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Duplication of pelvicalyceal system: A rare diagnosis made reliably by use of volume rendering technique on a 384 slice CT machine

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Abstract
A duplex collecting system also known as duplicated collecting system in some literatures, is one of the most common congenital renal tract abnormalities to be found incidentally during evaluation of the person for some other complaints. It shows an incomplete fusion of upper and lower pole moieties which may cause a variety of complete or incomplete duplication defects of urinary collecting system [1]. While considered an anatomical variant we need to keep in mind that these duplex collecting systems may be associated with various complications like vesicoureteric reflux, obstruction or ureterocele. In this study, we are going to discuss a case of a young boy who presented with urinary difficulty, on haematological evaluation it showed renal infection. On further radiological evaluation, patient was found to have duplication collection system.

Keywords: duplicate ureter, double ureter, duplicated pelvicalyceal system, weigert–meyer law, VRT, ureterocele

1. Introduction

1. A duplex renal collecting system on both sides is a not so common abnormality of renal tract. Duplication happens if a single Wolffian duct gives rise to two separate ureteric buds. This can present as partial ureteric duplication, bifid renal pelvis, incomplete ureteric duplication with ureters joining near or in bladder wall or complete ureteric duplication with separate ureteric orifices, based on the degree of fusion.
2. Computed tomography is often used to evaluate abdominal conditions in adults and may therefore be the first imaging modality to reveal a duplex collecting system complicated by a pathological process [3]. Involvement of only one moiety was frequently related to the duplication, with a predilection for the upper moiety, while involvement of both systems was used unrelated to the duplication.
3. Objective of this study is to review the computed tomography (CT) findings in this patient with complicated renal system duplication, and to assess whether the complications were anomaly-related or superimposed by acquired disease such as tuberculosis.
4. According to the Weigert–Meyer law, the upper pole ureter typically opens medially while the lower pole ureter opens laterally. The incidence of ureteral duplication has been reported as 1 in 125 or 0.8% [1].
5. The case that is presented here seems to fit this law.

2. Materials and Methods

On admission, patient complained mainly of hemoptysis since one year with chest pain and was also having dysuria and burning micturation. He also had a history of tuberculosis for which he was on ATT for 6 months. A physical examination was conducted. His temperature was raised to 40.8 C, his blood pressure was 130/72 mmHg, and his pulse rate was regular at 128 beats per minute. Laboratory tests were conducted by the HLS department of our hospital. His KFT shows blood urea: 26mg/dl and creatinine: 0.6 mg/dl; in particular, a urine examination showed leukocyturia or bacteriuria. He underwent an abdominal ultrasound on GE LOGIQ P9 which showed a maintained corticomedullary differentiation with normal size

of the kidneys. His right kidney measured ~(8.1 X 4.1) cm while the left measured ~(10.7 X 5.2) cm with duplex right kidney & dilated upper pole moiety calyx, which has been shown in Fig. 1 and 2.

An abdominal and pelvic computed tomography (CT) scan on SOMATOME FORCE 384 SLICE MACHINE, detected a completely duplicated bilateral pelvi-calyceal system and ureter with right upper pole moiety demonstrates no contrast excretion on immediate delayed phase and is dilated with small suspicious ureteocele in the distal ureter present with no hydroureteronephrosis. A lower moiety ureter is contrast opacified with normal course through which is shown in figure 3 and 4 throughout its length. Left sided distal ureters appears to join proximal to ureterovesical junction which were not being appreciated on ultrasound due to their thin caliber which is shown in figure 5 and 6.

It was very difficult to delineate the duplication of the pelvicalyceal system on plain CT, but the use of contrast enhancement and its VRT image cleared the diagnostic dilemma and clearly demonstrated both collecting systems.

