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Urolithiasis management in kidneys with anomalies - Our institutional study

Dr.R.GOPI SARAVANAN,M.S.,M.Ch(UROLOGY)
ASSISTANT PROFESSOR OF UROLOGY,
GOVERNMENT MEDICAL COLLEGE AND HOSPITAL,DHARMAPURI,TAMILNADU

ABSTRACT
Objectives:
To review our experience with treating patients with calculi in anomalous kidneys and ureter.
Methods:
Seven patients with renal calculi in anomalous kidneys and ureter were managed by ureteroscopic surgery(URS),percutaneous nephrolithotomy(PCNL) and open surgery. Demographic information, preoperative stone burden, operative information, follow-up imaging and complications were obtained .
Results:
Our cohort consisted of 3 patients with horse shoe kidneys (HSK), 2 patients with pelvic kidneys(PK),1 patient with crossed fused ectopia and 1 patient with double moiety with incomplete duplication of ureter (6 male, 2 female, mean age, 50.6 years). The average preoperative stone burden of the treated calculi was 2.5cm, with 4 stones located in the renal pelvis, 2 in the proximal ureter and 1 stone in PUJ level.A 6/ 7.5F ureteroscope, 22fr nephroscope ,pneumatic lithotripsy and graspers were used in endoscopic management. One horseshoe kidney patient underwent PCNL for renal calculi and two patients with PUJ calculus were managed with URS surgery. Two pelvic kidney patients with renal stone were managed by open pyelolithotomy. Crossed fused ectopia with ureteric calculi was managed by URS surgery. One patient underwent heminephrectomy for non-functioning lower pole moiety with ureteric calculus.Six patients had complete clearance of the stone on postoperative imaging, one patient with residual calculi was managed by ESWL,with 88% of patients asymptomatic after their procedure. No patients required additional surgical intervention.
Conclusion:
Stone disease in horseshoe and pelvic ectopic kidneys can present unique challenges to the endourologist. In general, stones less than 1– 1.5 cm in size can reasonably be managed with an attempt at SWL or flexible URS. Stones greater than 1.5 cm in size are more effectively dealt with using percutaneous techniques. Pelvic kidneys with large calculus can be managed by laparoscopic assisted PCNL and open pyelolitholitomy. Complete radiologic evaluation and planning are vital in order to ensure efficient treatment and avoid complications

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I. Introduction:

Abnormalities of ascent, form or fusion of the kidneys during embryologic development can result in an anomalous kidney. Of those, the horseshoe kidney (HSK) and pelvic kidney (PK)are the most frequently encountered.1 The ectopic position and altered anatomy of these kidneys can present a challenge to the management of patients with symptomatic renal calculi, not only from an anatomic but also from a metabolic perspective.Percutaneous nephrolithotripsy (PNL) and shockwave lithotripsy (SWL) are the most frequently used methods for managing patients with renal calculi in anomalous kidneys.2 Although several studies have demonstrated the efficacy of these approaches in this population, there are several circumstances under which PNL and SWL are not technically feasible, on such cases open surgery approach will be ideal.We report our experience with URS,PCNL & open approach in the management of patients with renal calculi in anomalous kidneys and ureter.

II. Material And Methods:

Seven patients with calculi in anomalous kidney and ureter data were collected from January 2019 to December 2019. Preoperative profile age,sex,stone size,site,contrast CT KUB and associated anomaly data were collected. An anomalous kidney was defined as a kidney with abnormal ascent, form, or fusion and an anomalous ureter as double moiety with duplication of ureter. Pertinent medical history that might be a contraindication to PNL or SWL, such as uncontrolled hypertension,significant cardiovascular or pulmonary

disease, anticoagulation therapy and unfavorable stone composition were noted.Preoperative imaging was reviewed for type of anomalous kidney, stone size, location and evidence of obstruction.

X ray KUB or CT was taken postoperatively to monitor residual fragments. The need for additional interventions was recorded.

