**“RENAL ECTOPIA”****EMBRYOLOGICAL BASIS AND ITS CLINICAL IMPORTANCE**

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**ABSTRACT**

To report two cases of right crossed non-fused renal ectopia diagnosed in male patients about 30 years of age who arrived to emergency Centre's with symptoms of renal colic. We report two cases of male patients who arrived to an emergency centre complaining of colic lumbar pain. Crossed renal ectopia was finally revealed by means of intravenous urogram after several analytical and imaging examinations. Right crossed non-fused renal ectopia is an uncommon congenital anomaly with a higher incidence in males. It is much more common to find a crossed fused renal ectopia of the orthotopic kidney. In contrast, if there is no fusion it may be located on the lower portion of the normal kidney, which is not the case in this instance. This malformation is not usually accompanied by other congenital anomalies. Most of cases are spontaneously solved and they do not require an intercurrent surgical intervention.

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**Introduction**

The embryological enlargement of the kidney outcomes after the interaction between the mesonephric duct-derived ureteric bud, and the metanephros, the greatest caudal part of the nephrogenic cord. Growth activates primary in the 4th week of development and during the 6th and 8th weeks the lobulated embryonic kidneys rise from the pelvic region upwards along the posterior abdominal wall to their common position and undergo a 90° axial rotation after horizontal to medial. At the equal time the ureteric bud divides successively to form the pelvicalyceal system. During the method of ascent from the pelvis, the kidneys originate their blood supply successively from vessels that stay closest to them- initially median sacral, then common iliac and inferior mesenteric, and lastly, the aorta. An ectopic kidney marks from incomplete, excess or irregular ascent. If through the process of rise the kidneys come into contact, a curve kidney or crossed renal ectopia will result.

Renal ectopia results from disappointment of normal rise of the embryonic kidney. This dismiss arise as a result of abnormalities of the ureteric bud or metanephros, an abnormal vascular complete or genetic anomalies. The incidence of renal ectopia in postmortem educations varies after 1 in 500 to 1 in 1290; it happens slightly extra frequently on the left side and 10% of bags are bilateral. The male to female part is the same. Around 50% remain unrecognized throughout life. In parts of Kenya near is a 3 times increased incidence in unconnected topics, suggesting an as so far approximate environmental factor. The maximum common Difficult associated with an ectopic kidney is vesico-ureteric reflux (VUR) which follows in active to 85% of children. Pelvi-ureteric junction (PUJ) block is present in 33-52%; this is Often due to a high addition of the ureter on the renal pelvis, malrotation of the kidney or an irregular blood supply which blocks the saving system. Renal calculi are also told in this condition. The contralateral kidney is abnormal in as a lot of as 50% of patient's contralateral renal agenesis takes place in

10%. Additional defects of the cardiovascular, respiratory, genital or skeletal systems are common, Skeletal irregularities are best commonly scoliosis and hemivertebrae. Genital abnormalities in females including duplication of the vagina, bicornuate uterus and hypoplasia or agenesis of the uterus or vagina could outcome problems during menstruation, conception, and pregnancy. The greatest common genital anomalies in males are hypospadias and cryptorchidism

**Incidence**

The projected incidence of an ectopic kidney be different by location: one normal and one pelvic kidney - 1 in 3000. Crossed renal ectopia - 1 in 7000. Ectopic thoracic kidney - 1 in 13 000.

**Ontogenesis of Normal Development of Kidney**

Phases:-

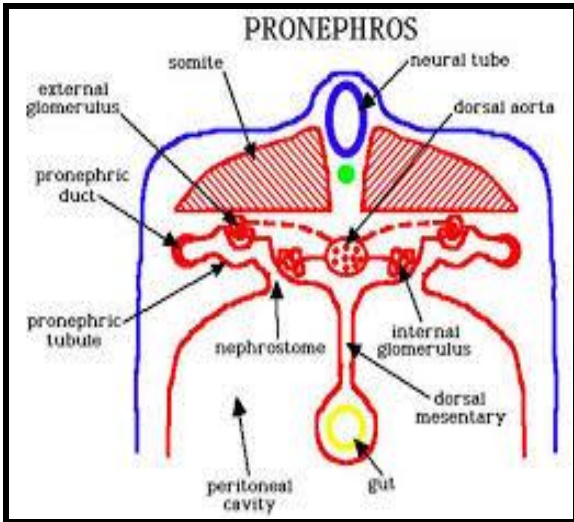
The growth of the kidney incomes through a series of successive phases, both marked by the development of a other advanced kidney: the pronephros, mesonephros, and metanephros. The pronephros is the most immature form of kidney, though the metanephros is maximum developed. The metanephros persists as the ultimate adult kidney.

