



## Case report

## Large varicocele revealing a nutcracker syndrome: A case report and literature review

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## ABSTRACT

**Introduction:** Varicocele is a common condition that can cause male infertility and chronic scrotal pain. While most cases are idiopathic, secondary causes such as Nutcracker Syndrome (NCS) should be considered in atypical presentations, especially when hematuria is present.

**Case presentation:** A 22-year-old male presented with chronic left scrotal pain and intermittent hematuria. Physical examination and Doppler ultrasound confirmed a grade III left varicocele. Further imaging with CT angiography revealed NCS, characterized by left renal vein compression. Due to the mild nature of NCS symptoms and the patient's preference to avoid major surgery, only a varicocelectomy via the Ivanissevich technique was performed.

**Discussion:** Secondary varicoceles require careful evaluation to rule out underlying causes such as NCS. Treatment varies based on symptom severity, with options ranging from conservative management to surgical intervention. In cases where NCS is mild, varicocelectomy alone can effectively relieve scrotal pain.

**Conclusion:** NCS should be considered in patients with varicocele and hematuria. While major interventions may be necessary in severe cases, isolated varicocelectomy can be an effective treatment for pain relief in selected patients.

## 1. Introduction

Varicocele, characterized by the abnormal dilation of the pampiniform plexus veins, affects approximately 15 % of the male population, with a higher incidence among men evaluated for infertility [1]. While the majority of cases are idiopathic, secondary causes such as Nutcracker Syndrome (NCS)—where the left renal vein is compressed between the aorta and superior mesenteric artery—can lead to venous hypertension and subsequent varicocele formation [2]. This case report describes a rare presentation of voluminous varicocele secondary to NCS, emphasizing diagnostic challenges and therapeutic approaches, followed by an in-depth literature review.

## 2. Case presentation

A 22-year-old male with no notable past medical history presented with a three-year history of chronic left scrotal pain. The pain, moderate in intensity, worsened with physical activity and warm temperatures,

radiating along the spermatic cord. It was partially relieved by level 1 analgesics, and the patient denied associated symptoms such as fever or dysuria. He also reported intermittent hematuria, which raised suspicion of an underlying secondary cause.

On physical examination, the left testicle was mildly tender, and a large, visible varicocele (grade III) was noted in the left spermatic cord. The varicocele was painful on palpation and dilated further during the Valsalva maneuver (Fig. 1). The right scrotum and testicle were unremarkable. Scrotal Doppler ultrasound confirmed significant pampiniform plexus dilation, with a venous diameter of 3.5 mm at rest, increasing to 4.2 mm with Valsalva, and retrograde flow persisting for >2 s. The left testicle measured 18 mL (slightly hypotrophic) compared to 22 mL on the right (Fig. 2). Semen analysis was normal, ruling out infertility as a complicating factor.

The presence of hematuria prompted a renal ultrasound, which revealed left renal vein dilation. A CT angiogram subsequently confirmed NCS, demonstrating a left renal vein diameter of 12 mm at the hilum and 6.3 mm at the aortomesenteric junction (hilum-to-

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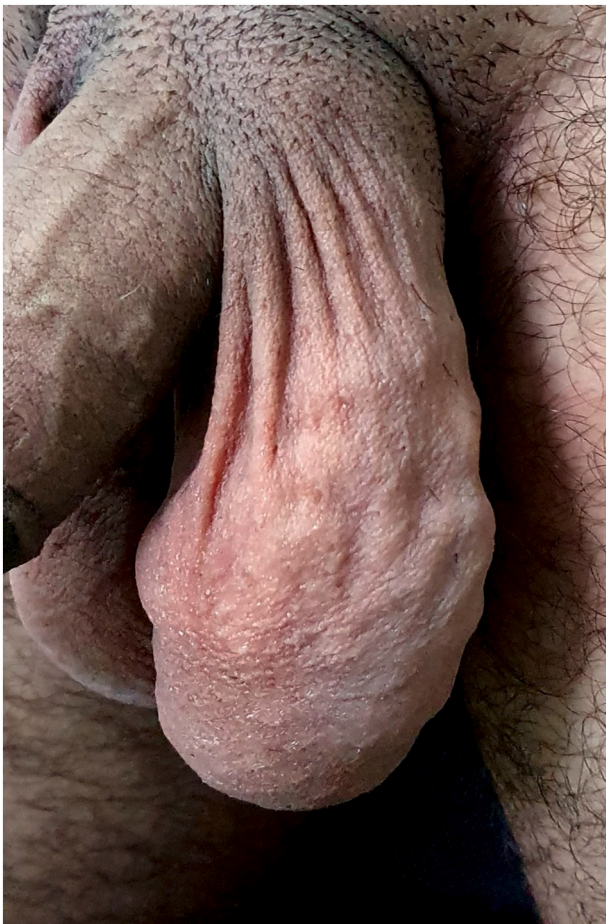
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**Fig. 1.** Clinical image showing a visibly dilated and tortuous spermatic cord, characteristic of a prominent grade III varicocele, accentuated by the Valsalva maneuver.

