Section: General Surgery

Case Series

NON-FUNCTIONING KIDNEY AND RISK OF SEPSIS – THE OUTCOME OF LONGSTANDING OBSTRUCTIVE URETERIC CALCULI: A CASE SERIES

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ABSTRACT

A large renal or ureteric stone can block the flow of urine, causing a buildup of urine in the kidney (hydronephrosis) which when prolonged can lead to damage to the kidney tissue, potentially causing chronic kidney disease (CKD) and eventually ESRD. A blocked ureter can also increase the risk of urinary tract infections, which can further damage the kidneys. Many a times patients will be asymptomatic and the stone acts as a silent killer of kidney function. In ESRD kidneys become nonfunctional and shrunken with hidden threat of risk of pyelonephritis and sepsis. Management includes removal of the ureteric calculus by URSL or RIRS laser Lithotripsy. But in a Non-functioning kidney with risk of recurrent pyelonephritis nephrectomy becomes inevitable due to risk of sepsis. Here we discuss a case series of patients who presented to the hospital with non-functioning kidney due to large impacted ureteric calculus with its evaluation, complications, management and outcome for the period between 2024 May to 2025 April.

Keywords: ESRD: End Stage Renal Disease, CKD: Chronic Kidney Disease, URSL: Ureteroscopic Surgery, RIRS: Retrograde Intra Renal Surgery, PCNL: Percutaneous Nephro Lithotomy, UTI: Urinary Tract Infection, HPE: Histo Pathological Evaluation.

INTRODUCTION

A ureteric calculus is a kidney stone that has migrated from the kidney and become lodged in the ureter, the tube that carries urine from the kidney to the bladder while renal calculus are stones which remains in renal calyces or renal pelvis. However, when it blocks the flow of urine it can cause severe pain in the side and back, which can radiate to the groin, as well as nausea, vomiting, and bloody or cloudy urine.[1]

But in many cases patient will be asymptomatic and acts as a silent killer slowly diminishing kidney function leading to chronic kidney disease, and ESRD as in our patient finally leading to non-functional kidney.[2]

If a stone is too large to pass on its own, surgical intervention may be needed, such as PCNL, URSL, extracorporeal shock wave lithotripsy (ESWL), or RIRS. However, when kidney function is minimal and patient is exposed to the recurrent risk of pyelonephritis it becomes inevitable to do nephrectomy with removal of stone to prevent impending sepsis as in these patients.[3-6]

CASE REPORTS

CASE 1: A 69-year-old male, known case of prediabetes, presented with complaints of exertional dyspnea for six months. Patient was diagnosed with severe AS, mild AR, and moderate MS. In view of these findings, the patient was advised to undergo double valve replacement (DVR) with coronary artery bypass grafting (CABG). On evaluation urine routine showed sterile pyuria. BUT patient was asymptomatic with no complaints of dysuria, abdominal pain, hematuria, fever. USG (A+P): 8mm calculus in the right ureter with hydronephrosis. CT urography showed a radio-dense ureteric calculus (2 cm) in the right upper -ureter with marked proximal hydroureter and hydronephrosis with features of chronic obstructive uropathy. The patient underwent

right URSL with DJ stenting on 10/12/24.Stone was partially broken and DJ Stenting done to bypass the obstruction. Complete stone removal could not be achieved due to its location in the upper ureter with Ureteric lumen being narrow not allowing the scope to reach up to the stone. A DTPA scan was subsequently performed to assess bilateral kidney function and determine the salvageability of the right kidney. Right kidney only contributed to 7.49 % of split kidney function while GFR was 3.23 ml/min indicating markedly impaired cortical function.

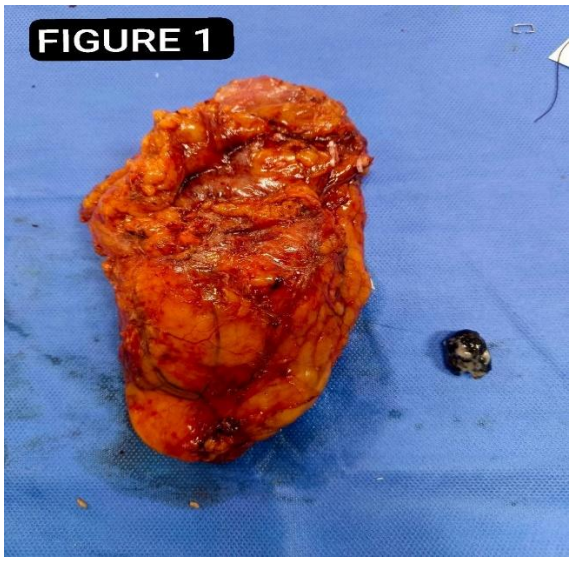

Figure 1: Ct image showing shrunken right kidney with impacted ureteric calculus (original)

