

# Traumatic Intrarenal Arteriovenous Fistula Treated by Conservative Surgery

## CASE REPORT AND REVIEW OF THE LITERATURE

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### SUMMARY

A case of traumatic intrarenal arteriovenous fistula treated by conservative renal surgery is reported. Reference is made to 7 other cases treated without resort to renal nephrectomy. Clinical features are outlined and the indications for surgery discussed.

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John Hunter first described arteriovenous fistulae more than 200 years ago. Reid in 1920 was the first to observe that organic cardiac disease was frequently associated with these vascular lesions.<sup>1</sup> Varela<sup>2</sup> in 1928 reported the first case of intrarenal arteriovenous fistula.

Arteriovenous fistula of the kidney is an infrequently encountered lesion, with only approximately 60 cases reported in the literature to date. With the increasing use of percutaneous needle biopsy of the kidney for diagnostic purposes, as well as the escalation in incidence of blunt and penetrating abdominal trauma, this lesion will be encountered with increasing frequency. Selective renal artery catheterisation aids materially in making the diagnosis.<sup>3</sup>

This condition has in the main been treated by nephrectomy, there being only 5 reports in the literature describing 7 cases of successful conservative renal surgery.<sup>4-6</sup> For this reason, treatment of an intrarenal arteriovenous fistula by proximal ligation of a segmental renal artery is reported.

### CASE REPORT

A 50-year-old Black male was admitted to King Edward VIII Hospital on 10 December 1971 with a history of having sustained stab wounds in the right loin and right shoulder region. There was no history of previous surgery, renal disease, heart disease or hypertension.

On examination he was in obvious distress with a blood pressure of 70/50 mmHg, pulse rate 120/min and a respiratory rate of 60/min. A stab wound was present in the right loin, but no tumour was palpable. By catheter-

isation 400 ml of grossly blood-stained urine containing fresh clot was removed.

### Radiological Investigations

**Excretory urogram:** This did not reveal any abnormality (Fig. 1).

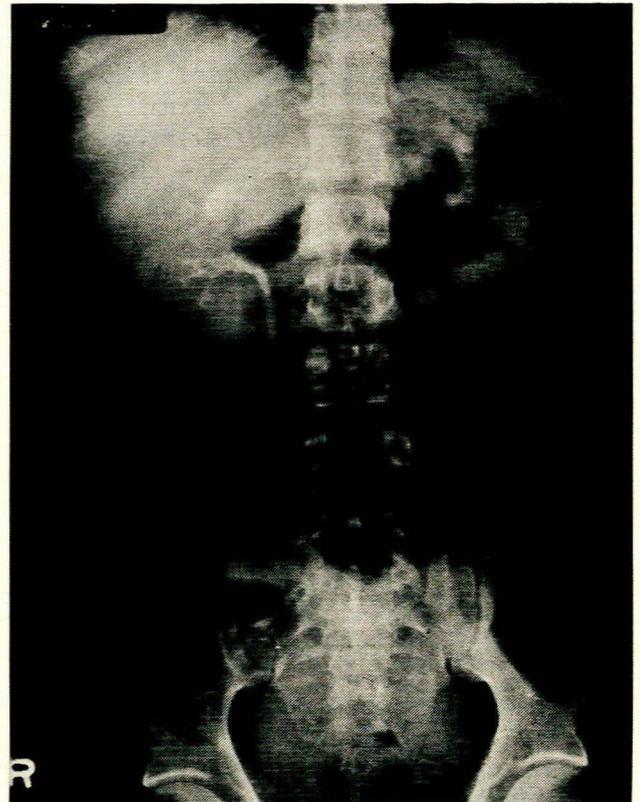


Fig. 1. Excretory urogram demonstrating normal renal parenchyma and collecting system.