Pronephros:-

The pronephros grows in the cervical region of the embryo. During around day 22 of human development, the paired pronephri appear just before the cranial end of the intermediate mesoderm. In this region, epithelial cells arrange themselves in a sequence of tubules called nephrotomes and join laterally with the pronephric duct. This duct is fully kept in check within the embryo and hence cannot excrete filtered material outside the embryo; hence the pronephros is measured nonfunctional in mammals.

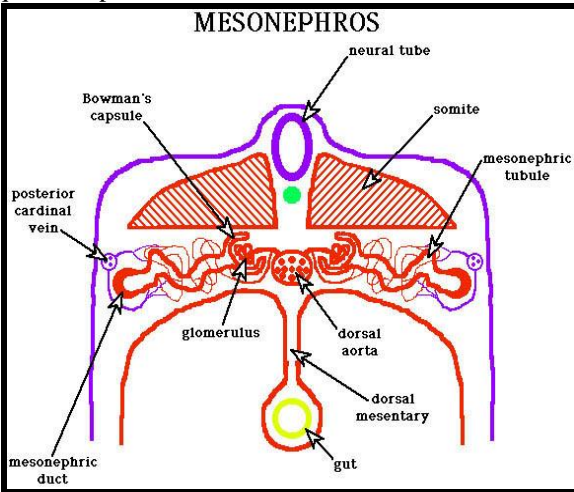
Mesonephros:-

The development of the pronephric duct proceeds in a cranial-to-caudal direction. As it make longer caudally, the pronephric duct makes nearby intermediate mesoderm in the thoracolumbar area to grow into epithelial tubules called mesonephric tubules.



**Fig 1.** this diagram represents pronephros of embryo.

Each mesonephric tubule takes a blood supply after a branch of the aorta, ending in a capillary clump similar to the glomerulus of the definitive nephron. The mesonephric tubule forms a capsule around the capillary clump, clearing for filtration of blood. This filtrate flows through the mesonephric tubule and is sapped mad approximately the maintenances of the pronephric duct, now called the mesonephric duct or Wolffian duct. The nephrotomes of the pronephros moral although the mesonephric duct covers just before the most caudal end of the embryo, originally according to the cloaca. The mammalian mesonephros is related towards the kidneys of aquatic amphibians and fishes.

