

Is renal ultrasound a reliable indicator of a nonobstructed duplication anomaly?

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Abstract. Twelve kidneys which had a non-obstructed duplication anomaly on excretory urography were studied sonographically. Ten of the twelve kidneys had a single central renal sinus echo complex; only two kidneys had a split sinus complex typical of duplication. Sonography is not a reliable technique to identify a nonobstructed duplication anomaly.

By virtue of its ease of access, relative inexpense, and lack of ionizing radiation, ultrasound frequently is used as a screening examination for the genitourinary tract. Consequently, it is important for physicians and radiologists to be aware of any limitations to its diagnostic capabilities. The ability of ultra-

sound to identify duplicated collecting systems when obstruction is present has been noted by a number of authors [1, 2]. This modality also has been advocated as a replacement for urography in the search for a nonobstructed duplication anomaly prior to abdominal or pelvic surgery [3].

The purpose of this paper is to report our experience with ultrasound in the identification of the non-obstructed duplicated renal collecting system.

Methods and materials

Twelve kidneys in nine patients seen between June, 1980 and February, 1983 were included in the study. The patients ranged in age from 3 months to 35 years (mean 11¼ years; 2 were adults and 7

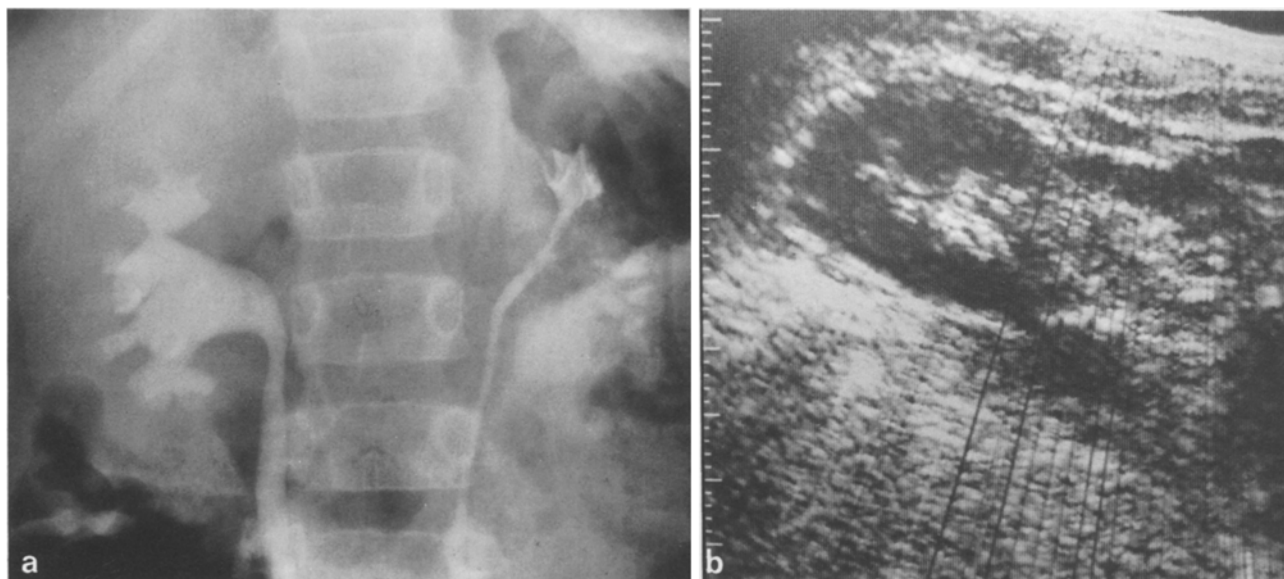


Fig. 1 a, b. Patient 5. Complete duplication with normal sinus. **a** Excretion urogram showing left sided duplication. **b** Coronal sonogram of left kidney with normal sinus echo complex. All other views demonstrated a single central sinus echo complex

