RETROCAVAL URETER*

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Numerous isolated reports of single cases and small series of patients having retrocaval ureter have appeared in the literature.

During the period January 1965—March 1968, I have seen 5 patients with retrocaval ureters, and in addition have seen the anomaly in a Cape Chacma baboon.

This constitutes the largest series by a single author, and contains both the youngest and oldest patients in the literature, as well as the first description of this anomaly in a primate.

CASE REPORTS

Case 1

A 64-year-old White male with a history of repeated urinary tract infections for 10 years, complained of pain in both renal areas for 3 months. Urinalysis revealed gross bacteriuria, and the blood urea nitrogen was 68 mg./100 ml. Intravenous and retrograde pyelography revealed medial displacement of both ureters, with bilateral hydronephrosis (Fig. 1). The pre-operative diagnosis was retroperitoneal fibrosis. Drugs had not been taken for any length of time.

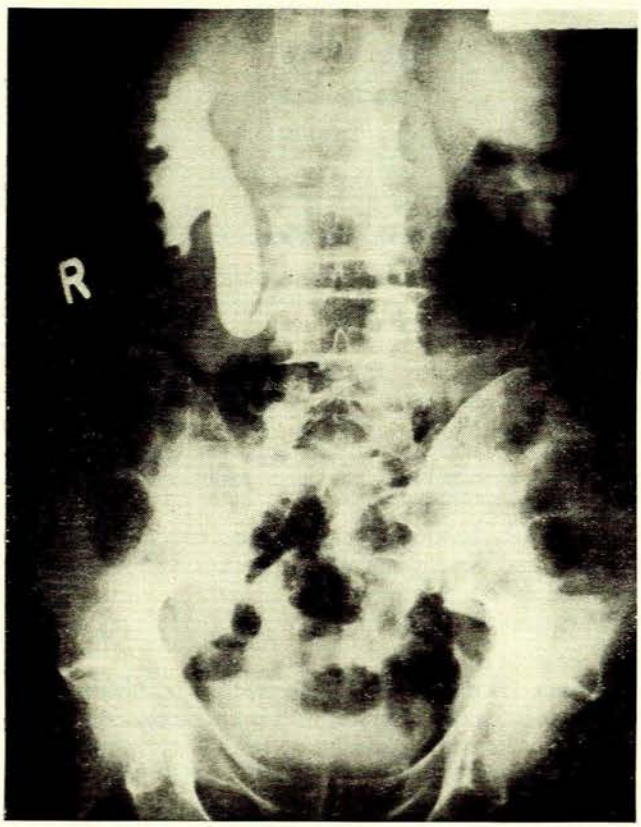

Fig. 1. Intravenous pyelogram. Bilateral hydronephrosis due to retrocaval ureter on the right, and peri-ureteric fibrosis on the left.

On transperitoneal exploration the findings were a right-sided retrocaval ureter opposite the third lumbar vertebra, and gross retroperitoneal fibrosis on the left side. The right ureter was bisected and re-anastomosed obliquely, anterior to the inferior vena cava. The left ureter was freed from the renal pelvis to the pelvic brim, and displaced laterally and intraperitoneally in part.

The aetiology of the retroperitoneal fibrosis was probably recurrent ureteric infection, as the biopsy of the tissue around the left ureter revealed non-specific inflammatory fibrosis.

Case 2

A 3-month-old child, weighing 4½ lb., with the history of prematurity and postnatal hypoglycaemia, was referred

