

Retrocaval ureter and the diagnostic utility of dynamic scintigraphy: A case report

Sıla Ece Tiryaki¹, İrem İnanç², Dinçer Avlan³

Retrocaval ureter, also known as circumcaval ureter or pre-ureteral vena cava, is a rare congenital anomaly characterized by the persistence of posterior cardinal veins in front of the ureter due to their failure to regress in early embryonic development.^[1,2] It has an autopsy incidence of 0.9 per 1,000, with a predominance on the right side. On the left side, it is associated with partial or complete situs inversus anomalies or inferior vena cava duplications.^[2]

With multiple variants defined in the literature, in most cases, the main symptoms include discomfort, right flank pain, hematuria, recurrent infections, fever, and stone formation that manifest in the third or fourth decades.^[1,2] While some patients remain asymptomatic throughout their lives, patients who present with obstruction symptoms or kidney function deficits require surgical intervention.^[2] There are several open surgical methods; in particular, ureteroureterostomy has been considered gold standard, since it was first used to treat a patient with a retrocaval ureter by Anderson and Hynes in 19492.^[3] Recent studies have also suggested laparoscopy as a less invasive method with significantly prolonged operation duration.^[2]

Received: July 22, 2024

Accepted: December 06, 2024

Published online: March 17, 2025

Correspondence: Sıla Ece Tiryaki, MD.

E-mail: setiryaki11@gmail.com

Department of Pediatric Surgery, Trakya University Faculty of Medicine, Edirne, Türkiye.

Citation:

Tiryaki SE, İnanç İ, Avlan D. Retrocaval ureter and the diagnostic utility of dynamic scintigraphy: A case report. Turkish J Ped Surg 2025;39(1):43-45. doi: 10.62114/JTAPS.2025.55.



This is an open access article licensed under the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0). <https://creativecommons.org/licenses/by-nc/4.0/>

Abstract

Retrocaval ureter is a rare congenital anomaly characterized by the persistence of posterior cardinal veins in front of the ureter due to their failure to regress in early embryonic development. Its main symptoms are discomfort, right flank pain, hematuria, recurrent infections, fever, and stone formation. A seven-year-old male patient presented with hematuria. Urinary ultrasound revealed Grade 2 hydronephrosis in the right kidney and dilation in the right proximal ureter. Considering the possibility of ureteropelvic junction obstruction, dynamic renal scintigraphy was performed which showed radiopharmaceutical accumulated in the mid-segment of the right ureter, likely due to compression that did not pass distally. To confirm the diagnosis, retrograde pyelography was performed perioperatively, and it was consistent with the retrocaval ureter. Laparotomy showed that the ureter ran behind the inferior vena cava from its mid-segment. A ureteroureterostomy was performed, the ureter was positioned anterior to the inferior vena cava, and a ureteral stent was inserted. In conclusion, renal scintigraphy traditionally provides information about the degree of obstruction and renal function. However, as in the presented case, the examination of dynamic renal scintigraphy images showing the accumulation of radiopharmaceutical substance in the mid-segment of the ureter and the absence of the distal ureter may indicate a retrocaval ureter. It is, therefore, of utmost importance for clinicians to review the images obtained from dynamic scintigraphy in cases of obstructive uropathy and recognize the possibility of retrocaval ureter.

Keywords: Retrocaval ureter, scintigraphy, ureteral obstruction.

In this article, we report a case of retrocaval ureter diagnosis which was confirmed by renal scintigraphy and was successfully treated with ureteroureterostomy.