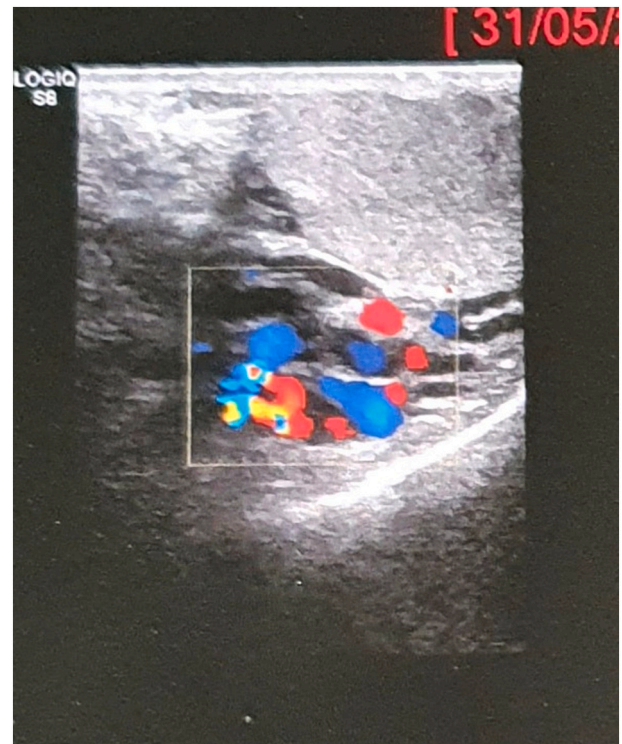
aortomesenteric ratio of 1.9, normal  $<1.5$ ), an aortomesenteric angle of 25 degrees (normal  $>35^\circ$ ), and marked dilation of the pampiniform plexus. (Fig. 3).

Given the chronic pain and its impact on quality of life, and considering the pauci-symptomatic nature of Nutcracker Syndrome, the patient opted to avoid a major surgical intervention. As a result, only a varicocele repair using the Ivanissevich technique was performed. This approach was chosen due to the surgical team's experience with this method and the limited availability of microsurgical resources. The procedure involved an inguinal incision, dissection to the spermatic cord, and selective ligation of the dilated veins (See Fig. 4). The surgery was uncomplicated, and the patient was discharged the same day.

Postoperative follow-up was conducted for six months. During this period, the patient reported complete resolution of hematuria and a marked improvement in scrotal pain. No recurrence of symptoms was observed.

### 3. Discussion

Varicoceles are predominantly idiopathic, but secondary etiologies must be considered in atypical cases, such as those with hematuria, bilateral involvement, or resistance to conventional treatment. Rare causes include Nutcracker Syndrome (NCS), renal tumors, retroperitoneal pathology, and venous malformations. NCS results from compression of the left renal vein between the aorta and the superior mesenteric artery, leading to venous hypertension, gonadal vein dilation, and varicocele formation. It remains underdiagnosed but is increasingly