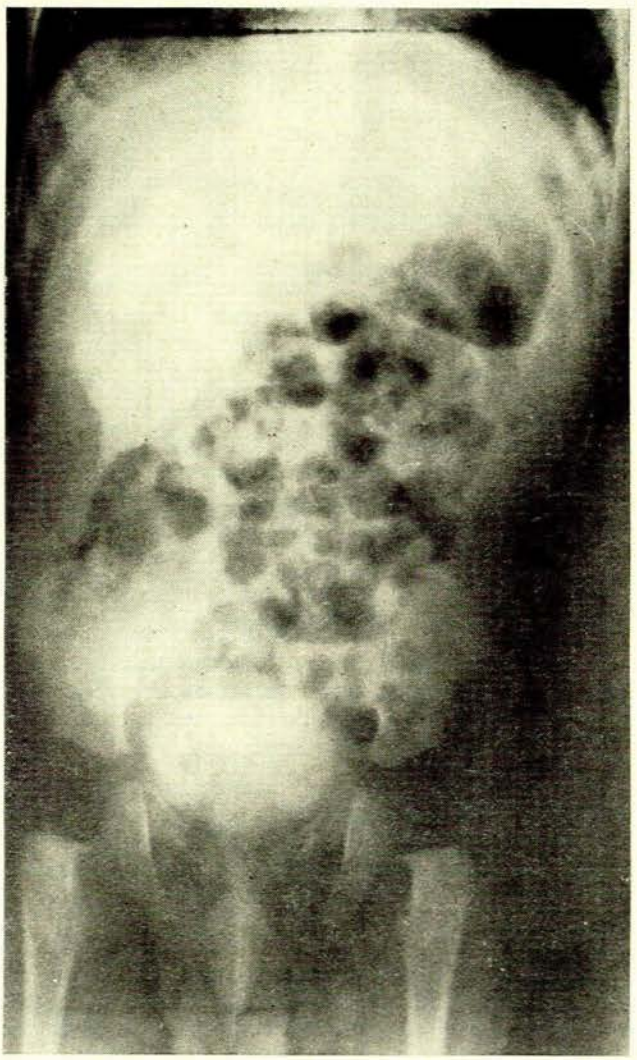

Fig. 2. Case 2. Intravenous pyelogram showing hydronephrosis of right kidney and medial displacement of the dilated ureter. No function demonstrated on the left side.

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to us with persisting urinary infection and a blood urea nitrogen of 70 mg./100 ml.

On examination the right kidney was enlarged and tender. Intravenous pyelography (Fig. 2) showed a large right kidney with hydronephrosis and medial displacement of the dilated ureter. There was no excretion of dye on the left side. Prograde percutaneous pyelography on the right side (Fig. 3) confirmed the diagnosis of a retrocaval

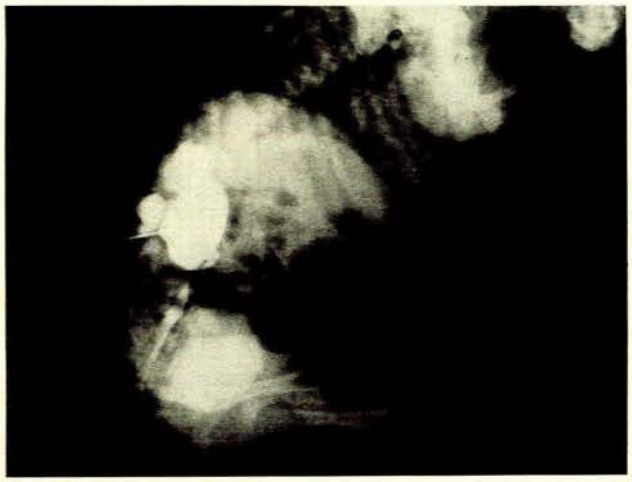

Fig. 3. Case 2. Prograde percutaneous pyelogram demonstrating hydronephrosis and the narrowed retrocaval portion of the ureter.

ureter. On voiding cystography there was vesico-ureteric reflux on the right side to the level of the pelvic brim.

The right upper ureter was explored and the retrocaval position confirmed. The ureter was divided at the pelvi-ureteric junction and re-anastomosed to the renal pelvis, anterior to the anomalous vein, after the method of Anderson and Hynes.[1]

At laparotomy through the same lumbar incision no kidney could be found on the left side.

Continuous drainage of the bladder was instituted. Three months later a ureteroneocystostomy was performed after the method of Politano and Leadbetter[2] to control vesico-ureteric reflux.

At follow-up examination 15 months later, intravenous pyelography demonstrated good excretion on the right side, with a radiologically normal ureter. The child now weighs 15 lb. and the blood urea nitrogen is 40 mg./100 ml.

Case 3

A young Bantu female presented with severe pain in the right renal area one week postnatally. There was gross pyuria. After the pyuria had cleared up on antibiotic treatment, intravenous pyelography showed hydronephrosis and medial displacement of the right ureter. The left side was normal (Fig. 4). As this status can be normal after childbirth, we continued with antibiotic therapy. The pain persisted, and 6 months later there was still medial displacement of the ureter.

