

CONGENITAL UPJ OBSTRUCTION

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DEFINITION

(UPJ) obstruction can be thought of as a restriction to flow of urine, from the renal pelvis to the ureter, which, if left uncorrected, leads to progressive renal deterioration.

EVIDENCE

- ✗ UPJ obstruction occurs in all pediatric age groups, but there tends to be a clustering in the neonatal period.
- ✗ UPJ obstruction is the most common cause of significant dilation of the collecting system in the fetal kidney, accounting for 48% of all dilation of the collecting system.
- ✗ Kidneys with an anterior-posterior diameter greater than 20 mm seen prenatally are certainly at greater risk for requiring surgery postnatally.

- ✖ Obstruction occurs more commonly in boys than in girls , the ratio exceeds 2:1.
- ✖ Left-sided lesions predominate, (approximately 67%).
- ✖ Bilateral UPJ obstruction is present in 10% to 40% of cases.
- ✖ Occur in infants younger than 6 months of age and it has been known to affect members of more than one generation.
- ✖ UPJ obstruction is seen during childhood and adolescence but to a lesser degree.

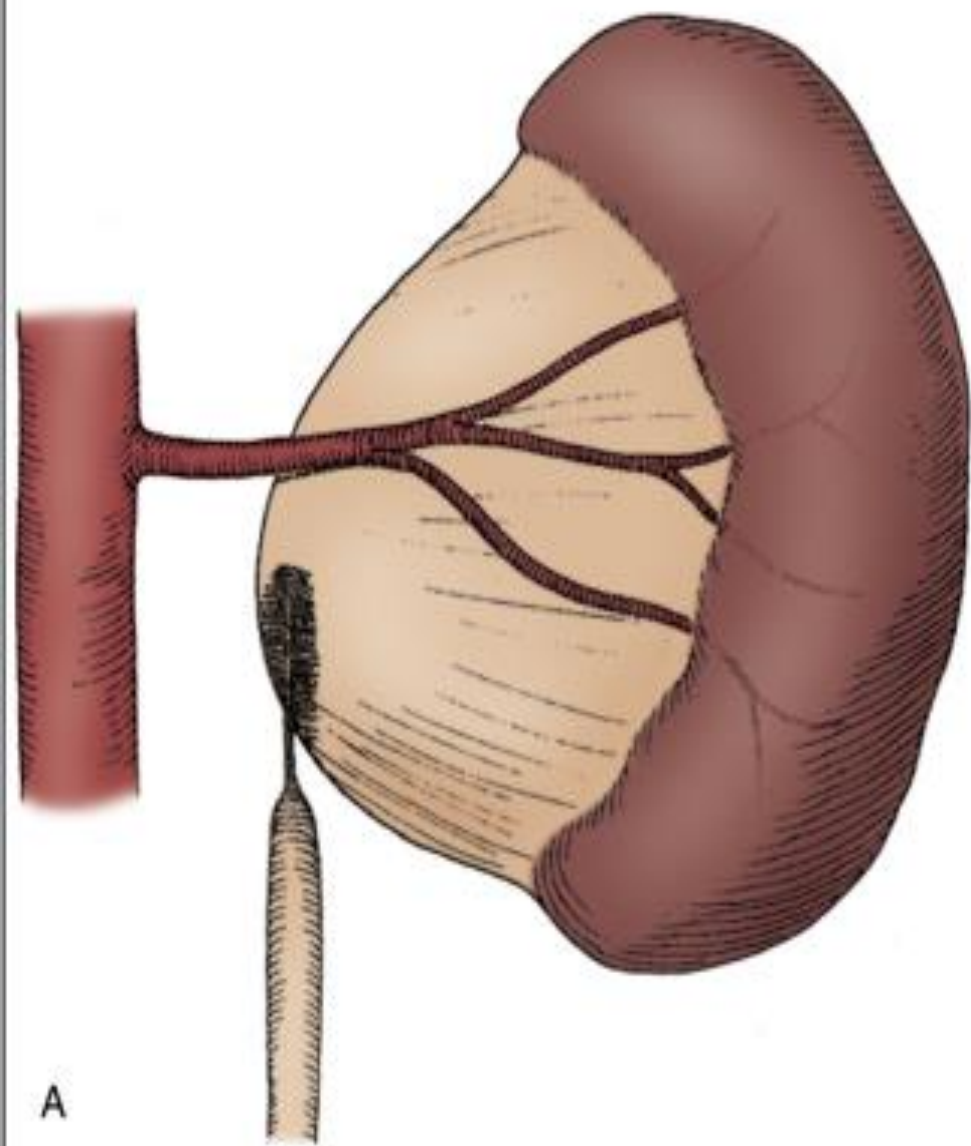
ETIOLOGY

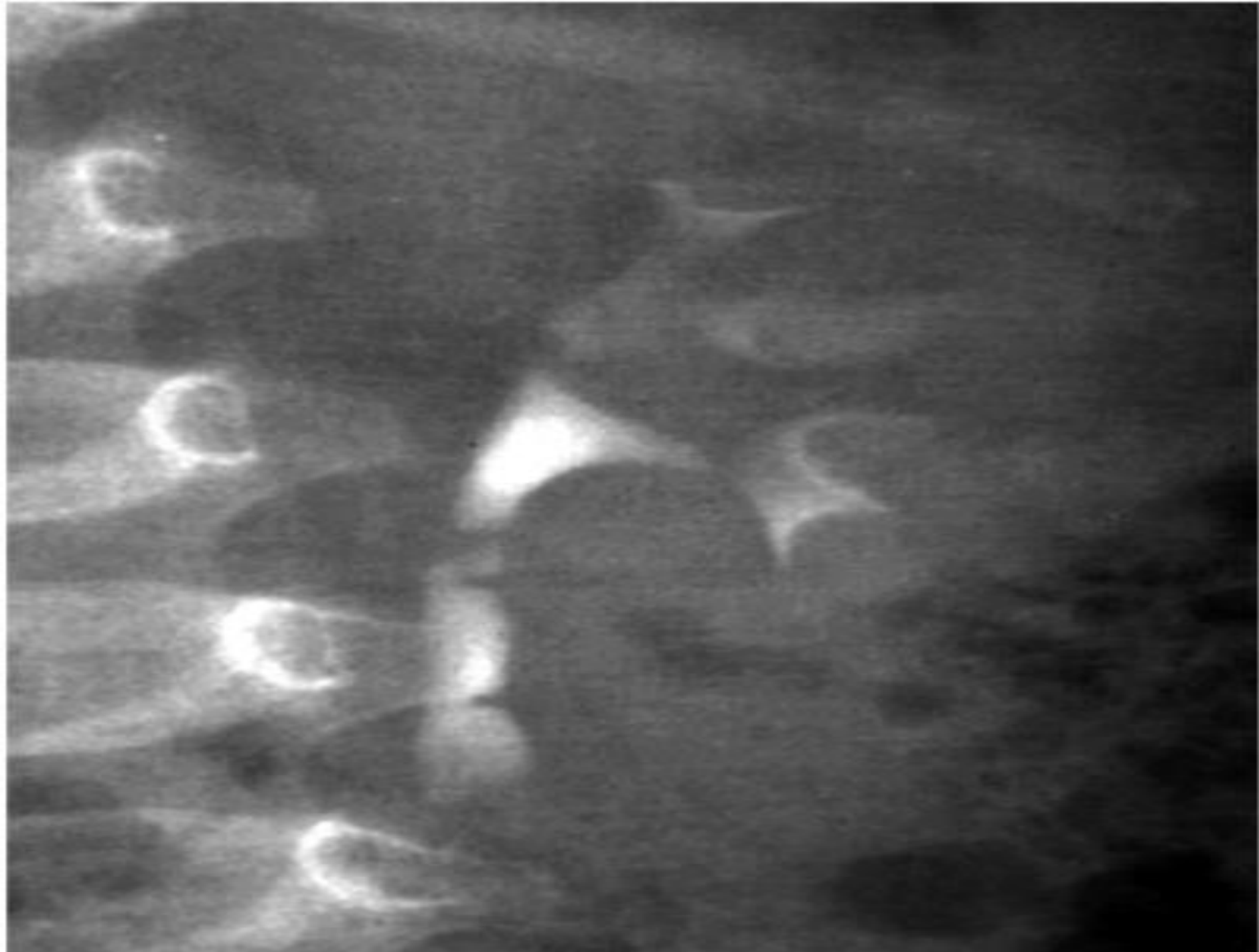
A. Intrinsic: there is a narrowed segment of the ureter at the UPJ due to:

1. interruption in the development of the circular musculature of the UPJ.
2. an alteration of the collagen fibers and composition between and around the muscle cells.
3. increase in the lamina muscularis and in the number of inner longitudinal muscular bundles of the UPJ complex of obstructed kidneys.

4. valvular mucosal folds, persistent fetal convolutions and upper ureteral polyps.

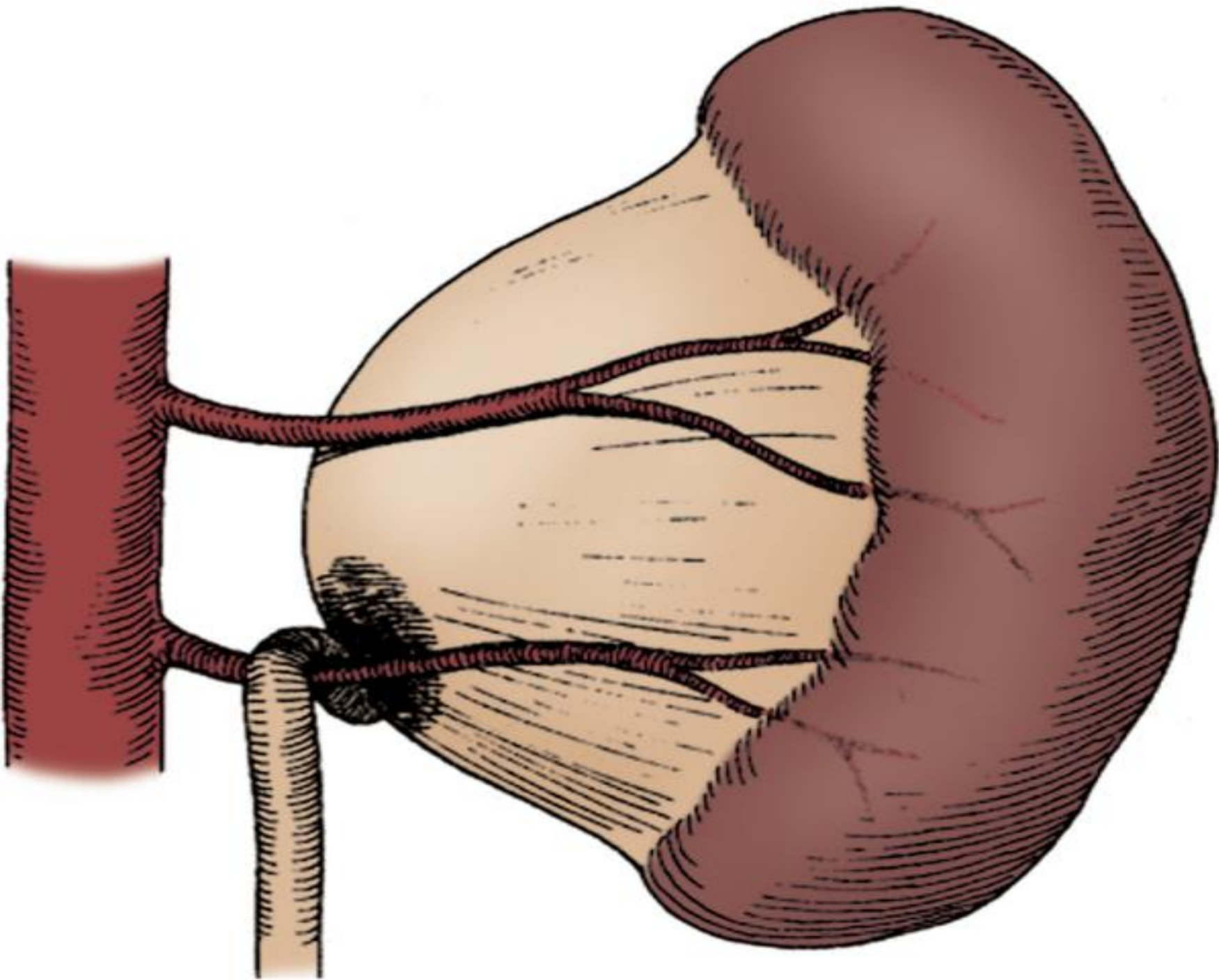
Congenital folds “Ostling's folds” are a common finding in the upper ureter of fetuses after the fourth month of development and may persist until the newborn period. “Ostling's folds” are now considered folds that are not obstructive and disappear with a person's linear growth. persistent fetal folds containing muscle and high insertion of a valvular leaflet at the UPJ may become obstructive.





