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The Association of a Supernumerary Kidney and a Sigmoid Fusion Pattern: A Study about One Case

H. Tadili[1*], Z. Ait Said[1], A. Diani[1], R. Bouroumane[1], M. Benzalim[1], S. El Alj[1]

[1]Department of Radiology, Ibn Tofail Hospital, University Hospital Center Mohamed VI, Marrakech Morocco

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***Corresponding author:** H. Tadili
Department of Radiology, Ibn Tofail Hospital, University Hospital Center Mohamed VI, Marrakech Morocco

Abstract | **Case Report**

Supernumerary kidney is an extremely rare congenital anomaly, defined by the presence of an additional kidney with its own capsule, blood supply, and collecting system. Even more unusual is the occurrence of a supernumerary kidney associated with a fusion anomaly such as a sigmoid kidney, in which the renal units are joined in an S-shaped configuration. We report the case of a 33-year-old woman in whom a supernumerary kidney forming a sigmoid fusion pattern was identified an abdominal CT performed for abdominal pains accentuated in the lumbar area. Imaging demonstrated three renal units, with the lower supernumerary kidney fused to the contralateral kidney in a sigmoid arrangement, each possessing its own collecting system and vascular supply. No associated obstruction, calculi, or infection were observed. Recognition of such rare anomalies is important, as they may be mistaken for renal or retroperitoneal masses and can present significant challenges during surgical or interventional procedures. This case contributes to the limited literature on supernumerary kidneys with sigmoid fusion and underlines the value of detailed radiological evaluation for accurate diagnosis and management planning.

Keywords: Supernumerary Kidney, Sigmoid Kidney, Renal Fusion Anomaly, Congenital Renal Anomaly, Case Report.

INTRODUCTION

Congenital anomalies of the urinary system are relatively frequent, but a supernumerary kidney is extremely rare, with fewer than 100 cases reported. It is defined as an additional renal unit with its own capsule, blood supply, and collecting system.

A sigmoid kidney (S-shaped kidney) is an uncommon type of renal fusion in which the lower pole of one kidney joins the upper pole of the opposite kidney while each retains a separate collecting system.

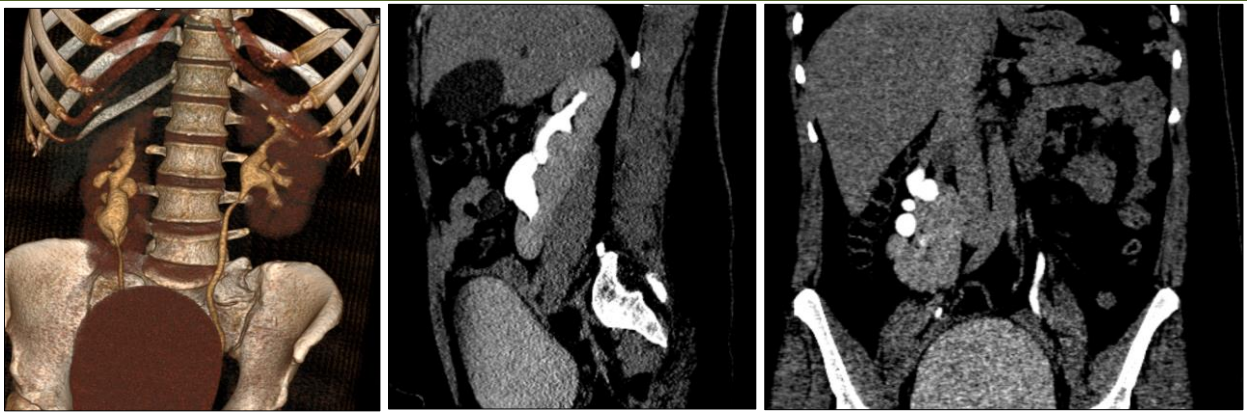
The coexistence of a supernumerary kidney with a sigmoid configuration is exceptionally rare and may mimic retroperitoneal masses or complicate surgical procedures. We report such a case and briefly review its clinical and embryological significance.

