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Mesoblastic Nephroma

- Mesoblastic nephroma is the most common renal tumor identified in the neonatal period and the most frequent benign renal tumor in childhood. Solid, homogeneous, usually large tumor that could mimic a Wilms' tumor. Hemorrhage and necrosis develop in the aggressive and malignant variants, although cystic degeneration is not common.
- Adult mesoblastic nephroma differs from the pediatric one, standing as a different disease, could also mimic other tumors such as cystic hamartomas and adrenal tumors.
- The signal intensity characteristics are similar to those of the normal renal parenchyma. The lesion appears isointense to the kidney on T1-weighted images. The signal is lower than that of the surrounding fat and higher than that of the renal medulla. The mass shows increased signal on T2-weighted images. Contrast-enhanced MRIs show no or minimal contrast enhancement in the mass.

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Megaureter

- The term megaureter may refer to two conditions: first one, it represents a sequela of uncorrected massive chronic reflux and can also affect the bladder, whereas the second one is a congenital condition (the width exceeds 10 mm).
- The condition is more often detected in children than adults and is more common on the left side.
- US findings show a massive dilation, consisting in an anechoic signal flanked above and below by two hyper/isoechogenic strips which represent the ureter stretched walls.
- CT/MRI well assesses this anomaly. CT without contrast agent shows an enlarged lumen of the ureter.
- CT urography protocol allows to assess a hyperdense signal originating from the lumen itself, caused by the stagnation of contrast agent.
- MRI findings are similar to CT, except that on heavily T2-weighted sequences it could be possible to evaluate lumen swelling thanks to fluid stasis which gives back a strong hyperintense signal, so no contrast could be required.

Metastases to Kidney

- Metastases to the kidneys are common, with multiple foci and bilateral involvement typical.
- Usual metastases to kidney involved melanoma, thyroid carcinoma, liver, colon, lung and breast cancer, and ovarian carcinoma.
- Renal metastases have a CT, US, and MRI appearance similar to that of renal cell carcinoma or lymphoma.
- CT findings reveal that metastases are hypodense and inhomogeneous on unenhanced CT, whereas contrast-enhanced CT reveals most to have inhomogeneous enhancement. Most enhance less than normal renal parenchyma. Metastatic

thyroid carcinomas, on the other hand, tend to be hyperdense and have variable contrast enhancement. Renal vein invasion is rare with metastatic disease.

Multicystic Dysplastic Kidney

- Multicystic dysplastic kidney (MCDK) or multicystic dysplasia is a condition, which occurs during the fetal life, consisting in an anomaly of kidney development. It is a form of renal dysplasia that is secondary to altered metanephric differentiation during embryogenesis. The kidney itself consists of irregular cysts of varying sizes and has no function. This condition could be only unilateral because complete bilateral involvement is incompatible with life. Depending on the extent of involvement, dysplasia is limited to the infundibula, renal pelvis, and proximal ureter, or it involves a kidney to the point that dilated calyces appear as intrarenal cysts. Segmental multicystic dysplasia occurs in a setting of a duplex collecting system.
- A multicystic dysplastic kidney is commonly associated with vesicoureteral reflux in the contralateral kidney and with a posterior location of the urethral valves.
- Ultrasound is the imaging modality of choice.
- MRI with T2 sequences imaging clearly shows the altered structure of the kidney.
- CT is not recommended since almost all exams are performed on pediatric population.

Malacoplakia of Kidney

- Malacoplakia is a rare, inflammatory process related to an abnormal host response to chronic infection (chronic tubulointerstitial nephritis) characterized by round intra and extracellular inclusion bodies (the eponymic Michaelis–Gutmann bodies).

- Malacoplakia most commonly manifests as a mucosal mass involving the bladder or ureter, the most frequent renal finding is obstruction secondary to a lesion in the lower tract. In approximately 15 % of reported cases, the kidney is identified as the primary site of disease.
- CT: The lesions appear with minimal enhancement on the contrast-enhanced CT and stand out against the vascular blush of the normal renal cortex. The classic appearance is an enlarged kidney with multiple hypovascular masses.
- MRI: Low signal intensity on both T1- and T2-weighted images and delayed enhancement of the fibrous stroma is noticed.

Medullary Carcinoma of Kidney

- Renal medullary carcinoma is a rare collecting duct and a highly aggressive neoplasm that almost always develops in teenagers and young adults with sickle cell trait or hemoglobin SC disease.
- At imaging, these tumors appear as ill-defined, infiltrative masses that arise in the renal medulla and invade the renal sinus; occasionally, a necrotic tumor communicates with the collecting system.
- The lesion is hypointense on T2-weighted images. They show heterogeneous contrast enhancement, presumably due to necrosis.
- Venous invasion and nodal metastases are common.