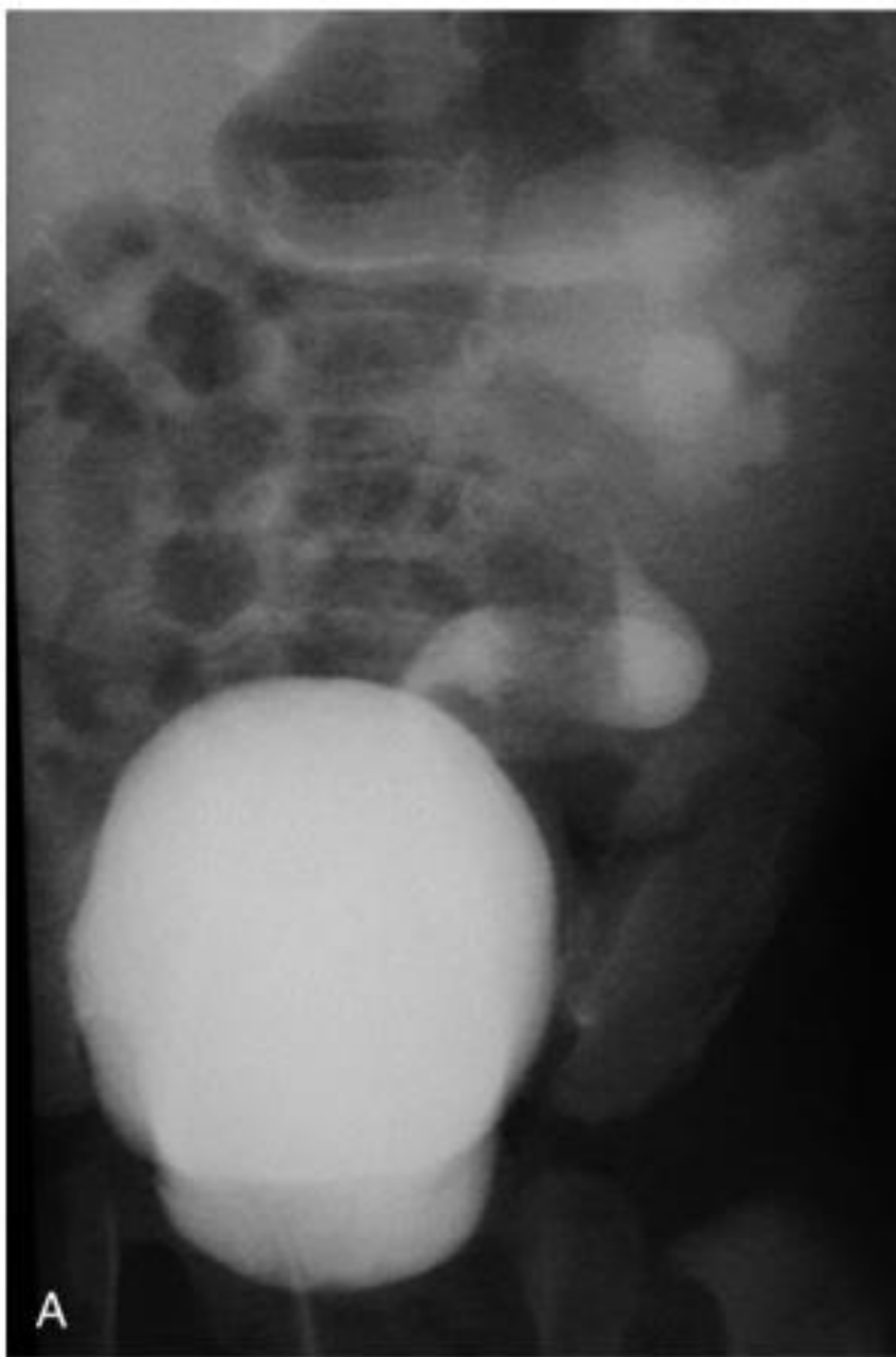
B. EXTRINSIC

- ✖ An aberrant, accessory, or early-branching lower pole vessel is the most common cause of extrinsic UPJ obstruction.
- ✖ incidences have varied between 15% and 52%.
- ✖ This is a major cause of UPJ obstruction in adults.
- ✖ Stephens (1982) could find no evidence of stricture or fibrosis at these points when the ureter was freed of its adhesions and lifted off the vessel. However, he suggested that, over time, these areas may become ischemic, fibrotic, and finally stenotic.



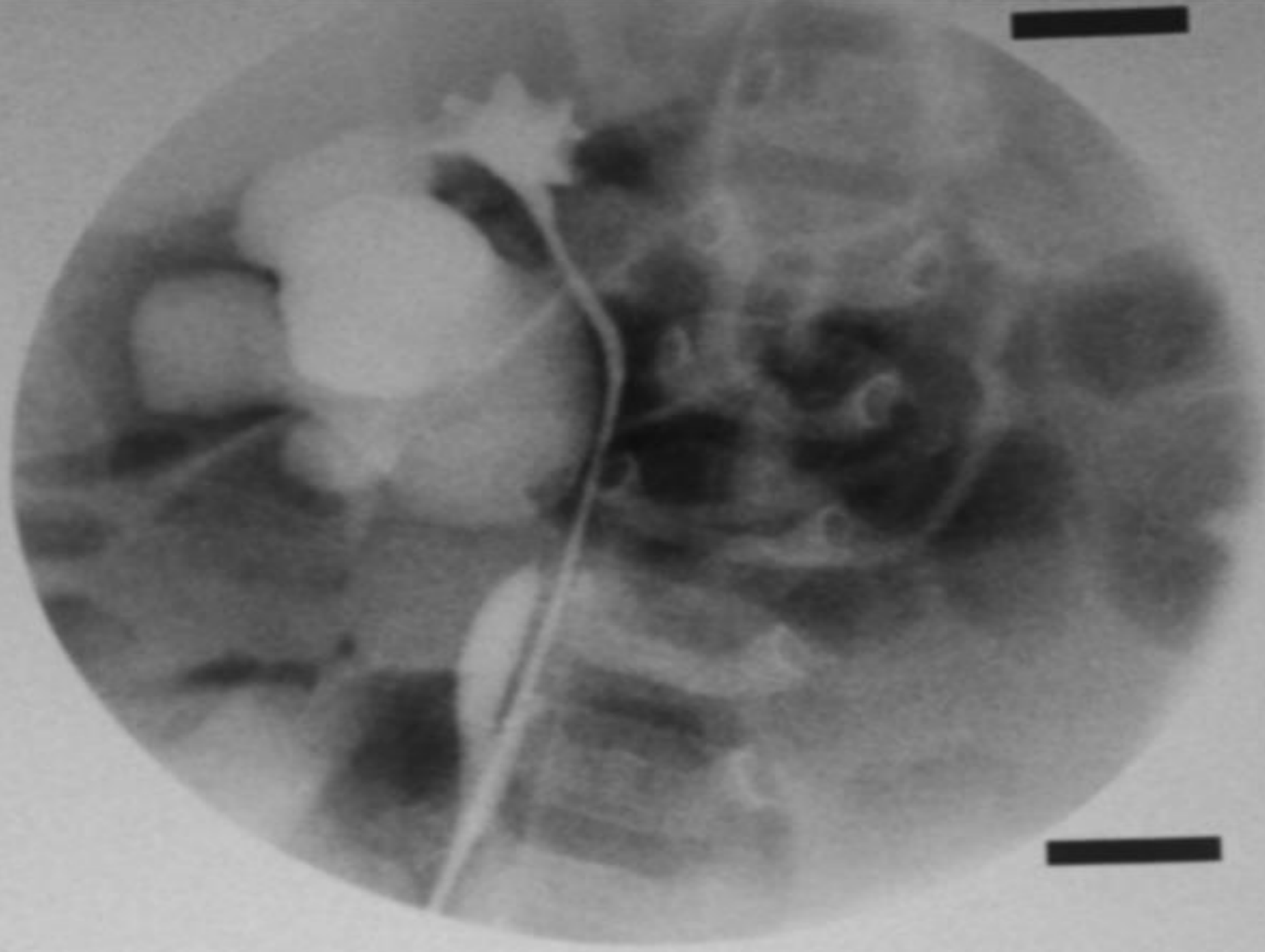
C. SECONDARY UPJ OBSTRUCTION

- ✖ seen with severe vesicoureteral reflux (VUR); these conditions coexist in 10% of cases.
- ✖ A kink may develop in the UPJ area, a point of relative fixation, and may cause obstruction secondarily.
- ✖ In such a situation the obstructive lesion needs to be corrected initially, even though the VUR contributed to the initial problem .With the advent of injectable biomaterials such as Deflux (Q-Med, Uppsala, Sweden) and Macroplastique (Uroplasty, Minneapolis, MN), consideration should be given to correcting the proximal obstruction as well as the distal reflux by an endoscopic approach.



D. LOWER POLE URETERAL PELVIC JUNCTION OBSTRUCTION

- ✘ Lower pole UPJ obstruction can occur in kidneys with an associated incomplete renal duplication.
- ✘ The incidence of renal duplication is predicted to be 0.3% to 6%. Incomplete duplications are found approximately 70% of the time in comparison with complete duplications.
- ✘ The anatomy of lower pole UPJ obstruction is either a short bifurcating ureteral segment distal to the UPJ or a longer bifurcating ureteral segment.



E. ASSOCIATED ANOMALIES

- ✖ UPJ obstruction is the most common anomaly encountered in the opposite kidney; it occurs in 10% to 40% of cases.
- ✖ Renal dysplasia and multicystic dysplastic kidney are the next most frequently observed contralateral lesions.
- ✖ unilateral renal agenesis has been noted in almost 5% of children.
- ✖ UPJ obstruction may also occur in either the upper or the lower half of a duplicated collecting system or of a horseshoe or ectopic kidney.



- ✖ UPJ obstruction was noted in 21% of children with the VATER (vertebral defects, imperforate anus, tracheoesophageal fistula, and radial and renal dysplasia).
- ✖ VUR has been found in as many as 40% of affected children.

SYMPTOMS/PRESENTATION

1. *Infant:*

- ✗ Most infants are asymptomatic.
- ✗ OR presented with: failure to thrive, feeding difficulties, sepsis secondary to urinary tract infection, or pain or hematuria related to nephrolithiasis.
- ✗ Urinary tract infection is the presenting sign in 30% of affected children beyond the neonatal period.

2. older child:

- ✖ Episodic flank or upper abdominal pain, associated with nausea and vomiting.
- ✖ Cyclic vomiting alone.
- ✖ Hematuria, which is seen in 25% of children, after minor abdominal trauma.

3. Young adult:

- ✘ Episodic flank or abdominal pain, particularly during diuresis.**
- ✘ Hypertension, renin-mediated hypertension.**

DIAGNOSIS

1. Ultrasonography

standard method for identifying hydronephrosis in infancy. The size of the renal pelvis (anteroposterior diameter) can correlate with the likelihood of obstruction.

the renal parenchyma-pelviccaliceal area has been measured and compared with the result of conventional diuretic renography. A ratio of less than 1.6 correlates well with an obstructive process and need for pyeloplasty, whereas patients with a ratio greater than 1.6 can be safely observed.

Renal duplex Doppler ultrasonography has also shown promise as a means of identifying obstruction. A resistive index (RI) is defined as the peak systolic velocity minus the lowest diastolic velocity divided by the peak systolic velocity. Infants younger than 1 year of age had a greater RI (0.66) than children older than 1 year of age (0.57). In hydronephrotic kidneys, the RI values were much higher in the kidneys that had an obstructive pattern on diuretic renography ($RI \geq 0.75$). follow-up of these patients demonstrated that the RI normalized after successful pyeloplasty (average preoperative RI, 0.87; average postoperative RI, 0.63).