Preoperative and intraoperative demographic data:

Case	1	2	3	4	5	6	7
Age	55	50	60	50	21	60	55
Gender	Male	Female	male	female	male	female	male
Anomaly	Horseshoe kidney	Left pelvic kidney	Left kidney double moiety with duplication of ureter	Left pelvic kidney	Horseshoe kidney	Right kidney crossed fused ectopia	Horseshoe kidney
Stone site	Renal pelvis	Pelvic calculus	Proximal ureteric calculus with non functioning of lower moiety	Pelvic calculus	Right renal pelvis	Right PUJ calculus	Right pelvic calculus
Size	3cm	3.5cm	1.5cm	2.5cm	1.5cm	1.1cm	2.5cm
Procedure	PCNL	Open pyelolithotomy	Heminephrectomy	Open pyelolithotomy	URS+ICL+ DJ STENTING	URS+ICL+ DJ STENTING	PCNL
Previous procedure	-		Open pyelolithotomy 7yrs back				

Case 1 Horseshoe kidney

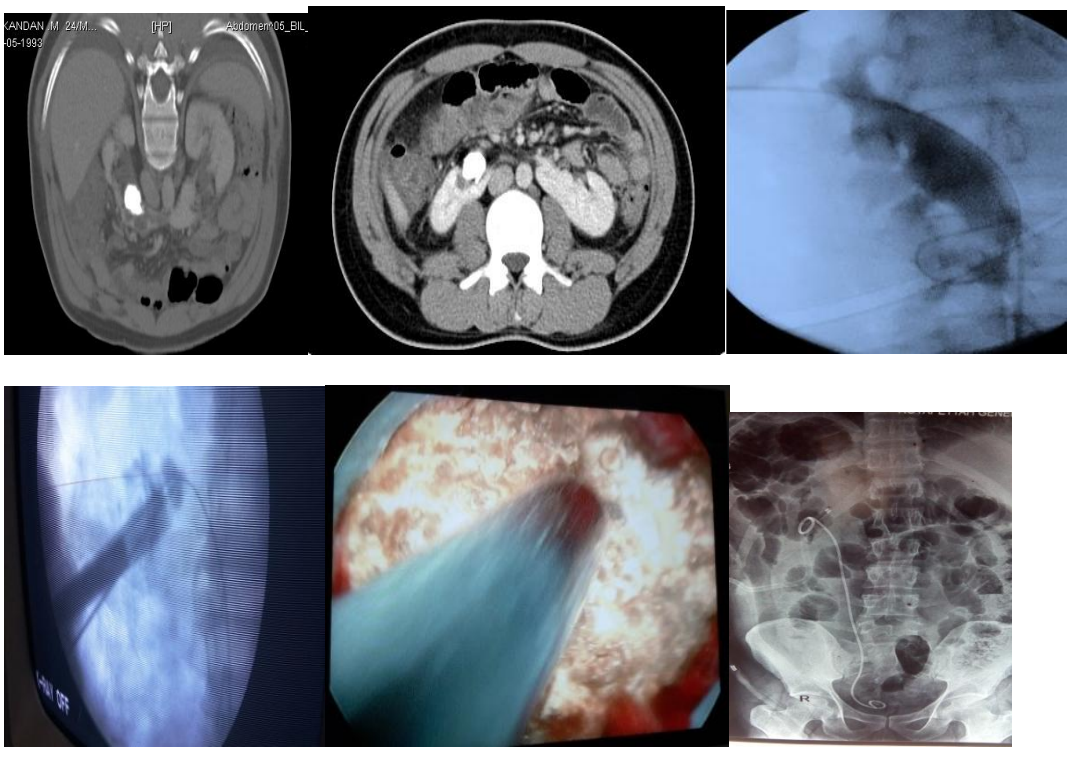

FIG NO 1. A case of horse shoe kidney with right renal pelvic calculus 3.5cm managed by PCNL , upper calyx punctured under C-ARM guidance , ICL done, stone fragmented completely, antegrade DJ Stenting done. Post op x ray - no residual calculus

