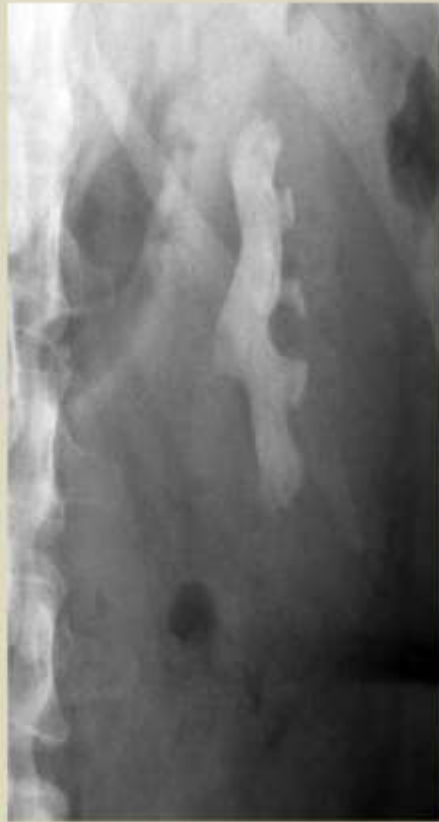


COMMON PATHOLOGIES IN URINARY SYSTEM AND SIGNS ASSOCIATED WITH THEM

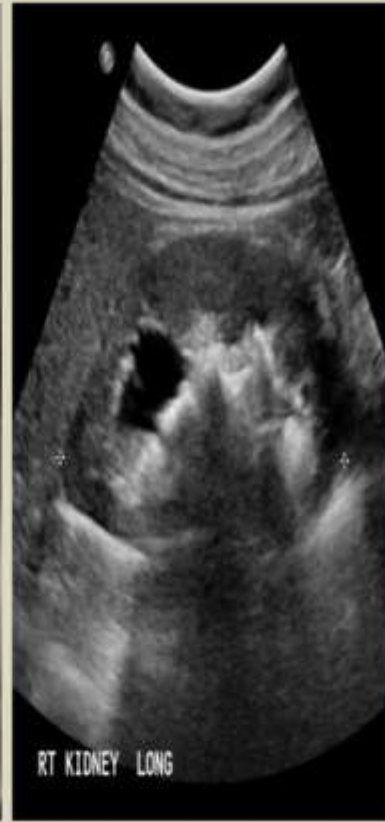
Staghorn calculi, also sometimes called **coral calculi**, are renal calculi that obtain their characteristic shape by forming a cast of the **renal pelvis** and calyces, thus resembling the horns of a stag.



(a) Staghorns. (b) On a scout image obtained before excretory urography, a calculus fills nearly the entirety of a bifid right renal collecting system, giving it a branched appearance that resembles the antlers of a stag



Staghorn calculus.



Staghorn Coral calculi.

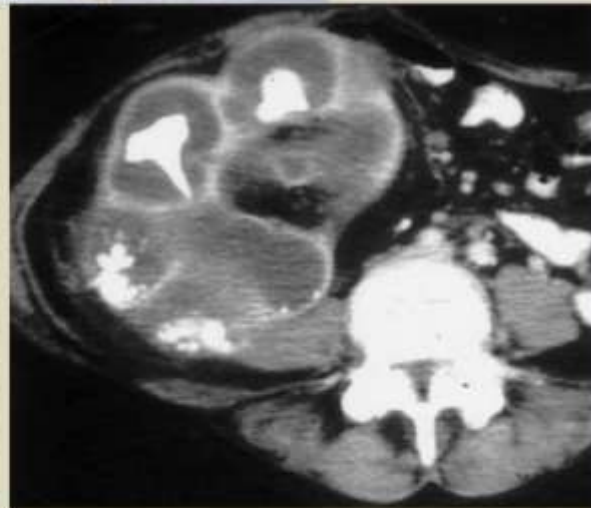


a) Scout radiograph obtained before excretory urography demonstrates disruption of the elements of a staghorn calculus—a fragmented staghorn—in an enlarged right kidney. (b) Excretory urogram shows no evidence of contrast material excretion from the right kidney. Renal enlargement, presence of an obstructing stone, and absence of excretion are considered the classic imaging triad of xanthogranulomatous pyelonephritis.

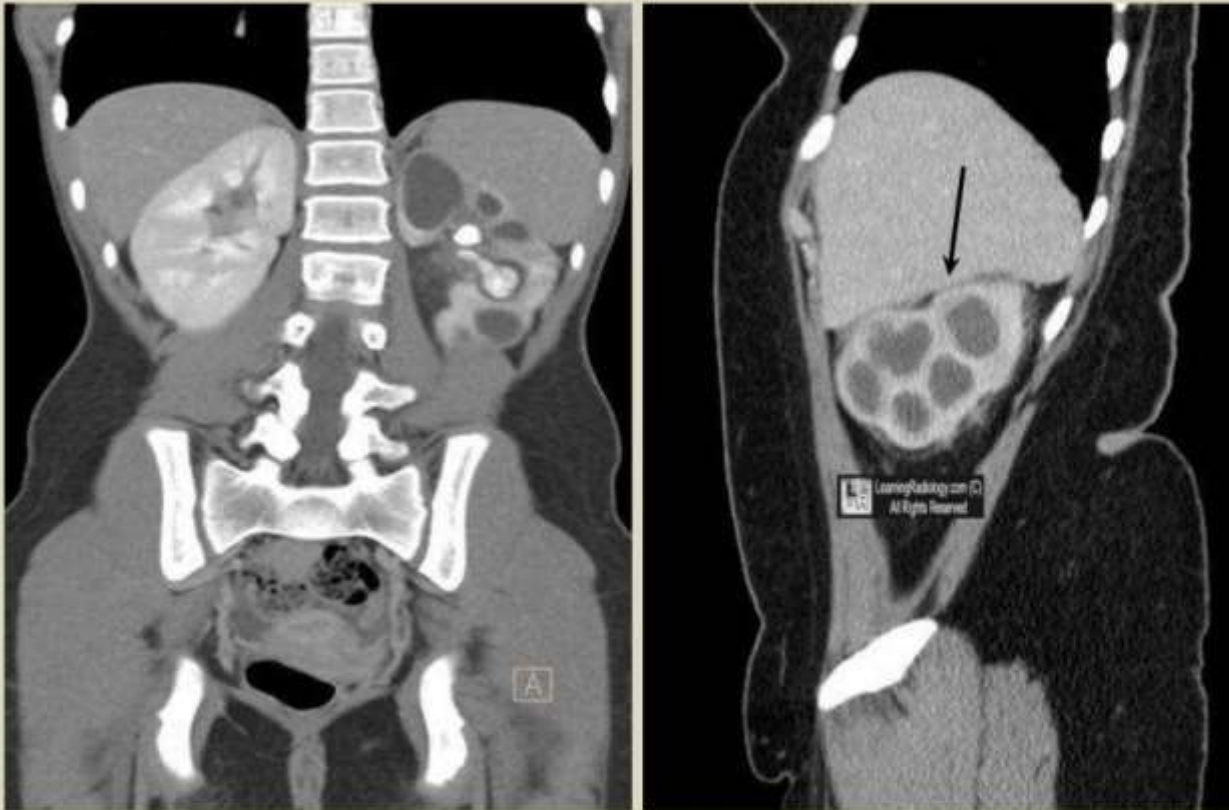
The **bear paw sign** is seen in xanthogranulomatous pyelonephritis and refers to the cross-sectional appearance of the kidney which is said to resemble the paw of a bear. The renal pelvis is contracted whereas the calyces are dilated, mimicking the toe-pads of the paw.