2. Radionuclide Renography :

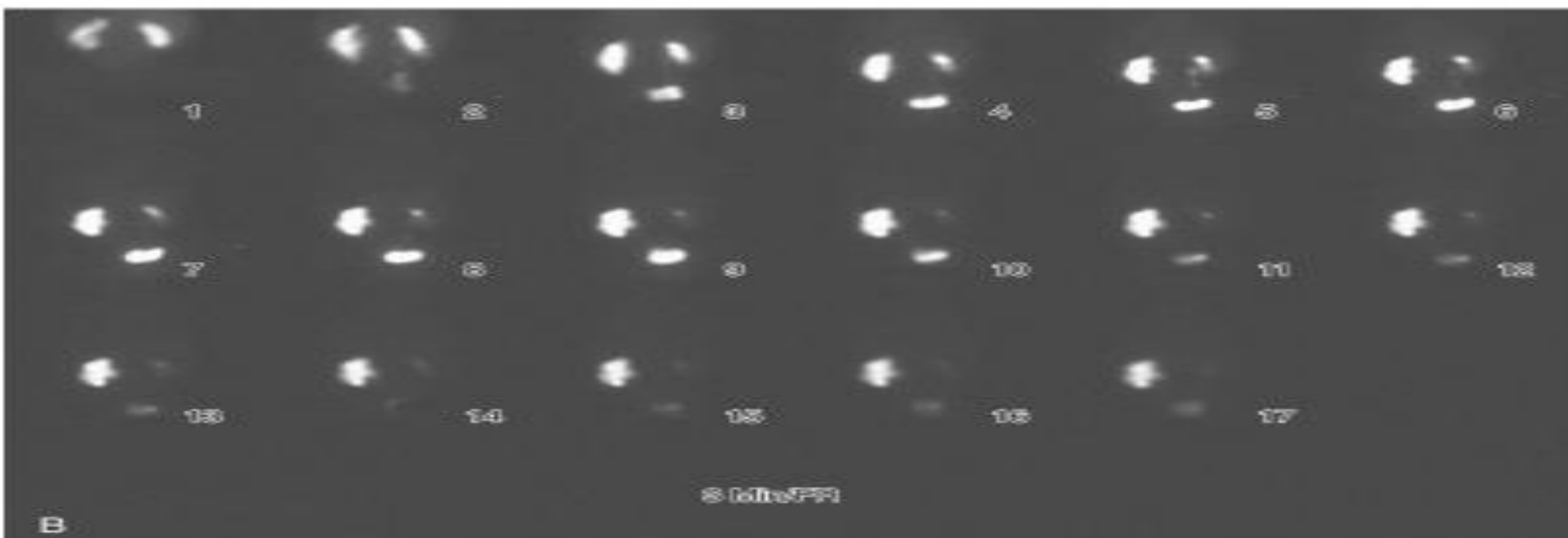
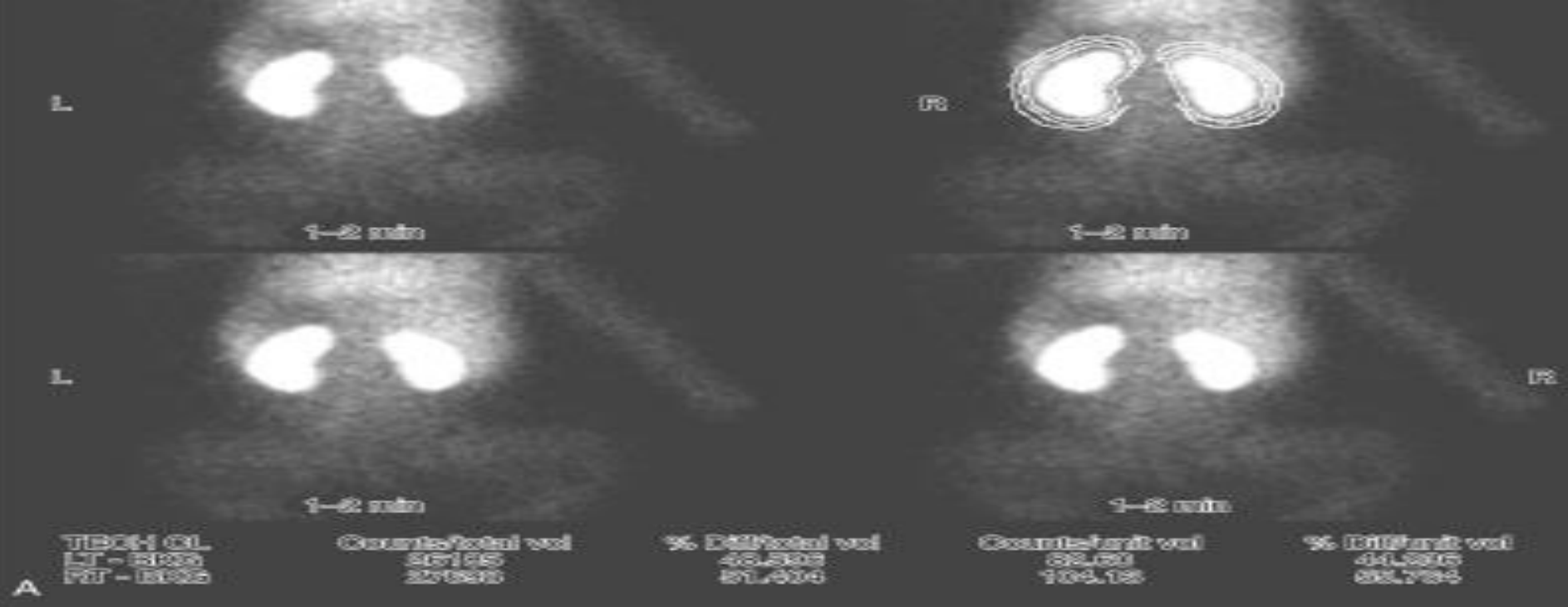
It provides differential renal function data and an assessment of washout from the individual kidney.

Early studies used ^{99m}Tc -diethylenetriaminepentaacetic acid (DTPA) as the radionuclide, which has since been supplanted by ^{99m}Tc -mercaptoacetyltriglycine (MAG3) at many institutions.

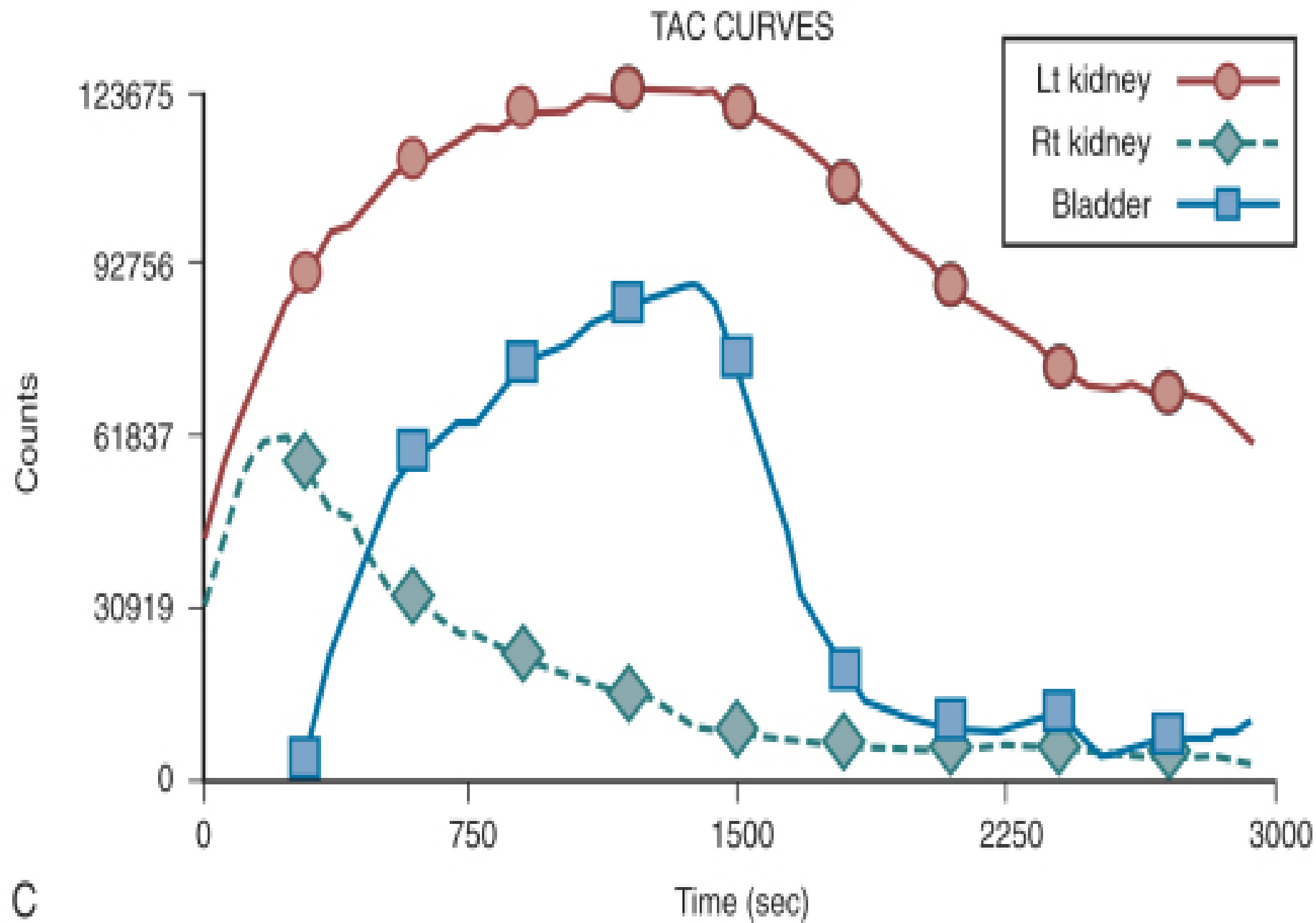
- × **DTPA** is a small molecule that is exclusively filtered by glomeruli with an **extraction coefficient of 20%** in the mature kidney. Because it is excreted only by glomerular filtration, this agent provides an indirect means of measuring the glomerular filtration rate (GFR). Differential GFR can be determined by comparing the amount of uptake in each kidney during the first **1 to 3 minutes** after intravenous injection.

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- ✗ **MAG3** is cleared by the kidneys by secretion in the proximal tubules with a higher extraction fraction than DTPA (about **50%** in mature kidneys) and **MAG3** remains essentially within the intravascular space. This provides a high target-to-background ratio, good image quality, and more accurate numerical values, particularly when the kidney function is low or immature.

- ✖ The nuclear renogram is one test that can help define whether obstruction exists. A kidney that shows symmetric uptake and good washout is not obstructed. In many situations with hydronephrotic kidneys, there is a small difference in the differential function of the affected kidney compared with its contralateral mate and the Lasix renogram shows some impairment of drainage.



C



3.MAGNETIC RESONANCE IMAGING

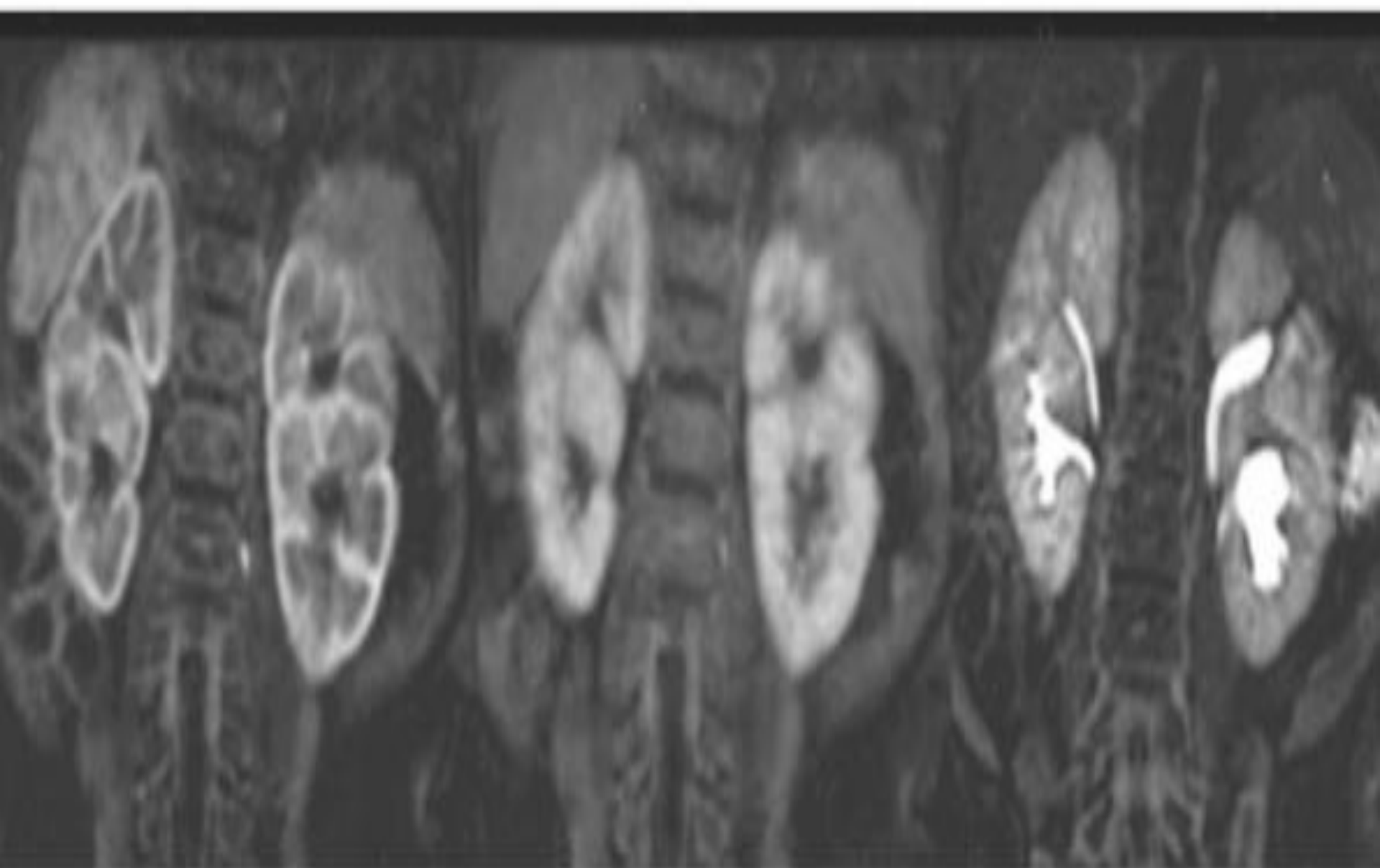
- ✖ Offers unique advantages for evaluating renal blood flow, anatomy, and urinary excretion.
- ✖ MRI noncontrast studies showed precise dilatation of the hydronephrotic pelvis and corticomedullary junction in a rat model with unilateral congenital hydronephrosis.
- ✖ MRI urography is being investigated to define urinary tract anatomy, calculate differential renal function, and assess urinary tract obstruction.

- ✗ MR urography measure renal transit time.
- ✗ In kidneys with poor drainage, in which no contrast was seen in the ureter at the end of 15 minutes of dynamic imaging, the RTT was 900 seconds (15 minutes).
- ✗ RTT defined normal kidneys (less than or equal to 245 seconds).
- ✗ Equivocal (RTT between 245 and 490 seconds), or obstructive (RTT greater than 490 seconds).