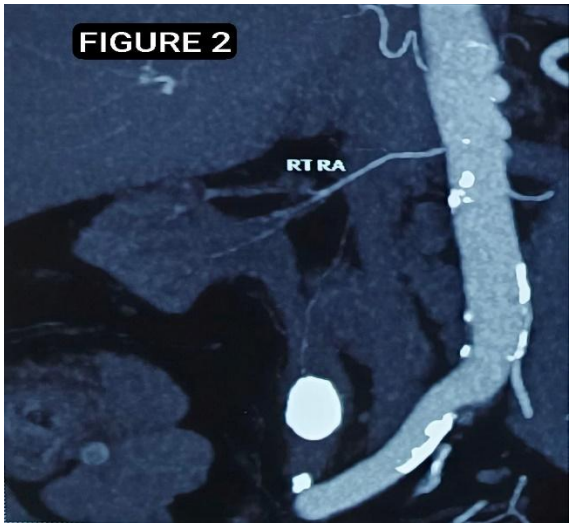

Figure 2: right laparoscopic nephrectomy specimen with ureteric stone (original)

After a multidisciplinary discussion involving cardiologists, CVTS surgeon and urologist, it was decided that to prevent recurrent urinary tract infections and the risk of sepsis due to a non-functioning kidney with an ureteric calculus, the patient should undergo a total right nephrectomy with stone removal before DVR. The patient successfully underwent right laparoscopic nephrectomy with the removal of ureteric calculus in-situ. Histopathology of the resected specimen showed End stage renal disease with chronic glomerulonephritis and pyelonephritis.

Case 2: A 33-year young male patient who came for his medical checkup was incidentally found to have a large obstructive 2x2 cm calculus in right pelvi ureteric junction with shrunken right kidney. Patient was asymptomatic, with no complaints of flank pain, hematuria, oliguria, or recurrent UTI. Patient was evaluated further with CECT Abdomen Plus Pelvis which showed marked thinning of right renal parenchyma, with large obstructive calculus 18x22x19 mm in right renal pelvis. DTPA scan was done which showed 16 % split kidney function in right kidney. Patient underwent right PCNL for the stone and was in regular follow-up. However, after one-year follow-up DTPA scan right kidney split function reduced to 11 %. Patient was also complaining of recurrent episodes of fever and burning micturition with evaluation showing pus cells and bacteria in complete urine examination. Decision was taken that to prevent further risk of UTI and sepsis, right nephrectomy has to be done, hence patient underwent Laparoscopic nephrectomy successfully. HPE was suggestive of Interstitial Tubulonephritis with focal acute tubular necrosis. Patient was followed up till 6 months postop, which revealed no episodes of UTI yet.

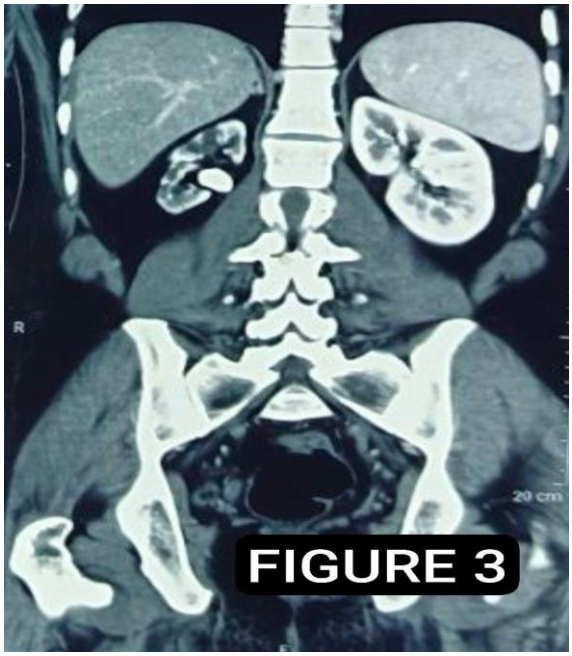

Figure 3: CT image showing shrunken left kidney with large PELVI ureteric stone (original)