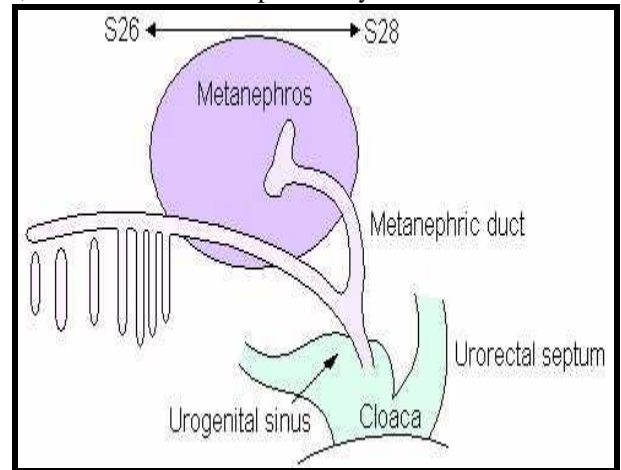


**Fig 2.** This diagram represents mesonephros of embryo

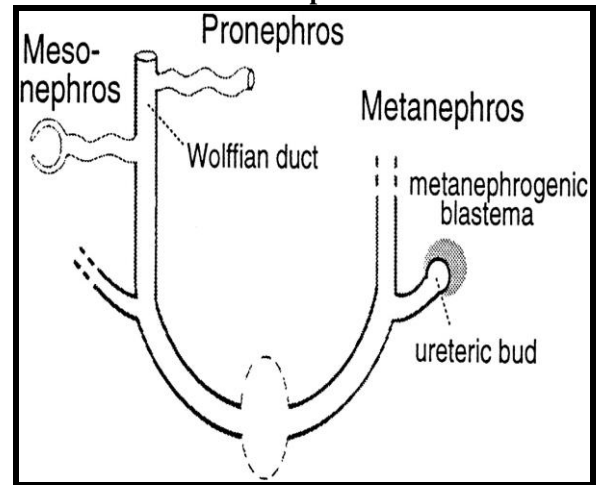
Metanephros:-

All through the fifth week of development, the mesonephric duct grows an outpouching, the ureteric bud, near its addition to the cloaca. This bud, also called the metanephrogenic diverticulum, grows posteriorly and just before the head of the embryo. The elongated stalk of the ureteric bud, called the metanephric duct, later methods the ureter. As the cranial end of the bud prolongs into the intermediate mesoderm, it practices a series of branchings to method the collecting duct system of the kidney. It as well forms the major and minor calyces and the renal pelvis. The portion of interchangeable in-between mesoderm in interchange through the tips of the branching ureteric bud is known as the metanephrogenic blastema. Signals released since the ureteric bud make the differentiation of the metanephrogenic blastema keen on the renal tubules. As the renal tubules produce, they originate into contact and join with

connecting tubules of the collecting duct system, making a continuous passage for flow from the renal tubule to the collecting duct. Simultaneously, originators of vascular endothelial cells originate to take their location at the orders of the renal tubules. These cells differentiate keen on the cells of the conclusive glomerulus. In humans, all of the branches of the ureteric bud and the nephronic units have been formed by 32 to 36 weeks of development. Though, these structures are not yet mature, and resolve continue to mature after birth. Once matured, persons have an estimated two million nephrons (approximately 1,000,000 per kidney) but this number is highly variable alternating usually from almost 300,000 to over 2 million per kidney.

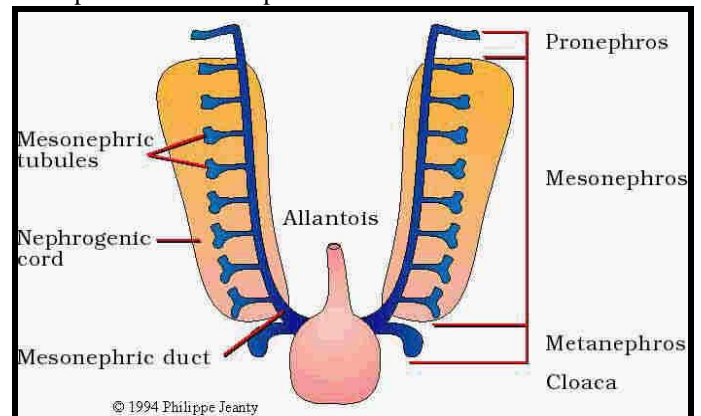


**Fig 3.** This diagram represents the development of metanephros.



**Fig 4.** this diagram represents the development of metanephros.

Pronephros and mesonephros



**Fig 5.** This diagram represents the development of metanephros.

Pronephros and mesonephros

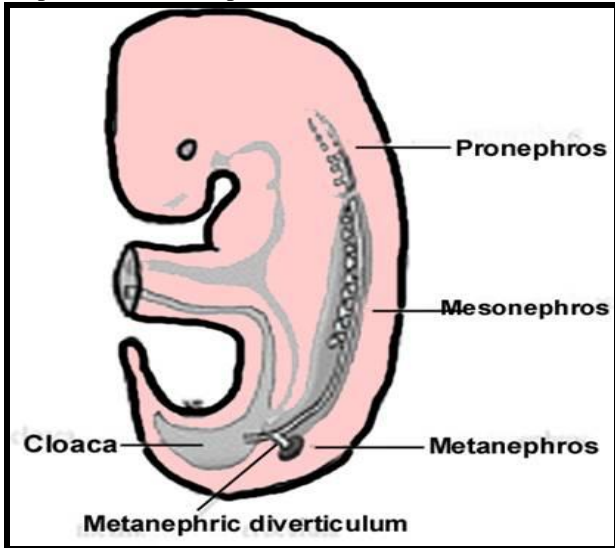


Fig 6. The schematic representation shows the metanephros pronephros and mesonephros developed in the embryo.