Perfusion

Uptake

Excretion



A



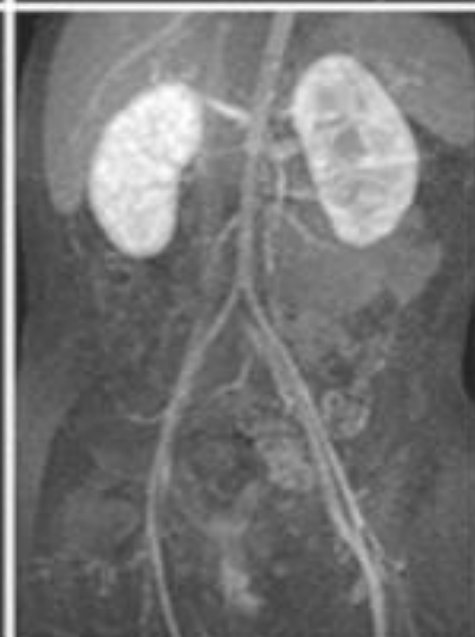
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C



D



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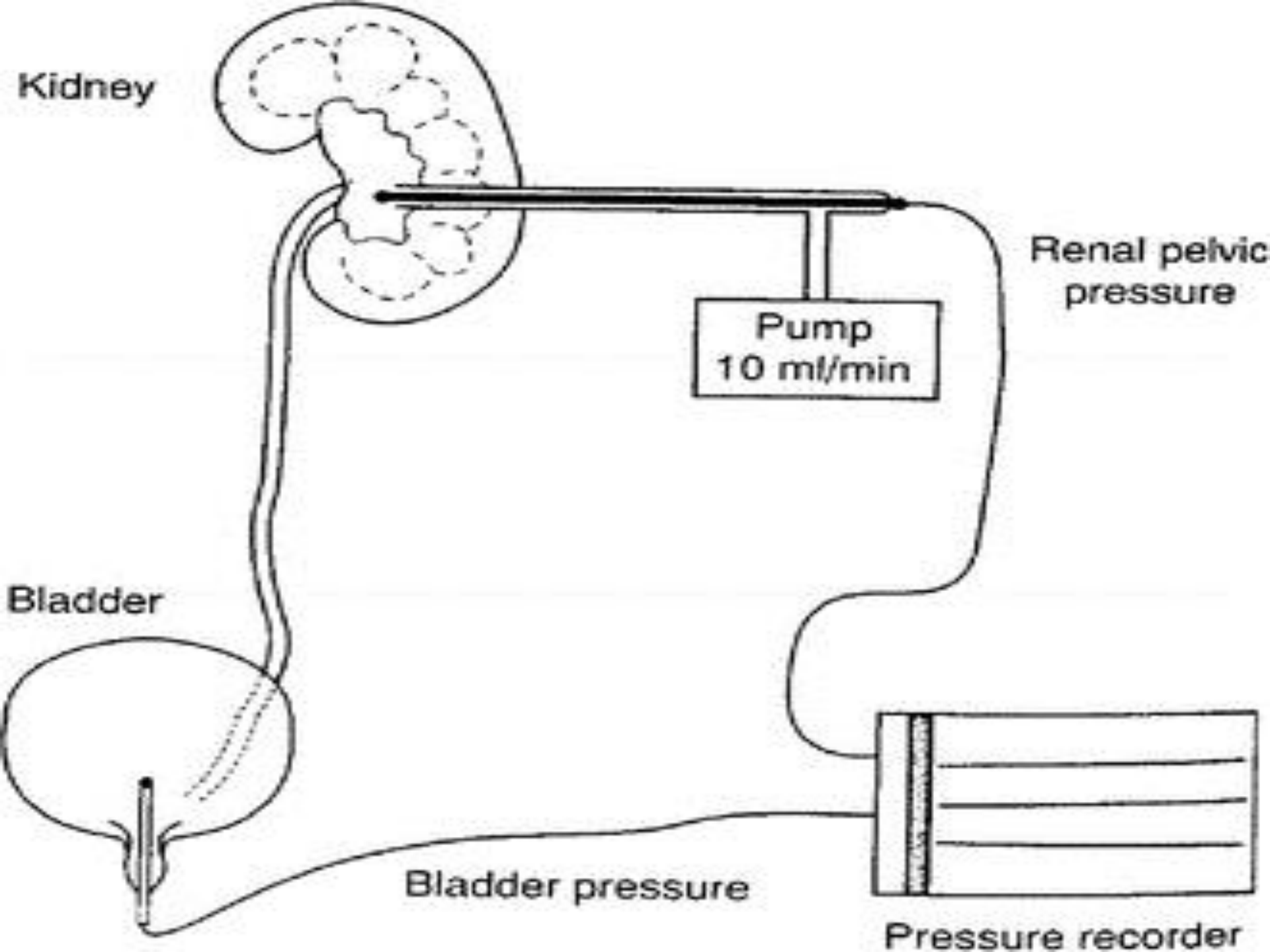
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H

4. PRESSURE-FLOW STUDIES

- ✖ A differential pressure between kidney and bladder indicate of obstruction to the kidney.
- ✖ The Whitaker test in all patients with a renal pelvic pressure greater than 14 cm H₂O, the pressure-flow study demonstrated evidence of obstruction.

✘ Pressure-flow measurements that define outflow resistance have also been used to help define obstruction. Servoregulating the infused flow to preset pressure levels was used to assess patients with hydronephrotic kidneys so that steady-state flow was achieved at pressures of 5, 10, 15, 20, 25, and 30 mm Hg greater than the intra-abdominal pressure. This was compared with the standard Whitaker procedure at an infusion rate of 10 mL/min. The Whitaker test proved to be of no value for calculating outflow resistance in UPJ obstruction. A pressure-flow study was found to be superior to the Whitaker test and allowed categorization of the patients requiring surgery or observation.



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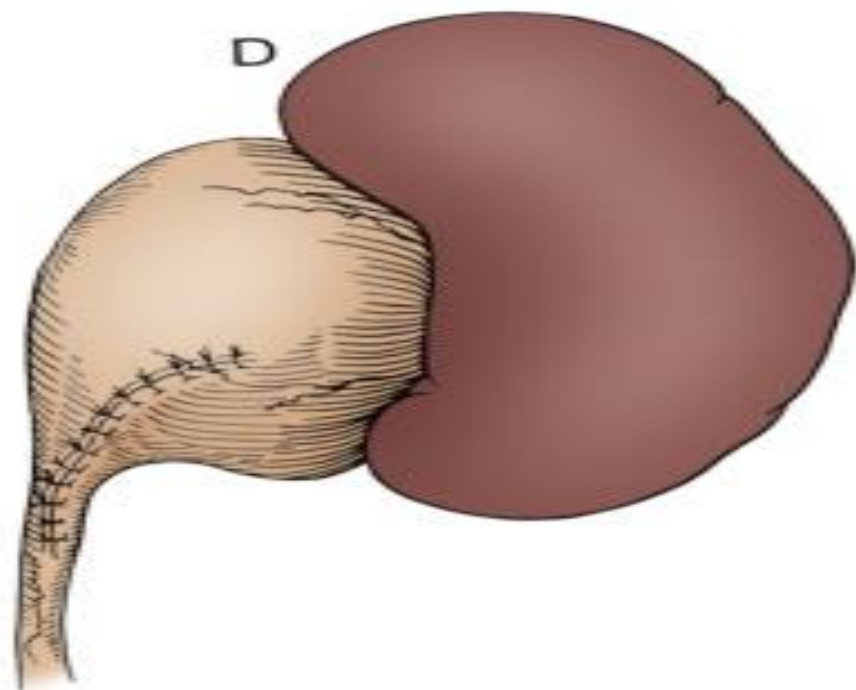
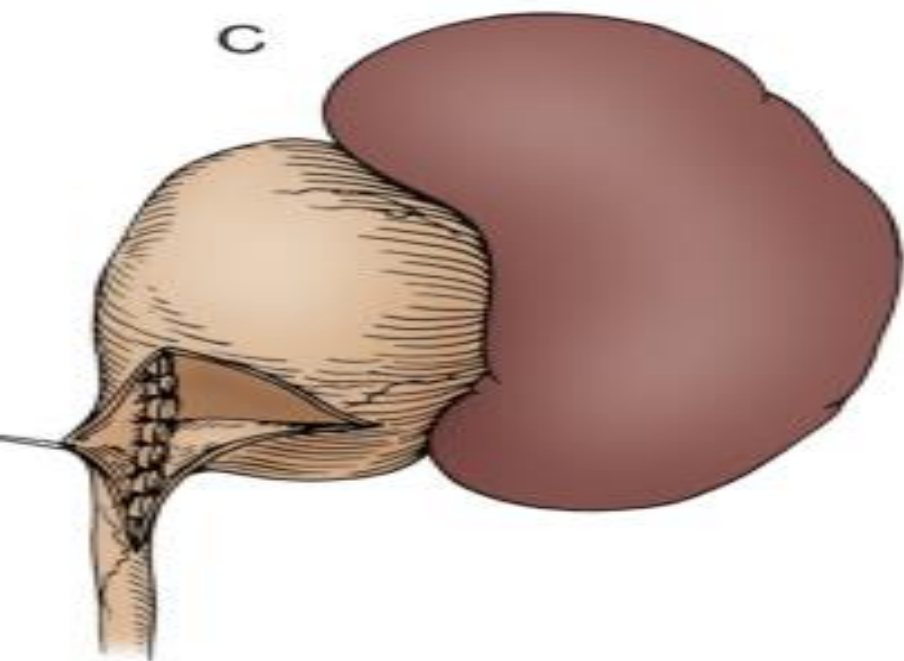
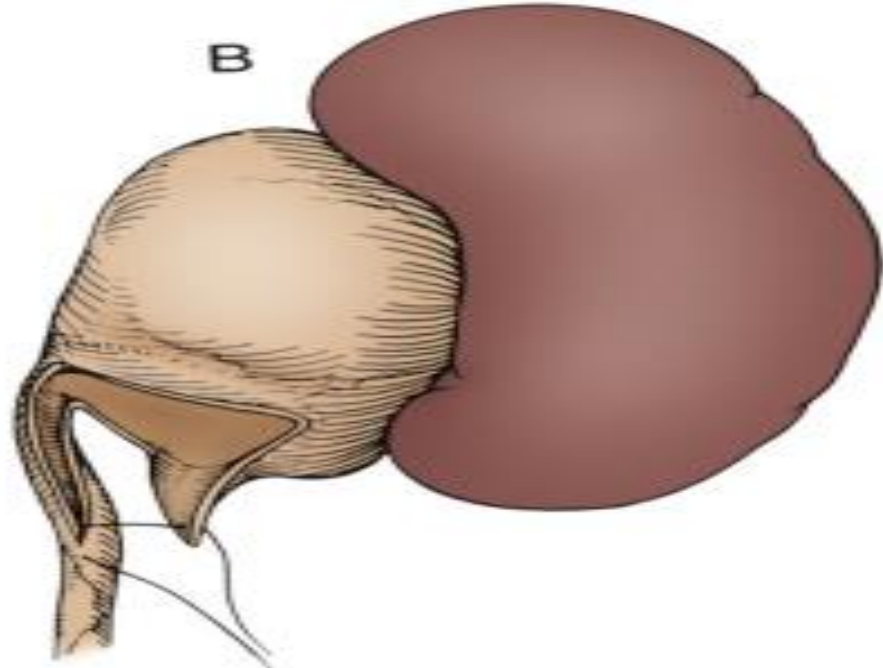
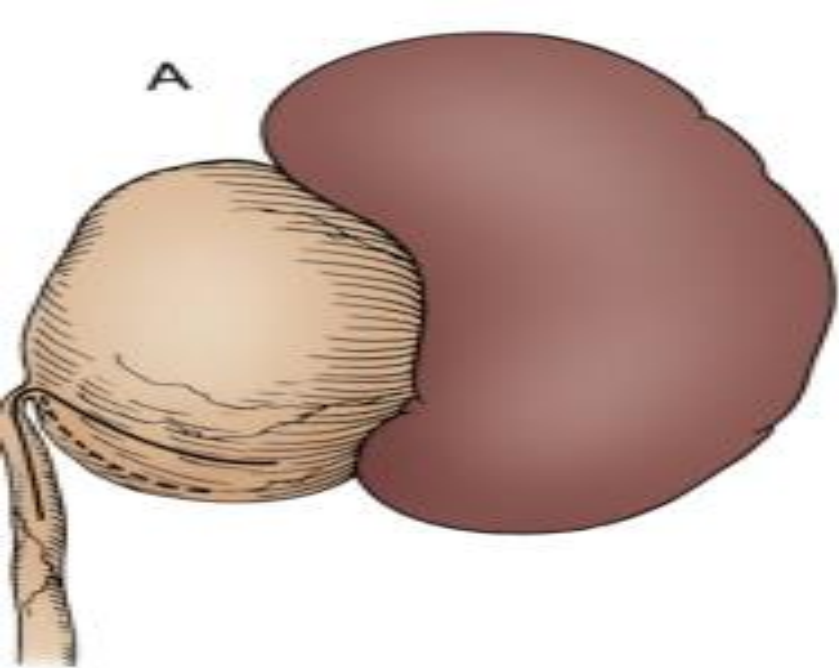
5. BIOCHEMICAL PARAMETERS

- ✖ Urinary *N*-Acetyl- β -D-glucosaminidase (NAG).
- ✖ Urinary TGF- β 1 (fourfold higher). TGF- β 1 was 80% sensitive, 82% specific, and 81% accurate for the diagnosis of obstruction.

