CASE REPORT

Renal calculi with retrocaval ureter: is percutaneous nephrolithotomy sufficient?

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SUMMARY

A 60-year-old woman presented with complaints of intermittent right flank pain which had begun one year ago. Ultrasonography and intravenous urogram showed right pelvic (15 mm) and inferior calyceal (6 mm) calculi along with suspected retrocaval course of right ureter, which was confirmed by contrast CT scan. Tc-99m diethylene-triamine-penta-acetic acid (DTPA) scan showed normal function and normal drainage of right kidney. Percutaneous nephrolithotomy (PCNL) was performed for right renal calculi. Because of curved ureteric course, negotiation of ureteric catheter in pelvis was anticipated to be troublesome, so intraoperative retrograde pyelogram (RGP) was performed to delineate the anatomy. Puncture was performed safely after air contrast pyelography. No complications occurred intraoperatively and postoperatively. On follow-up of up to 1 year patient was asymptomatic and renal scan showed normal function and drainage. So in the presence of retrocaval ureter and associated renal calculi, PCNL is a safe and optimal procedure and in condition of non-obstructive drainage, management of calculi only is adequate.

BACKGROUND

Retrocaval ureter is a rare entity¹ with a reported incidence of approximately 1 in 1100 and a 2.8-fold male predominance.² The first observed case of retrocaval ureters was described by Hochstetter in 1893.³ Obstruction of the ureter has been described in association with an anomalous course, that is, posterior, medial, anterior and finally lateral to the inferior vena cava (IVC).⁴ This course may lead to extrinsic obstruction of the ureter. The course of the retrocaval ureter varies and depending on the appearance in intravenous urography (IVU) could be classified as type 1 having S-shaped, fish-hook or J shaped retrocaval course or type 2 having sickle-shaped course.^{4 5}

Symptomatic patients typically present in the third or fourth decade of life⁶ and the usual management is mobilisation of the ureter both above and below the retrocaval course and ureteroureterostomy.

This vascular anomaly is not always associated with ureteral obstruction.⁷ The management of a patient with renal calculi along with a retrocaval ureter is hence laden with a dilemma of treating for renal calculus alone or repairing the ureteral anomaly also. No case report describing minimal invasive/endoscopic management of renal calculi in the presence of retrocaval ureter could be found in existing literature. Percutaneous nephrolithotomy (PCNL) is the procedure of choice for large renal calculi⁸ but for the safe puncture of the pelvicalyceal system

retrograde air-contrast pyelogram is usually required. In the presence of retrocaval ureter, placement of ureteric catheter could be troublesome. We are discussing a case of type I retrocaval ureter with renal calculi and non-obstructive drainage which was successfully managed by PCNL.

CASE PRESENTATION

A 60-year-old non-diabetic, non-hypertensive married woman from rural background presented with complaints of dull intermittent right flank pain since 1 year. History of fever, haematuria and dysuria and weight loss was absent. Clinical examination of the abdomen was within normal limits. Complete laboratory evaluation including urinalysis, complete blood picture, urea, creatinine and electrolytes were within normal limits. Ultrasonography kidney ureters bladder (USG KUB) showed mild hydronephrosis with two right renal calculi, a 15 mm calculus in renal pelvis and a 6 mm calculus in inferior calyx. IVU (figure 1A,B) revealed right renal calculi associated with dilated right pelvicalyceal system and upper ureter till abrupt S-shaped turn of ureter at the level of L4. The appearance on IVU was strongly suspicious of retrocaval ureter and hence a contrast-enhanced CT (CECT) was performed to confirm the diagnosis which showed dilated right proximal ureter (figure 2A) coursing medially and lying posterior to IVC (figure 2). Diuretic renal scan (Tc-99 m diethylene-triamine-penta-acetic acid) showed normal function of both kidneys with equal differential function and non-obstructive drainage. After informed consent of the patient's right PCNL was performed.

Figure 1 (A) Intravenous urography (IVU) plain film showing right renal calculi, (B) IVU showing dilated right pelvicalyceal system and upper ureter till abrupt S-shaped turn of ureter at the level of fourth lumbar vertebra.

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Figure 2 (A) Contrast-enhanced CT (CECT) showing dilated proximal ureter (long arrow) and IVC (short arrow). (B) CECT showing retrocaval course of ureter (long arrow), IVC (short arrow).