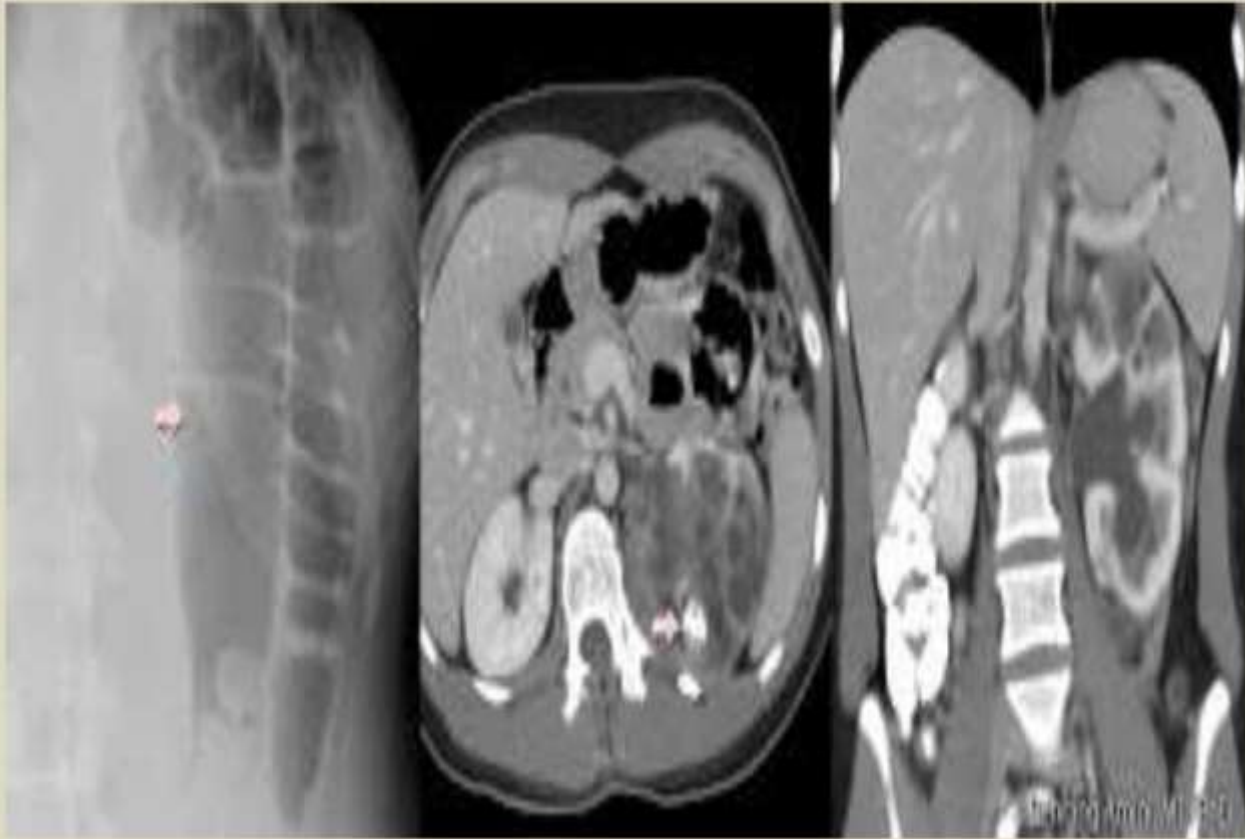
Bear paw sign



(a) A bear's paws. (Photograph entitled "Bad Boys of the Arctic" reprinted with permission from Thomas D. Mangelsen, Inc.) (b) Contrast material-enhanced CT scan (same patient as in Fig 2) demonstrates a centrally obstructing stone with replacement of the renal parenchyma by low-attenuation collections in a "hydronephrotic" pattern. Note the lack of dilatation of the renal pelvis and infundibula. (c) CT scan obtained at a slightly lower level shows the fragments of a staghorn calculus within the parenchymal collections, which exhibit marginal enhancement. The pattern seen at CT resembles a bear's paw