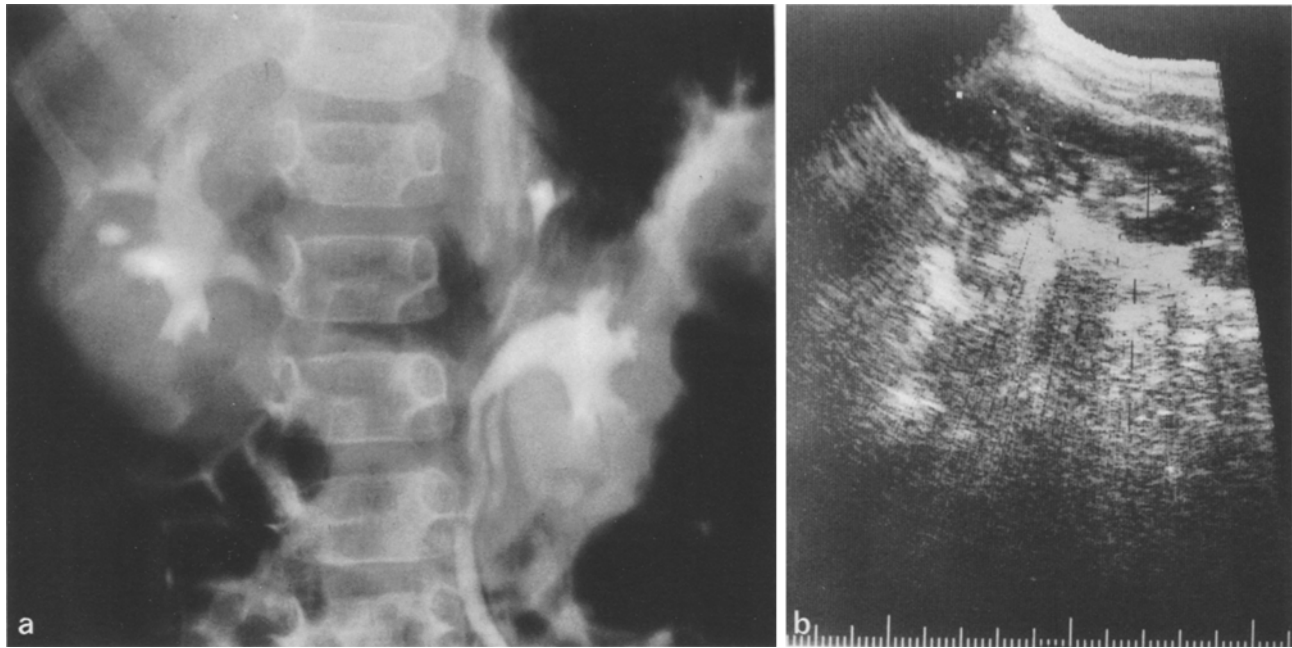


Fig. 2a, b. Patient 8. Complete duplication with normal renal sinus. **a** Left sided duplication on urogram. **b** Coronal section through left kidney with single sinus echo complex on ultrasound of left kidney. Other views showed a similar pattern in the renal sinus