SURGICAL REPAIR

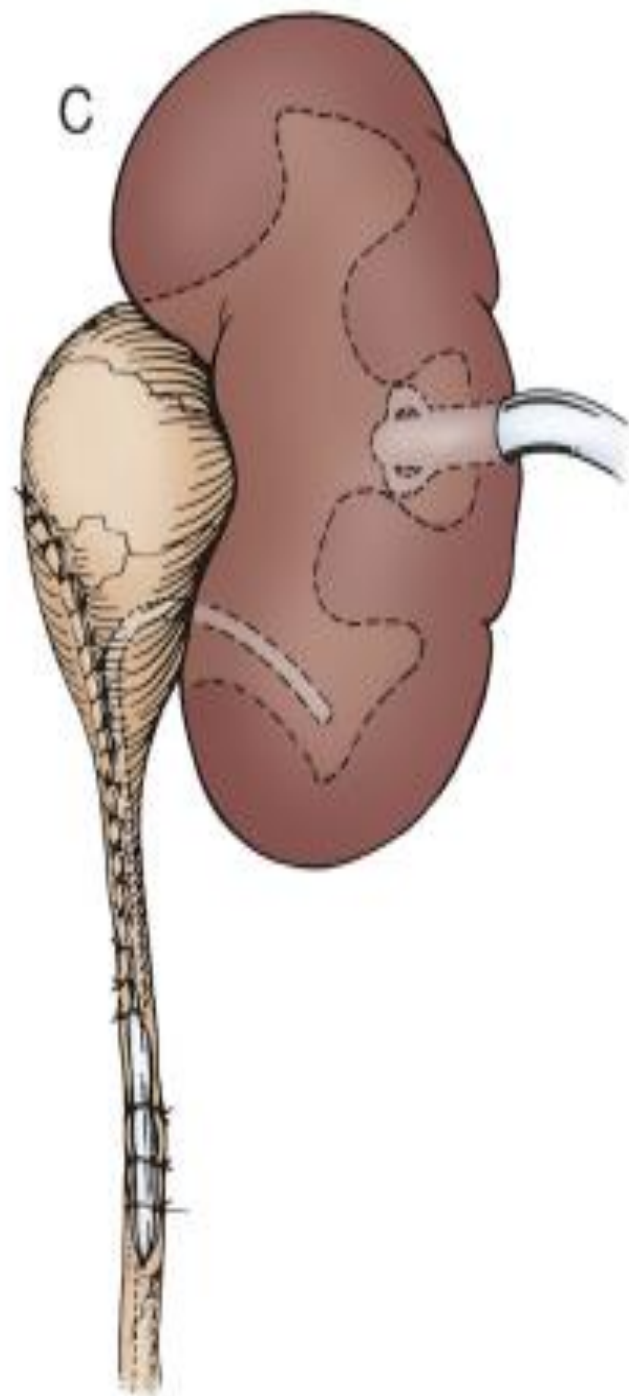
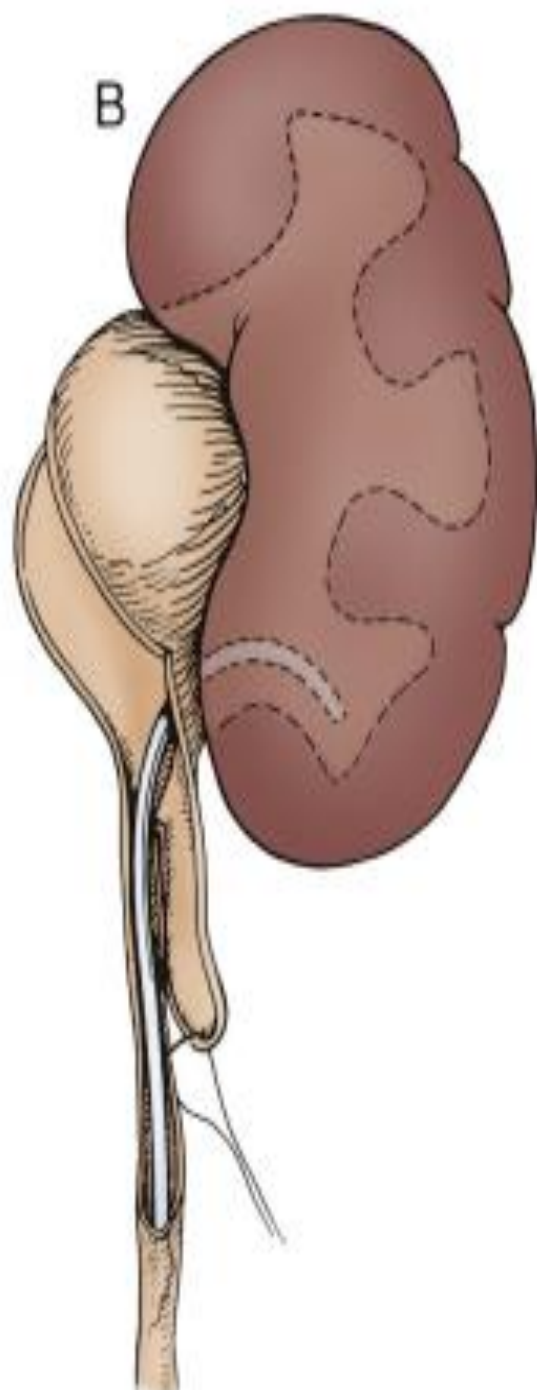
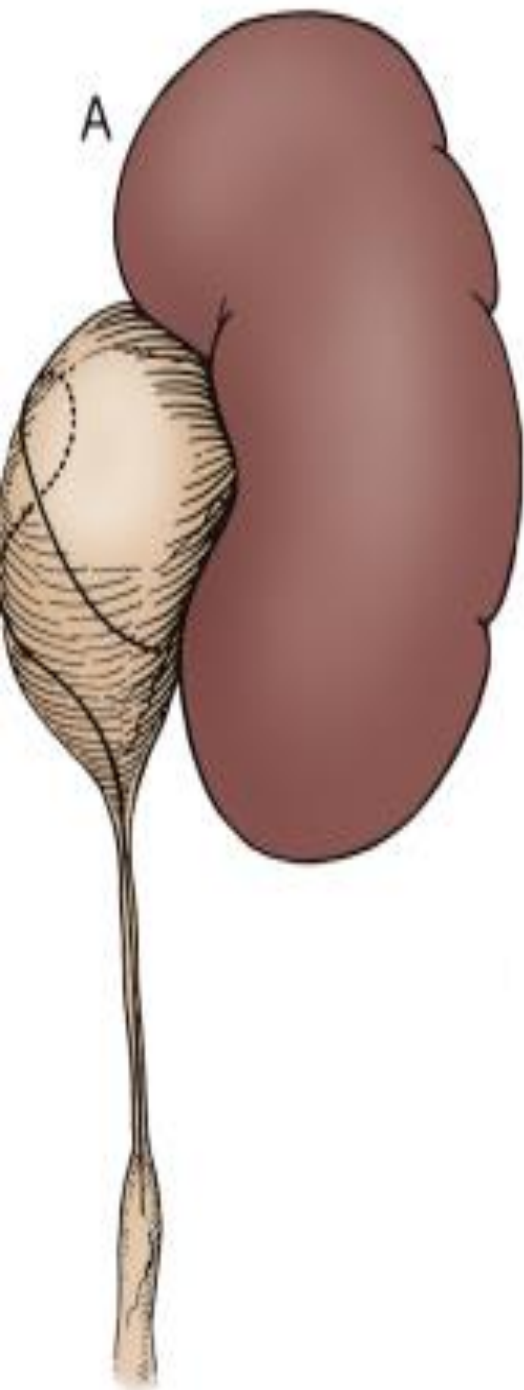
A.open surgical techniques:

1. The Foley Y-V plasty operation: was designed for the correction of UPJ with a high ureteral insertion.

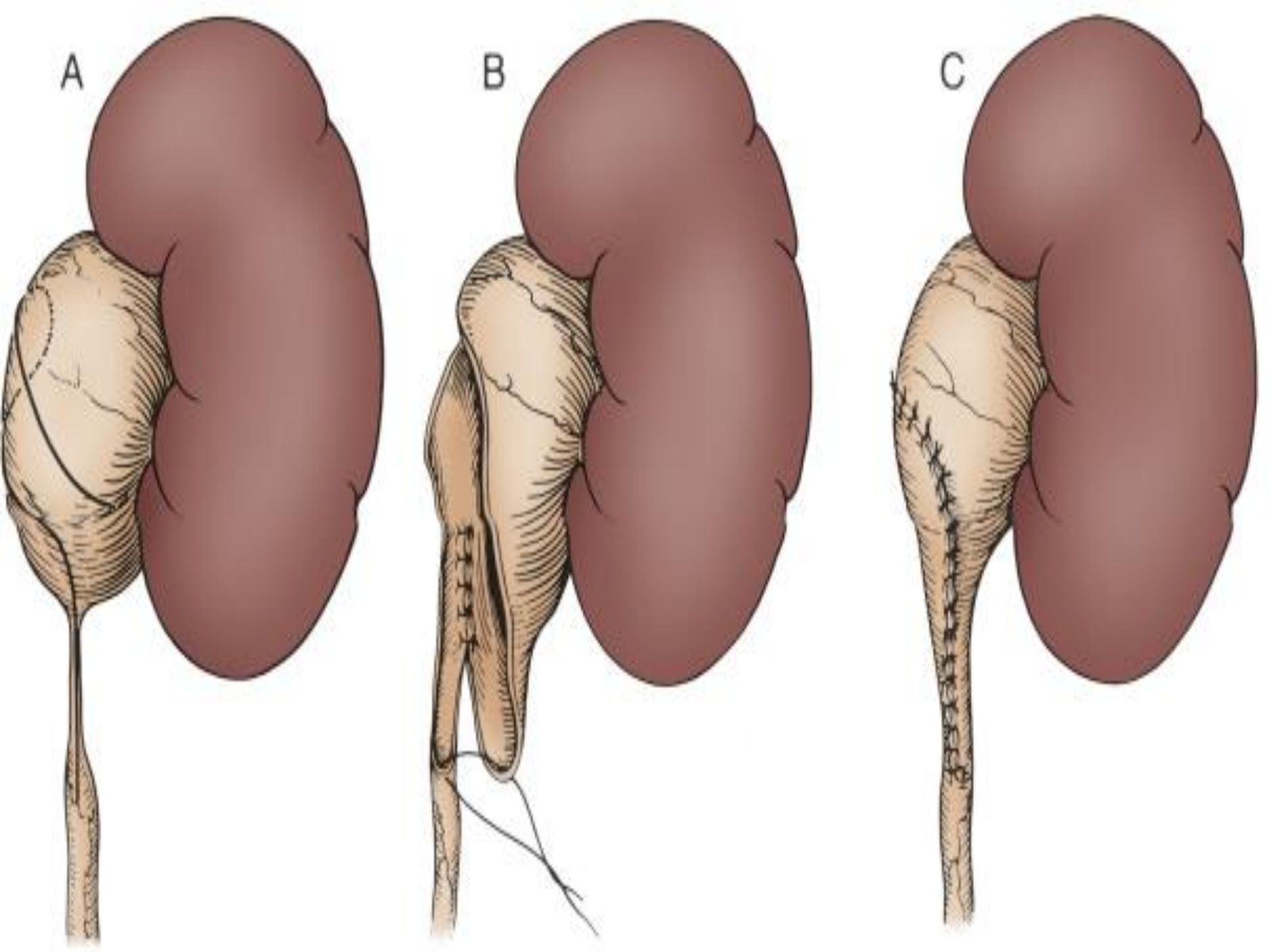


2.The Davis intubated ureterotomy :

