Nutcracker Syndrome: It Exists And We Should Treat It

Peter Gloviczki MD, FACS

Joe M. and Ruth Roberts Emeritus Professor of Surgery, Chair, Emeritus, Division of Vascular and Endovascular Surgery, Mayo Clinic Rochester, MN, USA
Editor-In-Chief, Journal of Vascular Surgery
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

PSV: 147 cm/s
PSV ratio: 7.4
PSV: 20 cm/s

Narrowest Point
Hilum
CTA/MRA

Aorta-SMA angle:

\[ 23.3 \pm 5.8^\circ \]

\( n=34 \)

(Normal: \( 38^\circ \))

Angle \( 18.5^\circ \)
Venogram with Pressure measurements

Lumbar and gonadal collaterals

Pressure gradient (LRV/IVC): $3.4 \pm 1.4$

$n=27$
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-ilial vein anastomosis
- Renal autotransplantation
- Transposition of the SMA
- Nephropexy
- Nephrectomy
Operative Technique

Saphenous vein cuff

Saphenous vein patch
Treatment of nutcracker syndrome with open and endovascular interventions

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

Conclusion: 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, 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;1:1-8.)
Treatment of nutcracker syndrome with open and endovascular interventions

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

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

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, or patch may reduce reinterventions. 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;1:1-8.)
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

Purpose: We report the efficacy and safety of endovascular stenting for nutcracker syndrome based on followup.

Materials and Methods: A total of 61 consecutive patients experienced hematuria, and all were treated with endovascular stenting. The patients were followed up at 3, 6, and 12 months. The stents were left in place, and the diameter of the renal vein on Doppler ultrasound improved in all patients.

Results: Of the 61 patients, 59 had good to excellent results. Hematuria resolved in 60%. One stent migrated and required open heart surgery. One conversion was reported.

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.
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 mm. Technical success of operation was achieved in all patients. No perioperative complications occurred. Two cases of stent migration were found at 12 months: both stents prolapsed into the inferior vena cava, with uneventful follow-up (49 and 56 months). At 1-month follow-up, patients improved, including two patients who had persistent but less microscopic symptoms for 12 months. The clinical symptoms related to NCS almost disappeared at 7 to 14 months, and no secondary symptoms were observed.

Conclusions: For these patients, endovascular treatment is an efficient and safe method for the long-term management of NCS. The clinical symptoms related to NCS almost disappeared at 7 to 14 months, and no secondary symptoms were observed.

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

• If diagnosis confirmed, treat conservatively
NUTCRACKER SYNDROME
Conclusions

• If diagnosis confirmed, treat conservatively

• Open surgery remains the first line of intervention
Conclusions

• If diagnosis confirmed, treat conservatively
• Open surgery remains the first line of intervention
• Stents have a high mid-term success rate but migration, fracture, perforation and restenosis are problems
Conclusions

- If diagnosis confirmed, treat conservatively
- 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!