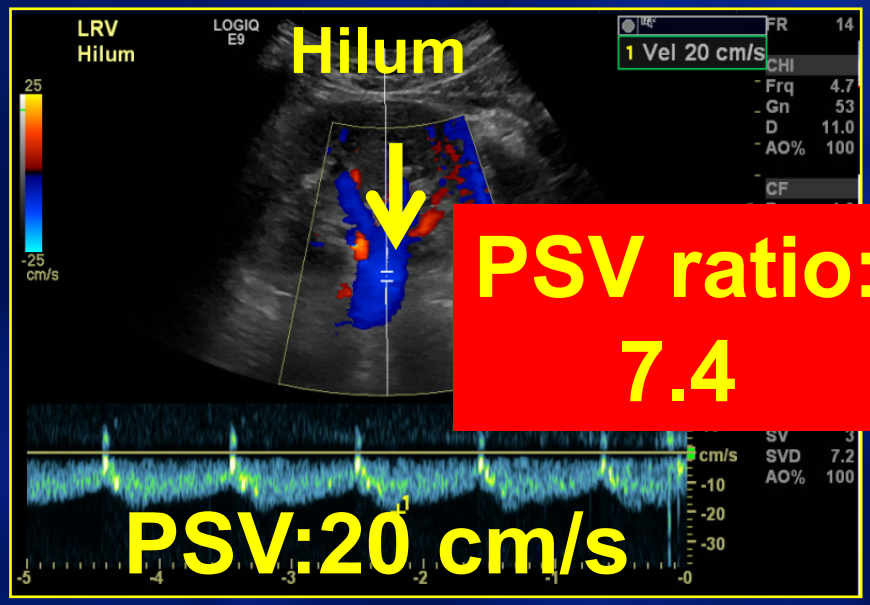
Duplex US
LRV

MEAN RATIOS
IN 31 PATIENTS:

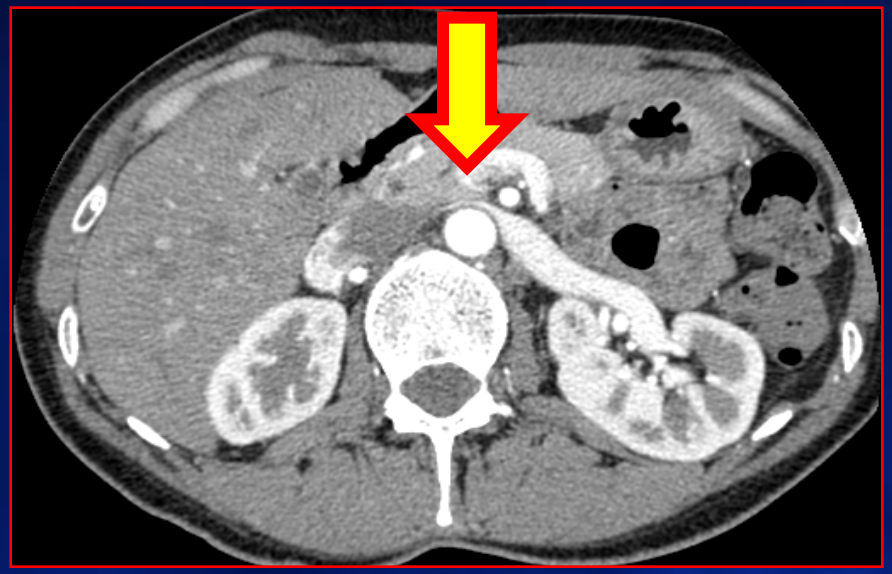
PSV ratio*: 6.1 ± 2.6

Diameter ratio*: 6.1 ± 2.7





CTA/MRA

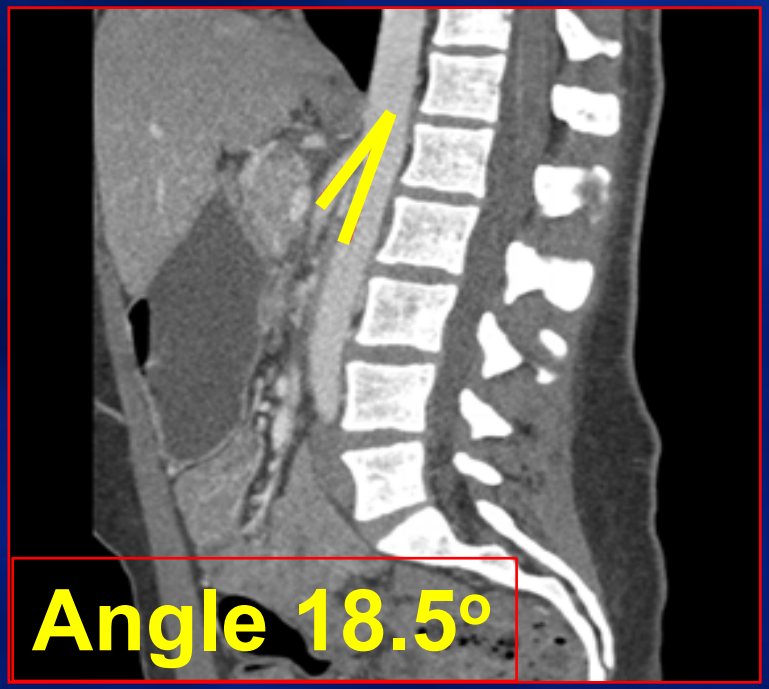


Aorta-SMA angle:

23.3 ± 5.8°

n=34

(Normal: 38°)

