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Incomplete Bifid Ureter with Corresponding Venous Anomalies

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Background

Duplication of the ureter can be classified as complete and incomplete duplex ureters and is one of the most common congenital anomalies of the urinary tract.[4] The most accepted theory of a ureteral duplication (complete duplication) involves two ureteric buds developing from the mesonephric duct instead of one. The ureteric bud divides early, inducing two collecting systems. This bifid ureter will insert into the bladder in an abnormal position, leading to increase risk of UTIs and vesicoureteral reflux. Incomplete duplication is thought to result from a single ureteric bud bifurcating during development.[1,3]

Case Presentation and Findings

- During routine cadaveric dissection of a nonagenarian female donor, an incomplete duplicated (bifid) ureter was identified on the right side.
- The duplicated ureter united proximally before entering the bladder as a single ureter.
- In addition, an unusual positional relationship between the abdominal aorta and inferior vena cava was observed, with the major vessels demonstrating an atypical orientation.
- The inferior vena cava was positioned on the left side.
- The kidneys appeared grossly unremarkable, and no additional urinary tract abnormalities were appreciated.

Clinical Significance

Although bifid ureters and renal vascular anomalies have been described independently and in association with one another, the literature regarding the coexistence of a unilateral bifid ureter and inferior vena cava anomalies remains limited.

More research is needed to access the relationship between a bifid ureter and left IVC for a deeper understanding for clinicians.

A left IVC can cause confusion when interpreting radiographs, venous and arterial access, and IVC filter placement.[2]





Conclusion

- This case highlights the incidental discovery of a right-sided bifid ureter with concurrent atypical great vessel anatomy during cadaveric dissection.
- Although a direct embryologic relationship cannot be established from a single observation, awareness of these anatomic variants is essential for operative planning, radiologic interpretation, and anatomy education.
- Additional reports are needed to determine whether this combination is coincidental or reflects a broader pattern of developmental variation.

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References

1. Mugunthan N, Felicia C, Anbalagan J. Bifid ureter and multiple renal arteries: clinical and embryological significance. *Indian J Basic Appl Med Res.* 2016;5(2):203-209.
2. Smillie RP, Shetty M, Boyer AC, Madrazo B, Jafri SZ. Imaging evaluation of the inferior vena cava. *RadioGraphics.* 2015;35(2):578-592. doi:10.1148/rg.352140136
3. Hopkins LM. Duplicated collecting system. *Am J Obstet Gynecol.* 2021;225(5):B12-B13. doi:10.1016/j.ajog.2021.06.040.
4. Seu Y, Park HJ, Park JS, Moon YS, Kim H, Hur MS. A bifid ureter originating from separate major calyx and renal pelvis with dual calyceal systems: a case report. *Anat Cell Biol.* 2024;57(3):476-480. doi:10.5115/acb.24.033.