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Current Medical Imaging, 2020, *16*, 1-00

CASE REPORT

A Rare Case of Ureteral Diverticulum Incidentally Detected During Angiography

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ARTICLE HISTORY

Received: February 26, 2020
Revised: August 11, 2020
Accepted: September 16, 2020

DOI:
10.2174/1573405616999201029123851

Abstract: ***Background*:** A ureteral diverticulum (UD) is a rare urological malformation characterized by the saccular enlargement of the ureteral wall. It can be of different sizes and in various localizations. In the literature, three types of UD have been defined as abortive bifid ureter, congenital, and acquired.

***Case Report*:** In a 65-year-old male patient, an enlargement was incidentally detected in the distal part of the right ureter on fluoroscopy during the passage of the contrast agent applied during angiography. The medical history of the patient was not remarkable; thus, computed tomography (CT) was performed to investigate the etiology. A dilated tubular structure separate from the ureter was observed in the middle part of the right ureter on CT, clearer in the excision phase. This tubular structure distally connected with the ureter and was consistent with the abortive bifid ureter type of UD.

***Discussion*:** UD may present with renal colic, hematuria, and upper urinary tract infections, or it may be asymptomatic as in our case. Asymptomatic cases are usually incidentally detected during radiological imaging. Although treatment is not required for these patients, surgical treatment may be required in the presence of symptoms.

***Conclusion*:** UD is an entity that can be asymptomatic until adulthood and may be detected incidentally in radiological evaluations. UD should be kept in mind when the cystic lesion associated with the ureter is detected in radiological examination. Excretory phase CT/CT urography noninvasive imaging method must be preferred to evaluate the relationship of the lesion with the ureter.

1. INTRODUCTION

A ureteral diverticulum (UD) is a rare urological malformation characterized by the saccular enlargement of the ureteral wall. It can be seen in different sizes and different localizations. Symptomatic patients usually present with symptoms, such as flank pain, fever, and painless hematuria [1]. Although many theories about the etiology of UD have been proposed, it is not yet precisely known. Three types of UD have been described in the literature: abortive bifid ureter, congenital, and acquired diverticulum; features are summarized in Table **1** [2]. In this paper, we havediscussed an asymptomatic case incidentally detected during diagnostic angiography.

2. CASE REPORT

A 65-year-old male patient presented to the interventional radiology outpatient clinic for prostatic artery embolization. The patient had no additional symptoms except for benign prostatic hyperplasia findings. There were no abnormal findings in routine blood and urine tests performed before the procedure. The patient's creatinine values were within normal limits. During the passage of the contrast material applied in the angiographic procedure, a focal enlargement was detected in the distal part of the right ureter on fluoroscopy (Fig. **1**).

Table 1. Ureteral Diverticulum Types.

Abortive Diverticulum	Congenital Diverticulum	Acquired Diverticulum
Most frequently		Least commonly
Ety: Disordered ureteric budding	Ety: Congenital tru diverticul	Ety: Distally ureteric obstruksion (calculus, BPH)
True congenital diverticulum (containing all tissue layers)	True congenital diverticulum (containing all tissue layers)	Only mucosal herniation
Asymptomatic	Asymptomatic	Symptomatic
Conservative management (If symptomatic- diverticulectomy)	Conservative management (If symptomatic- diverticulectomy)	Treatment of the underlying cause

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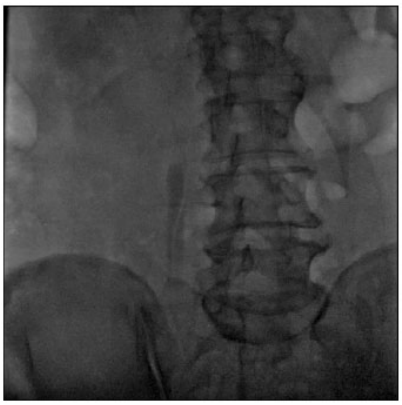

Fig. (1). The right oblique fluoroscopy image showing excessive filling in the middle-distal part of the right ureter and the immediately medial normal right ureter.

The patient had no history of the stone disease or urological surgery. There was also no known history of an additional disease. No physical feature was detected during the physical examination. Therefore, computed tomography (CT) was performed with the urography protocol to investigate the etiology of the dilatation in the middle-distal part of the right ureter, which was detected incidentally. CT revealed a distinct tubular structure showing dilatation in the middle part of the right ureter and was more clearly visualized in the urographic phase. It joined the ureter at the distal end, immediately proximal to the ureterovesical junction, and opened to the bladder (Figs. **2**, **3**, **4**). The findings were evaluated as the abortive bifid ureter type of UD. During the follow-up, both kidneys, the left ureter, and the bladder were evaluated as normal.

3. DISCUSSION

UD is a very rare urological pathology. It was first described in an autopsy case in 1808, and according to the review undertaken in 2013, only 47 cases have been reported in the literature [3]. Gray and Skandalakis divided UD into three categories as abortive ureteral duplication blind-ending bifid ureters, congenital diverticulum, and acquired diverticulum [2].

