Pyelonephritis
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History
8 year old female with fever and flank pain.

Diagnosis
Pyelonephritis

Discussion
Urinary tract infection is common in children, occurring in approximately 1-3% of school-age children. Differentiating upper tract (pyelonephritis) from lower tract (cystitis) can be difficult. Treatment for these entities are different and imaging plays an important role.

The pathophysiology of acute ascending pyelonephritis represents a continuum of disease. The bladder is originally inoculated with an infectious organism, which migrates to the collecting system even in the absence of reflux, owing to special virulence properties of the bacteria. Endotoxins are believed to inhibit ureteral peristalsis by blocking the -adrenergic nerves within smooth muscle, thus creating a functional obstruction. The obstruction compromises the forward flow of urine, which is a normal protective mechanism against upper urinary tract infection. Continuing their retrograde ascent, bacteria enter the renal tubules at the papillary tip and cause an inflammatory response that extends up the tubule and into the renal interstitium.

Gray-scale diagnostic criteria of acute pyelonephritis include 1) nephromegaly or asymmetric renal enlargement, 2) altered parenchymal echogenicity (hypoechoic and hyperechoic regions), and 3) loss of corticomedullary differentiation. Geometric areas of renal hypoperfusion on power Doppler are considered suspicious for pyelonephritis in the proper clinical scenario and represent peripheral vasoconstriction from bacterial infection. Occasionally, the whole kidney is hypovascular. The overall specificity and sensitivity for power Doppler detection of pyelonephritis is about 80%. On contrast-enhanced CT, acute bacterial nephritis most commonly manifests as one or more wedge-shaped areas or streaky zones of lesser enhancement that extend from the papilla to the renal cortex. This pattern of differential enhancement reflects the underlying pathophysiology of tubular obstruction caused by inflammatory debris within the lumen, interstitial edema, and vasospasm.

Reference

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