Case 2 Pelvic kidney

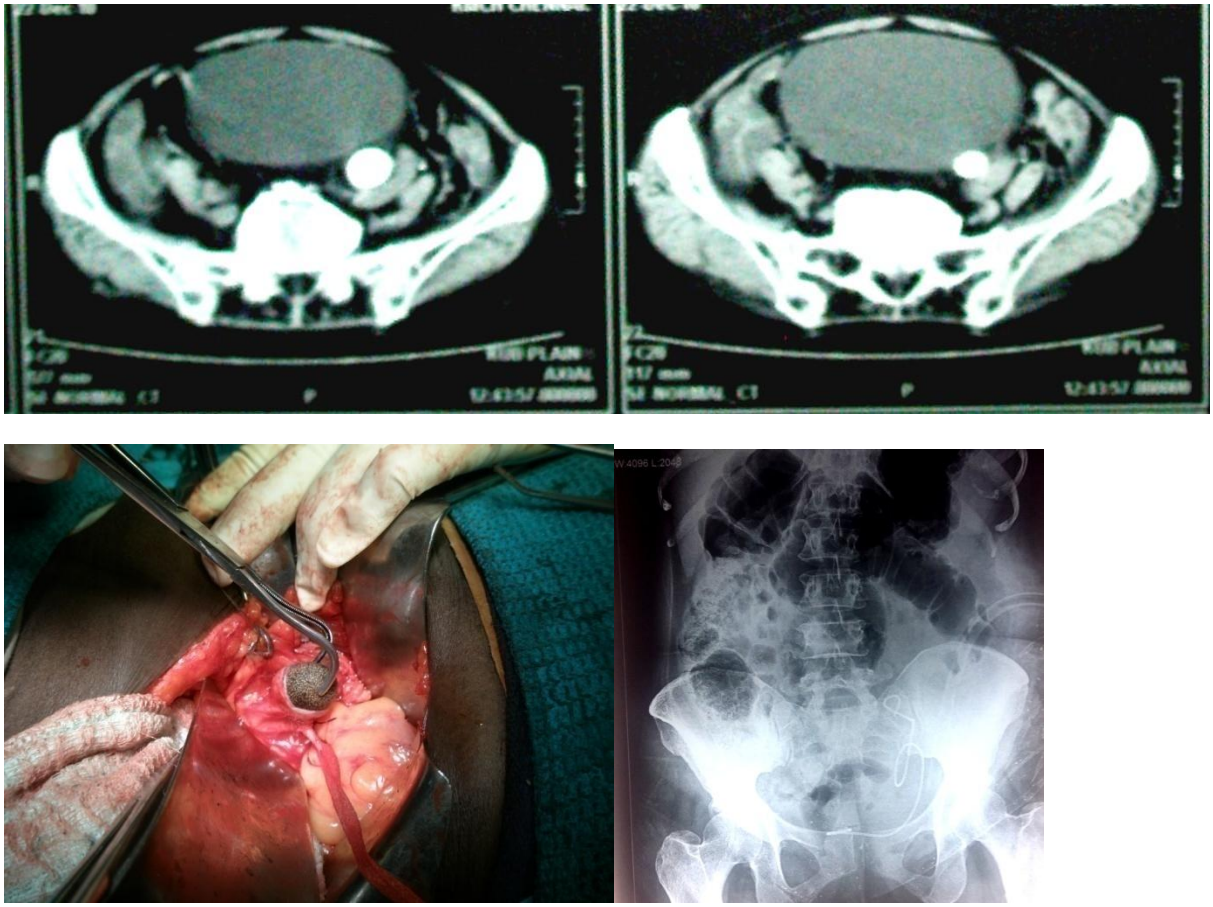

FIG NO2. Left renal pelvic calculus in pelvic kidney (4cm) managed by open pyelolithotomy,intraoperatively had difficulty to identify ureter, as it was more posterior .Ureter dissected proximally and pelvis identified, pyelolithomy done ,stone extracted .Post operative x ray- stent in situ.