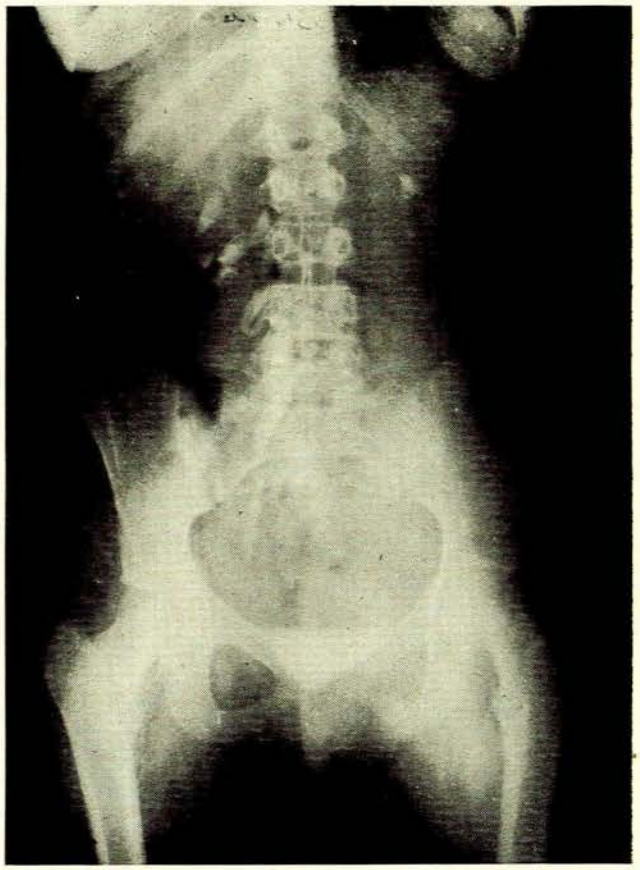

Fig. 4. Case 3. Intravenous pyelogram demonstrating medial displacement of the right ureter opposite the 4th lumbar vertebra.

The diagnosis of retrocaval ureter was made, and was confirmed at operation. The middle third of the ureter passed behind the first portion of the vena cava, 2 cm. above the junction of the common iliac veins. The vena cava was transected and ligated, with anterior and lateral displacement of the ureter.

There was minimal oedema of the legs in the early postoperative period, and elastic stockings were used for only one month. At present there is no oedema of the lower extremities.

Case 4

A White male doctor of 27 years, with no urinary complaints, had an intravenous pyelogram done because he had been exposed to schistosomiasis 3 years previously. The only abnormality was medial displacement of the right ureter which could not be ascribed to schistosomiasis, and could only be due to a retrocaval ureter (Fig. 5).

The urine showed no abnormality on biochemical, microscopic and bacteriological examination.

We propose to treat this anomaly only if it should present with a complication.

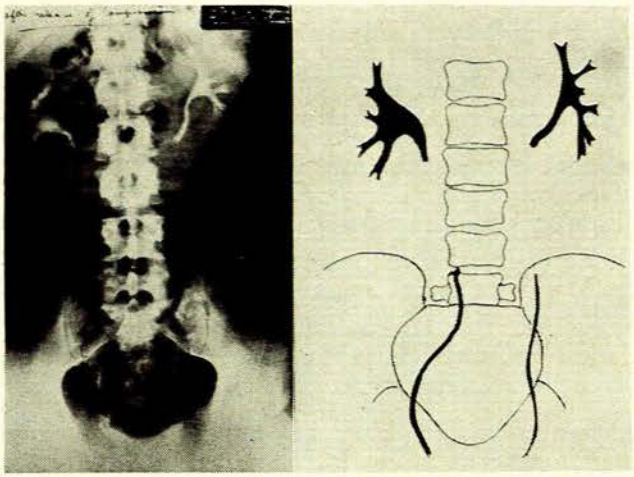

Fig. 5. Case 4. Intravenous pyelogram demonstrating medial displacement of the right ureter opposite L.5 - S.1.