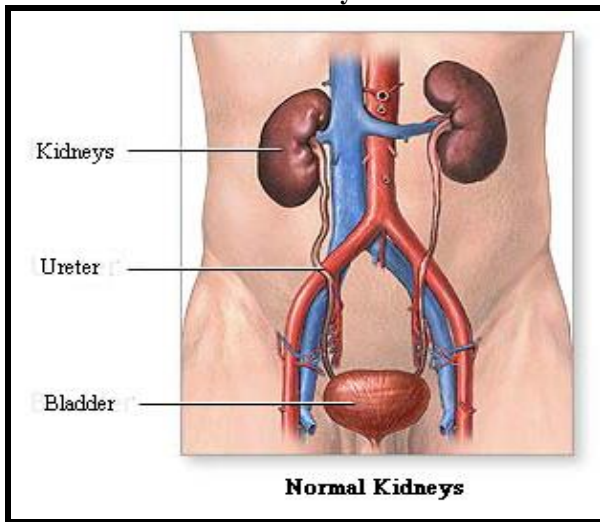
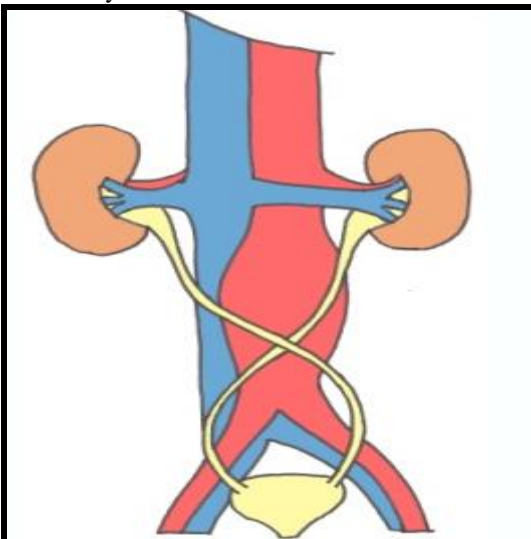


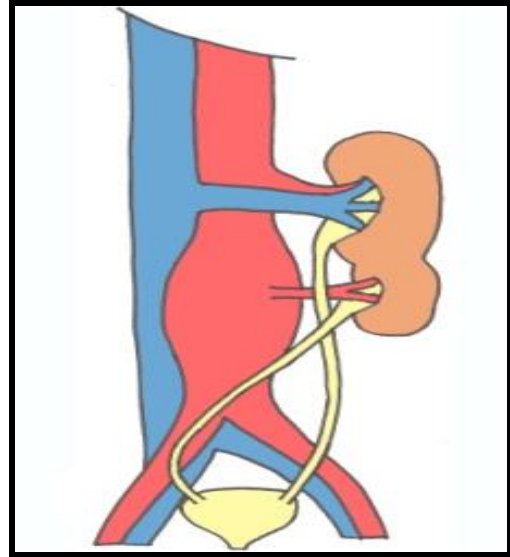
Fig 7. this diagram represents normal kidney.

**Ontogenesis of Development of Renal Ectopia**

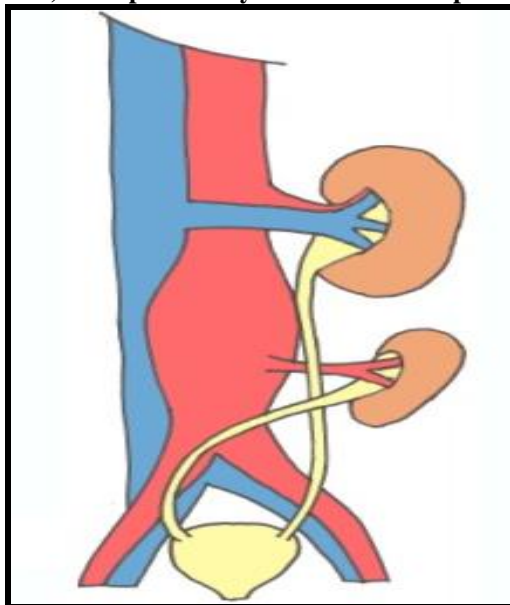
Crossed renal ectopia is the location of the kidney on the contralateral side in respect to the ureteral orifice location at the bladder. Often, the crossed kidney is fused with the uncrossed kidney