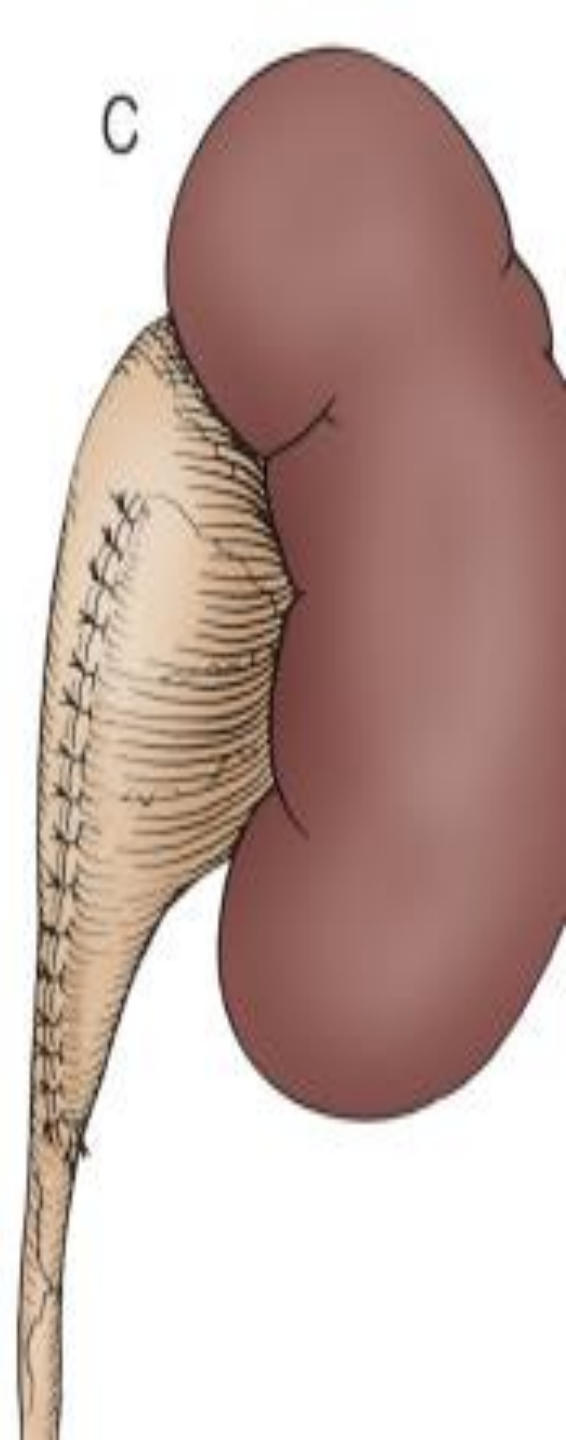
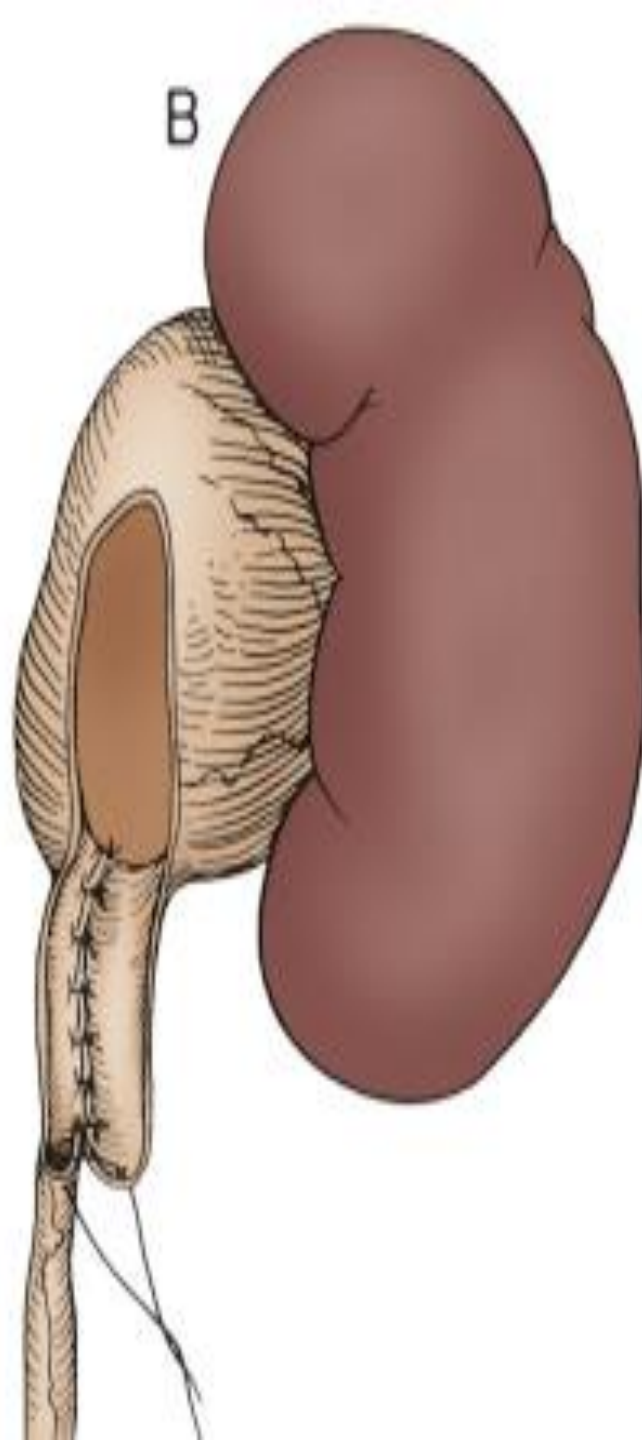
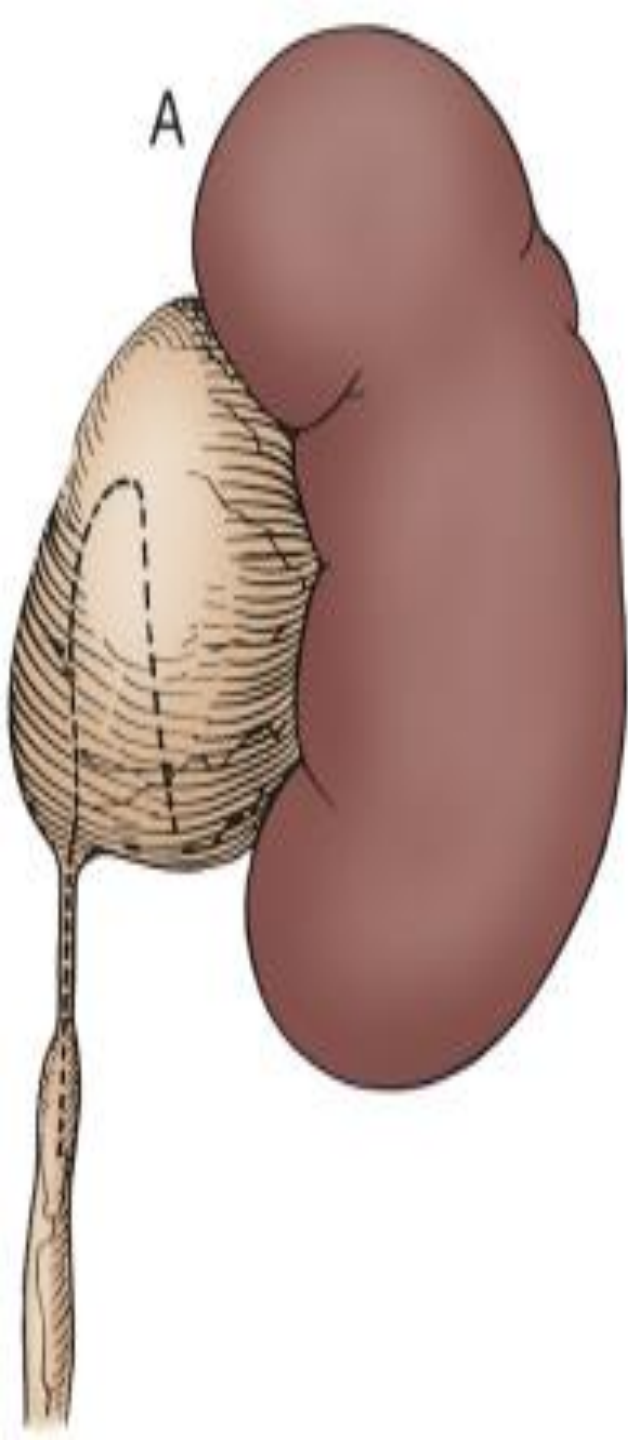
Depends on secondary epithelialization from the incised ureter. It is applicable when multiple or extensive strictures of the proximal ureter are present but cannot be bridged by a pelvic flap. Its use requires maintenance of ureteral continuity on at least one side and the presence of an indwelling ureteral stent for 6 weeks, the time needed for full circumferential regeneration of all layers of the ureter.



× **spiral flap** is created from the renal pelvis, which is used to repair the defect at the UPJ. Such a flap is able to bridge the gap between the pelvis and healthy ureter over a distance of several centimeters

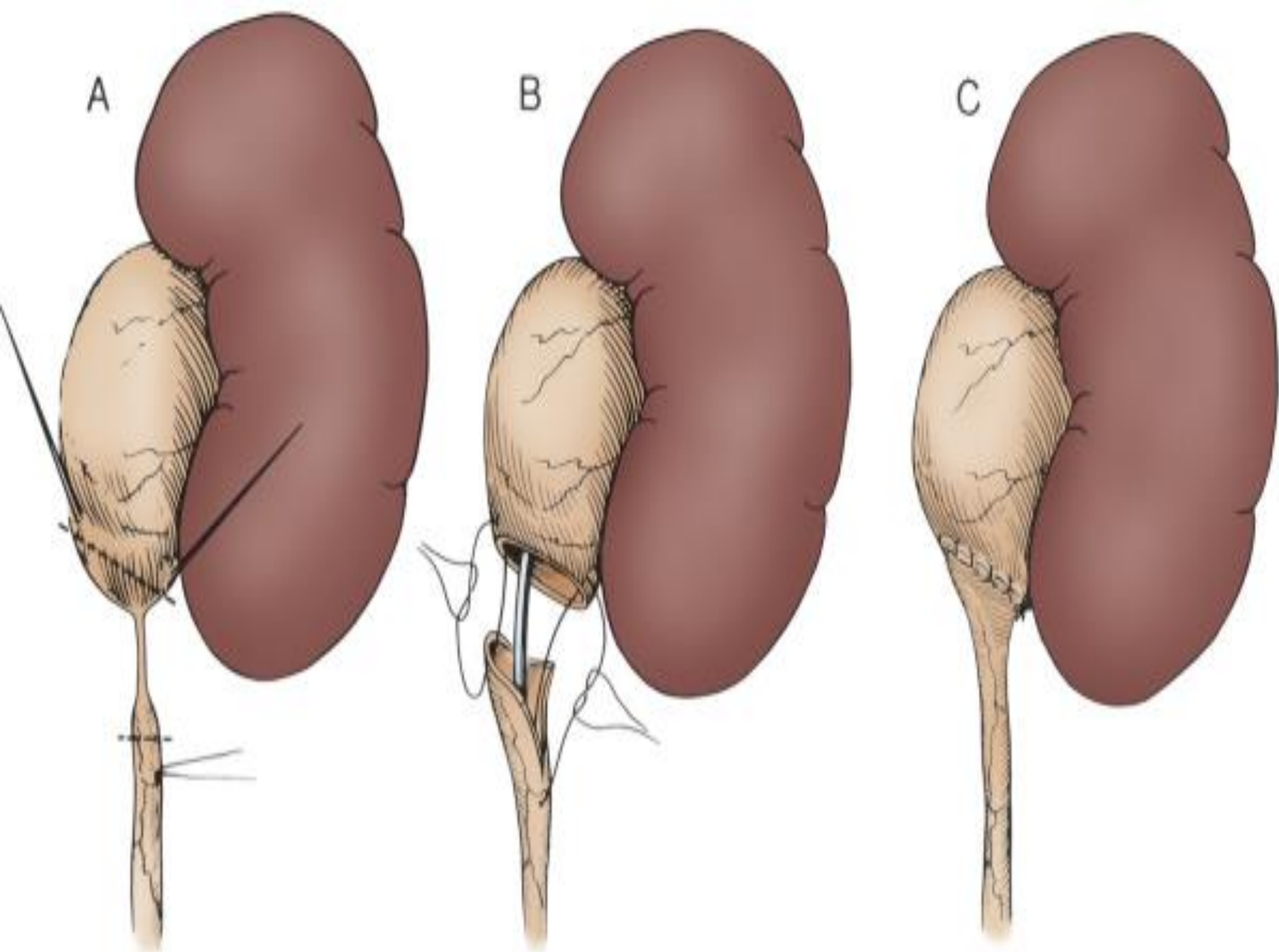


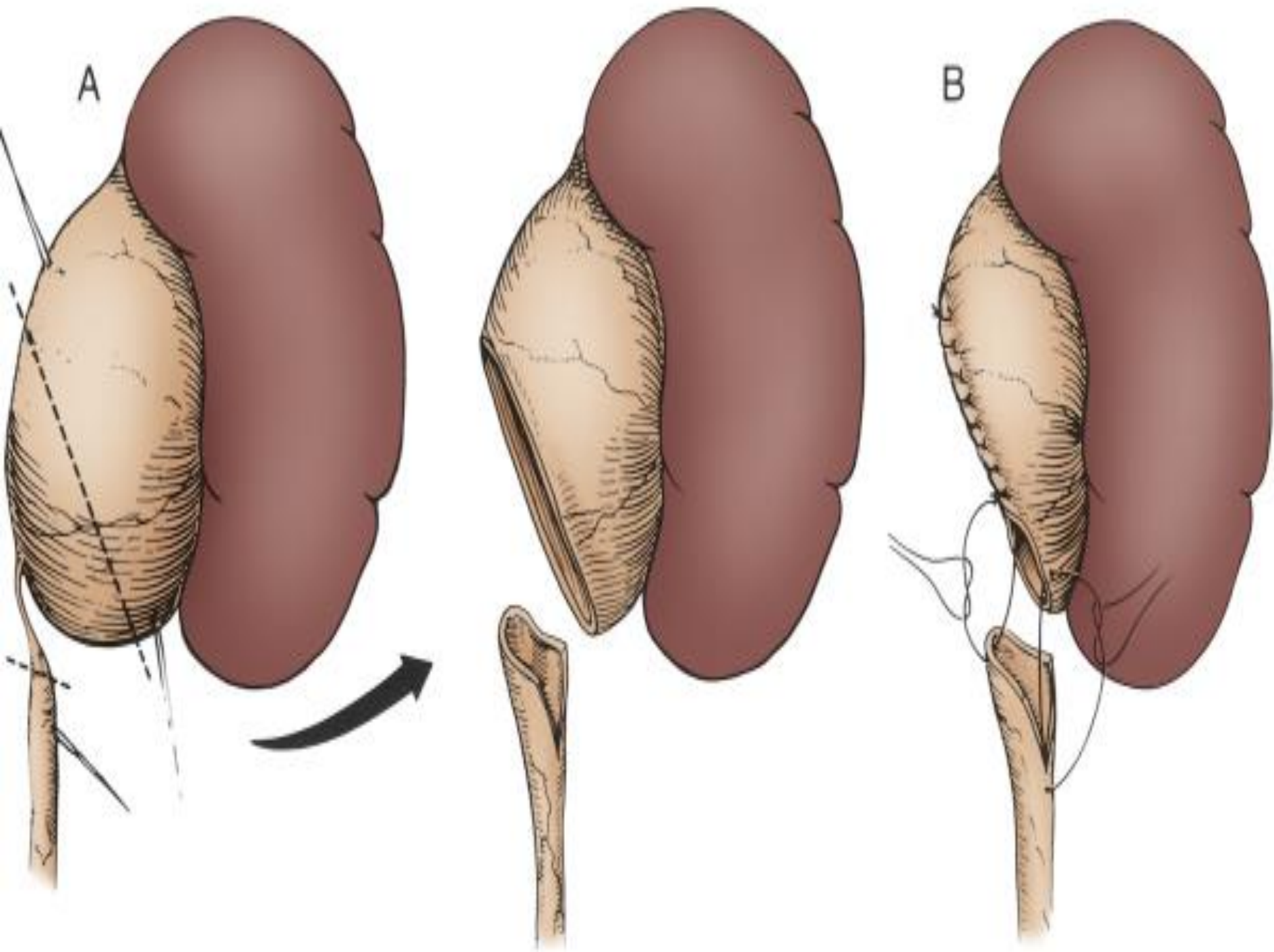
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- × **vertical flap** that can be used in the situation of a dependent UPJ with a large, square-shaped extrarenal pelvis. The rare cases of giant hydronephrosis that may be associated with a completely atretic ureter can be corrected by reconstructing the entire ureter using redundant pelvic tissue



3. DISMEMBERED PYELOPLASTY:

- ✖ The principal reasons for the universal acceptance of the dismembered pyeloplasty are (1) broad applicability, including preservation of anomalous vessels; (2) excision of the pathologic UPJ and appropriate repositioning; and (3) successful reduction pyeloplasty.
- ✖ This operation is generally easy to perform and can be accomplished by a number of surgical approaches, including anterior subcostal, flank, and posterior lumbotomy.