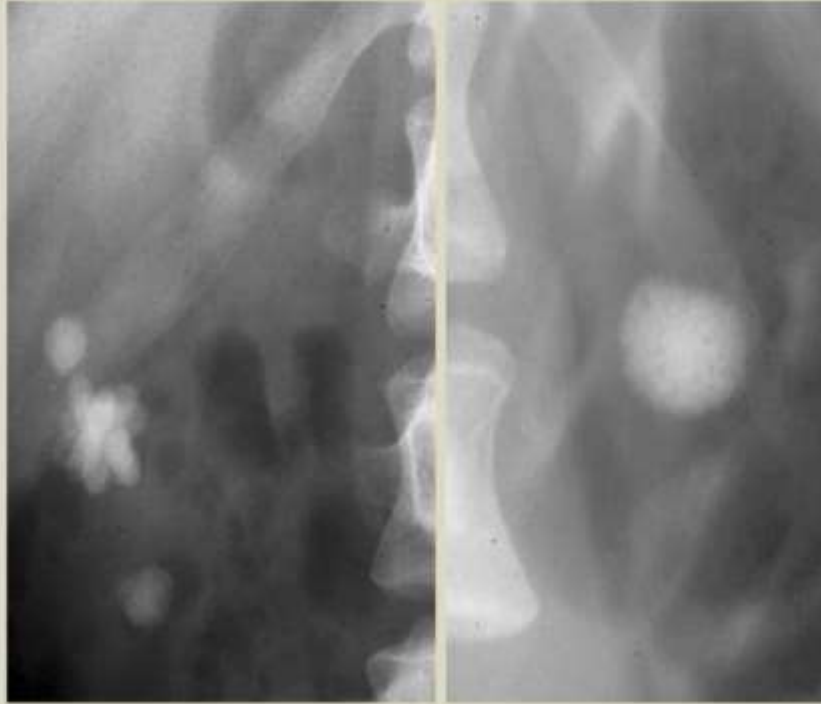
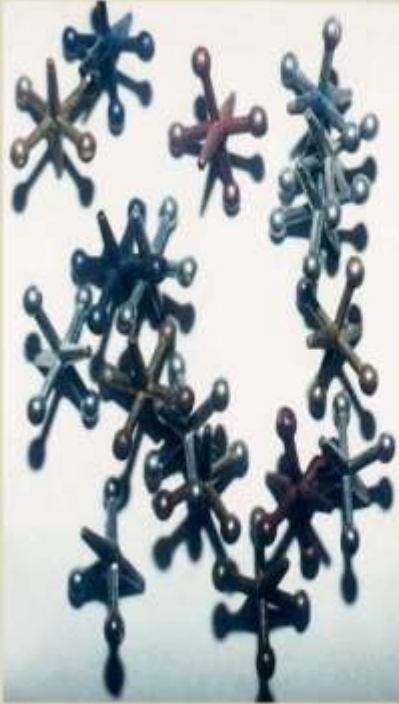


Xanthogranulomatous pyelonephritis (XGP).



Xanthogranulomatous Pyelonephritis: Bullets sign.

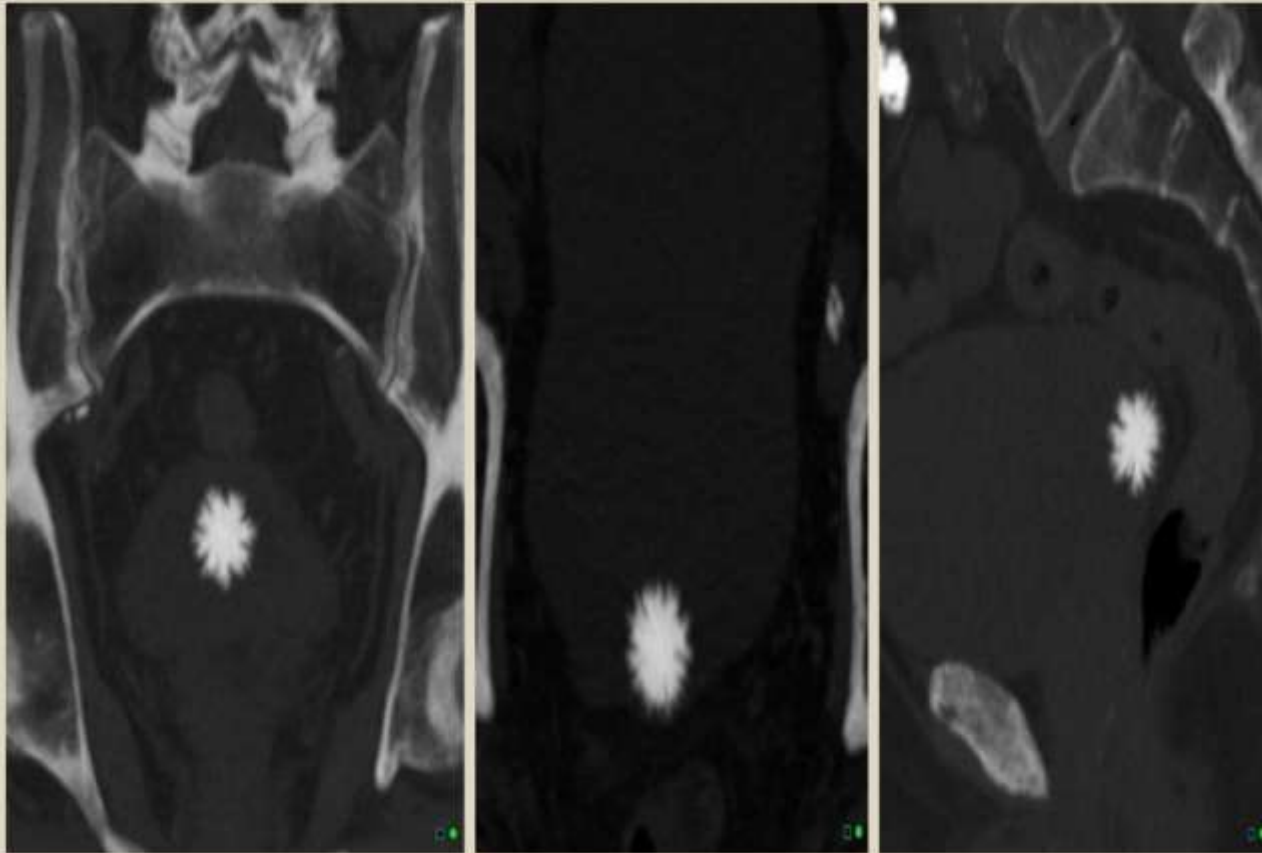
Jackstone calculus is the name assigned to the appearances of a sub-set of urinary tract calculi.