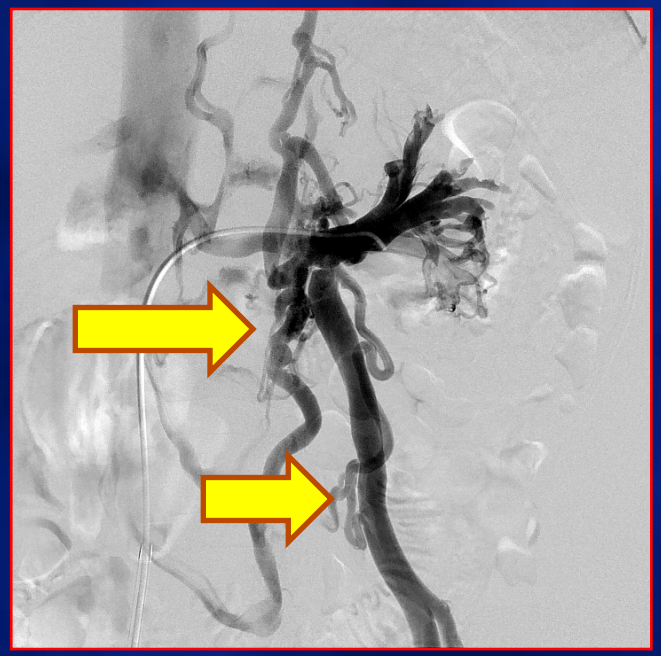


Venogram with Pressure measurements

Lumbar and gonadal collaterals

Pressure gradient (LRV/IVC): 3.4 ± 1.4

n=27



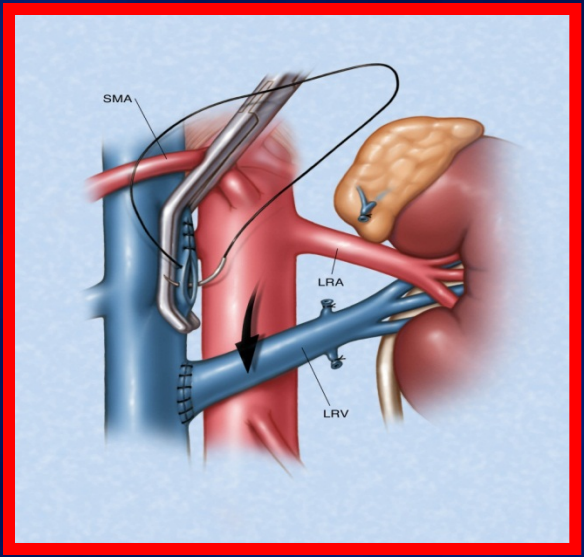
Nutcracker Syndrome
Treatment

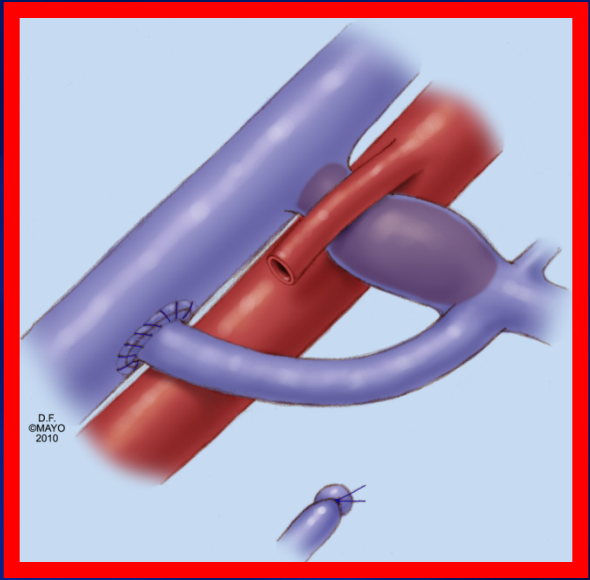
- Conservative
  - Observation
  - Pain management
  - Improved nutrition, weight gain, exercise

Nutcracker Syndrome
Treatment

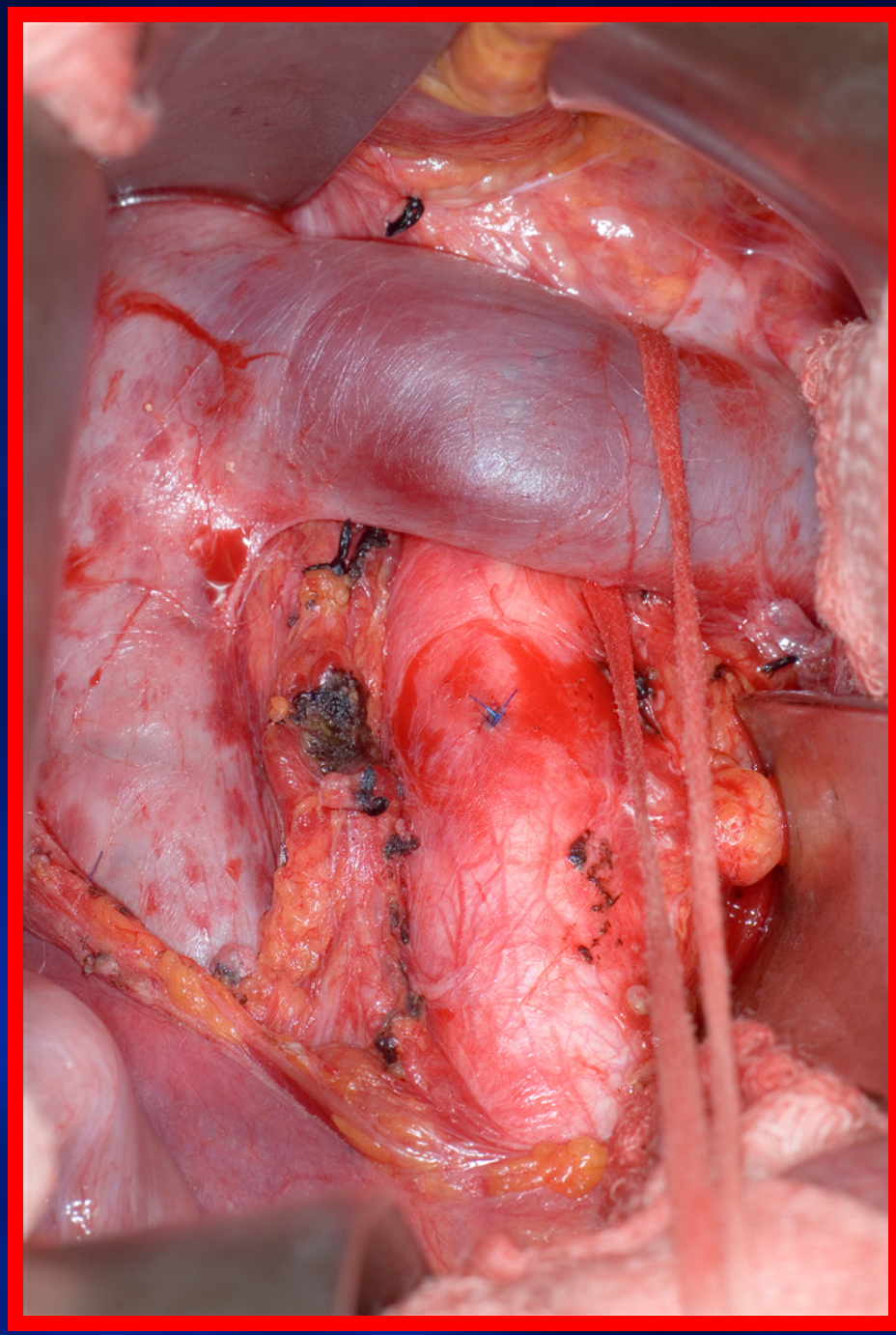
- Conservative
  - Observation
  - Pain management
  - Improved nutrition, weight gain, exercise
- Open surgical
- Endovascular
- Hybrid
- Laparoscopic/Robotic