CASE REPORT

A seven-year-old male patient presenting with hematuria was referred to the Department of Pediatric Surgery. Urinary ultrasound revealed

Grade 2 hydronephrosis in the right kidney and dilation in the right proximal ureter. No significant pathology was reported in the left kidney and ureter. Considering the possibility of ureteropelvic junction obstruction, dynamic renal scintigraphy (Tc-99m mercaptoacetyltriglycine [MAG3]) was performed. It was reported as a partial response to diuretics in the right kidney, with ongoing retention in the renal pelvis and dilated 1/2 proximal ureter. In the dynamic scintigraphy images, the radiopharmaceutical was found to be accumulated in the mid-segment of the right ureter, likely due to compression, and did not pass distally (Figure 1). To confirm the diagnosis, retrograde pyelography was performed perioperatively and it was consistent with the retrocaval ureter (Figure 2). Subsequently, a laparotomy was performed. During laparotomy, it was discovered that the ureter ran behind the inferior vena cava from its mid-segment (Figure 3). An open ureteroureterostomy was, then, performed, and the ureter was positioned anterior to the

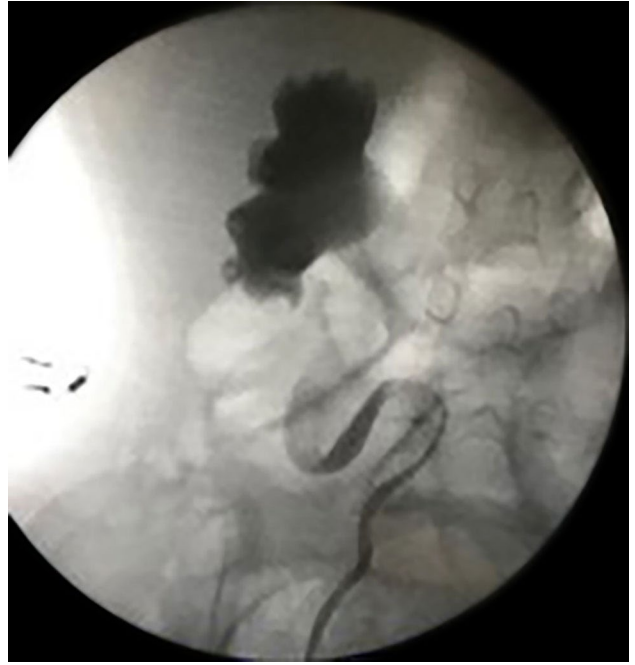


Figure 2. Retrograde pyelography image.



Figure 1. Reverse J sign in MAG3 (arrow).

MAG3: Mercaptoacetyltriglycine.

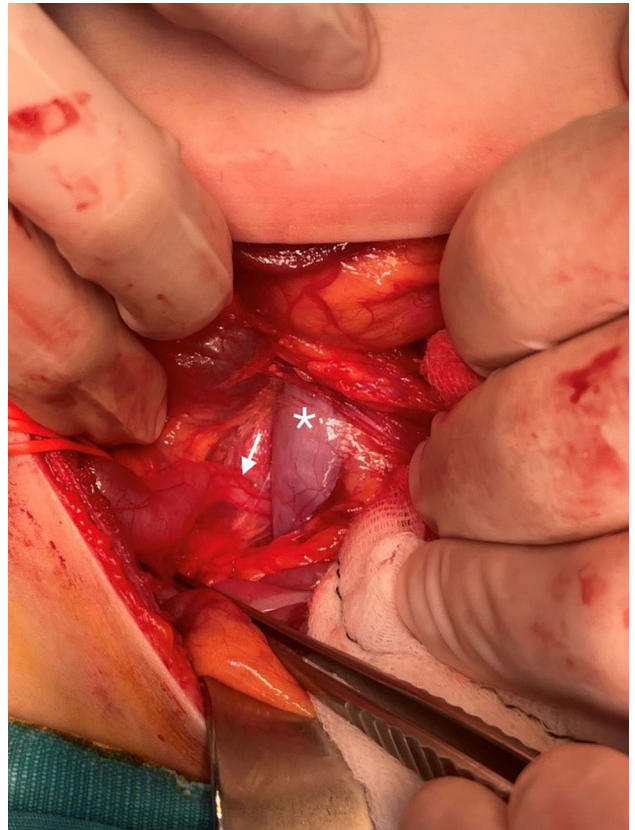


Figure 3. Intraoperative image of vena cava and ureter.