(4a) Jacks. (4b) Scout radiograph shows a jack stone with long spikes that has formed within the kidney. (5) Scout radiograph of a mulberry stone shows its less well-developed spikes, which give it a mamillated appearance, resembling a mulberry.

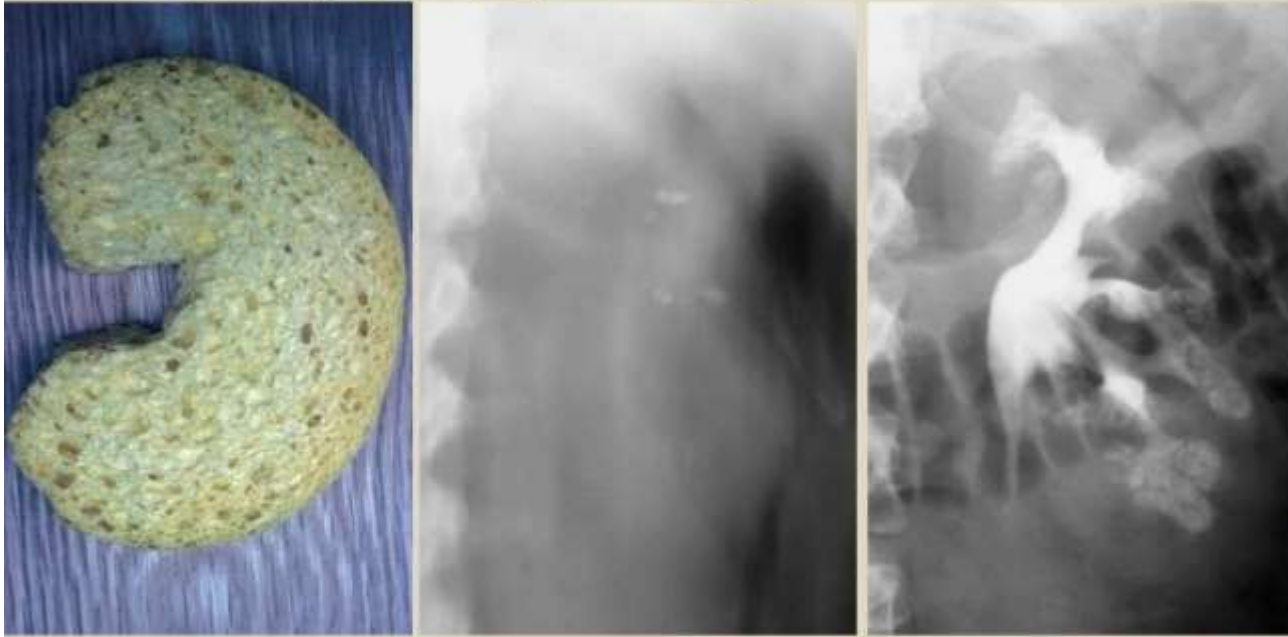


Jackstone calculus.

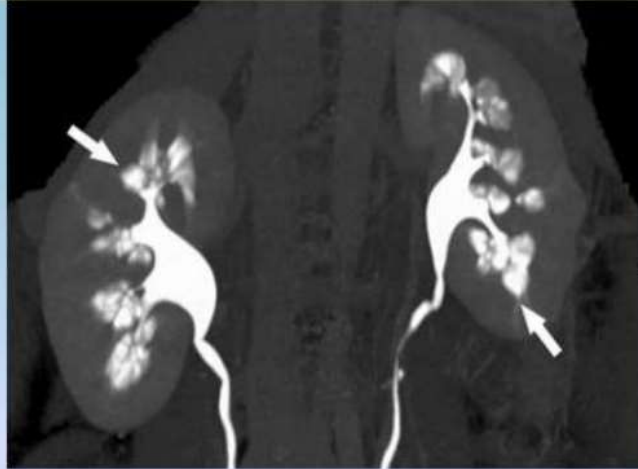


Jackstone calculus.

Medullary sponge kidney (MSK) is a sporadic condition where the medullary and papillary portions of the collecting ducts are dysplastic, and dilated and in most cases develop medullary nephrocalcinosis.



(a) "Sponge" kidney, made from a sponge! (b) Scout image from excretory urography demonstrates calcifications clustered in the medullary portion of the left kidney. (c) After contrast material administration, numerous cavities are identified within the renal papilla in the patient with medullary sponge kidney. Some of the calcifications appear to grow, as contrast agent fills the entire cavity containing the stone.



Sponge kidney!

CT - Numerous cavities with calcifications within renal papilla.