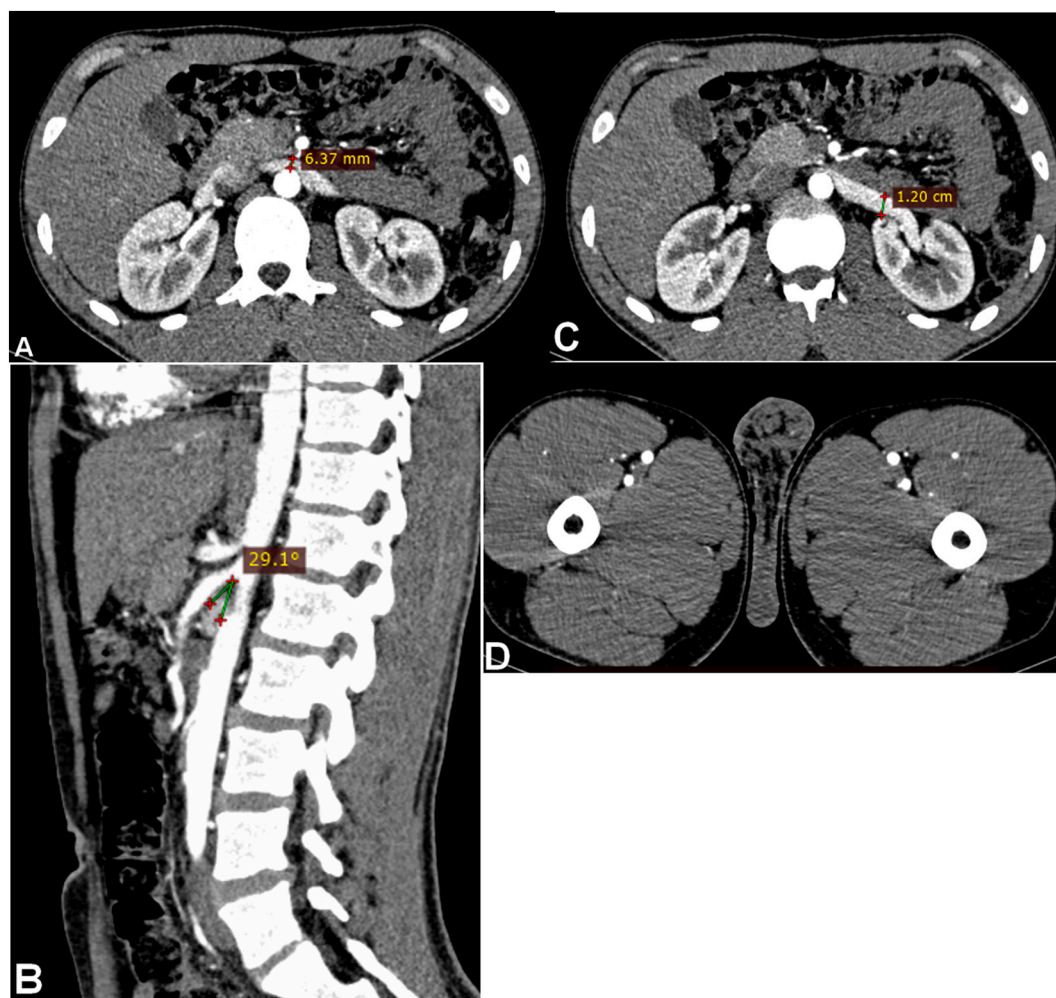
**Fig. 2.** Doppler ultrasound image showing dilated veins of the pampiniform plexus with visible venous distension and retrograde flow, accentuated during the Valsalva maneuver, consistent with a varicocele.

recognized in young adults presenting with hematuria and scrotal pain [2,3]. Renal tumors, particularly renal cell carcinoma, may extend thrombi into the renal vein or inferior vena cava, obstructing venous outflow and producing varicocele, typically on the left side due to anatomical venous drainage patterns [4]. Retroperitoneal masses, fibrosis, or lymphadenopathy may also exert compressive effects on the gonadal vein, mimicking the hemodynamic consequences of NCS [5]. Additionally, congenital venous malformations can predispose individuals to varicocele formation [6].

