Bifid Pelvis Appearance and Yo-Yo Reflux on Dynamic Renal Scintigraphy: Two Case Reports

Mine Araz* and Derya Cayir

University of Health Sciences, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Nuclear Medicine Department, Ankara, Turkey

Abstract: Bifid (two-compound) renal pelvis constitutes 10% of normal renal pelvis. The Yo-Yo reflux is reflux from one ureter to another in incomplete ureteral duplications. The diagnosis of yo-yo reflux is difficult. Technetium-99m diethylenetriamine pentaacetic acid (Tc-99m DTPA) is used to evaluate renal function. We present two cases of bifid renal pelvis and yo-yo reflux with Tc-99m DTPA dynamic renal scintigraphy.

Keywords: Renal pelvis, DTPA, Radionuclide imaging, Renal scintigraphy, Yo-Yo reflux.

INTRODUCTION

A bifid renal pelvis is a congenital renal tract abnormality characterized as a duplication of the two ureters that unite before emptying into the bladder. The embryological development of urinary system is complicated and approximately 10% of the children are born with some urinary tract anomalies. Among all urinary tract anomalies, duplication of the upper urinary tract is the most commonly seen [1, 2]. It is characterised by an incomplete fusion of upper and lower pole moieties resulting in a variety of complete or incomplete duplications of the collecting system. While considered an anatomical variant, duplicated collecting systems may be complicated by vesicoureteric reflux, obstruction or ureterocele. Duplicated collecting systems are seen in 0.7% of the healthy adult population and 2-4% of patients investigated for urinary tract symptoms [3]. Most duplicated systems are asymptomatic and mostly diagnosed incidentally. We present two cases of bifid renal pelvis and yo-yo reflux with Tc-99m DTPA dynamic renal scintigraphy.

CASE 1

Tc-99m DTPA dynamic renal scintigraphy was performed to a 22-year-old female patient with recurrent urinary tract infection (UTI). Tc-99m DTPA dynamic renal scintigraphy was performed according to F+20 protocols. Oral hydration (500 mL) started 30 minutes before the study, and iv furosemide (20 mg) was given 20 minutes of study. 5 mCi (185 MBq) Tc-99m DTPA was given intravenously at the begining of dynamic scanning. Imaging was performed from posterior projection using e-soft gamma camera (Siemens ecam signature; Siemens, Hoffman Estates, Illinois, USA) with a low energy paralel-hole general purpose collimator at 140 keV energy peak with a 20% symmetrical energy window. Dynamic acquisition at 64x64 matrix was acquired 1 second per frame for 1 minute for the renal perfusion and 60 seconds per frame for 39 minutes for the renal function. Left kidney functions were normal except for pelvicalyceal stasis with complete response to iv diuretic. Yo-Yo reflux in the renogram curve and bifid pelvis was detected in dynamic images in the left kidney (Figure **1a**, white arrow). Renal perfusion and concentration functions were within normal limits on the right side (Figure **1b** and **1c**). Excretion function of the right kidney was on time but was mildly prolonged with pelvicalyceal stasis showing complete response to iv diuretics (Figure **1d**). Intravenous pyelography (IVP) study showed bifid pelvis and ureteral duplication in the left kidney. The left kidney urinary tract collection system was normal on urinary ultrasonography (USG).

CASE 2

Tc-99m DTPA dynamic renal scintigraphy was performed to a 47-year-old female patient with recurrent UTI. Tc-99m DTPA dynamic renal scintigraphy was performed according to above explained procedure. The perfusion and concentration functions of the left kidney were normal. Excretion started on time, but was only mildly prolonged with pelvicalyceal stasis responding to diuretic. Bifid pelvis was observed on dynamic images and Yo-Yo reflux was seen on the renogram curve (Figure **2a**, black arrow). The perfusion and concentration functions of the right kidney were lower compared to the left

*Address correspondence to this author at the University of Health Sciences, Dışkapı Yıldırım Beyazıt Training and Research Hospital, Nuclear Medicine Department, Ankara, Turkey; Tel: +905326667313;
Fax: +903123163499; E-mail: minesoylu@yahoo.com