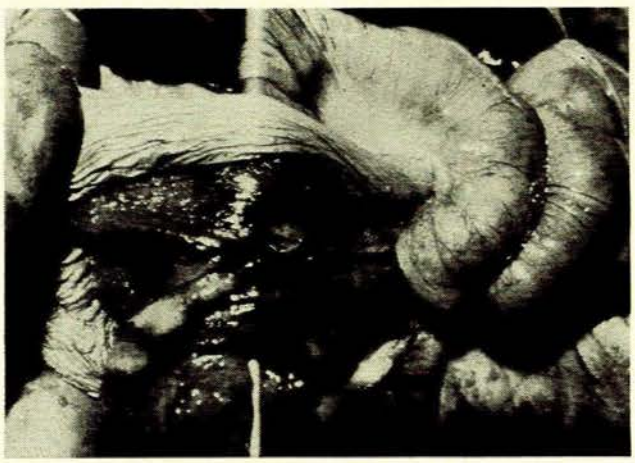

Fig. 6. Case 5. Probe passing through base of bladder into opening of distal ileum.

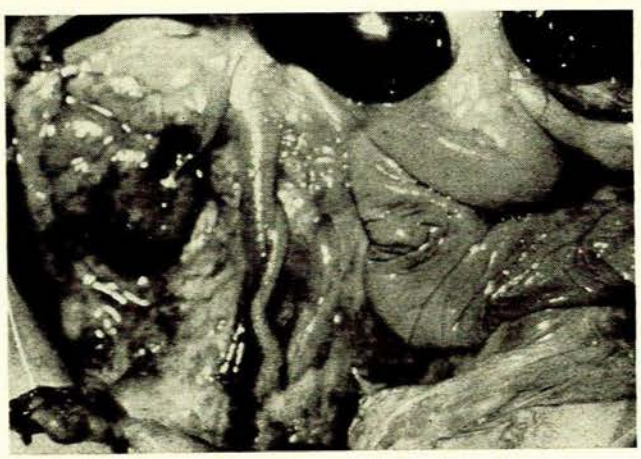

Fig. 7. Case 5. Autopsy demonstrating retrocaval position of right ureter.

Case 5

A premature Bantu baby of 2 lb. 6 oz. had an intestinal fissure[2] discharging meconium at the base of the common opening of the urinary and intestinal tracts.

The child died 30 hours after birth. At autopsy there was agenesis of the colon, and the ileum ended in a 3-in.-long constricted segment draining in the base of the intestinal fissures (Fig. 6).

The right ureter was in the retrocaval position (Fig. 7).

Case 6

During experimental work on renal transplantation at the University of Stellenbosch Renal Transplantation Project, a retrocaval right ureter was found in a primate (Cape Chacma baboon) (Fig. 8). To our knowledge this is the first report of a retrocaval ureter in the primate. No other congenital abnormalities were found.