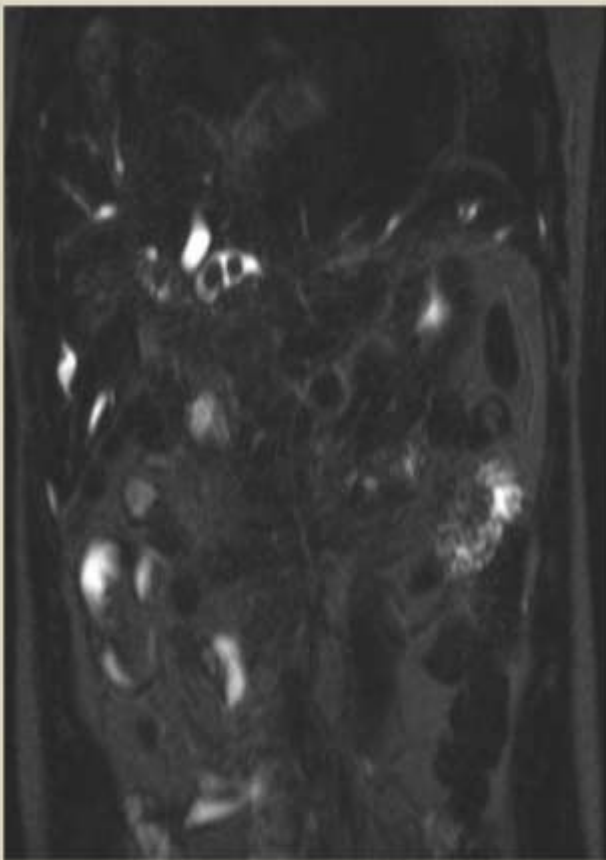
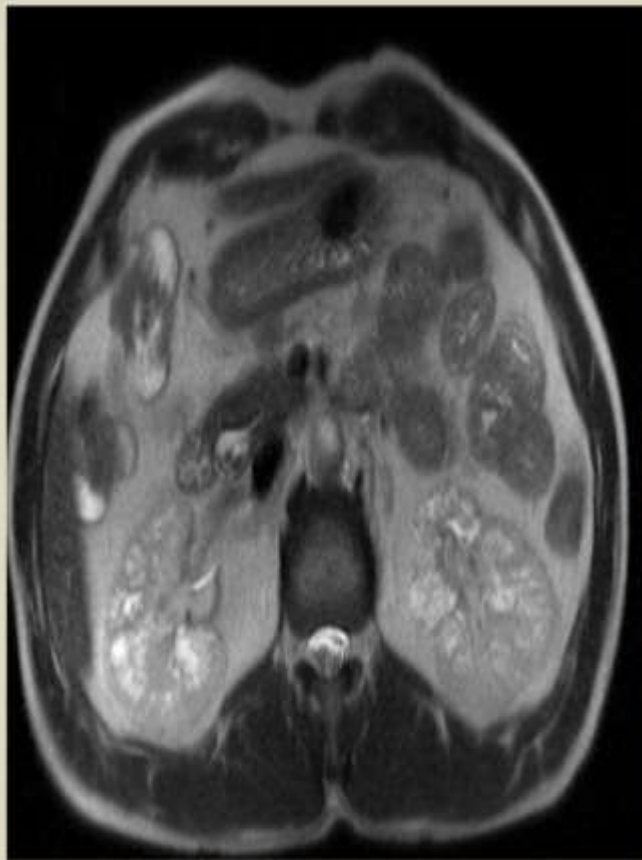
Diagnosis? Medullary sponge kidney.

What is MSK?

Term applied to the development of ectatic tubules occurring in medullary pyramids.

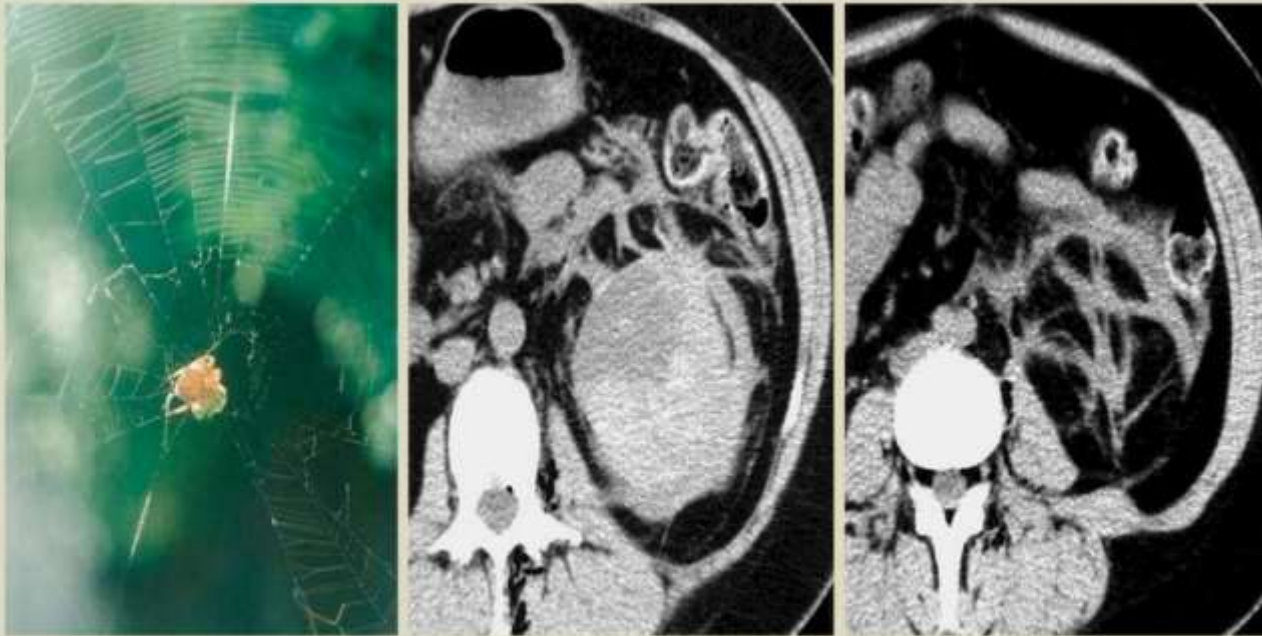


Medullary Sponge Kidneys with Calculi.