In this case, NCS was confirmed through imaging criteria, including a hilar-to-aortomesenteric diameter ratio  $>1.5$  and an aortomesenteric angle below  $35^\circ$ , which align with established diagnostic thresholds [7,8]. A study by Shin et al. (2007) validated these parameters using Doppler ultrasonography, reporting a sensitivity of 80 % and specificity of 94 % for diagnosing NCS in symptomatic patients [9]. Kurklinsky and Rooke (2010) highlighted CT and MRI as the gold standards for diagnosis, emphasizing the “beak sign” as a hallmark feature of severe renal vein compression [10]. Additional literature describes rare presentations of varicocele, including renal vein thrombosis due to hypercoagulable states, as documented by El-Saeity and Sidhu (2006), reinforcing the necessity of hematologic assessment in atypical presentations [11]. Similarly, retroperitoneal sarcomas have been linked to secondary varicocele formation in 3 % of cases, as reported by Chen et al. (2018) [12].

Management of secondary varicocele varies according to the underlying etiology. Conservative management is an option for mild NCS, with Kim et al. (2015) reporting that 60 % of asymptomatic NCS cases remained stable without intervention over a two-year period [13]. Surgical varicocelectomy remains a viable approach, particularly in cases where pain is the predominant complaint. Ivanissevich (1960) demonstrated a 95 % success rate for pain relief following ligation of dilated veins via an inguinal incision [14]. Microsurgical subinguinal varicocelectomy further improves outcomes by preserving arteries and lymphatics, leading to a recurrence rate of only 1–2 %, with Goldstein





**Fig. 3.** (A, C) Axial CT images showing the difference in left renal vein diameter, with significant dilation at the hilum and narrowing at the aortomesenteric junction. (B) Sagittal reconstruction demonstrating a reduced aortomesenteric angle of  $<35^\circ$ , consistent with Nutcracker Syndrome. (D) axial view highlighting the dilation of the pampiniform plexus, indicative of secondary varicocele.

et al. (1992) reporting improved semen parameters in 70 % of infertile men undergoing this procedure [15,16]. Specific interventions for NCS include renal vein stenting, venous transposition, and percutaneous embolization. Chen et al. (2014) reported an 85 % symptom resolution rate following stenting, with no major complications at 12-month follow-up [17]. Venous transposition, though associated with higher morbidity, has been shown to provide sustained symptom relief in 78 % of patients over five years [18]. Percutaneous embolization, although effective for idiopathic varicocele, has a higher recurrence rate in NCS-associated cases due to persistent renal venous hypertension, as observed by Halpern et al. (2016) [19]. A comparative meta-analysis by Kumar et al. (2020) found surgical ligation superior to embolization for pain relief, with 90 % versus 75 % resolution rates in secondary varicocele cases [20]. Emerging research suggests that laparoscopic decompression of the aortomesenteric angle may offer a promising alternative, with Wang et al. (2021) reporting a 92 % success rate in patients with combined varicocele and hematuria [21].

#### 4. Conclusion

Varicocele secondary to Nutcracker Syndrome represents a rare yet treatable cause of scrotal pain and testicular dysfunction. This case underscores the importance of recognizing atypical features and pursuing targeted imaging. Surgical intervention, tailored to the patient's symptoms and etiology, remains the mainstay of treatment, with emerging

NCS-specific options offering promise for complex cases.

#### Consent

patient consent is obtained.

#### Methods

This the work has been reported in line with the SCARE criteria.

#### Ethical approval

ethical approval is obtained from the ethical comity of the hospital.

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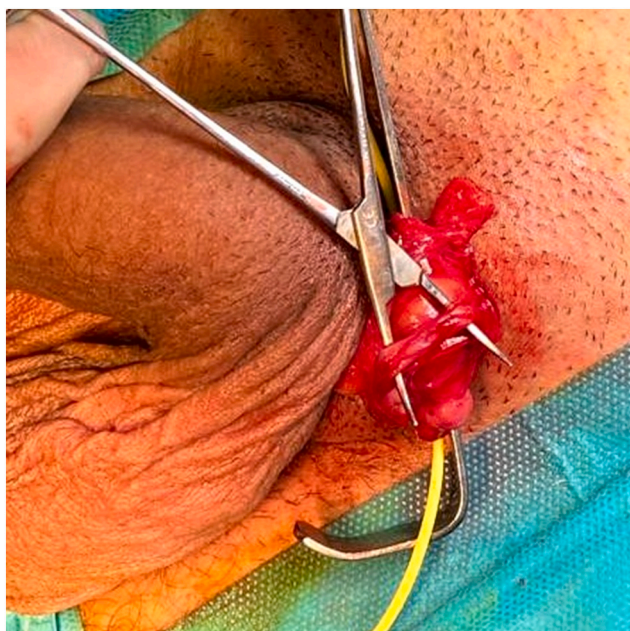
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**Fig. 4.** Inguinal incision for the Ivanissevich procedure, showing exposure of the spermatic cord with individualization of a dilated vein for selective ligation.