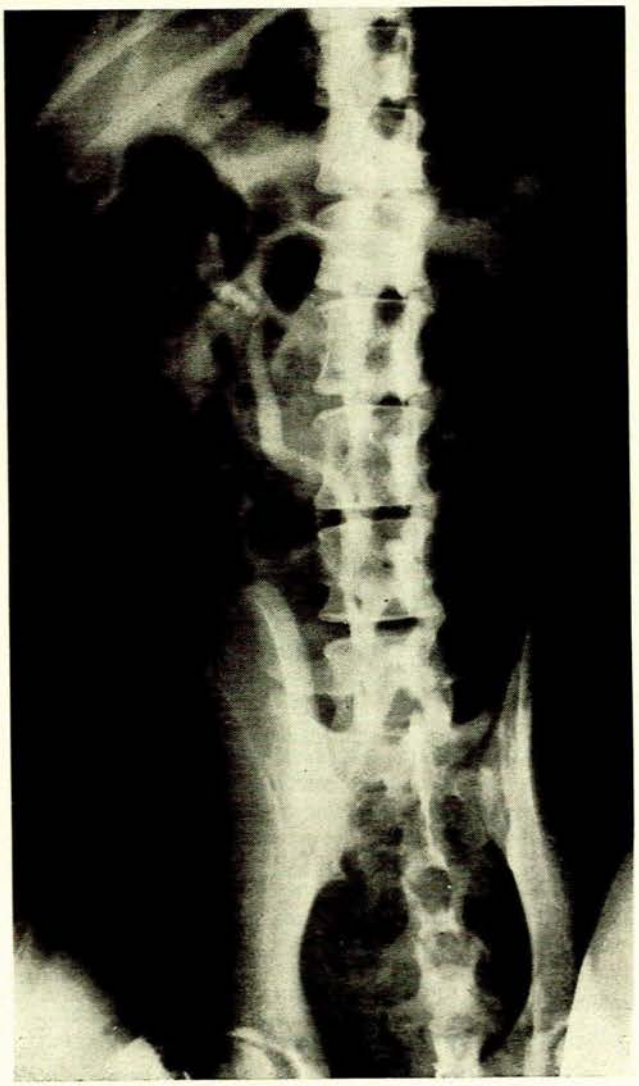

Fig. 8. Case 6. Intravenous pyelogram after left nephrectomy and operative confirmation of the retrocaval ureter, demonstrating medial displacement opposite L.4/5 - S.1.

DISCUSSION

Retrocaval ureter is a condition that certainly occurs more commonly than the literature suggests.

Embryology

The explanation commonly accepted is the one given by Arey.[4] The normal inferior vena cava is composed of 4 parts:

(*i*) The common iliac veins and their juncture arise from the dorsal (or posterior) cardinal vein.

(*ii*) The subnephric portion of the vena cava arises from the supracardinal vein.

(*iii*) The internephric part arises from the subcardinal vein.

(*iv*) The supranephric part of the inferior vena cava arises from a new vein which connects the subcardinal to the persisting right vitelline duct.

When the subcardinal vein, which normally gives rise only to the internephric portion of the inferior vena cava, persists and replaces the supracardinal vein, to form the subnephric portion of the inferior vena cava, it lies anterior to the ureter.

The true anomaly is therefore not a developmental abnormality of the ureter, but an abnormality of the venous development, placing the inferior vena cava anterior to the ureter.

Complications of this anomaly only occur when there is compression of the ureter in its passage round the inferior vena cava.

Clinical Management

I would suggest the following management on the basis of personal experience and the review of the literature on this subject:

No clinical or radiological evidence of obstruction (case 5). No surgical intervention is necessary, but clear instructions must be given to the patient to return at the first sign of renal pain or urinary infection.

Radiological and/or clinical obstruction of the ureter (cases 1 and 2). If there is a high retrocaval position of the ureter, transection of the ureter at the renal pelvis with displacement of the ureter anterior to the intact inferior vena cava should be done. The ureter is then anastomosed to the renal pelvis after the technique of Anderson and Hynes.[1] With low retrocaval position of the ureter, transection and re-anastomosis of the ureter itself may lead to stricture formation in the best hands. For this reason I suggest transection of the vena cava with anterior displacement of the ureter. Re-anastomosis of the inferior vena cava would be the ideal management. However, ligation of the proximal and distal ends of the vena cava can be done at the price of oedema of the legs, which is usually transient[5] and not disabling.

Irreparable renal parenchyma damage requires nephroureterectomy.

SUMMARY

Six cases of retrocaval ureter are presented, including the youngest and oldest cases in the literature, and the first case in a primate.

Treatment is based on the abnormal embryology and clinical features.

I wish to thank Drs I. P. Maas and V. I. McCusker for their help in compiling this article; Prof. J. J. W. van Zyl, of the Department of Surgery, University of Stellenbosch, for permission to publish the retrocaval ureter in a primate; and Dr P. N. Swanepoel, Medical Superintendent of H. F. Verwoerd Hospital, for permission to publish the cases.

REFERENCES

1. Anderson, F. C. and Hynes, W. (1949): Brit. J. Urol., **21**, 209.
2. Politano, V. and Leadbetter, W. F. (1958): J. Urol. (Baltimore), **79**, 932.
3. Wilson, P. M. (1967): S. Afr. Med. J., **41**, 712.
4. Arey, L. B. (1954): *Developmental Anatomy*, 6th ed. Philadelphia: W. B. Saunders.
5. Goodwin, W. E., Burke, D. E. and Muller, W. H. (1957): Surg. Gynec. Obstet., **104**, 337.