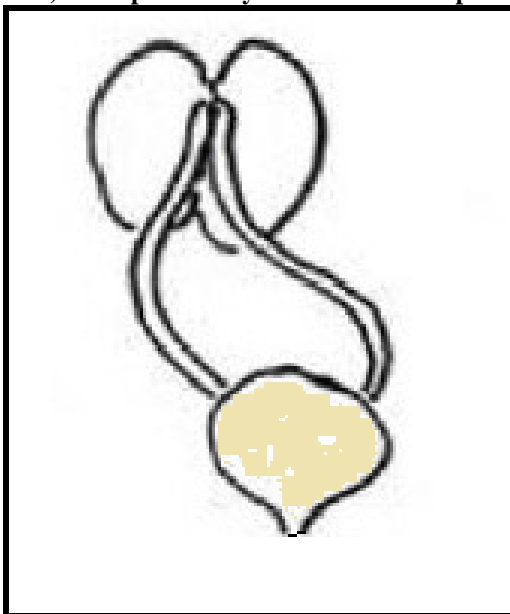
A) Bilaterally crossed renal ectopia.



B) S-shaped kidney crossed renal ectopia



C) L-shaped kidney crossed renal ectopia



D) Disc kidney crossed renal ectopia

Several examples of crossed renal ectopia: A) Bilaterally crossed renal ectopia B) S-shaped kidney C) L-shaped kidney D) Disc kidney

**L-shaped kidney**

Transversal location of the traversed kidney, the uncrossed kidney lies in normal position with the lower pole in connection to the crossed kidney.

**Disc kidney**

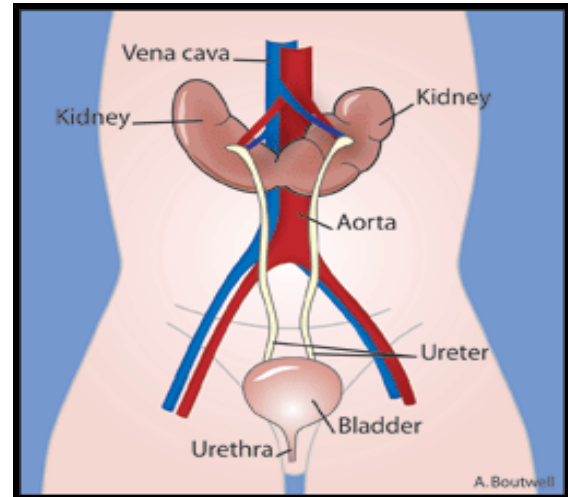
Crossed and uncrossed kidneys are merged with their medial borders, the lateral features are normal and produce a disc shape. The renal pelvis are focused anteriorly.

**S-shaped kidney**

Second most common form of crossed renal ectopia. Both kidneys are in longitudinal position. The crossed kidney is inferior of the uncrossed kidney, the renal pelvis is focused laterally. The uncrossed kidney is in regular position.

**Unilaterally fused kidneys with inferior ectopia:**

Most common form of crossed renal ectopia. Both kidneys are in longitudinal position, the upper pole of the crossed kidney is fused to the uncrossed kidney (lower pole). The renal pelvis are directed anteriorly.

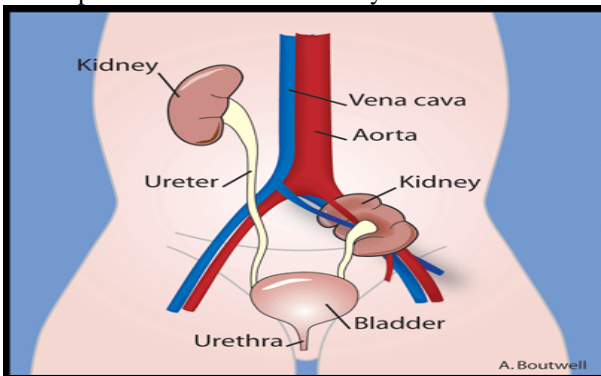


**Fig 9.** this diagram represents horseshoe kidney.

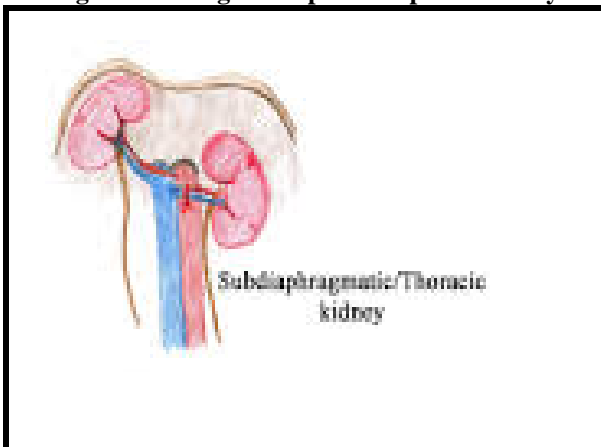
**Discussion**

The reported incidence of crossed renal ectopia is 1:2000 to 1:7000 autopsies. It was first designated by Pannorlus in 1654. McDonald and McClellan 4 categorized crossed ectopic kidney into 4 types (i) crossed renal ectopia with fusion, (ii) crossed renal ectopia without fusion, (iii) solitary crossed renal ectopia and (iv) bilaterally crossed renal ectopia.