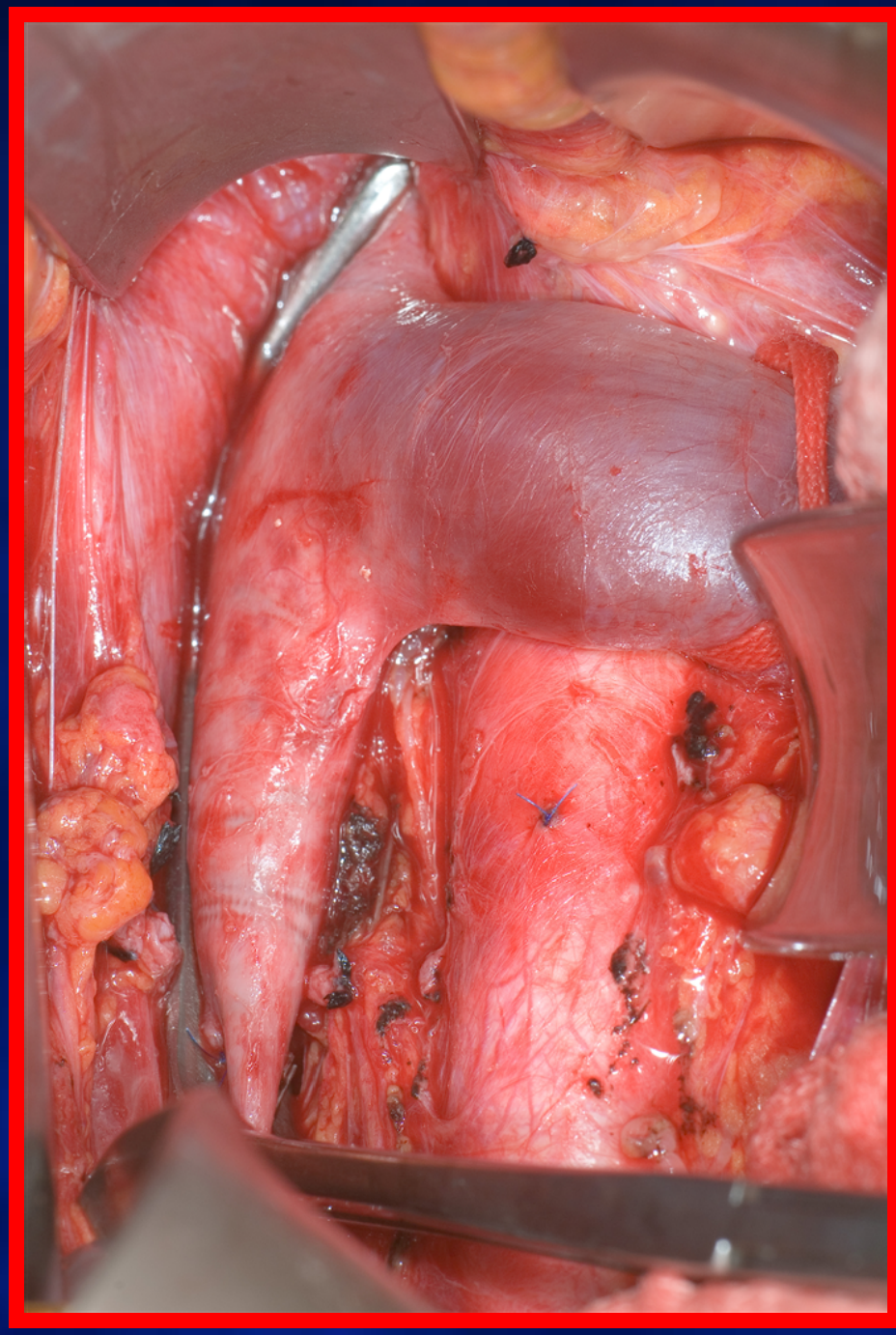
Open Surgical Treatment

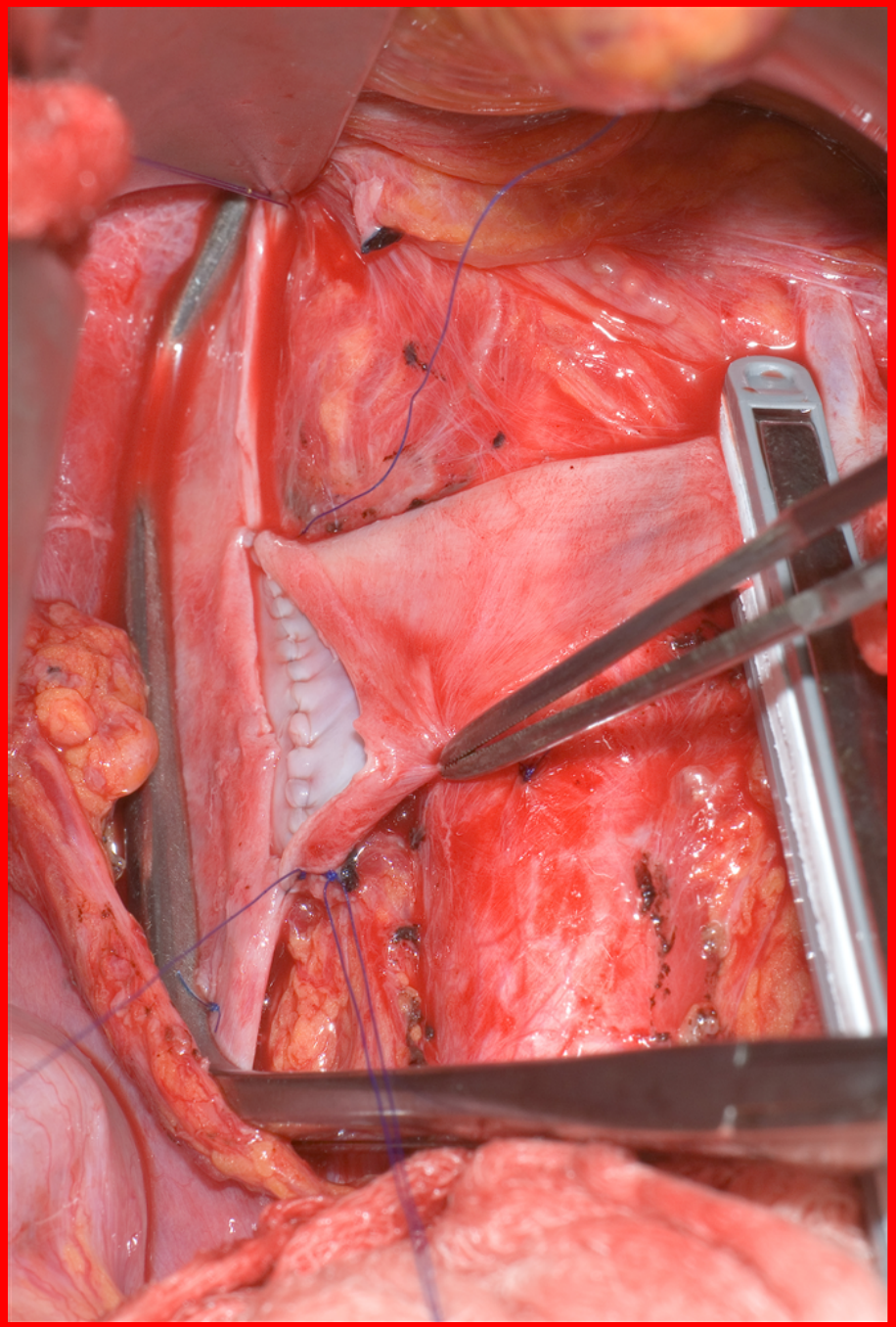


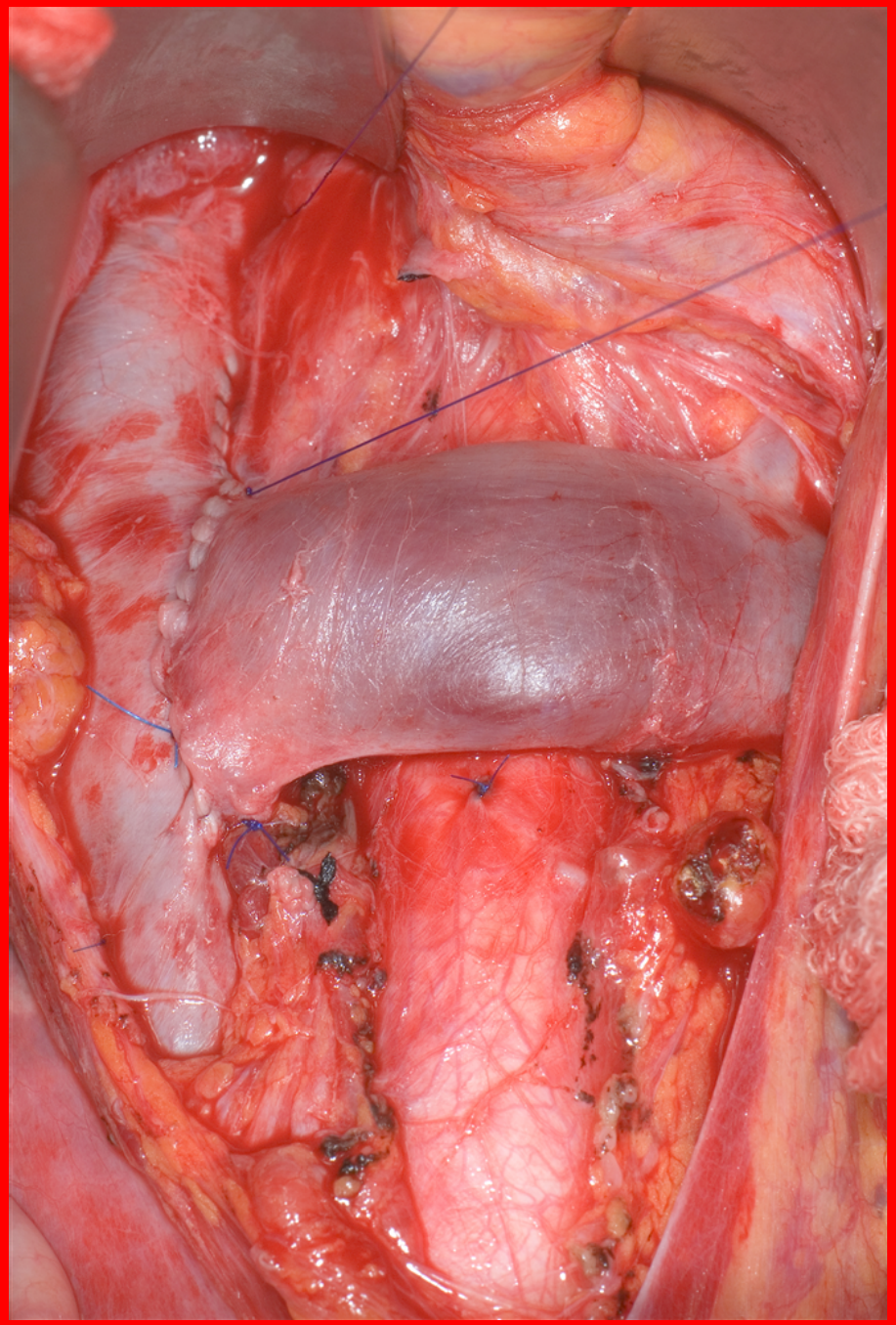


- Left renal vein transposition
- Left renal vein bypass
- Gonadal vein IVC transposition
- Gonadal- iliac vein anastomosis
- Renal autotransplantation
- Transposition of the SMA
- Nephropexy
- Nephrectomy