CASE REPORT

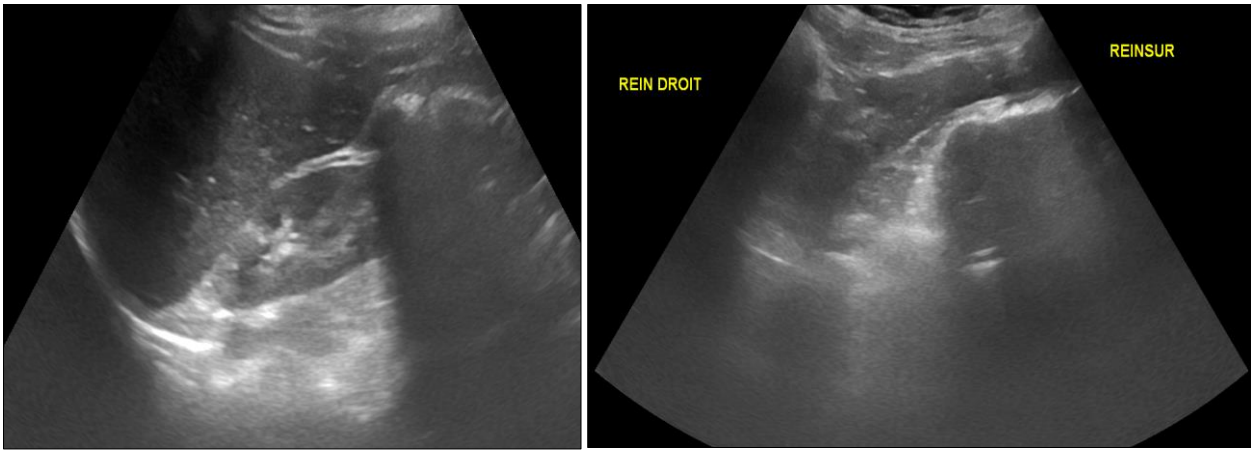
A 33-year-old woman presented with abdominal pains accentuated in the lumbar area. The patient had no significant past medical history of urinary tract infections, renal stones or congenital anomalies. Clinical examination marked pain the in percussion of the lumbar area, and laboratory investigations, including renal function tests, were within normal limits.

Imaging with ultrasound and CT revealed the presence of three renal units. The supernumerary kidney was located caudal to the right kidney and was fused in a sigmoid configuration. Each renal unit had its own capsule, vascular supply, and separate pelvicalyceal system. The ureters were observed to drain separately into the bladder.

No evidence of hydronephrosis, calculi, mass, or infection was found. The patient was managed with follow-up, as the anomaly was an incidental finding without clinical complications.



"Images showing a 3d reconstruction, a coronal and sagittal view showing the surnumerary kidney merged in a sigmoid configuration with the right kidney"



« Ultrasound images showing on the left the image of the normal kidney and on the left we can see the superior pole of the surnumerary kidney in a sigmoid configuration with a communication in between"