Case 3: 63-year-old known case of carcinoma prostate status post robot assisted radical prostatectomy 10 years back, was referred from railway divisional hospital in view of left pyelonephritis. Contrast enhanced CT scan was suggestive of regular radiodense calculus in left

upper ureter, just beyond the pelviureteric junction with proximal hydronephrosis. There was also marked thinning of left renal parenchyma with poor concentration and delayed excretion. Patient was initially managed conservatively with IV antibiotics. DTPA scan was done further to evaluate kidney function which suggested left kidney split function to be only 9 %. Hence to prevent recurrent pyelonephritis patient underwent left nephroureterectomy with stone insitu.HPE was suggestive of chronic pyelonephritis with glomerulonephritis consistent with end stage renal disease. 1-year postop patient was followed up and no episodes of UTI or pyelonephritis occurred.

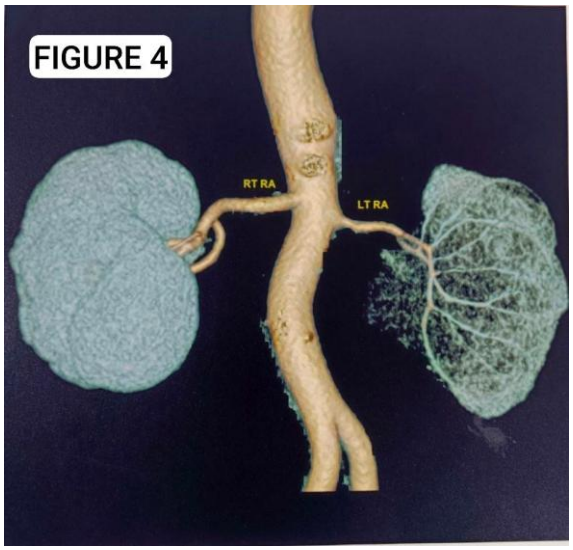

Figure 4: 3d reconstructed image of bilateral renal vessels indicating reduced perfusion(original)

Case 4: 68-year-old male known case of Diabetes, Hypertension was admitted under cardiology for severe LV dysfunction and 20 % ejection fraction and was planned for CABG. However, patient started developing oliguria, fever, flank pain. Serum Creatinine was raised suggestive of acute kidney injury. Urine culture was positive for multidrug resistant Klebsiella. Ultrasonography suggested right pyelonephritis with a large impacted ureteric calculus 1.5 cm in right upper ureter just below the renal pelvis with proximal hydronephrosis. CT KUB Plain was done which was suggestive of marked renal cortical thinning of right kidney with hydronephrosis and focal areas of abscess in right kidney with obstructive calculus in right upper ureter. Patient was diagnosed to be in septic shock. Considering patient's cardiac and hemodynamic status, emergency Percutaneous Nephrostomy tube insertion was done in right kidney to bypass obstruction and it showed pus collection. However, patient succumbed to death one day later due to septic shock.

Case 5: 64-year-old female, known case of Diabetes Mellitus, Hypertension, Ischemic heart disease, hypothyroidism on medications was admitted for fever, burning micturition and generalized myalgia. Patient had history of multiple renal calculus over renal calyces, pelvis and upper ureter causing hydronephrosis. CECT scan was suggestive of renal cortical thinning with marked hydronephrosis. DTPA scan was also taken which showed 12 % split function in left kidney. Patient underwent RIRS with PCNL for the same 2 years ago. Patient now again admitted for UTI. Latest CECT urography showed multiple non obstructive renal calculi of maximum size 1 cm with marked thinning of renal parenchyma. DTPA scan was done to evaluate the present bilateral renal function which was suggestive of 8 % in left kidney. Patient was advised nephrectomy given the comorbidities and sepsis risk. Patient and relatives were counselled about the indications, advantages, disadvantages and complications regarding these including sepsis risk. Patient and relatives wanted time to decide. Hence discharged after management of UTI. But the patient was lost in follow-up.