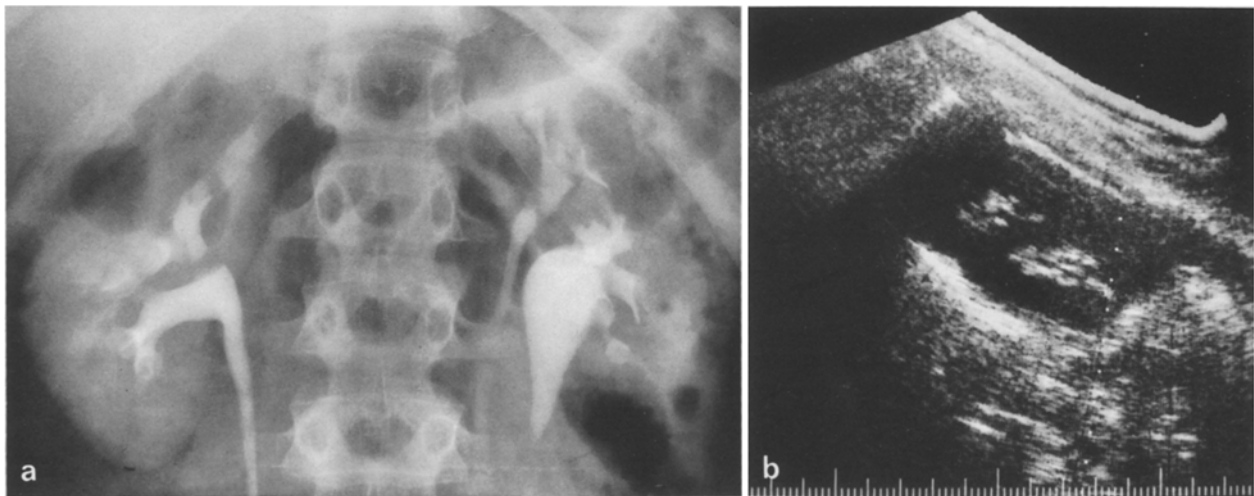


Fig. 3a, b. Patient 9. Complete duplication with splitting of renal sinus echo complex. **a** Excretion urogram showing left duplication. **b** Coronal sonogram demonstrating splitting of left sinus echo complex

were children). Each patient had excretory urography, which showed a nonobstructive, nondilated, duplicated system and each had renal sonography. The ultrasound examinations were performed by an experienced sonographer and sonologist using dynamic and static scanning on standard equipment. Particular attention was directed toward identifying the integrity of the renal pelvis, collecting systems and renal sinus. Excretory urography was performed in the standard fashion. Neither the excretory urogram nor the radiology report was available at the time of the ultrasound study.

Results

Excretory urography demonstrated duplication of the renal collecting system in all nine patients. Three patients had bilateral duplication, while four had duplication on the left side alone and two had duplication on the right side alone. In only one patient was the disparity in renal length, as measured on the excretory urogram, greater than 0.5 cm.