Case 3
Left double moiety with complete duplication of left ureter with non functioning of lower moiety

FIG 3- USG-hydronephrosis of lower moiety 2.IVU- normal excretion of contrast in left upper moiety and proximal ureteric calculus and non functioning of lower moiety.Patient planned for URS and proceed. Intraoperatively single ureteric orifice with duplication of ureter seen distally,narrowing at lower distal ureter and pus pouring seen , surgery deferred. RGP normal entry seen in upper pole moiety, contrast not entered due to severe narrow ureter.

FIG – 4.MRI UROGRAM left kidney double moiety with duplication of left ureter 2. DMSA non- functioning of lower moiety

Fig 5. Duplication of ureter 2.Heminephrectomy of lower pole moiety 3.heminephrectomy specimen with proximal ureteric stone

Case 4 pelvic kidney

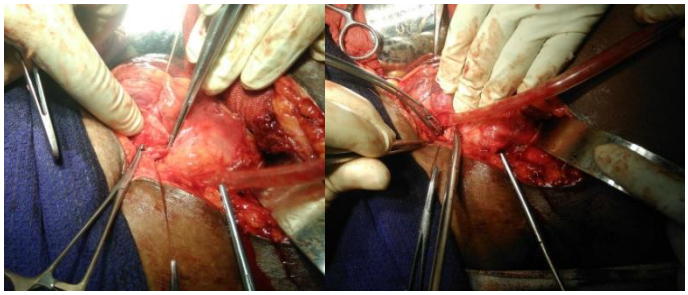

FIG NO6 – left renal pelvic calculus of size 2.5cm , previously operated for pyelolithotomy 7yrs back. Intraoperative dense adhesions present, ureter and pelvis identified ,pyelolithotomy done & stone retrieved.

HORSESHOE KIDNEY

Case 5 – 23yr old male on evaluation,found to have horseshoe kidney with left PUJ calculus of size 1.5cm, no evidence Of PUJobstruction on contrast CECT KUB.

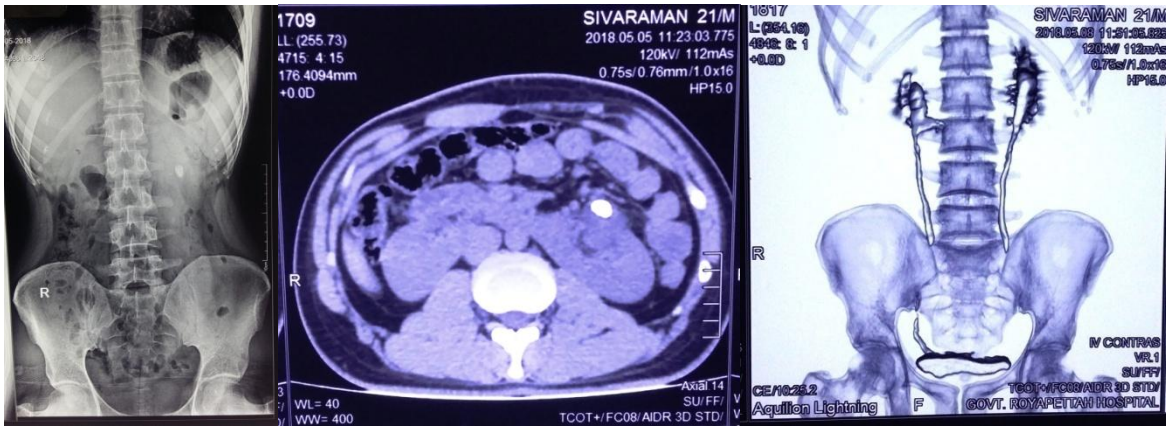

FIG NO 8- Horseshoe kidney with PUJ calculus managed by URSL and DJ stenting

FIG NO.9 postoperative XRAY

CASE 6 CROSSED FUSED ECTOPIC KIDNEY

FIG NO10 crossed fused kidney right kidney fused with left kidney Right PUJ calculus managed with ureteroscopy + lithotripsy + DJ stenting.Left distal ureteric calculus passed out.