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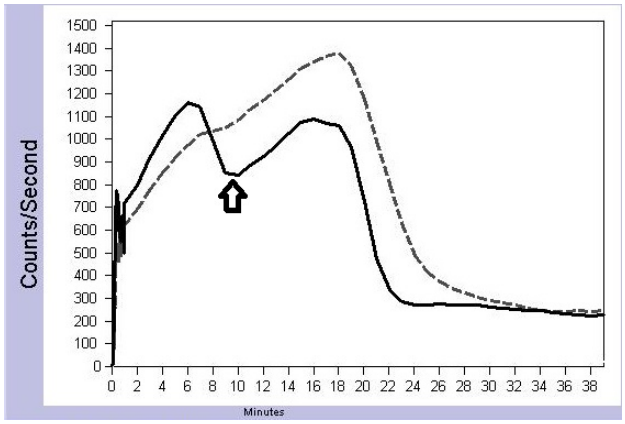


1(a)

1(b)

1(c)

1(d)

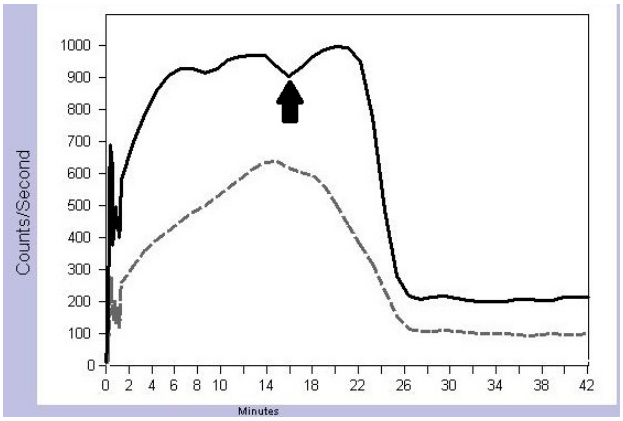
Figure 1: Demonstration of Yo-Yo reflux in the renogram curve (**a**), normal renal perfusion and concentration functions on the right side (**b** and **c**), mildly prolonged excretion function with pelvicalyceal stasis showing complete response to iv diuretics of the right kidney (**d**).

(Figure **2b** and **2c**). Excretion started on time but was prolonged with pelvicalyceal stasis responding to intravenous diuretic injection (Figure **2d**). The patient's IVP and USG findings were similar to Case 1.

DISCUSSION

Ureteral duplication is the most common urinary tract anomaly. In two-thirds of the cases, ureteral duplication is incomplete and ureteroureteral reflux may occur in as many as 80% of cases [4]. Bifid (two-compound) renal pelvis constitutes 10% of normal renal pelvis [1]. Duplicated systems are mostly diagnosed incidentally. However, where symptoms do occur (infection, reflux or obstruction), the patient is likely to have completely duplicated ureters. Sometimes, hydronephrosis can be severe enough to result in flank discomfort or even a palpable mass. The Yo-Yo reflux is reflux from one ureter to another during incomplete ureteral duplications. The diagnosis of yo-yo reflux is difficult [5].

USG is not always accurate to detect duplicated collecting systems especially if there is no sign of obstruction/hydronephrosis. Partial-complete duplication is also very hard to differentiate sonographically.



2(a)

2(b)

2(c)

2(d)

Figure 2: Yo-Yo reflux on the renogram curve (**a**), lower perfusion and concentration functions on the right kidney compared to the left (**b** and **c**), prolonged excretion with pelvicalyceal stasis responding to intravenous diuretic injection on the left side (**d**).

Real time demonstration of Yo-Yo reflux by anatomical imaging is almost impossible, as there is only one case report in the literature demonstrating visualisation of urine reflux from one collecting system to the other by colour doppler ultrasound [4]. However, Chu *et al.* has described a scintigraphic method for detection of yo-yo reflux and renal scintigraphy is able to evaluate renal function and is particularly useful in planning surgery [6, 7].

We present two cases with yo-yo reflux in which the diagnosis has been made with similar method. Here, the dual pelvicalyceal system and bifid pelvis could not be detected by USG, but by dynamic renal scintigraphy and IVP, clinical and scintigraphic findings were similar in two female patients, demonstrating a rare yo-yo reflux appearance

CONCLUSION

The presented two cases emphasize the scintigraphic method to overwhelm the diagnostic difficulties encountered in yo-yo reflux. In cases with suspected duplicated collecting systems, dynamic renal scintigraphy should be performed in order not to miss Yo-Yo reflux, so that appropriate management can be carried out.

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