B.MINIMALLY INVASIVE TECHNIQUES:

1.Endoscopic Approaches: The endoscopic

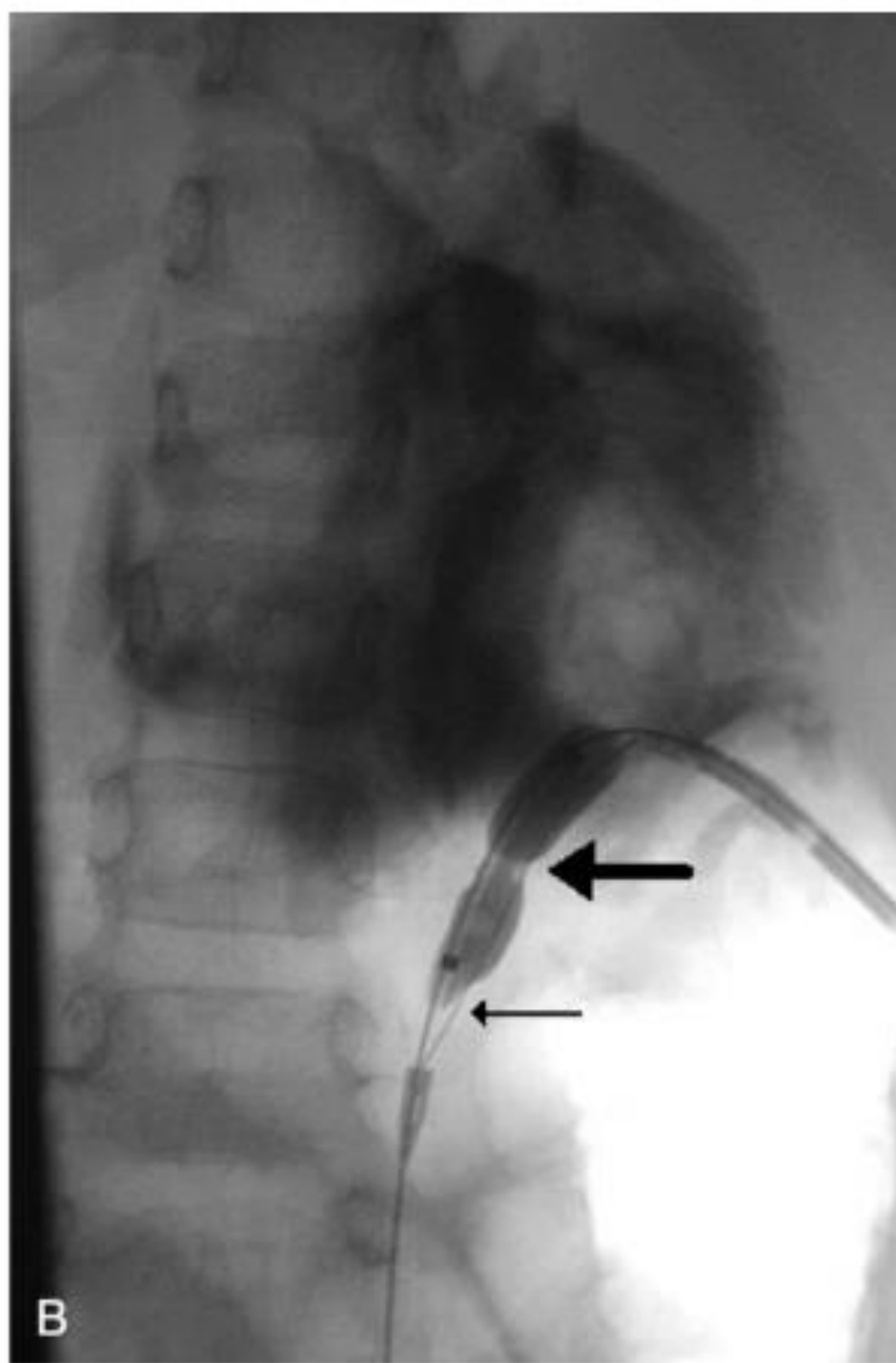
approach to the UPJ has been successful in both an antegrade and retrograde fashion.

1. balloon dilatation: have been superseded by the use of an Acucise device (Applied Medical, ureteral cutting balloon catheter, No. 5 Fr).

Postoperative stenting is required for 6 weeks, with a 100% success rate being reported in a small series of patients. In a much larger series of adult patients, reported an overall success rate of 78%.

2. *Antegrade endopyelotomy*: can readily be accomplished in both adults and preadolescent or adolescent patients. This procedure is recommended for any patient with a reasonably functioning kidney, mild to moderate hydronephrosis, and no evidence of a crossing vessel.

In one of the largest pediatric experiences to date, endopyelotomy in children ranging in age from 4.5 to 17 years was successful 89% of the time.



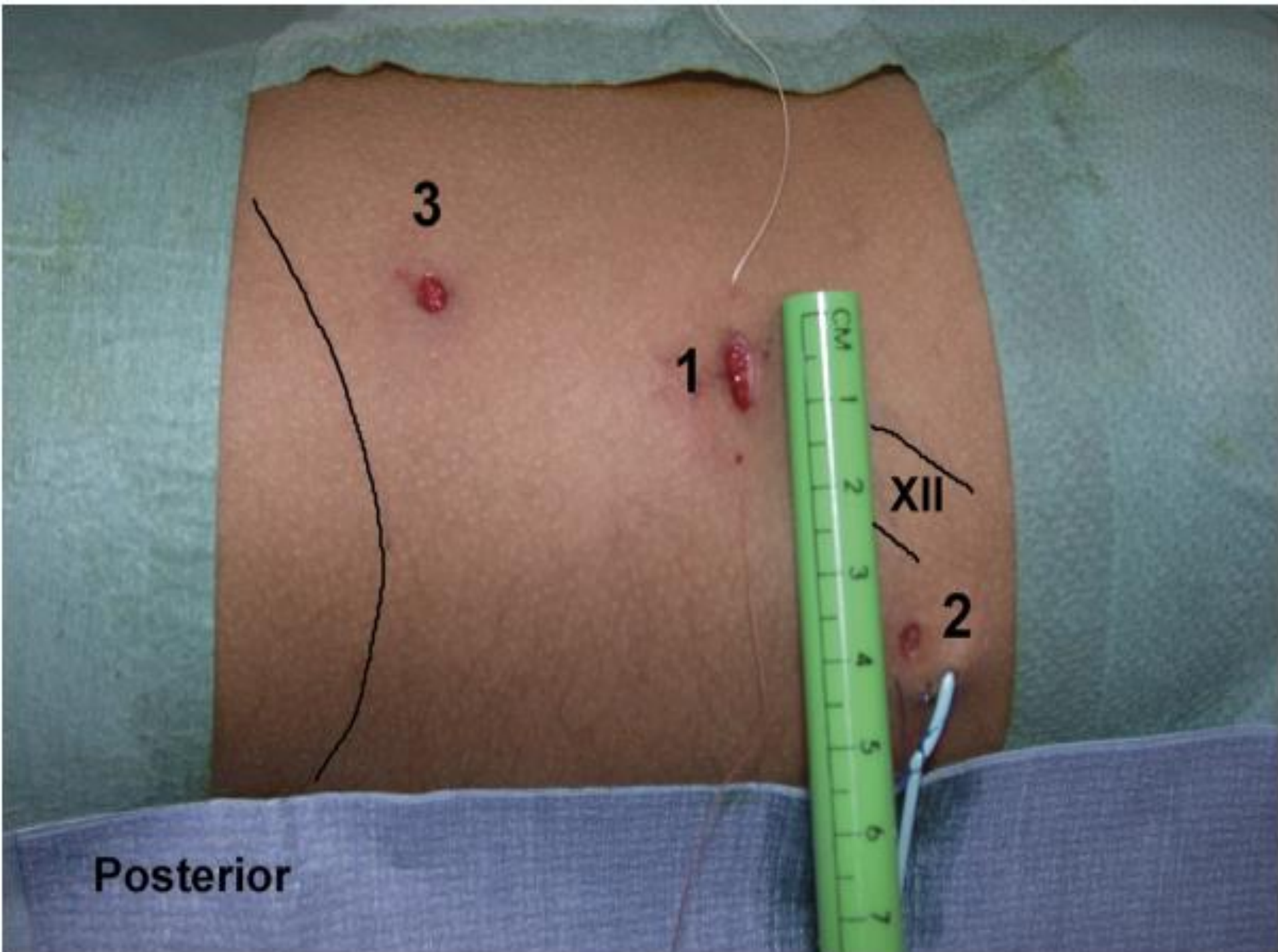
2.LAPAROSCOPIC PYELOPLASTY

- ✖ Laparoscopic pyeloplasty was introduced in adults in 1993.The procedure has gained in popularity, and more recent series have reported a success rate of over 95%.

RETROPERITONEAL ACCESS

LATERAL APPROACH





PRONE POSTERIOR APPROACH

- ✗ The access begins with an incision in the costovertebral angle at the edge of the paraspinous muscles. The secondary trocars are placed just above the iliac crest, one medially at the edge of the paraspinous muscles and one laterally at the posterior clavicular line.

