Postrenal Acute Kidney Injury Pathophysiology and Presentation

Postrenal acute kidney injury occurs as a result of bilateral outflow tract obstruction which leads to increased backpressure on the glomerulus and subsequently decreased GFR. Common etiologies include benign prostatic hyperplasia, nephrolithiasis, neoplasm, and neurogenic bladder. On presentation, patients may have bladder distension, lower abdominal pain, edema, or oliguria.

PLAY PICMONIC

Pathophysiology

Bilateral Outflow Obstruction

Bi-ladder Renal System Obstructed

Postrenal acute kidney injury can occur as a result of bilateral urinary obstruction in any part of the renal collection system, from the renal pelvis to the urethra. Unilateral kidney obstruction does not lead to acute kidney injury since the unobstructed kidney compensates. The unaffected kidney can maintain a physiologic GFR and normal serum creatinine. This is also the reason why kidney transplant donors can maintain a normal serum creatinine with only one functional kidney.

Decreased GFR

Down-arrow Gopher

Decreased GFR can be observed in postrenal acute kidney injury. The bilateral outflow tract obstruction causing this condition can lead to retrograde buildup of fluid in the renal collection system proximal to the obstruction. This can lead to hydronephrosis with subsequently decreased GFR.

Etiologies

Benign Prostatic Hyperplasia (BPH)

Bunny Plum Hiker-plates

Benign Prostatic Hyperplasia is a common cause of post-renal acute kidney injury. An enlarged prostate prevents the passage of urine through the urethra leading to a buildup of urine in the bladder, ureters, and kidney.

Nephrolithiasis

Kidney Throwing Stones

Bilateral nephrolithiasis can lead to postrenal acute kidney injury. The bilateral nephrolithiasis can occur in any of the these locations: the renal pelvises, ureters, and bladder.

Neoplasm

New-growths

A neoplasm may invade or compress the renal collecting system leading to bilateral outflow tract obstruction. Prostate cancer is the most common one; however, any cancer that can exert compression or invasion of these structures can be a cause of postrenal acute kidney injury e.g. cervical cancer. Other conditions that can lead to postrenal AKI include congenital malformations such as posterior urethral valves.

Neurogenic Bladder

Sleeping-nerves on Bladder

Flaccid Neurogenic Bladder is a condition in which the nerve innervation of the bladder is dysfunctional. This condition leads to buildup of urine in the bladder causing overflow incontinence. The urine buildup leads to retrograde urine buildup in the renal collecting system and can cause post-renal acute kidney injury. Flaccid neurogenic bladder can occur in patients with multiple sclerosis, peripheral neuropathy due to diabetes mellitus, and spinal cord lesions.

Presentation

Bladder Distension

Bladder Distended

Bladder distension can occur in cases where the obstruction in the urethral area or due to flaccid neurogenic bladder. Common etiologies of bladder distension include benign prostatic hyperplasia or prostate cancer. Causes of flaccid neurogenic bladder include diabetes and multiple sclerosis.

Lower Abdominal Pain

Lower Abdominal Pain-bolt

Lower abdominal pain is a common finding in patients with post-renal acute kidney injury. The pain may be due to the obstructive causes themselves, such as renal stones, or due to an overfilled bladder, such as that from flaccid neurogenic bladder.

Edema

Edamame

Edema can occur in postrenal AKI. The reduced GFR can lead to fluid buildup causing third-spacing and subsequent interstitial edema.

Oliguria

Old-gopher

Oliguria is a common finding in cases of post-renal acute kidney injury since the obstruction will inhibit the passage of urine.