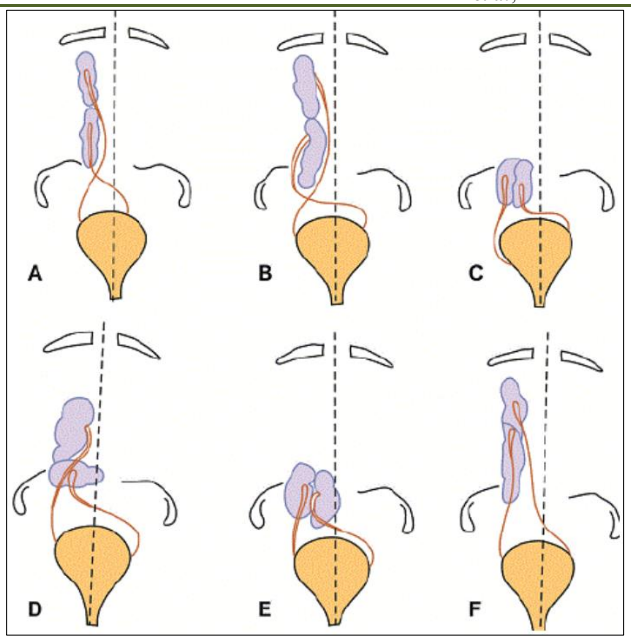
DISCUSSION

Supernumerary kidneys are one of the rarest congenital anomalies of the urinary tract. It differs from a duplex kidney by the presence of a separate capsule, independent blood supply, and distinct collecting system. Its embryological origin is thought to result from abnormal division of the nephrogenic cord into two metanephric blastemas, each developing into an individual renal unit.

Renal fusion anomalies are more common than supernumerary kidneys, with the horseshoe kidney being the most frequent. The sigmoid kidney (S-shaped kidney) is an uncommon fusion type, in which the lower pole of one kidney fuses with the upper pole of the contralateral kidney while preserving separate pelvicalyceal systems. The coexistence of a supernumerary kidney in a sigmoid configuration is exceedingly rare, and only isolated cases have been reported.

Most patients remain asymptomatic, and the anomaly is often discovered incidentally during imaging performed for unrelated reasons. However, such kidneys may be predisposed to complications including hydronephrosis, recurrent urinary tract infections, nephrolithiasis, or, rarely, neoplasms. Awareness of this anomaly is also important for surgeons and interventional radiologists, as aberrant vascular anatomy may complicate abdominal or retroperitoneal procedures.

In our patient, the anomaly was detected incidentally, with no functional impairment or associated pathology. Conservative management and follow-up were therefore appropriate. This case highlights the importance of radiological recognition of rare renal anomalies to avoid misdiagnosis and guide safe management.



"Six subtypes of crossed fused renal ectopia. A- Inferior ectopia type with upper pole of ectopic kidney fusing with lower pole of normal kidney. B- Sigmoid or S-shaped kidney where hilum of ectopic kidney faces laterally and that of normal kidney medially and with fusion form S-shaped mass. C- Lump kidney with fusion of two kidneys over a wide margin with ureter from ectopic kidney crossing the midline. D- L-shaped or Tandem kidney in which the ectopic kidney is placed horizontally fusing with lower pole of normal kidney. E- Disc kidney with extensive fusion of two kidneys forming a disc shaped mass. F- Superior ectopia type with ectopic kidney placed above the normal kidney and fusing with its upper pole. "

Embryological Basis

The development of a supernumerary kidney is thought to result from an abnormal division of the nephrogenic cord into two separate metanephric blastemas during embryogenesis. Each blastema may then interact with a ureteric bud, leading to the formation of an independent renal unit with its own capsule, blood supply, and collecting system. This anomaly is distinct from simple duplication of the collecting system, since it produces a completely separate kidney.

The sigmoid (S-shaped) kidney represents a rare type of renal fusion anomaly. It arises when the lower pole of one metanephric mass fuses with the upper pole of the contralateral kidney. Malrotation often accompanies this process, leading to the characteristic orientation in which the hilum of one kidney faces medially while the other faces laterally.

The coexistence of a supernumerary kidney with sigmoid fusion likely reflects a combination of these two developmental errors: duplication of the metanephric blastema with aberrant ureteric bud induction, followed by abnormal migration and fusion. This explains the presence of an additional renal unit forming a sigmoid configuration with its contralateral counterpart.

CONCLUSION

Supernumerary kidney is an exceptionally rare anomaly, and its occurrence in a sigmoid fusion pattern is even more unusual. Although often discovered incidentally, awareness of this condition is important to avoid misdiagnosis and to anticipate possible complications or surgical difficulties related to its unique anatomy. Careful radiological evaluation remains the key to accurate diagnosis and safe management.

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