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#### Declaration of competing interest

I declare no conflict of interest.

#### References

- [1] J.P. Jarow, Effects of varicocele on male fertility, *Hum. Reprod. Update* 7 (1) (2001) 59–64.
- [2] K. Ahmed, et al., Nutcracker syndrome: a rare cause of left flank pain that can also manifest as hematuria, *Kidney Int.* 78 (5) (2010) 502.
- [3] U. Rudloff, et al., Nutcracker syndrome: a rare cause of hematuria and proteinuria, *Urology* 68 (2) (2006) 428, e9–11.
- [4] A. Shafik, et al., Varicocele due to renal vein thrombosis: a case report, *Int. Urol. Nephrol.* 22 (4) (1990) 349–352.
- [5] B.L.R.A. Coolsaet, The varicocele syndrome: venography determining the optimal level for surgical management, *J. Urol.* 124 (6) (1980) 833–839.
- [6] S. Nosaka, et al., Congenital venous anomalies associated with varicocele, *J. Vasc. Surg.* 22 (3) (1995) 324–328.
- [7] S. Takebayashi, et al., MR imaging of the nutcracker syndrome: findings based on helical CT, *AJR Am. J. Roentgenol.* 163 (5) (1994) 1197–1201.
- [8] A.K. Kurklinsky, T.W. Rooke, Nutcracker phenomenon and nutcracker syndrome, *Mayo Clin. Proc.* 85 (6) (2010) 552–559.
- [9] J.I. Shin, et al., Nutcracker syndrome in children with orthostatic proteinuria: diagnosis on the basis of Doppler sonography, *J. Ultrasound Med.* 26 (1) (2007) 39–45.
- [10] A.K. Kurklinsky, T.W. Rooke, Nutcracker phenomenon and nutcracker syndrome, *Mayo Clin. Proc.* 85 (6) (2010) 552–559.
- [11] N.S. El-Saeity, P.S. Sidhu, Varicocele secondary to renal vein thrombosis: a case report, *Clin. Radiol.* 61 (5) (2006) 447–450.
- [12] Q. Chen, et al., Retroperitoneal sarcoma presenting as varicocele: a case series, *J. Surg. Oncol.* 117 (4) (2018) 682–686.
- [13] W.S. Kim, et al., Natural history of nutcracker syndrome: a 2-year follow-up study, *Korean J. Urol.* 56 (6) (2015) 452–457.
- [14] O. Ivanissevich, Left varicocele due to reflux; experience with 4,470 operative cases in forty-two years, *J. Int. Coll. Surg.* 34 (1960) 742–755.
- [15] J.L. Marmar, et al., Subinguinal microsurgical varicocelectomy: a technical critique and statistical analysis of semen and pregnancy data, *J. Urol.* 152 (4) (1994) 1127–1132.
- [16] M. Goldstein, et al., Microsurgical inguinal varicocelectomy with delivery of the testis: an artery and lymphatic sparing technique, *J. Urol.* 148 (6) (1992) 1808–1811.
- [17] Y.M. Chen, et al., Endovascular stenting for the treatment of Nutcracker syndrome: report of 9 cases, *J. Urol.* 191 (4) (2014) e715.
- [18] R.J. Hart, et al., Long-term outcomes of renal vein transposition for Nutcracker syndrome, *Ann. Vasc. Surg.* 56 (2019) 89–95.
- [19] J. Halpern, et al., Percutaneous embolization of varicocele: technique, indications, relative contraindications, and complications, *Asian J. Androl.* 18 (2) (2016) 234–238.
- [20] R. Kumar, et al., Comparison of outcomes in the management of varicocele: surgery vs. embolization, *Fertil. Steril.* 114 (2) (2020) 287–294.
- [21] L. Wang, et al., Laparoscopic decompression for Nutcracker syndrome with varicocele: a case series, *Surg. Endosc.* 35 (8) (2021) 4567–4573.