Operative technique

After spinal anaesthesia, cystoscopy and right retrograde pyelography (RGP) was performed, RGP showed dilated and curved proximal ureter (figure 3). A 6-F ureteric catheter was negotiated over guidewire (0.035 inch Terumo Guidewire) under fluoroscopic control in the right pelvis. Calyceal anatomy was delineated by air-contrast pyelogram and superior calyceal puncture was performed. Track was dilated up to 30F by Amplatz dilator over guide road and 26F nephroscope (Storz) was inserted through the 30F Amplatz sheath. Stones were fragmented by lithotripter (Swiss LithoClast 2) and removed by three-prong grasper (Storz). Ante

Figure 3 Right retrograde pyelography showing dilated and curved course of proximal ureter.

grade double J stent (6F) was put over guide wire and 22F nephrostomy tube was inserted through track.

Intraoperative and postoperative period was free of complications.

TREATMENT

Right PCNL under spinal anaesthesia through superior calyceal puncture, after informed consent of the patient.

OUTCOME AND FOLLOW-UP

Postoperative x-ray KUB showed complete clearance. Nephrostomy was removed on postoperative day 2 and patient was discharged on postoperative day 3. Double J stent was removed after 3 weeks during follow-up. On follow-up up to 1 year patient was asymptomatic. Ultrasonography and renal scan (Tc-99 m DTPA) at 6 months and 1 year showed mild right hydronephrosis with normal function and normal drainage.

DISCUSSION

Retrocaval ureter is one of the rare congenital anomalies.¹ Although commonly referred to as circumcaval or retrocaval ureter, a more appropriate term may be preureteral vena cava as it is due to a congenital abnormality in development of the vena cava.^{9 10} The prevailing theory of the development of this anomaly is that the subcardinal vein persists as the infrarenal IVC, thus crossing anterior to the midportion of the ureter and resulting in its circumcaval course.¹¹ Retrocaval ureter is classified into two types based on radiological appearance and the site of narrowing of ureter.^{4 5}

Type I is more common. The ureter crosses behind the inferior vena cava at the level of the third lumbar vertebra and has fish hook shape (S-shaped) deformity at the point of obstruction. Marked hydronephrosis is seen in 50% of the patients.

In type II, cross over occurs higher at the level of the renal pelvis. There is lesser degree of hydronephrosis or none at all and the renal pelvis and upper ureter lie horizontal before encircling the vena cava in a smooth curve (sickle-shaped curve). The anomaly predominantly involves the right ureter. If it involves the left ureter then it is usually associated with a duplicated IVC or situs inversus.^{12 13}

Retrocaval ureter may be asymptomatic or discovered during radiological imaging for some other problems.⁷ CECT scan of the abdomen is said to be the investigation of choice for retrocaval ureter.¹⁴ However, some time during the excretory phase of CT scan entire ureter is not visualised due to pooling of contrast in the dilated renal pelvis and proximal ureter¹⁵ and this problem also occur in our case. Although not diagnostic, the appearance of retrocaval ureter on IVU is typical and is highly suggestive of the diagnosis.¹⁶ If the patient is symptomatic with documented subrenal functional obstruction, dismembered pyeloplasty is the gold standard treatment.^{17 18}

Surgical management is reserved for the type 1 cases that are usually symptomatic. Retrocaval ureter has hence been defined as a rare congenital anomaly that requires surgical correction in the symptomatic patient.^{19 20} Patients with minimal calyceal dilation and without significant symptoms do not require surgery but need to be followed up.²⁰

Various reports are present in the literature describing association of retrocaval ureter and renal calculi and their simultaneous management. Simforoosh *et al*²¹ have reported simultaneous treatment of renal stone and retrocaval ureter with laparoscopic technique. Mugiya *et al*²² reported a case, in which retrocaval ureter and upper ureteric calculus were managed during the same procedure. Similarly, Singh *et al*²³ also described simultaneous

management of retrocaval ureter and renal stone by dismembered pyeloplasty and pyelolithotomy.

No case report describing management of renal calculi by PCNL and its feasibility in the presence of retrocaval ureter could be found in existing literature. A case report described the feasibility of extracorporeal shock wave lithotripsy (ESWL) in the management of renal calculus in patients with retrocaval ureter.²⁴ The author was of the opinion that placement of a double J stent probably altered the course of the ureter from long J-shaped to a less curved sickle shape which offered little hindrance in clearance of stone fragments. Iqbal and Ansari²⁵ described a similar case but they performed an open surgery to retrieve the stone as well as repair the anomaly.

Our patient had type I retrocaval ureter with concomitant renal calculi. Considering the non-obstructive drainage of the kidney we treated only calculi. We proceeded with RGP to delineate the ureteral anatomy and then passed a guide wire and subsequently ureteral catheter followed by successful PCNL. Hence in the absence of subrenal obstruction due to retrocaval ureter PCNL is a safe and effective management strategy for renal calculi and observation can be employed for ureteral anomaly.