Arrow: right ureter and asterisk; * Vena cava inferior.

inferior vena cava, and a ureteral stent was inserted to preserve the anastomosis. The stent was removed three weeks after surgery and control ultrasound showed regression of hydronephrosis. A written informed consent was obtained from the parent of the patient.

DISCUSSION

Obstructive uropathy caused by the ureter being compressed by the inferior vena cava results in findings of moderate hydronephrosis and dilation in the proximal ureter on ultrasound. Currently, intravenous magnetic resonance imaging-urography (MRI-urography), three-dimensional (3D)-computed tomography (3D-CT), and retrograde pyelography are the methods used for diagnosis, with the abrupt narrowing and interruption of the ureter in the mid-segment being described as a “fishhook” or “reverse J” sign.^[4-6] Renal scintigraphy traditionally provides information about the degree of obstruction (diethylenetriamine pentaacetate [DTPA] or MAG3) and renal function (dimercaptosuccinic acid [DMSA]).^[7] However, as in the presented case, the examination of dynamic renal scintigraphy images showing the accumulation of radiopharmaceutical substance in the mid-segment of the ureter and the absence of the distal ureter may be indicative of a retrocaval ureter. As a result of scintigraphy images, renograms, and clinical features suggesting obstruction, many causes, such as foreign bodies, inflammation, tumors, and anatomical abnormalities that cause obstruction, may be suspected. However, as in our case, the diagnosis should be confirmed via a CT or an MRI scan, the gold-standard imaging technique.^[2] In this case, scintigraphy is not mentioned as the gold-standard imaging method, but as a provider of findings that can direct clinicians to a retrocaval ureter diagnosis in mid-obstruction findings.

Scintigraphy remains a preferred method due to minimal complications and low costs.^[8] It is also preferred in cases where CT and MRI scans should be avoided, such as claustrophobia and allergy to contrast matter. Also, it can be preferred, particularly

in pediatric patients, due to lower-dose radiation exposure compared to a CT scan.^[8]

In conclusion, it is of paramount importance for clinicians to review the images obtained from dynamic scintigraphy in cases of obstructive uropathy and recognize the possibility of retrocaval ureter, among other differential diagnoses, while encountering such images.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept: S.E.T.; Design, analysis and/or interpretation: set literature review, writing the article: S.E.T., İ.İ.; Control/supervision: İ.İ., D.A.; Data collection and/or processing: İ.İ.; Critical review: D.A.; References and fundings, materials, other: N/A.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Lesma A, Bocciardi A, Rigatti P. Circumcaval ureter: embryology. *Eur Urol* 2006;5(Suppl.):444-448.
2. Salonia A, Maccagnano C, Lesma A, et al. Diagnosis and treatment of the circumcaval ureter. *Eur Urol Open Sci* 2006;5:449-462.
3. Anderson JC, Hynes W. Retrocaval ureter; a case diagnosed pre-operatively and treated successfully by a plastic operation. *Br J Urol* 1949;21:209-14. doi: 10.1111/j.1464-410x.1949.tb10773.x.
4. Hoffman CF, Dyer RB. The "fish hook" sign of retrocaval ureter. *Abdom Radiol (NY)* 2018;43:755-7. doi: 10.1007/s00261-017-1248-7.
5. Pienkny AJ, Herts B, Streem SB. Contemporary diagnosis of retrocaval ureter. *J Endourol* 1999;13:721-2. doi: 10.1089/end.1999.13.721.
6. Ratkal JM, Jadhav R, Naique Dessai RR. Circumcaval ureter-the paradigm shift in diagnosis and management. *Indian J Surg* 2016;78:37-40. doi: 10.1007/s12262-015-1352-2.
7. Abdessater M, El Khoury R, Elias S, Bart S, Coloby P, Sleiman W. Diagnosis and laparoscopic management of retrocaval ureter: A review of the literature and our case series. *Int J Surg Case Rep* 2019;59:165-75. doi: 10.1016/j.ijscr.2019.05.036.
8. Banker H, Sheffield EG, Cohen HL. Nuclear Renal Scan. [Updated 2023 Aug 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK562236/>