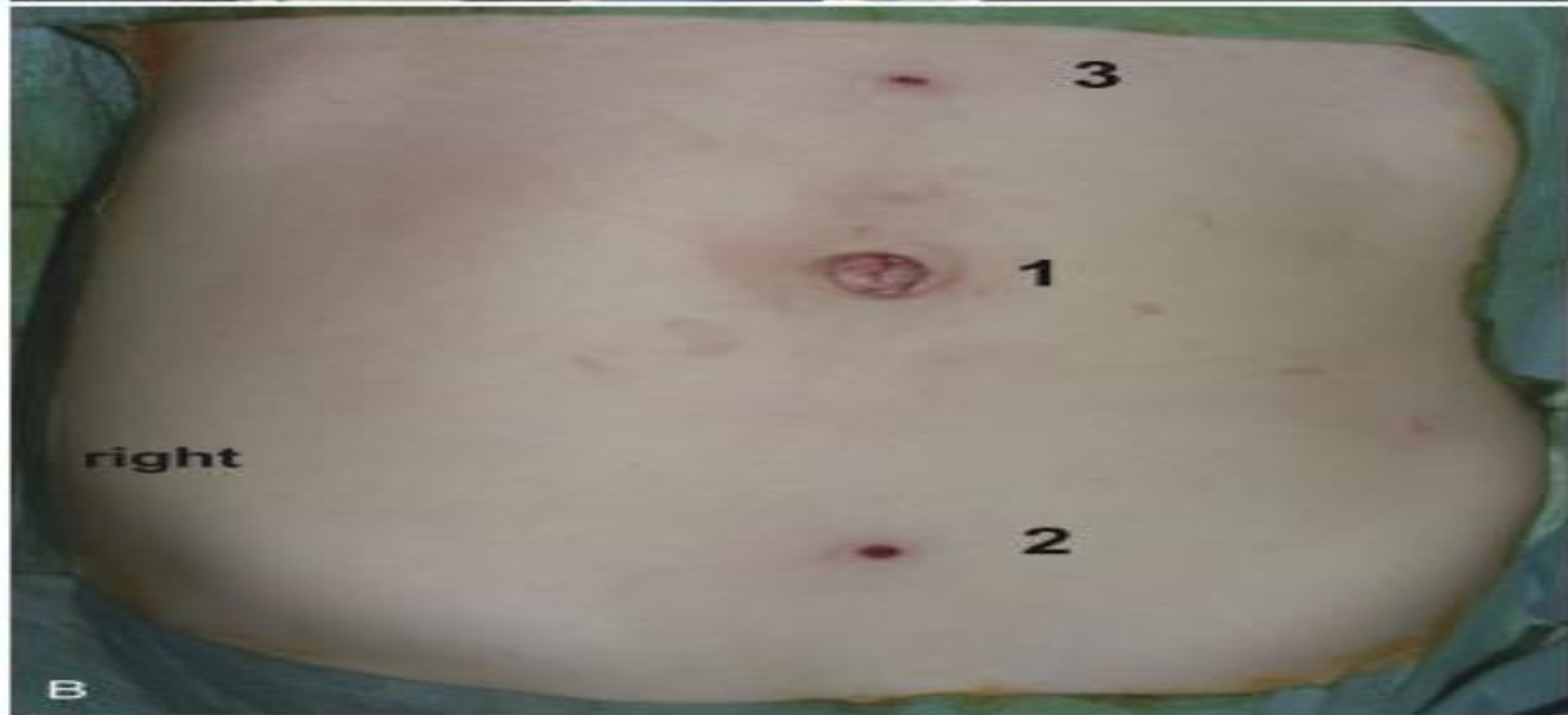
ANOTHER TECHNIQUE FOR ACCESS TO THE RETROPERITONEAL SPACE

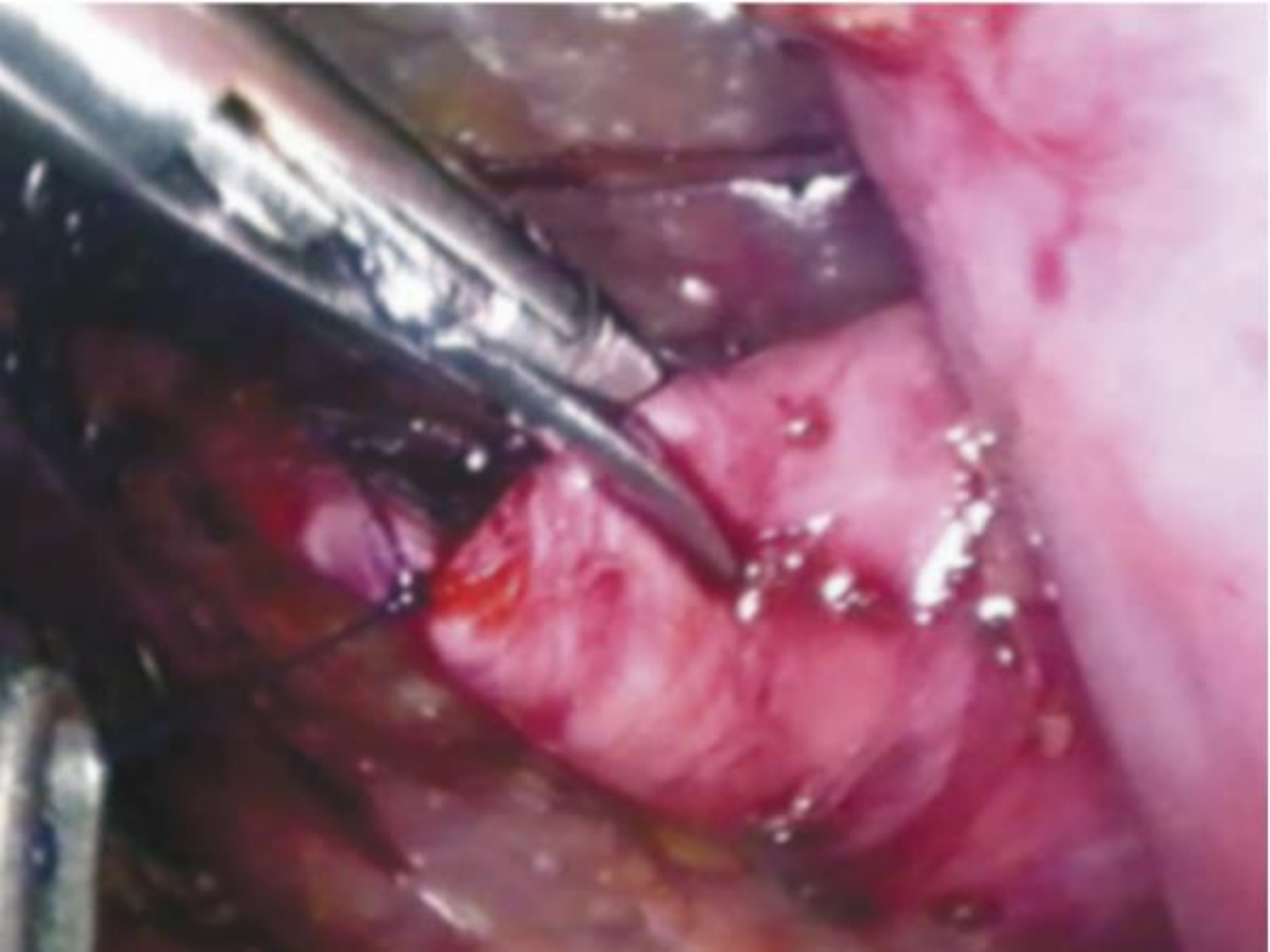
- ✗ **Balloon dissection has been the method applied by most urologists.**
- ✗ **Disadvantages of balloon dissection are the cost of disposable materials and the rupture of the balloon.**

✗ **Modification of lateral access** by inserting the first trocar through the costovertebral angle. This modification helped the authors to avoid an accidental peritoneal tear during access through the first lateral incision and allowed a smaller incision for the laparoscope. The use of the Visiport visual trocar for direct access to the retroperitoneal space. The advantage of this method is the use of a small incision for the first trocar, which may benefit reconstructive surgery

TRANSPERITONEAL ACCESS

- ✖ The most frequently described is the flank position. The pneumoperitoneum is created through an open umbilical approach. The child is positioned with the surgeon standing in front of the abdomen (opposite side of pyeloplasty).
- ✖ The most frequent configuration has been an umbilical port and two ipsilateral ports in the midclavicular line above and below the umbilicus. A fourth trocar may be placed in the midaxillary line to allow liver or spleen retraction, if needed.





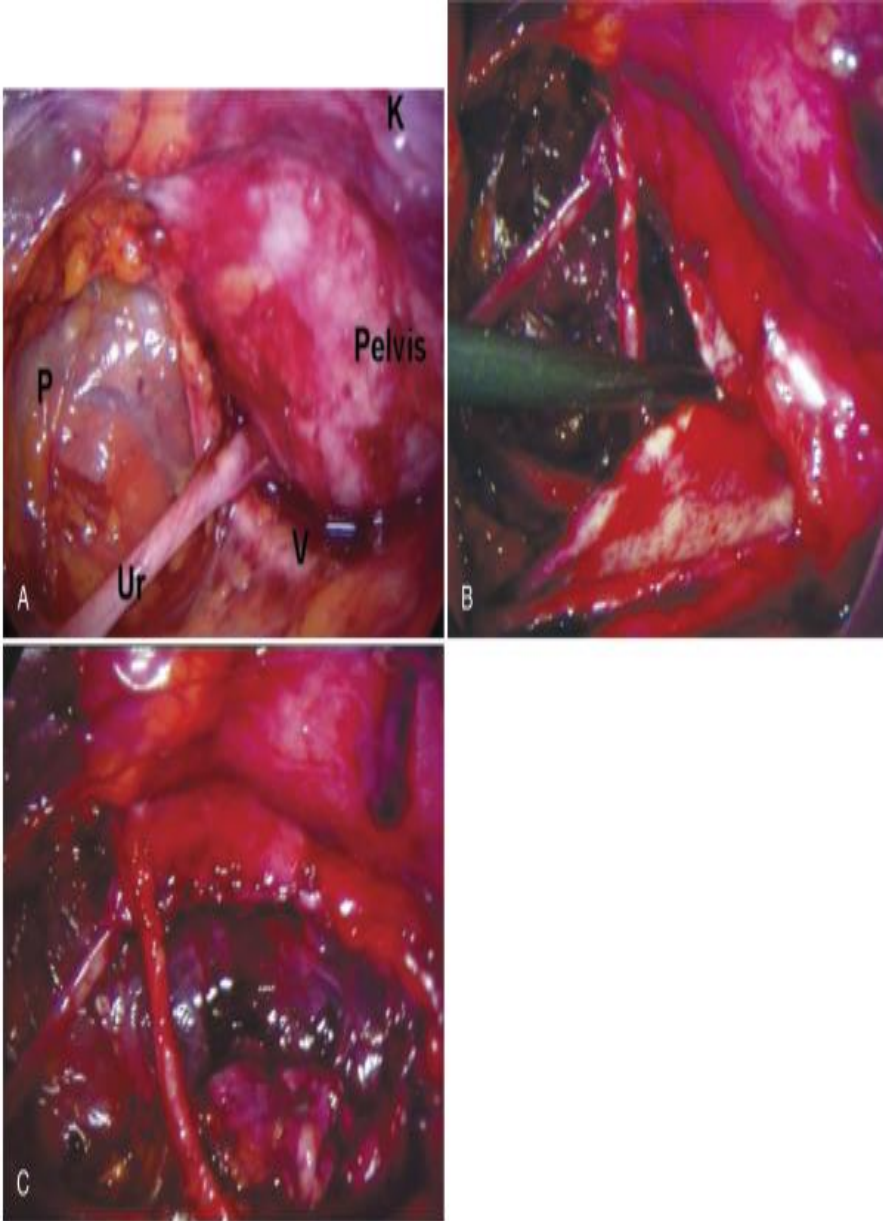


Figure 115-24 Left retroperitoneal laparoscopic pyeloplasty for hydronephrosis secondary to aberrant crossing vessels. **A**, The kidney is approached posteriorly and the renal pelvis is first identified. Aberrant crossing vessels are identified anteriorly to the ureteropelvic junction (UPJ). **B**, After placement of the stay suture, the ureter is completely divided and the UPJ and the pelvis are delivered anterior to the vessels with the help of the stay suture. Then the anastomosis is performed. A reduction of the renal pelvis is done when needed. **C**, The final aspect at the end of the pyeloplasty. K: kidney; P: peritoneum; Ur: ureter; V: crossing vessels.

SPECIAL SITUATIONS

- ✖ **Special situations include hydronephrosis secondary to low UPJ, retrocaval ureter, horseshoe kidney, ectopic kidney, ureterocaliceal anastomosis, and redo surgery.**
- ✖ **The only indications for performing a transperitoneal approach are the horseshoe kidney and the ectopic kidney. Even the presence of a retrocaval ureter was easily diagnosed, allowing transposition of the ureter without difficulty.**

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- ✖ A case of severe hydronephrosis with significant calyceal dilation and minimal pelvic dilation lent itself to a ureterocalyceal anastomosis. This was readily accomplished with a lateral retroperitoneal approach as well.

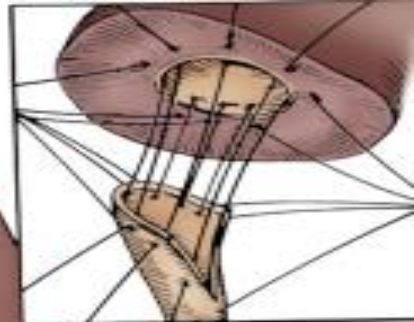
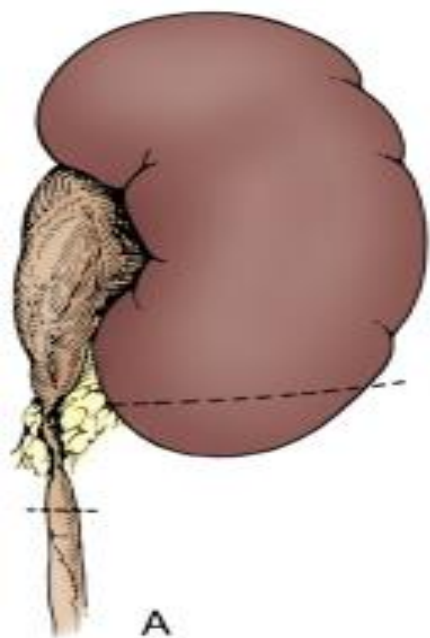
OUTCOME

- ✘ Minimal handling of the ureter at the time of repair, and judicious use of internal stenting or nephrostomy tube drainage ensure a successful outcome.
- ✘ Success is defined as improvement in hydronephrosis and stabilization or improvement in function on renal scan along with a decrease in washout time. In situations in which symptomatic presentation occurred, resolution of flank or abdominal pain or vomiting should also occur.

-
- ✖ A nephrostogram performed 10 to 14 days after surgery allows visualization of the anastomosis.
 - ✖ Clamped the nephrostomy tube for 24 hours and checked the residual in the renal pelvis. If the residual is less than 15 mL, the nephrostomy tube is removed.
 - ✖ If a double-pigtail ureteral stent is left indwelling, it is removed 2 to 6 weeks after the initial procedure.

- ✘ A renal ultrasound scan is obtained 6 weeks after pyeloplasty or after stent removal to ensure that the hydronephrosis (pelvocaliectasis) is improving. A renal scan may be obtained 1 year after the pyeloplasty to provide a relative assessment of the overall renal function.
- ✘ Early complications of pyeloplasty are uncommon and usually involve prolonged urinary leakage from the Penrose drain.
- ✘ If it persists beyond 10 to 14 days, placement of a retrograde ureteral stent.

- ✖ If a patient presents postoperatively with fever, flank pain, and significant hydronephrosis, a nephrostomy tube may be necessary to decompress the kidney.
- ✖ Lack of drainage for a prolonged period would necessitate further intervention, including an endopyelotomy, redo pyeloplasty, or even ureterocalicostomy.
- ✖ Ureterocalicostomy was performed when there was evidence of **extensive proximal ureteral strictures, an intrarenal pelvis, or diminished pelvis that prevented the performance of a tension-free anastomosis**. Experience with the laparoscopic redo pyeloplasty is thus far rare.



THANK YOU