Multilocular Cystic Tumor of Kidney

- Multilocular cystic tumor of kidney is represented by two entities (Multilocular Cystic Nephroma/Cystic Partially

Differentiated Nephroblastoma); the first one occur in adults, whereas the latter in pediatric patients. Their architecture consists of a mixture of epithelial and mesenchymal components. Imaging detects both of these cystic tumors but cannot differentiate between them. Their appearance is similar to other cystic tumors. They occur unilaterally.

- CT reveals multilocular cystic nephromas to be homogeneous, multicystic tumors containing thin septa without a solid component; for some reason a lower pole location predominates. The cystic component does not enhance with contrast.
- MR imaging of a multilocular cystic nephroma reveals a complex solitary renal cystic tumor often protruding into the renal collecting system and containing thin septa, with the cystic component varying from hypo- to hyperintense on T1-weighted images. Any solid component and septa enhance postcontrast in all cases.

Multidetector CT of Kidney

- Multidetector CT allows imaging during specific contrast opacification phases. MDCT urography with a two-phase (unenhanced and combined nephrographic and excretory phase) split-bolus technique and oral hydration is advised. Using a split-bolus technique, both a nephrogenic and excretory phases can be obtained with one scan, although such a protocol tends not to visualize all of the ureters completely.
- Renal opacification can be divided into three phases: first is an early vascular or bolus phase, then a nephrogram phase (consisting of a nephrogram), followed by a pyelogram or equilibrium (delayed) phase. A corticomedullary phase, providing maximum differentiation between renal cortex and medulla, occurs during the early phase. Both neoplasms and normal renal parenchyma enhance significantly more during

the nephrogram phase than during the corticomedullary phase. In general, more tumors <3 cm in diameter are detected on the nephrogram phase than on the corticomedullary phase.
- Corticomedullary phase is useful for detection of such conditions as an aneurysm, arteriovenous malformation, or fistula, and in evaluating tumor vascularity. Renal tumors tend to be detected with greater confidence on delayed images than on early-phase images.
- Three-dimensional CT imaging techniques are useful both in evaluating suspected tumors.

MRI of Kidney

- MRI is used in a setting of contrast allergy or renal failure and for studying some complex masses. It is also useful in evaluating venous thrombosis in a setting of renal carcinoma.
- MRI evaluates renovascular disease, assesses renal function, detects renal tumors, and identifies urinary tract abnormalities, all without radiation exposure.
- Magnetic resonance signal intensity normally decreases in the pyelocaliceal phase due to contrast agent concentration. When searching for small renal tumors, use of a body phased-array coil in combination with fast low-angle shot (FLASH) and fat suppression pre- and postcontrast thin section MR allow imaging in single breathholds. Sagittal and coronal plane images improve evaluation. Both T1- and T2-weighted sequences are useful with contrast-enhanced MRI to evaluate renal blood flow and renal function. During the early phase, a renal cortex signal increase in T1-weighted sequences is matched by a similar signal decrease in T2-weighted sequences; during later phases, however, T2-weighted sequence signal intensity in the medulla decreases markedly. Thus, renal cortical blood flow can be evaluated with either

sequence, but T2-weighted sequences appear more useful in evaluating renal medulla. Presumably increased amounts of contrast in renal tubules account for the medullary decreased signal intensity during later phase T2-weighted sequences. Serial dynamic MR-gradient echo imaging using a low contrast dose can be used to obtain an intensity–time curve, similar to radionuclide renography.
- A relative disadvantage in certain renal applications is its poor sensitivity in detecting calcifications.

Medullary Sponge Kidney

- Medullary sponge kidney (i.e., Lenarduzzi–Cacchi–Ricci disease) is a congenital developmental abnormality characterized by ectasia and cystic dilatation of the intrapyramidal or intrapapillary portions of the renal medullary collecting ducts. Among patients with calcific kidney stones, 12–20 % have medullary sponge kidney.
- In general this disease is asymptomatic. Symptoms which can be observed in patients are hematuria, renal colic, fever, and dysuria.
- Ultrasound: An echogenic appearance of the medullary pyramids is characteristic of medullary sponge kidney.
- CT: CT urography may show a characteristic papillary blush and associated calculi within the dilated collecting ducts.

Suggested Reading

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