III. Results

The mean age of our cohort was 45.6 years(range, 20 to 60 years). Of the 2 HSK patients,had no evidence of ureteropelvic junction obstruction. Preoperative stone burden was evaluated by intravenous pyelography or noncontrast abdominal CT. Of those stones, 5 were located in the renal pelvis and two patients had ureteric calculus.Three patients underwent open sugery,(two patients open pyelolithotomy and one heminephrectomy), two undergone PCNL for renal pelvic calculus in Horseshoe kidney and two patients undergone URS for uretric calculus(One patient- bilateral ureteric calculi with crossed fused ectopia and one patient double moiety with lower moiety ureteric calculi). A ureteral stent wasplaced in all patients at the completion of the procedure.There were no intraoperative complications.All patients had postoperative imaging

2days after procedure. No other patients have required additional surgical intervention. One patients had residual calculus , stone was cleared by ESWL.

IV. Discussion

According to autopsy series, the incidence of renal ectopia ranges from 1 in 500 to 1 in 1200 patients.Horseshoe kidney, which is considered a fusion abnormality, is found in approximately 1 in 666 people, according to a prospective evaluation of radiographic studies at a single institution.Abnormal fusion of the mesonephric blastema leads to incomplete ascent and also malrotation of the kidneys by the inferior mesenteric artery and lies more caudally.Calyces tend to be posterior and medial and the upper pole calyces lie more cranial and lateral .20% median incidence of stones was noted & stones were seen mostly in the posterior lower pole calyx and the renal pelvis. Mostly stones are calcium oxalate.Flexible ureteroscopes and lasers is the best option ,semirigid ureteroscopy is not ideal due to anterior, tortuous, and high insertions of the ureters makes flexi difficult and is limited for stone less than 2 cm. PCNL is the ideal procedure of choice – as the vasculature runs ventrally near the upper pole, more medial puncture is done.Success rate is in range from 65.5% to 75.0%.

Unilateral ureteral duplication has been reported as 0.8% in American autopsies, while bilateral ureteral duplication is rarer and includes 20– 40% of all ureteral duplication. Anatomic abnormalities likely predispose congenitally abnormal kidneys to stone formation because of inherently suboptimal urinary drainage. Raj et al. reviewed urine and serum studies from 11 patients with horseshoe kidneys and found that all of the patients had at least one metabolic abnormality. Most common were hypercalciuria and hypocitraturia.

Ectopic kidney is a relatively rare renal anomaly However, an endourologist does encounter stone disease in an ectopic kidney occasionally. Factors such as anomalous blood vessels and tortuous ureter with high insertion can lead to poor drainage and predisposition to the formation of renal calculi in these patients.Options for managing small renal calculi in pelvic ectopic kidney are shock wave lithotripsy (SWL), retrograde intrarenal surgery (RIRS), ultrasound or laparoscopy guided PCNL. Since these kidneys are surrounded by bowel and bone, the efficiency of SWL is low. Moreover, the clearance of fragmented stones is also impaired due to high insertion of ureter and impaired pyeloureteral motility due to surrounding fibrous bands.Open pyelolithotomy or lap assisted PCNL will be better option , in our institute managed by open surgery. Management of renal stone in CFRE is difficult because of abnormal location, malrotation, and its relations with vertebral column and small bowel. Usual treatment options such as SWL and PCNL, though described may not be effective and not applicable in all the cases. In our case , right PUJ calculus was managed by URSL and DJ stenting.

Post operative DJ stent was removed after 3 weeks , no patient had stent related complication.Post operative follow up was done every 3 months during 1 year follow up window.Symptomatic patients are clinically examined, sent for urine culture and ultrasound X-ray KUB.

V. Conclusion

Stone disease in horseshoe and pelvic ectopic kidneys can present unique challenges to the endourologist. In general, stones less than 1– 1.5 cm in size can reasonably be managed with an attempt at SWL or flexible URS. Stones greater than 1.5 cm in size are more effectively dealt with using percutaneous techniques. Pelvic kidneys with large calculus can be managed by laparoscopic assisted PCNL and open pyelolitholitomy. Complete radiologic evaluation and planning are vital in order to ensure efficient treatment and avoid complications.

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