

TRAUMATIC AVULSION OF THE UPPER URETER

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Avulsion of the ureter at or near the ureteropelvic juncture is a rare injury which seems to occur primarily in children who are run over. Abdominal findings are characteristically slight, and the urine often negative. Only several days or weeks after the injury does a mass become evident in the flank. Nephrectomy is the usual treatment. The case presented in this paper is believed to be the second reported successful repair, with preservation of the kidney.

The cases described in the literature have occurred in boys from two to eleven years of age who were struck by vehicles of different sorts. In some, the wheel is noted to have passed over the abdomen. The injury may be caused by direct pressure on the ureter or by upward displacement of the kidney, tearing the ureter apart.

LITERATURE

Howard and Hinman reported 3 cases of accidental ureteropelvic avulsion during surgery with successful anastomosis in all. They describe a technique of primary anastomosis over a splinting catheter similar to that used in our case. They note that if accurate anastomosis cannot be secured, the ureter may be successfully sutured in the renal hilus around a splint.¹

G. Blancato reported a case in Italy of a 9-year-old boy hit by a car, who entered the hospital with cerebral contusion and numerous contusions on the body. Four weeks later a mass appeared in the right flank. Intravenous and retrograde pyelograms failed to show the right kidney. Six weeks after injury an exploratory operation revealed avulsion of the ureter and nephrectomy was done.²

Seright, in England, reported a case in a 3-year-old boy who was hit by a truck. There was no clinical evidence of visceral injury until hematuria occurred, 9 weeks later. Pyelograms showed

hydronephrosis and upward displacement of the kidney. Complete avulsion of the ureter from the renal pelvis was found. The ureter was anastomosed to the pelvis over a polyethylene splint, and a good result was obtained.³

Recently Smith, Nanson and Campbell reported a case from Canada, of an 8-year-old boy caught beneath the wheel of a cultivator. He had abdominal contusions and hematuria. Thirty-eight days later a mass was observed in the right loin. Pyelograms showed the kidney to be elevated and displaced anteriorly. The ureter was avulsed 1 cm. below the ureteropelvic juncture. A nephrectomy was done.⁴

Wilenius, in 1950, reviewed "subcutaneous rupture of the ureter" and presented the cases of 3 patients who may have had avulsion of the upper ureter, though the ureter is described only as "torn." One was an 11-year-old boy whose abdomen was run over by the wheel of a motor car, whose urine was negative; swelling of the iliac fossa developed 1 week after injury. Forty-one days after the accident a nephrectomy was done. The ureter was found to be "torn above the innominate line." A second boy, of two, was run over by a lorry, the wheel of which passed over his abdomen. He died; and autopsy showed a ureter "torn at the innominate line." A third boy, of three, was jammed under a horse cart. His urine was negative. Twenty days later, at nephrectomy, the ureter was found to be "torn a few centimeters distal to the pole of the kidney."⁵

DIAGNOSIS

Signs, symptoms and urinary findings may be minimal or absent for several days. The abdomen may or may not show contusions. There may be little or no abdominal pain, tenderness, spasm, rebound or distention. The urinalysis may be negative. The gradual development of a flank mass has been the major evidence of injury.

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¹ Howard, F. S. and Hinman, F., Jr.: *J. Urol.*, **68**: 148, 1952.

² Blancato, G.: *Chirurgia*, Milano, **12**: 16, 1957 (abstract in *Surg., Gynec. and Obst.*, March 1959).

³ Seright, W.: *Brit. J. Surg.*, **46**: 511, 1959.

⁴ Smith, M. J. V., Nanson, E. M. and Campbell, J. M.: *J. Urol.*, **83**: 277, 1960.

⁵ Wilenius, R.: *Ann. Chir. et gynae. Fenniae*, **39**: 1, 1950.

Intravenous urography should make the diagnosis apparent, showing rotation and upward displacement of the kidney, with extravasation of dye below it. It appears that intravenous urography is indicated at least within a day or so of abdominal injury where there is any suspicion of this condition, even in the absence of signs, symptoms, or urinary findings. If the intravenous urogram is inconclusive a retrograde pyelogram should be considered.

TREATMENT

Exploration of the kidney would seem indicated as soon as the diagnosis is made and the patient is in reasonably good general condition. On the basis of 2 cases in which delayed exploration was done with successful repair, an attempt at repair is advocated if there seems to be any possibility of success. Nephrectomy can always be done later. After draining the urinary extravasation, the kidney is mobilized thoroughly. The ureter may be difficult to find; and a ureteral catheter inserted cystoscopically would have been very helpful in our case. The distal end of the avulsed ureter may be found two or three inches away from the kidney. The ureter is mobilized and its end, as well as the end of the kidney pelvis, cut obliquely or spatulated. A ureteral splinting catheter and a larger straight catheter for nephrostomy drainage are drawn through the cortex of the kidney and sutured to it. The ureteral catheter is passed down the distal ureter

and the cut ends anastomosed with size 4-0 or 5-0 catgut. The catheters should probably be left in place for five or six weeks.