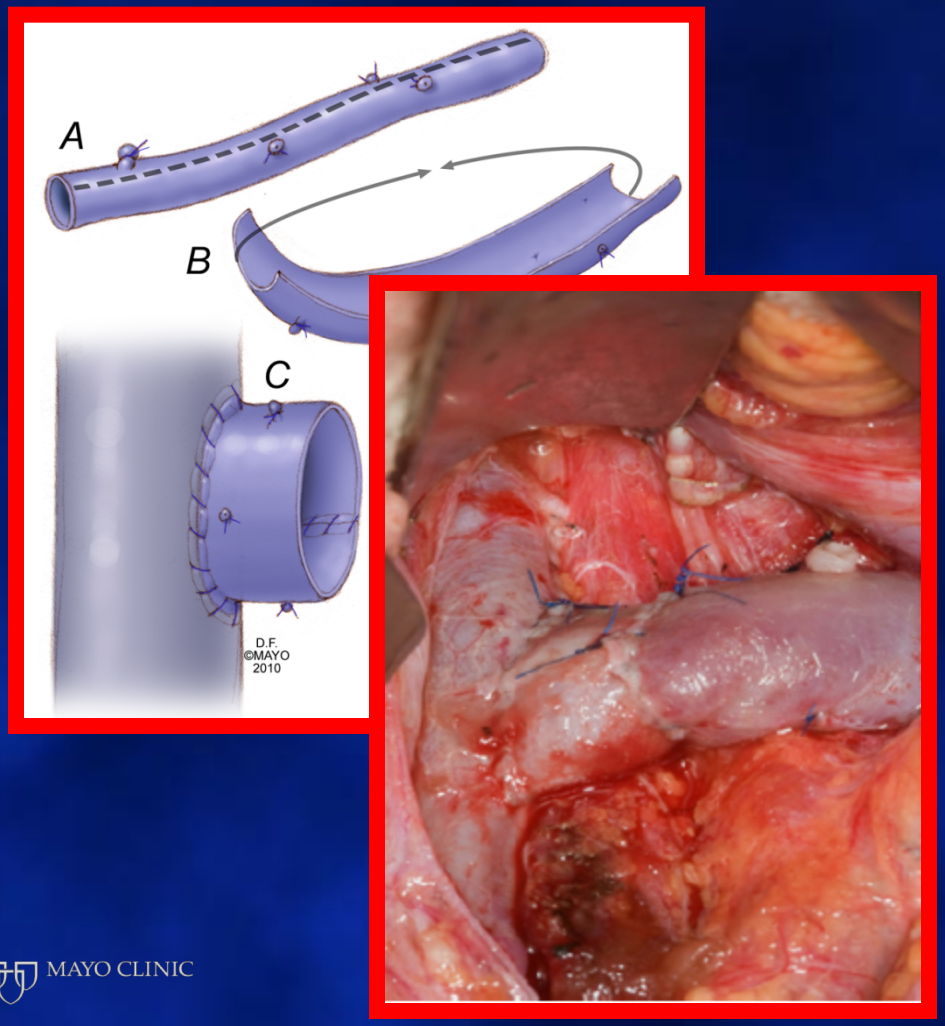




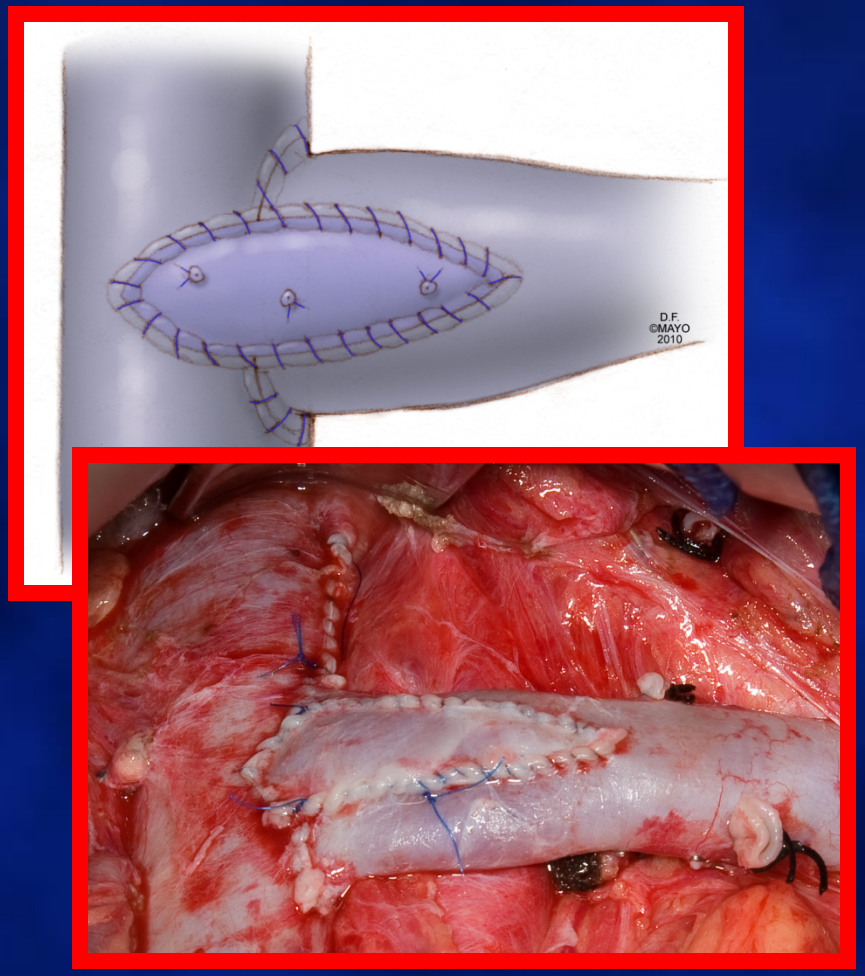


Operative Technique

Saphenous vein cuff



Saphenous vein patch



From the American Venous Forum

Journal of
Vascular Surgery
Venous and Lymphatic Disorders™

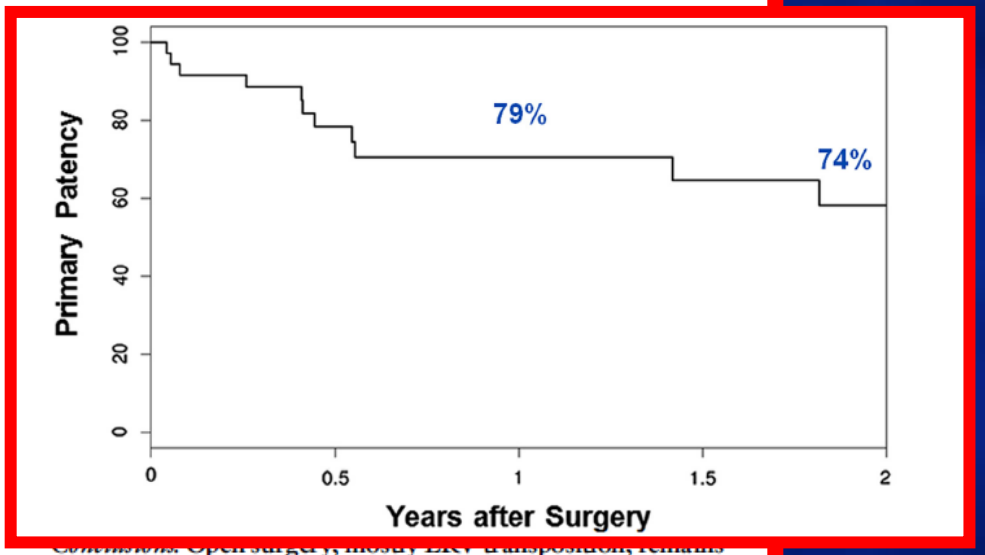
Treatment of nutcracker syndrome with open and endovascular interventions

Young Erben, MD,[a] Peter Gloviczki, MD,[a] Manju Kalra, MBBS,[a] Haraldur Bjarnason, MD,[b] Nanette R. Reed, MD,[a] Audra A. Duncan, MD,[a] Gustavo S. Oderich, MD,[a] and Thomas C. Bower, MD,[a]
Rochester, Minn

Objective: Nutcracker syndrome (NS) is a rare cause of hematuria, flank pain, and renal venous hypertension due to compression of the left renal vein (LRV) between the aorta and the superior mesenteric artery. To evaluate outcomes of open surgery and endovascular interventions, we reviewed our experience.

Methods: A retrospective review of clinical data of all patients treated at our institution with an intervention for NS between January 1, 1994, and February 28, 2014, was performed. Primary outcomes were morbidity and mortality. Secondary outcomes included late complications, patency, freedom from reintervention, and resolution of symptoms.