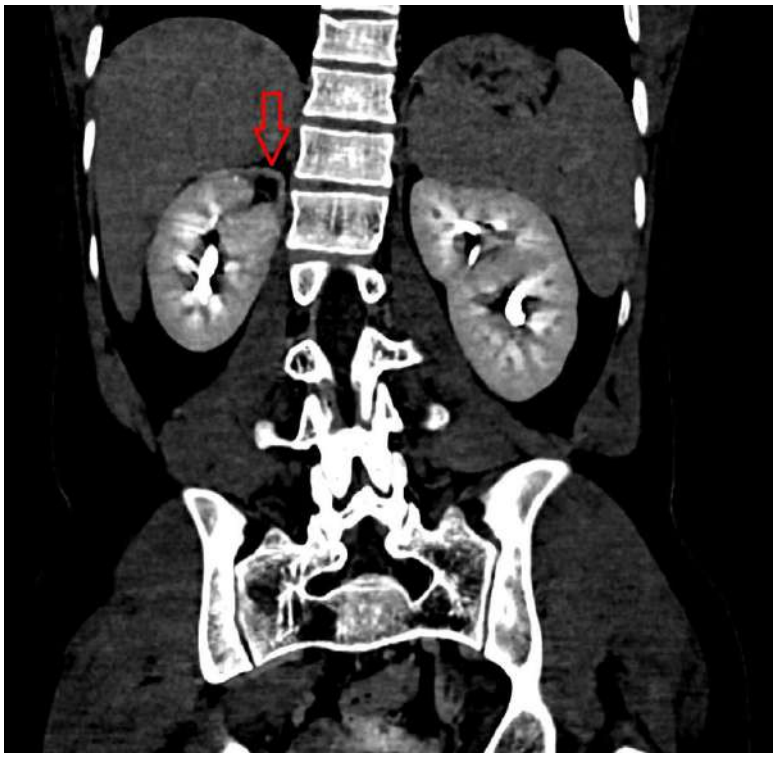

Fig 1: Coronal section of contrast enhanced computed tomography image of patient showing non opacified moeity of right kidney in delayed image as marked with arrow, which further implies its non functional status

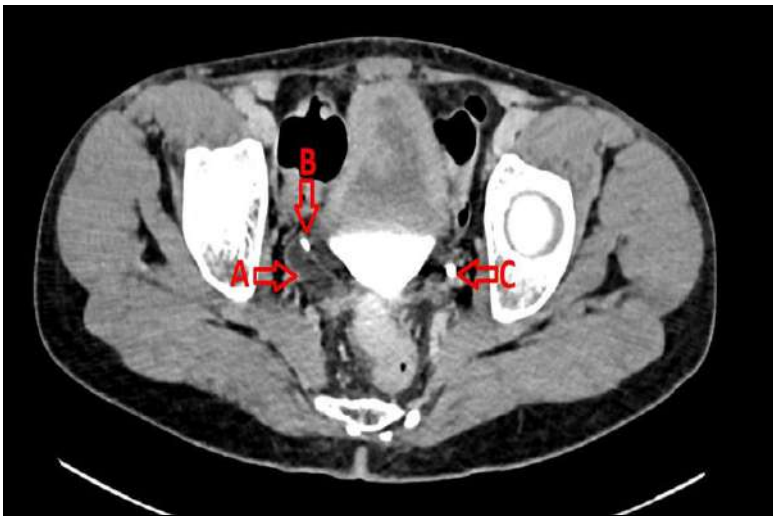

Fig 2: Axial section of contrast enhanced computed tomography image of the patient showing extravesicular cystic dilatation of distal most part of upper ureter of right kidney [marked as A] which is opening medially and justifying weigert meyer law. Distal end of right side lower moeity ureter is contrast opacified and marked as [B]. On the left side both the ureters are runjing adjacent to each other marked as [C].

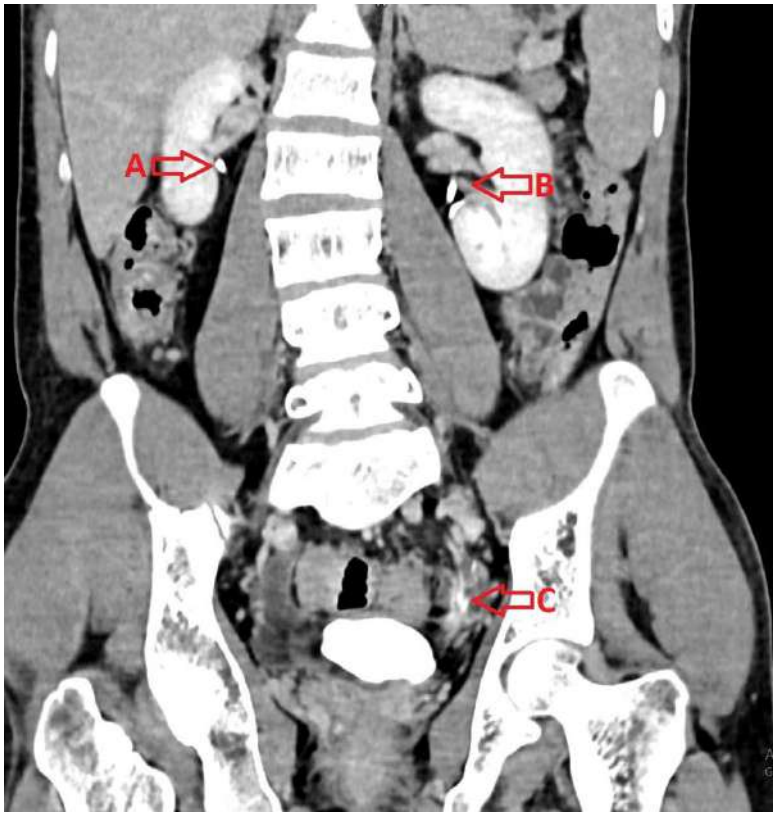

Fig 3: Coronal section of contrast enhanced computed tomography showing duplex anatomy in bilateral kidneys, where upper moeity of right kidney is non functional and lower moeity is contrast opacified as marked with arrow [A].on the left side two contrast filled separate ureters can be appriciated marked with arrow [B]. These two uretes are running adjacent to each othe and can be seen seperately marked as [C]