Followup intravenous urograms are necessary because of possible stricture at the site of anastomosis. In our case this happened, probably because of the considerable tension necessary to bring the ends together. Operation was repeated with a successful result.

CASE REPORT

D. H. (37934), a 5-year-old boy, was standing in front of the school bus, waiting to cross the street, when the bus started suddenly and ran him down. Physical examination showed marked ecchymosis of his entire face, conjunctival hemorrhages and bleeding from the ears, apparently all due to diffuse subcutaneous pressure with bursting of small blood vessels. The suprapubic region was tender, and there was moderate right flank tenderness, but none in the left flank. Urine showed only a very rare red cell. X-ray showed fracture of the pubic rami; and a cystogram was negative.

His course was one of gradual improvement. The abdomen remained soft and nontender for 8 days, when slight tenderness and spasm were noted in the left flank and he was observed to hold his left leg flexed. Intravenous urography 18 days after injury showed upward displacement of the left kidney with extravasation of dye below it (fig. 1, A). Exploration was done through

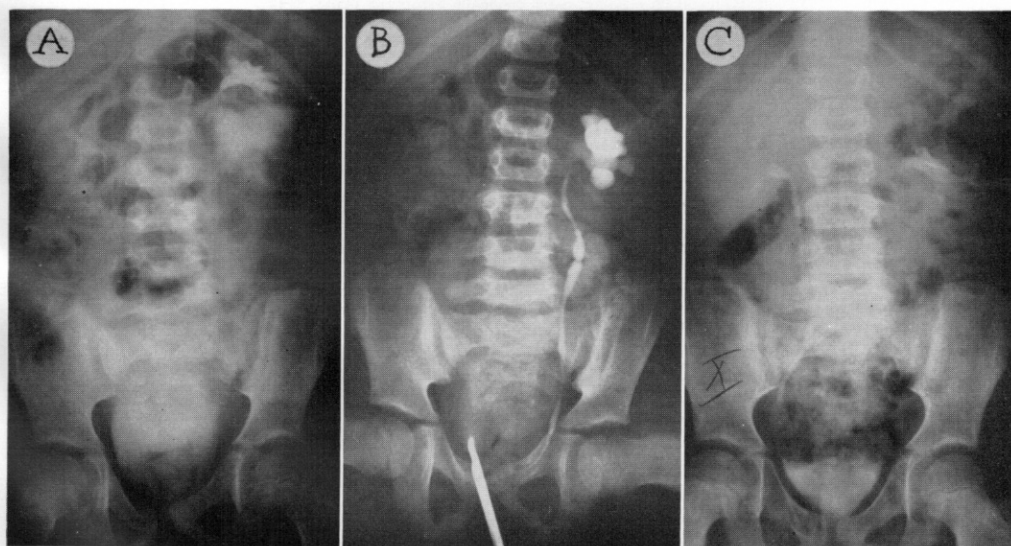


FIG. 1

the flank. An orange-sized collection of cloudy urine was found below the kidney. The kidney was displaced upward and encased in fibrous tissue. Thorough dissection below the kidney failed to reveal the ureter. The kidney was mobilized, and the pelvis found to be moderately distended, with only a small, edematous opening where the ureteropelvic juncture should have been found. The end of the ureter was finally located near the pelvic brim, about three inches from the renal pelvis. The kidney and ureter were freed with difficulty from the extensive scar tissue. The stumps of pelvis and ureter were cut obliquely. A size 5 ureteral catheter and a size 12 rubber catheter were inserted through a nephrostomy and sutured to the renal capsule. The ureteral catheter was passed down the ureter and the pelvis and ureter anastomosed with four sutures of size 4-0 chromic catgut, under tension. Catheters were removed 15 days later.

Intravenous urograms at 3 week intervals showed increasing hydronephrosis, and finally no function of the left kidney. A retrograde pyelogram showed a ureteropelvic stricture (fig. 1, *B*); the urine in the left kidney was purulent. Three months after the first operation the patient was re-explored with a ureteral catheter in place. The strictured anastomosis was freed with difficulty, opened, and the pelvis and

ureter again cut off obliquely above and below the anastomosis, respectively. Re-anastomosis was done, using the same technique of size 4-0 chromic catgut and size 6 splinting ureteral catheter. This time tension on the suture line was a great deal less. The catheter was left in place for 5 weeks; the patient was kept on streptomycin, and sulfisoxazole (gantrisin) for Proteus infection. A postoperative intravenous urogram 1 year later (fig. 1, *C*) showed good kidney function; the urine is clear, and the patient feels well.

SUMMARY

A case of traumatic avulsion of the upper ureter, treated successfully by ureteropelvic anastomosis, is presented. A review of reported cases reveals one similarly repaired. The signs, symptoms and urinary findings may be minimal until a mass gradually develops in the flank. The diagnosis has been made from 18 to 63 days after the injury.

Intravenous urograms should be made promptly when there is any suspicion of this type of injury, since an early repair is much more likely to be a successful repair.

Primary anastomosis with nephrostomy drainage should be attempted whenever possible, even though the condition may not have been discovered early; and the tissues may not be found in optimum condition.