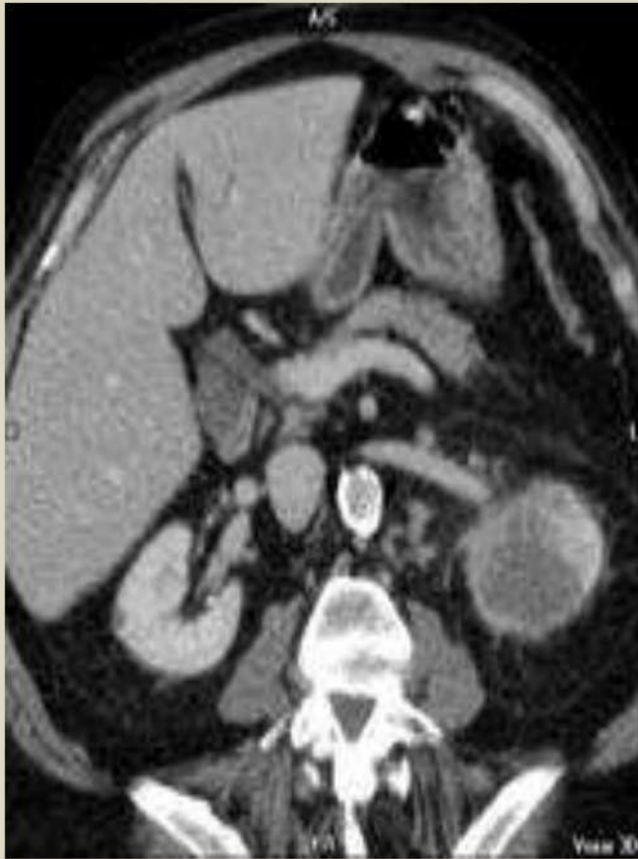


Medullary sponge kidney (MSK).

Peri-renal cobwebs is the presence of prominent perinephric septae. It is best appreciated on CT images.

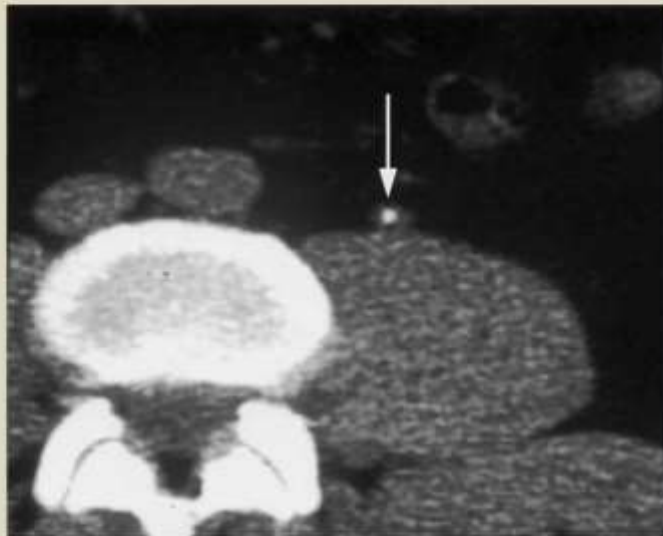


(a) Cobwebs. (b) CT scan obtained after extracorporeal lithotripsy reveals a subcapsular hematoma and exaggeration of Kunin septa on the left. Reno-fascial and reno-renal septa are especially well identified. (c) On another CT scan obtained at the lower aspect of the left kidney, fascio-fascial septa are nicely seen, and the cobweb appearance is particularly well developed



Transitional cell carcinoma of the renal pelvis with Peri-renal cobweb.

The **soft-tissue rim sign** is used to distinguish a **ureteric calculus** from a **phlebolith**. The former appears as a calcific density with a surrounding rim of soft tissue which represents the oedematous ureteric wall. Phleboliths on the other hand usually have imperceptible walls (although up to 8% may have a soft tissue rim sign) but may have a **comet-tail sign**.



(a) One kind of rim (with thanks to Christopher R. Dyer for his assistance with this photograph.) (b) CT scan shows a thin soft-tissue rim (arrow) surrounding a stone impacted in the middle of the left ureter. The rim represents edema of the ureteral wall. The presence of a tissue rim sign allows a confident diagnosis of a stone within the ureter.

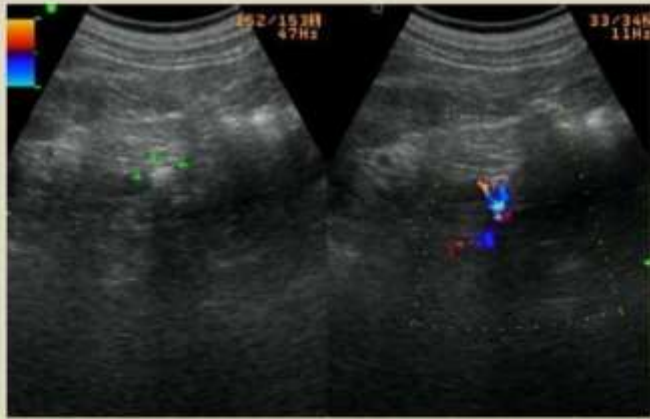
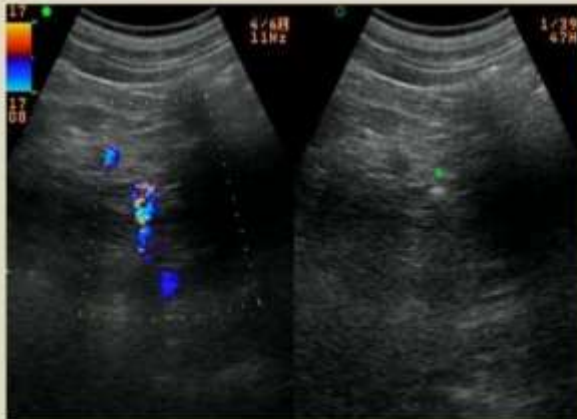


Soft-tissue rim sign.

The colour comet-tail artefact is an ultrasonographic signs seen in a number of situation with color Doppler scanning is performed, Typically the artefact, which resembles the grey-scale comet-tail artefact, is seen in situation when a small highly refractive (usually calcific) object is interrogated with colour Doppler. Twinkle artefact occurs and immediately deep to the object a tail linear aliased band of colour extends away from the probe. small renal or ureteric calculi.



(a) Comet. (Photograph entitled "Comet Hyakutake" reprinted with permission from Bill and Sally Fletcher.) (b) CT scan shows a calcification (the comet nucleus) (arrow) with a soft-tissue tail that represents a pelvic vein (arrowhead). Together, this appearance constitutes the comet sign. Note the stone at the left ureterovesical junction.