DISCUSSION

Ureteric calculi are identified as stones present in ureter anywhere between pelviureteric junction to vesicoureteral junction. It is often not identified at initial stages due to lack of any symptoms and when left untreated can lead to hydronephrosis especially if stone is at ureteropelvic junction. The main modalities of identification of stones are computed tomography and ultrasonography scanning. Ultrasound is an easy method to help and diagnose obstructive hydronephrosis.[6] However computed tomography is gold standard and more accurate. Furthermore, studies have showed that obstructive ureteric calculus can cause moderated degree of hydronephrosis.[4]

Patho physiologically, the obstruction to the urine outflow leads to an increase in the hydrostatic pressure of the collecting system which in turn raises intraglomerular pressure affecting glomerular filtration rate.[5] Decrease in kidney function is determined by the severity i.e., partly obstructive or completely obstructive and the duration of obstruction. When obstruction left unrelieved it can cause kidney scarring with glomerular and tubular functional compromise. Kidney function does not return in cases of chronic obstruction by ureteric calculus even when stone is removed and obstruction is relieved.[7] This prolonged obstruction causes a dilated papillae and thinning of parenchyma leading to cortical atrophy and tubulointerstitial fibrosis.

Though acute obstruction causes symptoms like constant dull ache due to stretching of renal capsule, intermittent severe pain due to genitourinary peristalsis and nausea, vomiting, dysuria, many at times patient might be asymptomatic. However, complications an occur like pyelonephritis, recurrent UTI, chronic glomerulonephritis, ESRD. Especially in patients with comorbidities like Diabetes mellitus

and ischemic heart disease and immunocompromised these patients are prone to complications like recurrent UTI which can ascend upwards to progress into pyelonephritis which may later lead to sepsis.

Asymptomatic ureteric stones (silent stones) accounts for 6.4% of all ureteric calculus. They are usually larger, more commonly present in upper ureter and more commonly associated with high grade hydronephrosis. They are more prone to cause tubular function deficiencies and irreversibly impair renal function even after proper management.[2,8]

Laparoscopic surgery is a minimally invasive therapy that reduces blood loss, shortens postoperative hospital stays, reduces wound pain, requires fewer analgesics, allows for early return to normal activities, rapid oral intake, and improves cosmesis.[9] Uremic patients often have metabolic acidosis, which might worsen with CO2 insufflation during laparoscopic nephrectomy.[10] Thus, until the infection is under control and the patient has fully recovered, nephrectomy is not initiated.[11]

A study conducted in a sample size of 56 patients suggested that patients who declined nephrectomy and had percutaneous nephrolithotomy (PCNL) due to big stones in their non-functioning kidneys. The vast majority of patients (67.9%) had big stones which further lead to chronic renal disease stage ≥3.[12]

In all the 5 cases, patients were asymptomatic for the ureteric stones. These 'silent' stones acted as obstructions to the pathway of normal urine flow causing hydronephrosis which later progressed to renal impairment and ESRD. In the first 3 cases patients were fully asymptomatic except when effects of hydronephrosis caused impaired renal function which in turn caused occasional UTI.

First 3 cases were relatively healthy with lesser comorbidities. They were identified before they progressed into sepsis and septic shock. They underwent prophylactic laparoscopic nephrectomy of the affected kidney with removal of the stone which may act as foci of infection in future. This procedure significantly reduced the risk of future infection and risk of sepsis which may prove to be live saving for the patient.

In the 4 the case, patient was asymptomatic initially and presented late when he was already in pyelonephritis when diagnosed about the obstructive ureteric calculus. This patient also had severe comorbidities which contributed to the development of sepsis which later led to shock and proved fatal for the patient. Had the patient been identified, diagnosed and evaluated for the ureteric calculus earlier, prophylactic nephrectomy could have been done which could have saved the life of the patient.

In case 5, patient is in the stage as of the first 3 cases and is rescuable at present since patient has not yet gone into pyelonephritis or shock considering the comorbidities the patient has. However, patient can develop infection at any time and needs to undergo prophylactic nephrectomy considering the multiple calculi which are source of infection and the impaired renal function and urine stasis aggravating it. If this occurs this patient may follow the same course as case 4 and can be fatal.

CONCLUSION

Ultrasonography should be considered as a continuation of clinical examination. It is important for people especially with comorbidities to undergo routine health checkup including ultrasonography of abdomen to rule out any renal or ureteric calculi. All patient who presents with UTI or sterile pyuria should be evaluated further with ultrasonography. Positive findings in ultrasonography should be confirmed with computed tomography. Any patient with asymptomatic obstructed ureteric calculus should undergo definitive procedure for stone removal. In case impaired renal function and ESRD already sets in, DTPA should be done to assess the functionality and viability of the kidney and patient should be counselled about the need for prophylactic nephrectomy either laparoscopic or open if kidney is not functioning.

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