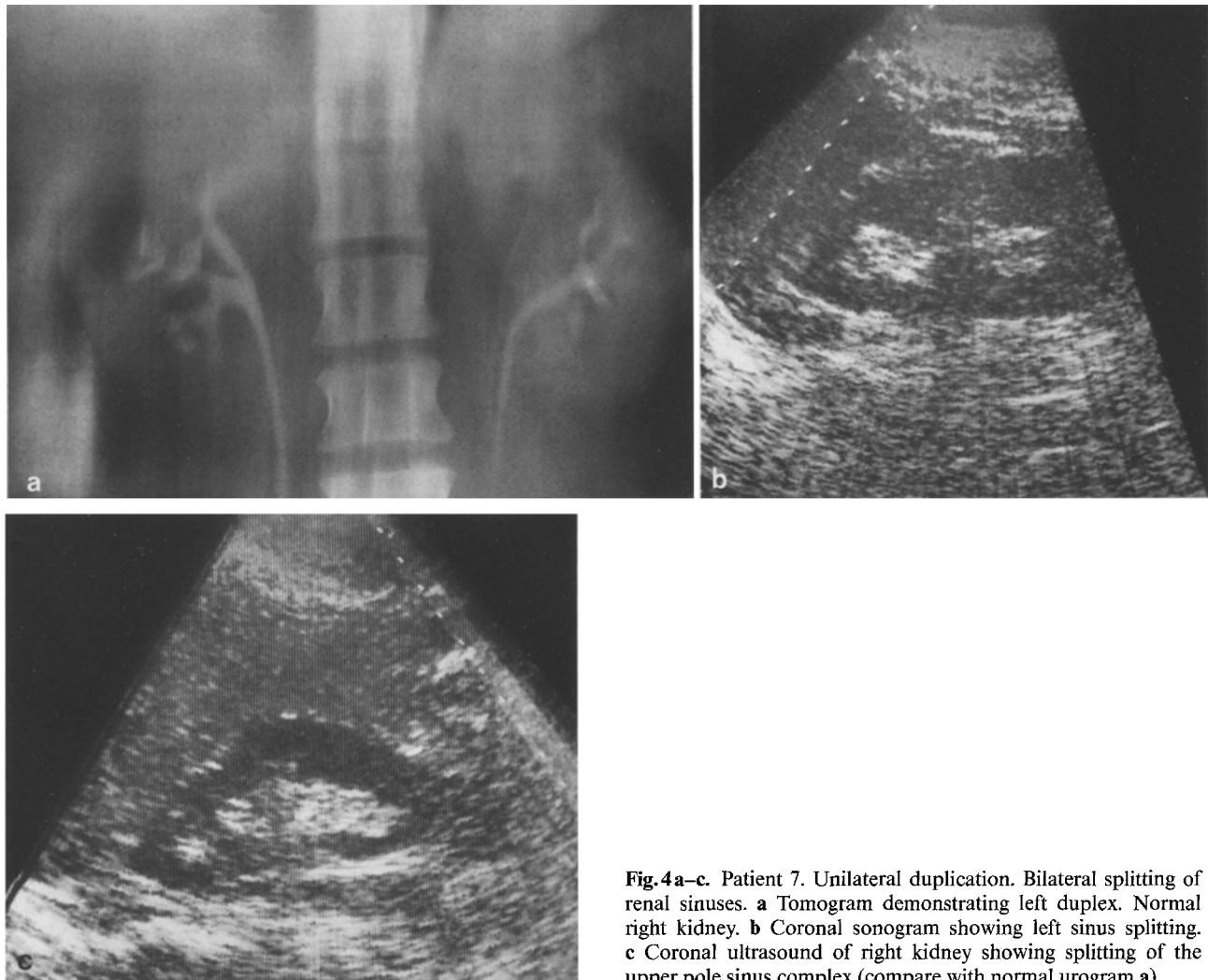


Fig. 4a-c. Patient 7. Unilateral duplication. Bilateral splitting of renal sinuses. **a** Tomogram demonstrating left duplex. Normal right kidney. **b** Coronal sonogram showing left sinus splitting. **c** Coronal ultrasound of right kidney showing splitting of the upper pole sinus complex (compare with normal urogram **a**)

Ultrasonic examination of the kidney demonstrated a single normal-appearing renal sinus echo complex in seven patients (three with bilateral duplicated systems and four with unilateral duplicated systems (Figs. 1 and 2). Of these, one patient had a suggestion of contralateral splitting of the renal sinus echo complex and a normal single sinus echogenicity on the affected (duplex) side. Two patients did have two separate echogenic regions in the renal sinus corresponding to the duplicated system (Figs. 3 and 4). One of these two patients had contralateral splitting, although this kidney was, in fact, normal. Thus, of twelve kidneys with a nonobstructed duplicated system on urography, the central renal sinus echo complex was split in only two.

Discussion

Ultrasound can strongly suggest an obstructed duplicated system by identifying the dilated upper pole

and dilated ureter leading into it. It is well known that splitting of the renal sinus echo complex can be seen both with a bifid system and with a true nonobstructed duplication. Others have suggested that a single central echo complex in the renal sinus is a strong indication that a duplicated system is not present and obviates the need for excretory urography prior to gynecologic or gastrointestinal surgery [3]. However, our results in these twelve kidneys do not support this concept. Only two of the twelve kidneys with this anomaly would have been prospectively identified by ultrasonography. Sonography alone would not be the optimal technique to screen for a subgroup in whom urography would be indicated as a means to distinguish between a bifid system and a duplication anomaly.

Of the six single system kidneys also imaged, ultrasound suggested sinus splitting in two. This finding emphasizes the lack of specificity of this modality in the identification of duplex systems.

The renal sinus is readily identified on ultrasound studies as an echogenic central zone [4]. Its contents include the renal collecting system, blood vessels, lymphatics, fat, and fibrous tissue. In the hydrated patient, the calyces and infundibula may be seen as echo-free, fluid-containing structures within the sinus. In contrast, in patients who are not overhydrated, the collecting system exists as virtually a potential space, is echogenic due to the reflective urothelium, and cannot be distinguished reliably from the remainder of the renal sinus. In practice, the degree of expansion of the renal collecting system is variable with each individual. It should be noted that in our study we used neither fluid stress nor ureteric compression [5, 6]. The combination of these two techniques might have identified two separate fluid filled collecting systems in the single renal sinus in some cases. Nonetheless, it is readily apparent from our experience that the typical ultrasonic signs for the presence of a renal duplication, including splitting of the renal sinus echo complex, the identification of two separate collecting systems at the renal hilum, and nephromegaly, will not identify many cases of renal duplication. Specifically, splitting of the renal sinus echo complex is not uncommonly absent in the duplication anomaly. Our study indicates that sonography cannot substitute for urography in screening for urinary tract duplication, since a single renal sinus echo complex can be seen with a nonobstructive duplication anomaly. However, ultrasound is of value in following patients who have a known duplication anomaly, since it can identify obstruc-

tion or reflux [7] in a dilated system as well as focal or diffuse loss of parenchyma in the affected kidney.

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