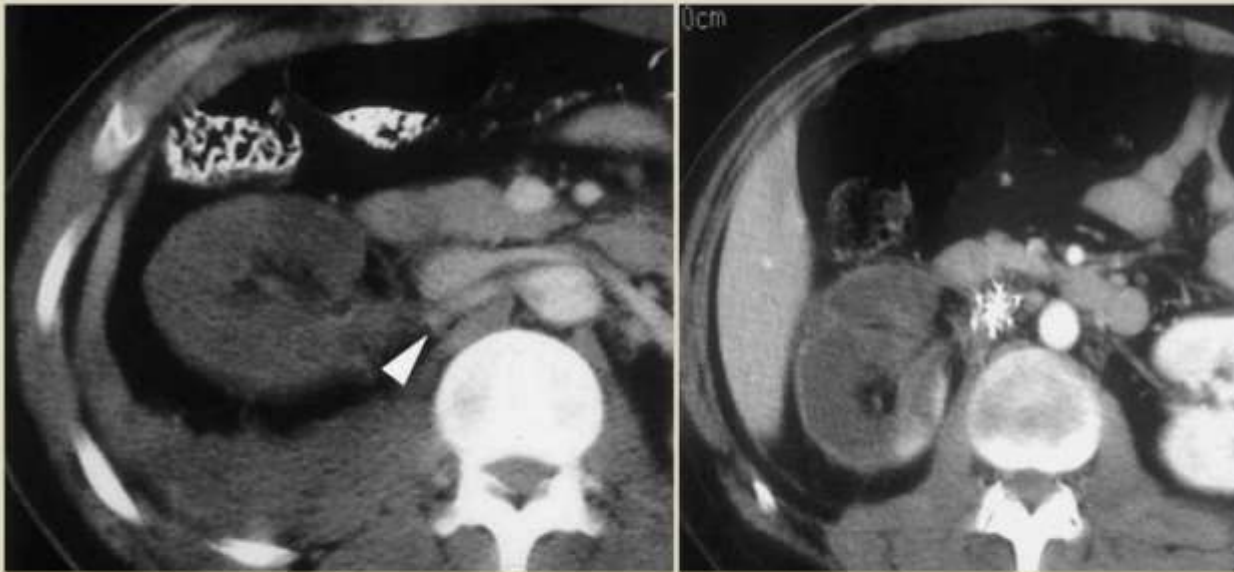


Twinkle and Colour comet-tail artefact.



Polycystic kidney disease. Sagittal sonograms with color display off (A) and on (B) display evidence of color comet-tail artifact from calcified wall cysts.

The reverse rim sign refers to a hypoattenuating renal cortex visualized at CT, seen against a background of intact medullary perfusion after contrast material is given. This sign also implies severe derangement of cortical blood flow with development of cortical necrosis.



Rim sign of vascular compromise. (a) Enhanced CT scan of a motor vehicle accident victim demonstrates no perfusion in the majority of the right kidney. The right renal artery abruptly terminates; this is the arterial cut-off sign (arrowhead). (b) Repeat contrast-enhanced CT scan, obtained 72 hours after a, demonstrates a thin marginal rim of preserved subcapsular enhancement in the left kidney, typical of the rim sign of renovascular compromise. Vascular compromise in this case was caused by intimal injury and thrombosis of the main renal artery.

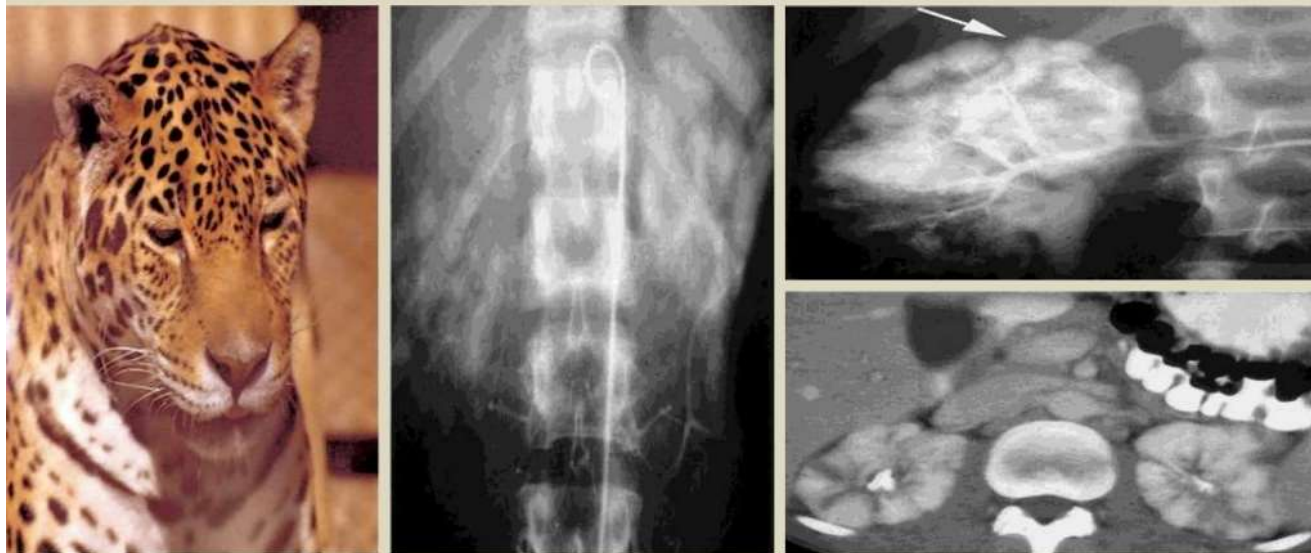


A reverse rim. CT scan, obtained to exclude a large retroperitoneal hematoma in a patient with sustained hypotension for 1 hour after cardiac catheterization and subsequent cardiac arrest, shows a hypoattenuating renal cortex (arrow) compared with the medullary enhancement. No additional contrast material was given after the catheterization. The patient rapidly developed multiorgan failure that led to her death.