Results: Thirty-seven patients (30 female, seven male) with a mean age of 27 years (range, 14-62 years) were treated. The most frequent symptom was flank pain (97%); the most frequent sign was hematuria (68%). NS was diagnosed with duplex ultrasound scanning with measurement of LRV diameters and flow velocities (87%), with computed tomography or magnetic resonance venography (94%), and with contrast venography with measurement of pressure gradients (93%). Initial treatment was open surgery in 36 patients, endovascular in 1. Distal transposition of the LRV into the inferior vena cava (IVC) was performed in 31 patients. Adjunctive procedures to optimize venous outflow included great saphenous vein cuff in six patients, great saphenous vein patch in four, and both cuff and patch in



a safe and effective treatment of patients with NS. However, one of three patients after open repair required reintervention, most frequently LRV stenting. Open reconstruction should be tailored to the patient's anatomy, and placement of vein cuff or patch may reduce restenosis. Although renal vein stents improved patency, the safety and durability of currently available stents need to be established. (J Vasc Surg: Venous and Lym Dis 2015;■:1-8.)

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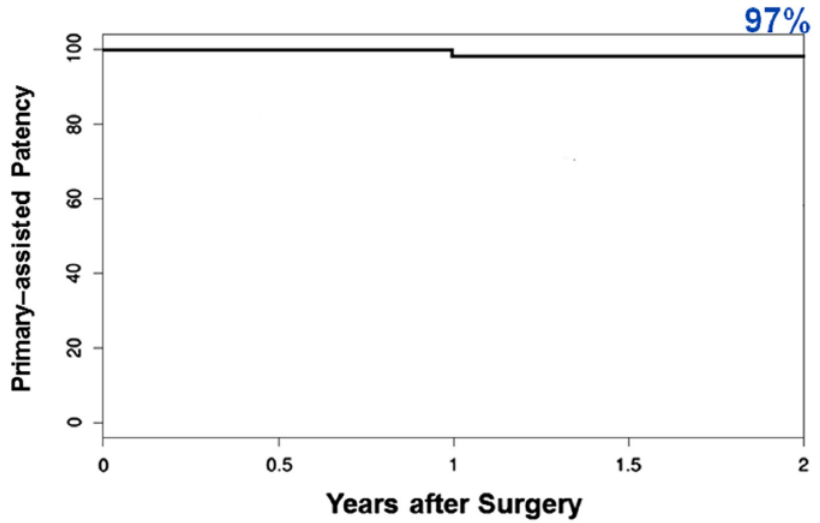

Conclusions: Open surgery, mostly LRV transposition, remains a safe and effective treatment of patients with NS. However, one of three patients after open repair required reintervention, [illegible] improved patency, the safety and durability of currently available stents need to be established. (J Vasc Surg: Venous and Lym Dis 2015;■:1-8.)

Resolution of symptoms in 87%

Endovascular Stenting for Treatment of Nutcracker Syndrome: Report of 61 Cases With Long-Term Followup

Shanwen Chen, Hongkun Zhang,* Heng Shi, Lu Tian, Wei Jin and Ming Li

From the Departments of Urology and Vascular Surgery (HZ, HS, LT, WJ, ML), First Affiliated Hospital of Medical College, Zhejiang University, Hangzhou, People's Republic of China

Abbreviations and Acronyms

EVS = endovascular stenting
IVC = inferior vena cava
LRV = left renal vein
NCS = nutcracker syndrome
PV = peak velocity
SMA = superior mesenteric artery

Submitted for publication December 9, 2010.

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Purpose: We report the efficacy and safety of endovascular stenting for nut-
cracker syndr
Materials
experienc
hematuri
Results:
diameter
vein on D
that on I
the hilar
improved
respectiv
patients
that is a s
collateral
stent migr
and stent mig
Conclusions: Based on our long-term followup endovascular stenting is a safe, effective procedure in select adults. We recommend endovascular stenting as primary option for nutcracker syndrome.

- 59 of 61 had good to excellent results
- hematuria resolved in 60%
- one stent migration – open heart surgery
- one conversion

J Urol 2011:186;570-575

Results of endovascular treatment for patients with nutcracker syndrome

Xiaobai Wang, MD, Yan Zhang, MD, Chengzhi Li, MD, and Hong Zhang, MD, *Guangzhou, China*

Objective: To retrospectively assess the therapeutic value of endovascular stenting for treatment of the nutcracker syndrome (NCS) in long-term follow-up and to explore the selection of the size of stents in Chinese patients with NCS.
Methods: From January 2004 to August 2010, 30 patients (two women and 28 men) between 13 and 32 years old (mean, 18.2) who were diagnosed with NCS were admitted for endovascular treatment. Each patient received one self-expanding metallic stent (14-mm diameter, 60-mm long) in the compressed portion of the left renal vein during the operation, and three patients with severe left-sided varicoceles received left gonadal vein embolization. The postoperative follow-up was 12 to 80 months (median, 36.0 months).
Results: The diameters at the ostium of left renal vein measured by the ultrasonic examination before treatment were 11.8 ± 1.8 [illegible] nical success of operation was achieved in all patients. No perioperative complications occurred. Two cases of stent migr[illegible]nd at 12 months: both stents prolapsed into the inferior vena cava, with uneventful follow-up (49 and 56 mo[illegible] 1-month follow-up, patients improved, including two patients who had persistent but less microscop[illegible]eatment. The clinical symptoms related to NCS almost disappeared at [illegible] and no second
Conclusions: I
long-term pat
60-mm-long
142-8.)

30 patients
No perioperative complications
2 stent migrations into IVC by 12 months
All patients improved (median follow-up of 36 mo)

A systematic review on management of nutcracker syndrome

Camilo A. Velasquez, MD,[a] Ayman Saeyeldin, MD,[a] Mohammad A. Zafar, MD,[a] Adam J. Brownstein, BA,[a] *and* Young Erben, MD,[b] *New Haven, Conn*

ABSTRACT

Objective: Although nutcracker syndrome (NS) is rare, patients presenting with symptoms or signs and anatomic compression of the left renal vein (LRV) can be considered for intervention. Open, laparoscopic, and endovascular techniques have been developed to decrease the venous outflow obstruction of the LRV. The paucity of data regarding the management of this uncommon disease process poses a challenge for adequate recommendations of the best treatment modality. Herein, we aim to present a systematic review for the management of NS.