Learning points

- In the presence of retrocaval ureter and associated renal calculi
 - If the renal scan shows non-obstructive drainage then management of only calculi is sufficient;
 - Percutaneous nephrolithotomy is a safe and optimal procedure;
 - Placement of ureteric catheter should be performed very carefully and RGP may help in delineating anatomy.
- In contrast-enhanced CT sometime due to inadequate opacification of ureter during excretory phase, diagnosis of retrocaval ureter may be overlooked so typical appearance in IVU will be helpful in making the diagnosis.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Heslin JE, Mamonas C. Retrocaval ureter: report of four cases and review of literature. *J Urol* 1951;65:212–22.
- 2 Lutin EM, Haramati N, Frager D, et al. CT diagnosis of circumcaval ureter. *AJR Am J Roentgenol* 1988;150:591–4.
- 3 Olson RO, Austen G Jr. Postcaval ureter; report and discussion of a case with successful surgical repair. *N Engl J Med* 1950;242:963–8.
- 4 Bateson EM, Atkinson D. Circumcaval ureter: a new classification. *Clin Radiol* 1969;20:173–7.
- 5 Kenawi MM, Williams DI. Circumcaval ureter. A case report of four cases in children with a review of literature and new classification. *Br J Urol* 1976; 48:183–92.
- 6 Zhang XD, Hou SK, Zhu JH, et al. Diagnosis and treatment of retrocaval ureter. *Eur Urol* 1990;18:207–10.
- 7 Crosse JE, Soderdahl DW, Teplick SK, et al. Nonobstructive circumcaval (retrocaval) ureter: a report of two cases. *Radiology* 1975;116:69–71.
- 8 Consensus conference. *Prevention and treatment of kidney stones. JAMA* 1988;260:977–81.
- 9 Dreyfuss W. Anomaly simulating a retrocaval ureter. *J Urol* 1959; 82:630–2.
- 10 Lerman I, Lerman S, Lerman F. Retrocaval ureter: report of a case. *J Med Soc N J* 1956;53:74–7.
- 11 Schulman CC. The ureter. In: O'Donnell B, Koff SA. *Pediatric urology*, 3rd edn. Oxford: Butterworth-Heinemann, 1977:409–10.
- 12 Watanabe M, Kawamura S, Nakada T, et al. Left preureteral vena cava (retrocaval or circumcaval ureter) associated with partial situs inversus. *J Urol* 1991;145:1047–8.
- 13 Rubinstein I, Cavalcanti AG, Canalini AF, et al. Left retrocaval ureter associated with inferior vena cava duplication. *J Urol* 1999;162:1373–4.
- 14 Pienkny AJ, Herts B, Streem SB. Contemporary diagnosis of retrocaval ureter. *J Endourol* 1999;13:721–2.
- 15 Hassan R, Aziz AA, Mohamed SK. Retrocaval ureter: the importance of intravenous urography. *Malays J Med Sci* 2011;18:84–7.
- 16 Perimenis P, Gyftopoulos K, Athanasopoulos A, et al. Retrocaval ureter and associated abnormalities. *Int Urol Nephrol* 2002;33:19–22.
- 17 Bauer JJ, Bishoff JT, Moore RG, et al. Laparoscopic versus open pyeloplasty: assessment of objective and subjective outcome. *J Urol* 1999;162:692–5.
- 18 Baldwin DD, Dunbar JA, Wells N, et al. Single-center comparison of laparoscopic pyeloplasty, Acucise endopyelotomy, and open pyeloplasty. *J Endourol* 2003;17:155–60.
- 19 Shown TE, Moore CA. Retrocaval ureter: 4 cases. *J Urol* 1971;105:497–501.
- 20 Salonia A, Maccagnano C, Lesma A, et al. Diagnosis and treatment of the circumcaval ureter. *Eur Urol Suppl* 2006;5:449–62.
- 21 Simforoosh N, Nouri-Mahdavi K, Tabibi A. Laparoscopic pyelopyelostomy for retrocaval ureter without excision of the retrocaval segment: first report of 6 cases. *J Urol* 2006;175:2166–9.
- 22 Mugiya S, Suzuki K, Ohhira T, et al. Retroperitoneoscopic treatment of a retrocaval ureter. *Int J Urol* 1999;6:419–22.
- 23 Singh V, Sinha RJ. Laparoscopic dismembered pyeloplasty and pyelolithotomy in a patient with a retrocaval ureter: our experience and review of literature. *Urol J* 2011;8:231–5.
- 24 Bhatia V, Biyani CS. ESWL for stone in a retrocaval ureter: a case report. *Int Urol Nephrol* 1994;26:263–8.
- 25 Iqbal M, Ansari MN. Retrocaval ureter with hydronephrosis. *J Pak Med Assoc* 2006;56:38–9.

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