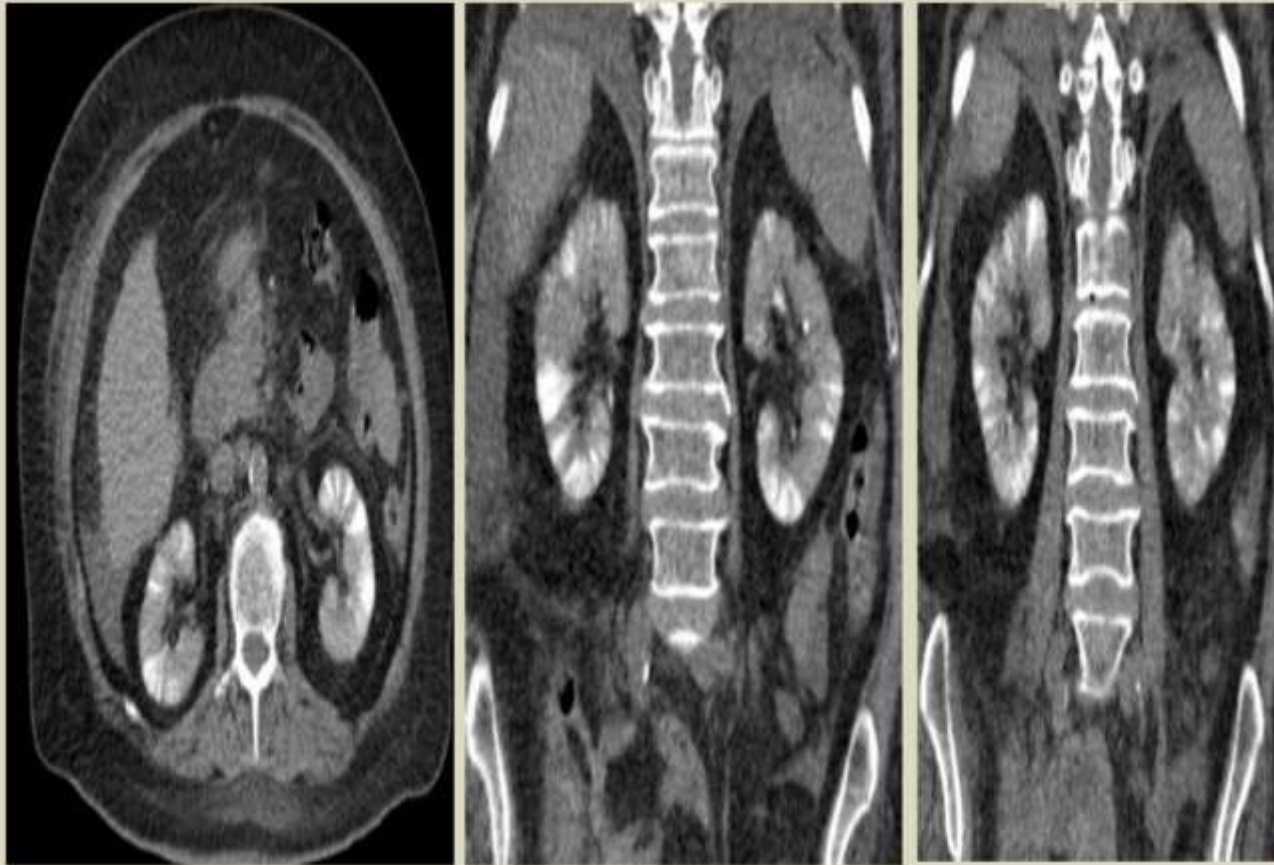


Hydronephrotic rim. CT scan, obtained in a patient with hematuria after minimal trauma, reveals a rim of enhancement surrounding a markedly dilated right renal pelvis and collecting system, findings consistent with congenital ureteropelvic junction obstruction. Note the variable thickness of the enhancing tissue rim (in contrast to the rim sign of vascular compromise [cf Fig 10]), as well as enhancement within cortical columns (arrow).

Spotted Nephrogram Irregular, patchy enhancement in the renal parenchyma, referred to as the spotted nephrogram, may occur as a result of small vessel occlusion, which can be seen with necrotizing vasculitis (periarteritis nodosa), scleroderma, and hypertensive nephrosclerosis. Although first observed on angiograms, the abnormal perfusion pattern can be identified on CT and MR images after contrast material administration



Spotted nephrogram. (13a) Spotted cat. (Courtesy of Russell I. Poole, Mishawaka, Ind.) (13b) Late image from midstream aortography demonstrates patchy perfusion in both kidneys, giving the parenchyma a spotted appearance: the spotted nephrogram. (13c) Late image from selective right renal arteriography in the same patient demonstrates small vessel occlusion and multiple areas of parenchymal infarction (arrow) with islands of preserved perfusion. The patient proved to have periarteritis nodosa. (14) CT scan of another patient with periarteritis nodosa demonstrates the CT correlate of the angiographic findings, with patchy perfusion of the kidneys caused by multiple areas of infarction



Striated nephrogram.

Crescent Sign This sign is fundamentally different in its pathophysiology from the rim sign of hydronephrosis. The crescent sign refers to the appearance of concentrated contrast material in collecting tubules, arranged parallel to the margin of a dilated calyx, which produces a thin line of contrast material at the edge of the calices, resembling a crescent



(a) Crescent. (Photograph entitled "Moon with Earthshine" reprinted with permission from Bill and Sally Fletcher.) (b) Crescent sign. CT image obtained during the corticomedullary phase of enhancement shows decreased thickness of the parenchyma surrounding the dilated collecting system in the left kidney. (c) Concentrated contrast material crescents surround the dilated collecting system elements (arrows) on this delayed image, which also shows a urine-contrast agent level in the dependent aspect.



Bosniak 1 renal cyst with crescent sign.