Methods: We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement standards to systematically search the electronic databases of MEDLINE from October 1982 to July 2017 for articles about the management of NS. Included were studies in English, Spanish, and German in all age groups.

Results: The literature search provided 249 references. After abstract and full review screening for inclusion, 17 references were analyzed. Eight (47%) described the open surgical approach. The LRV transposition was the most commonly reported technique, followed by renal autotransplantation. Seven (41.11%) described the endovascular technique of stent implantation, and two (11.7%) described the minimally invasive laparoscopic extravascular stent implantation.

Conclusions: NS is a rare entity. Multiple techniques have been developed for the treatment of this condition. However, the rarity of this syndrome, the paucity of data, and the short-term follow-up of the existing evidence are the disadvantages that prevent recommendations for the best treatment strategy. Up to now, open surgical intervention, specifically LRV transposition, has been considered by some experts the mainstay for treatment of NS. The endovascular approach is gaining strength as more evidence has become available. However, the long-term patency and durability of this appro[illegible]main to be elucidated. Therefore, careful selection of patients is necessary in recommending this technique. (J [illegible] Venous and Lym Dis 2017;■:1-8.)

Nutcracker syndrom[illegible]bed in 1937 by Grant,[1] refers to patients [illegible]toms and signs associated with the [illegible] the left renal vein (LRV). Most cor[illegible] NS, which refers to the compr[illegible] perior mesenteric artery (SMA) a[illegible] variant is the posterior NS, in which[illegible] between the aorta and the vert[illegible] known pathologic processes and co[illegible] LRV cor[illegible] aortic[illegible] archi[illegible] and r[illegible] Sev[illegible] branc[illegible] nosis[illegible]

aortomesenteric narrowing of the LRV with an ensuing increase in the intraluminal pressure and development of renal hilar varices around the renal pelvis and ureter. It is hypothesized that the rupture of the thin-walled veins [illegible] the collecting system leads to macroscopic and [illegible]ic hematuria as the most common presenting [illegible]also been associated with the develop- [illegible]pecifically orthostatic proteinuria), [illegible] the occurrence of gonadal

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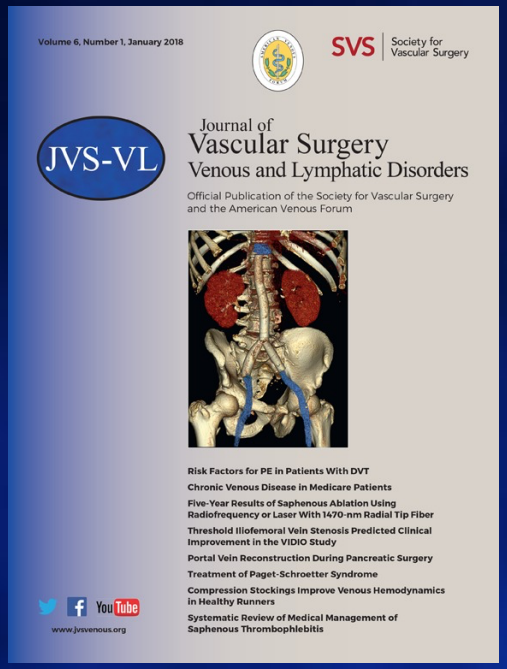


VENOUS STENTS

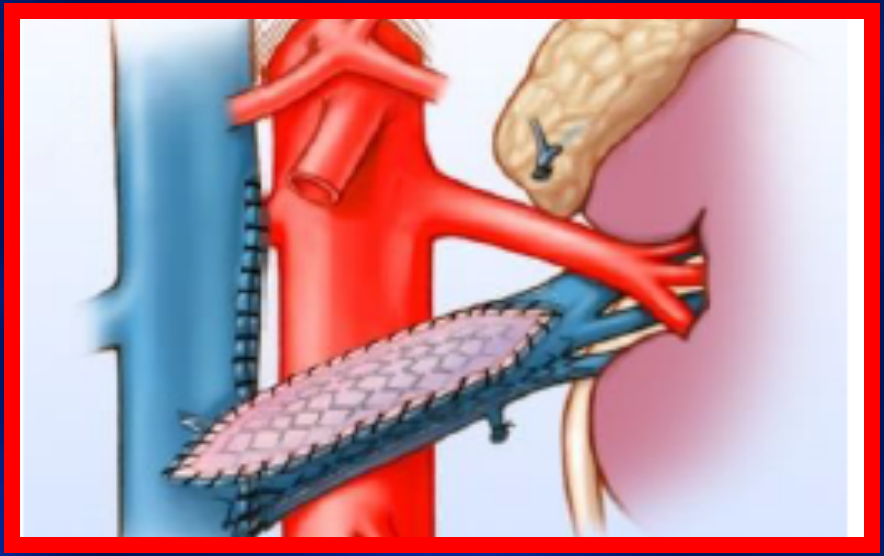
7 series, 180 patients (175 from China)

Good clinical results at 6 -126 months

Stent migration : 0 to 6.6%

HYBRID REPAIR

Transposition with patch and stent



NUTCRACKER SYNDROME
Conclusions

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Conclusions

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- Open surgery remains the first line of intervention
- Stents have a high mid-term success rate but migration, fracture, perforation and restenosis are problems
- Stent migration is prevented only with hybrid repair

NUTCRACKER SYNDROME

Clinical trials with dedicated venous stents

(short and flexible,

resist fracture and migration)

are urgently needed!

Nutcracker Syndrome: Exists And We Should Treat It With Intervention if Conservative Treatment Fails, with Excellent Chance of Clinical Success

THANK YOU!