The occlusion of the distal tip of the ureter plays a role in the pathogenesis of the acquired diverticulum. This is similar to the pathogenesis of the diverticula of other organs, such as the bladder. It is caused by pathologies, such as stones resulting in increased pressure and leads to an obstruction at the distal part. Urethral valves, strictures, and polyps have also been implicated in the etiology of UD. Due to the increase in pressure, mucosal herniation is observed at the weak point of the ureteral wall. Acquired diverticula are separated from pseudodiverticula with their single and large structures. Congenital diverticula arise from abnormal processes in the embryological period of the urogenital system. According to some authors, the congenital diverticulum is a variation of an incomplete double ureter. It can, therefore, be considered as a blind-ended incomplete bifid ureter during the development of congenital diverticulum [4, 5].

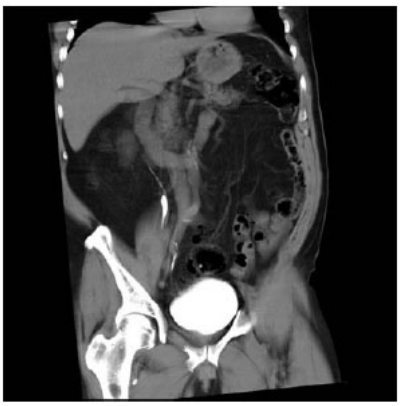

Fig. (2). The CT image in the coronal oblique excretory phase revealing a ureteral diverticulum separate from the ureter in the proximal part, observed to be filled with contrast medium.

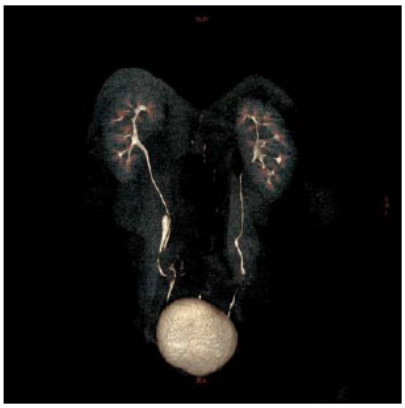

Fig. (3). The three-dimensional reconstructed CT image in the excretory phase revealing the relationship between the ureteral diverticulum and the right ureter. The proximally blind-ending ureteral diverticulum joins the normal ureter at the distal end, immediately proximal to the ureterovesical junction.

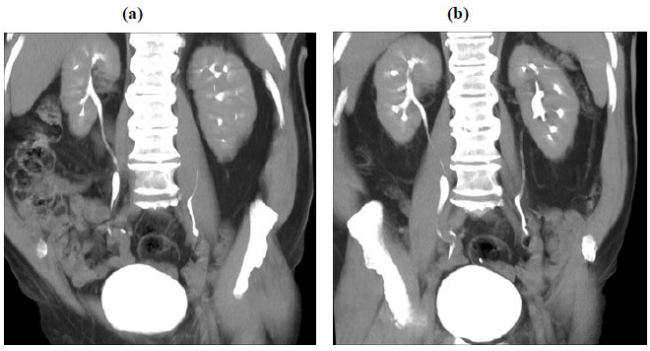

Fig. (4). The CT image in the coronal oblique MIP reformat images showing the course of the ureter adjacent to the ureteral diverticulum (**a**) and the ureter entry point of the diverticulum (**b**).

UD may present with renal colic, hematuria, and upper urinary tract infections, or it may be asymptomatic, as in our case. Unlike a ureterocele, it is reported that UD does not cause obstruction. However, the blockage of the distal of the

pouch can cause ureteral stenosis and, consequently, hydronephrosis. In addition, a case of UD that led to the development of pyelonephritis has been previously reported [6]. In the literature, only patients presenting with painless hematuria have been described [3].

Asymptomatic patients are usually incidentally detected during radiological imaging [7]. Due to the rarity of UD, it is not common to suspect this condition in preliminary diagnosis; however, it is reported that when the possibility of UD is considered, ultrasonography (US) is the first modality to be used for its diagnosis [8]. In the literature, cases of UD detected by antenatal US have been reported [4]. In patients presenting symptomatically, CT is generally used for the investigation of the etiology. If there are other pathologies, such as stones in the distal of the diverticulum, these can also be detected on CT. There are cases of UD detected by magnetic resonance imaging [3]. Since blind-ended UD may not show complete filling in the excretory phase, pretrograde pyelography can be used when needed [2].

Treatment is not required in asymptomatic patients and only indicated in those with distal stones, obstruction due to strictures, and secondary symptoms. In our case, we found it appropriate to follow up with our patient clinically since there were no findings such as renal colic, hematuria, and urinary system infection. In the first cases presented in the literature, it was advocated that nephroureterectomy should be performed in the treatment of UD; however, over time, segmental resection and end-to-end anastomosis surgery options emerged, and later successful laparoscopic UD resections were also described [1, 9]. Prognosis is good in untreated uncomplicated cases. Nevertheless, in the literature, two cases that developed transitional carcinoma and perforation associated with UD have been reported in the literature [3].

CONCLUSION

UD is a very rare urological anomaly. UD is an entity that can be asymptomatic until adulthood and may be detected incidentally in radiological evaluations. Although treatment is not required in asymptomatic patients, surgical treatment may be necessary in the presence of symptoms. Excretory phase CT/CT urography noninvasive imaging method must be preferred to evaluate the relationship of the lesion with the ureter.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Written and informed consent from the patient was obtained for publishing this case report.

STANDARDS OF REPORTING

CARE guidelines were followed in this study.

FUNDING

None.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

ACKNOWLEDGEMENTS

Declared none.

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