BIBLIOGRAPHY

Blundon, K. E. (1962): J. Urol. (Baltimore), **88**, 29.
Brooks, R. E. (1962): *Ibid.*, **88**, 484.
Cathro, A. J. M. (1952): *Ibid.*, **67**, 464.
Considine, J. (1966): Brit. J. Urol., **38**, 412.
Creevy, C. D. (1948): J. Urol. (Baltimore), **60**, 26.
Daniel, O. and Schackman, R. (1952): Brit. J. Urol., **24**, 334.
Derrick, F. C. jnr, Price, R. jnr and Lynch, K. M. jnr (1966): J. S. C. Med. Assoc., **62**, 131.
Duffy, D. B. (1957): Brit. J. Urol., **29**, 26.
Ekstrom, T. and Nilson, A. E. (1959): Acta chir. scand., **118**, 53.
Goyanna, R., Cook, E. N. and Counseller, V. S. (1946): Proc. Mayo Clin., **21**, 356.
Greene, L. F. and Kearns, W. M. (1946): J. Urol. (Baltimore), **55**, 52.
Gregersen, P. L. (1946): Acta chir. scand., **93**, 552.
Grossman, S. L. and Fehr, J. U. (1953): Amer. J. Surg., **85**, 679.
Gruenwald, P. and Surks, S. N. (1943): J. Urol. (Baltimore), **49**, 195.
Hamm, F. C., Weinberg, S. R. and Waterhouse, R. K. (1962): *Ibid.*, **87**, 43.
Harper, W. F. (1942): Brit. J. Urol., **14**, 63.
Harrill, H. C. (1940): J. Urol. (Baltimore), **44**, 450.
Heslin, J. E. and Mamonas, C. (1951): *Ibid.*, **65**, 212.
Hodges, C. V., Moore, R. J., Lehman, T. H. and Behnam, A. M. (1963): *Ibid.*, **90**, 552.
Hradcova, L. and Kafka, V. (1963): Urol. int. (Basel), **16**, 103.
Hyams, B. B., Schneiderman, C. and Mayman, A. B. (1968): Canad. Med. Assoc. J., **98**, 45.
Kimbrough, J. C. (1935): J. Urol. (Baltimore), **33**, 97.
Laidig, C. E. and Pierce, J. M. jnr (1959): J. Amer. Med. Assoc., **171**, 2312.
Laughlin, V. C. (1954): J. Urol. (Baltimore), **71**, 195.
Leberman, P. R., Znisser, H. H. and Milam, D. F. (1952): *Ibid.*, **68**, 679.
Lowsley, O. S. (1946): Surg. Gynec. Obstet., **82**, 549.
McCrea, A. N. (1958): Brit. J. Urol., **30**, 315.
McElbunicy, P. P. B. and Dorsey, J. W. (1948): J. Urol. (Baltimore), **59**, 497.
Millin, T. (1949): Proc. Roy. Soc. Med., **42**, 37.
Moore, T. D. (1948): J. Urol. (Baltimore), **59**, 712.
Mullen, W. H. jnr and Engel, W. J. (1953): Radiology, **59**, 528.
Muller, T. (1966): Med. Proc., **12**, 251.
Murphy, L. J. T. (1963): Aust. N.Z.J. Surg., **33**, 23.
Nielsen, P. B. (1959): Acta radiol. (Stockh.), **51**, 179.
Nourse, M. H. and Moody, H. C. (1946): J. Urol. (Baltimore), **56**, 525.
Oshin, D. R. (1964): *Ibid.*, **91**, 652.
Parks, R. E. and Chase, W. E. (1951): Amer. J. Dis. Child., **82**, 442.
Pick, J. W. and Anson, B. J. (1940): J. Urol. (Baltimore), **44**, 411.
Randall, A. and Campbell, E. W. (1935): *Ibid.*, **34**, 565.
Rowland, S. H. jnr, Bunts, R. C. and Iwano, J. H. (1960): *Ibid.*, **83**, 820.
Shearer, T. P. (1949): *Ibid.*, **62**, 152.
Torbey, K. and Leadbetter, W. F. (1962): Surg. Gynec. Obstet., **115**, 633.
Van Velzer, D. A., Barrick, C. W. and Jenkinson, E. L. (1955): Amer. J. Roentgenol., **74**, 490.
Williams, L. R. and Ankerman, G. J. (1957): Canad. Med. Assoc. J., **76**, 744.
Young, J. N. (1947): Brit. J. Urol., **19**, 22.