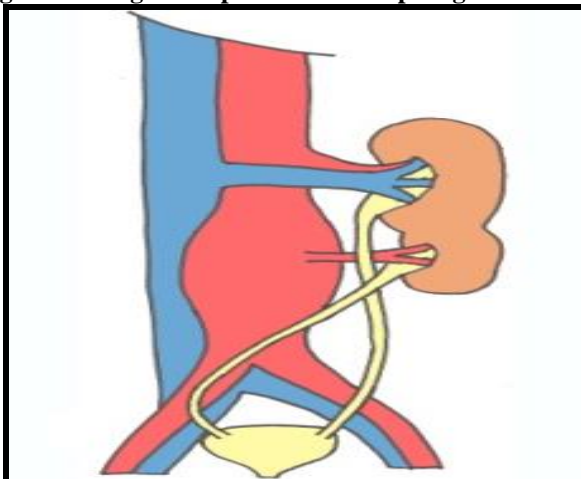
Those with fusion were additional classified by the nature of the fusion and position. The embryologic etiology of crossed ectopic kidneys is indistinct. Some have proposed that the developing kidney crosses to the contrary side. According to others the ureteral bud alone is accountable for crossing. This is based on the fact that the ureteral pain from stones is sensed on the side of the ureteral orifice, whereas renal pain is sensed on the side of the kidney. We feel that the occurrence of dysplasia can be explained by the latter theory as both ureters meet the similar nephrogenic cord; one at a site with maximum nephrogenic prospective while other with a suboptimal one. Our patient had segmental dysplasia and the kidney was non-functioning inspite of virtuous cortical thickness of around 1.5cm. The dysplasia in a crossed fused ectopic kidney has been reported infrequently. In 20-30% the pathology is an incidental finding. In the rest the most common symptoms informed are: abdominal or flank pains, a palpable mass, hematuria, urinary tract infection and dysuria. The urological conditions related with crossed ectopic kidneys are: hydronephrosis, reflux, tumours and nephrolithiasis. Tumours in crossed ectopic kidneys have been described sporadically. Pediatric patients most regularly present with several congenital anomalies, especially of the skeletal system. A 55% incidence of associated anomalies is reported in a series of 378 cases of crossed fused ectopy. The incidence is peak in regard to solitary crossed ectopy. There is no certain pattern of related congenital anomalies with crossed renal ectopia, which recommends that the lesion is a developed defect. Our patient had no other anomaly. The concomittant urinary pathology was pelvi-ureteric junction obstruction with hydronephrosis. The presentation was with an inflammation. The analysis is made by ultrasonography and intravenous urography. Ultrasound can sense concomittant urinary pathology and cystic variations. Anatomical delineation is best attained with IVU. Besides purpose it can give an idea about ureteric displacement. Cystourethrography should be done routinely in all children with renal anomalies of fusion or location. The theory of ureteric bud migration suggests abnormality at the lower and giving rise to a high incidence of reflux.



**Fig: 8-** this diagram represents pelvic kidney



**Fig 9.** this diagram represents subdiaphragmatic kidney



**Fig 10.** this diagram represents crossed fused ectopic kidney

In unclear cases when one cannot regulate the course of the ureter, a retrograde study is frequently helpful, nephrectomy is the management of choice in case of a crossed ectopic non-functioning kidney realising the fact that the chances of ipsilateral kidney being abnormal are high. The decision of nephrectomy can be supported by a renal scan. The diagnosis and management in our patient was aided by the above investigations.

### Conclusion

A high percentage of children with renal ectopia have connected urological anomalies, and VUR is the most common. The occurrence of VUR in the normally positioned kidney collected with decreased function of the ectopic kidney might influence these children if not recognized and preserved to renal function impairment.

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