Abdominal CT findings in Urolithiasis

Method:

Step 1 – evaluate for signs of obstruction

1. asymmetric stranding of perinephric fat
    a. Perninephric fat stranding represents fluid accumulation in bridging septa of the perinephric fat as a result of increased lymphatic pressure.
    b. usually obvious
    c. may appear as loss of interface between kidney and perinephric fat
    d. may be fine linear stranding
    e. may be slight difference in perinephric fat density at *poles* of kidney
    f. fluid collection around kidney suggests obstruction and forniceal rupture
2. dilation of intrarenal collecting system – less variation in size of intrarenal collecting system
    a. analyze the renal sinus in the upper and lower poles of the kidney
    b. analyze for obliteration of renal sinus fat due to compression of a dilated calicies and infundibula
    c. Unilateral loss of white pyramids suggest urinary tract obstruction
3. hydroureter -- Abnormal enlargement of the ureter caused by any blockage that prevents urine from draining into the bladder.
    a. Usually apparent if present
    b. Follow from kidney to bladder
4. unilateral enlargement of the kidney

Step 2 – Evaluation of the ureters for calcifications

1. Follow the ureters from the renal pelvis to the base of the bladder
    a. Easiest with PACS system (picture archiving and communications system)
    b. Areas of difficulty
        i. Level of the mid-pelvis – bifurcation of the iliac vessels widens makes it difficult to follow the ureters – many vessels, lymph channels and collapsed unopacified bowel loops
        ii. Phleboliths versus distal ureteral calculi
            1. Uteral stone versus pelvic phlebolith is difficult to diffrentiate for inexperienced readers.
            2. A rim of edematous ureteral tissue or localization of the stone at the UVJ often helps make this distinction.
            3. phlebolithis are usually below the ischial spine
            4. ureters usually enter the bladder above the level of the ischial spine
        iii. Recently passed stone and stone at UVJ
            1. both demonstrate rim sign
            2. both demonstrate signs of obstruction
            3. if uncertain – rescan patient in the prone position → as a passed stone will drop anteriorly
        iv. Patients on indinavir (Crixivan)

1. excreted drug is often in the form of crystals that are not visible on CT scan

c. More difficult to follow if they are normal or patient has minimal body fat
d. UVJ identification
    i. High-attenuation area in the posterior wall of the bladder
    ii. Ureters enter the bladder wall lateral to the UVJ

2. Stone locations (in descending order of frequency)
    a. UVJ*
    b. Pelvic Brim
    c. Transition between the renal pelvis and ureter (UPJ)*
    d. *Ureter changes calibur at the UVJ and UPJ
3. Rim sign – halo of soft-tissue attenuation seen around the circumference of an intraureteral calculus on unenhanced axial CT-has been described as useful in differentiating ureteral calculi from extraurinary abdominal or pelvic calcifications
    a. Helps to distinguish between ureterolithiasis and ileac artery calcifications in the are of the pelvic brim
    b. Helps to distinguish between ureterolithiasis and phleboliths

Diagnosis:

1. Primary - demonstration of a high attenuation stone within a well-identified ureter or at the ureter-vesicular junction (UVJ).
2. Secondary signs of ureteral obstruction
    a. Unilateral dilation of the involved ureter
    b. Dilation of the intrarenal collecting system
    c. Stranding of the perinephric fat

Definitions:

Hydronephrosis is defined as a dilation of the renal pelvis and calyces.
Hydroureter - Abnormal enlargement of the ureter caused by any blockage that prevents urine from draining into the bladder.

Multidetector unenhanced CT scan versus intravenous pyelogram (IVP)

- Faster
- No contrast
- More radiation
- Identifies alternative source of symptoms
- Not a physiologic study
- Non therapeutic

Unenhanced helical CT scan will replace IVP as the “gold standard” for the diagnosis of ureteral stone.

CT scan can detect 95 to 98% of obstructing stones.
Secondary signs are seen in 90 to 95% of patients.

Secondary signs of obstruction but no stone is present:

1. recently passed stone
2. pyelonephritis
3. urinary tract obstruction unrelated to stone disease
4. protease inhibitor deposition diseases

References:

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