Fig 4: VRT image showing duplex collecting system in bilateral kidneys. (Upper ureter of right kidney is not visualised because of its non functional status)

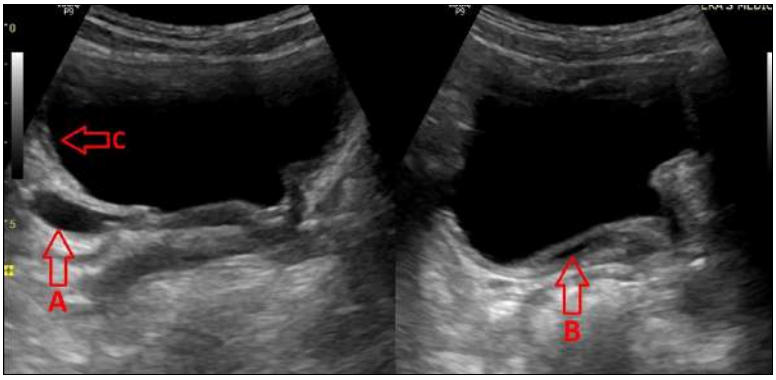

Fig 5: Pelvic ultrasound scan shows rounded cystic structure to the right of midline with some echogenic debris seen within it marked with arrow [A] elliciting communication into urinary bladder marked as [B]. There is evident marked thickening of urinary bladder wall marked [C].

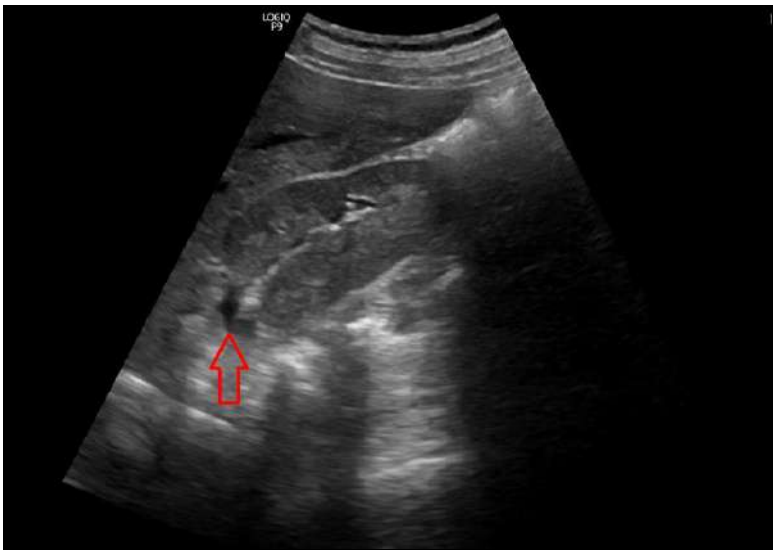

Fig 6: Renal ultrasound shows right kidney of normal size and corticomedullary differentiation with dilated non functional upper pole marked with arrow which is seen extending as a tubular structure which further tapers after proximal part. Another ureter originating from lower moeity is seen travelling through renal pelvis

3. Result and Discussion

- Most duplicated systems are asymptomatic and diagnosed incidentally. However, where symptoms do occur (infection, reflux or obstruction), the patient is likely to have completely duplicated ureters [4].
- As such duplex kidney usually does not require any treatment, however, if complications occur intervention may be required. Complications may be vesicoureteric reflux into lower pole moiety, marked hydronephrosis of the upper pole moiety may have a mass effect or become infected.
- In this patient treatment was modified after our investigation workup was over. Conservative treatment for urinary tract infection was started along with ATT

4. Conclusion

- When two ureteral buds are formed during fetal development a duplex collecting system arises. Though, diagnosis is sometimes made in instances during adulthood when duplex collecting systems are discovered incidentally during evaluation for some other complaints.
- A duplex collecting system with refluxing upper pole moiety ureter is a very rare entity. The diagnosis should be taken into consideration when investigating any flank pain with repeated episodes of urinary tract infections. Additionally, this case shows how some common symptoms may lead to finding an unexpected urinary tract abnormality.
- We also see that the use of VRT imaging also helps in confidently arriving at the diagnosis, which may be missed on a plain CT scan.

5. References

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