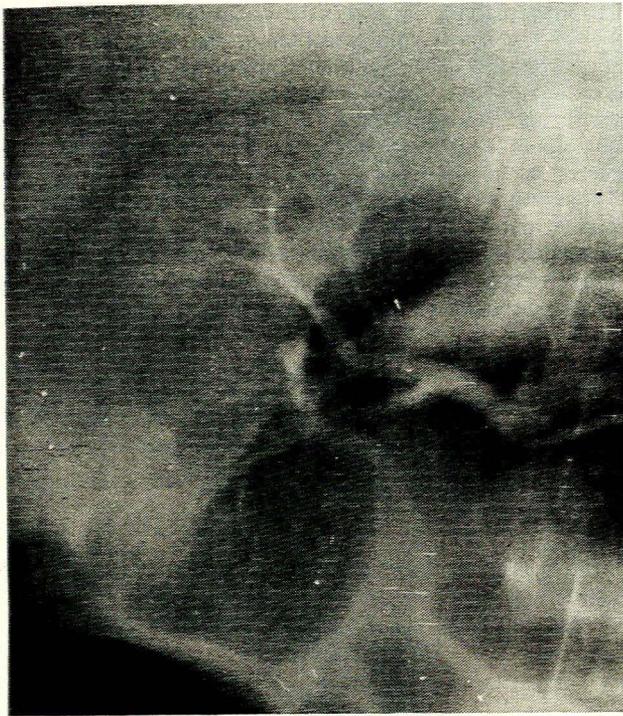
**Renal angiogram:** Selective right renal artery catheterisation demonstrated early filling of the right renal vein consistent with an arteriovenous fistula; a small traumatic pseudo-aneurysm; a relatively avascular area in the mid-portion of the kidney with a break in renal outline, due

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to renal ischaemia or an intrarenal haematoma; and poor filling of the peripheral arterial tree due to the presence of an arteriovenous fistula (Fig. 2).



**Fig. 2. Pre-operative renal angiogram demonstrating early filling of the renal vein and poor peripheral arterial filling due to arteriovenous fistula.**

### Clinical Course

The patient continued to have haematuria associated with loin pain and clot colic. Repeated blood transfusions were necessary to maintain a normal haematocrit. One week after admission a continuous bruit with systolic accentuation became audible to the right of the umbilicus. There was no detectable alteration in blood pressure and no evidence of congestive cardiac failure. In view of the persistent pain and bleeding, exploration of the right kidney was carried out on 24 December 1971.

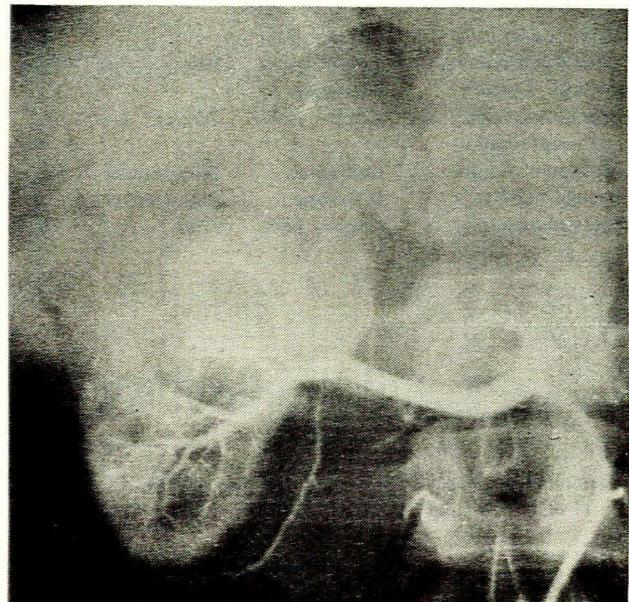
**Operative procedure.** The right kidney was approached through the bed of a resected 11th rib. The renal capsule was adherent to a cortical laceration at the midlateral renal margin. The right renal vein was markedly enlarged, the renal artery being of normal calibre. A palpable thrill and a bruit audible with a sterile stethoscope were present over the middle portion of the anterior aspect of the kidney.

The renal artery was dissected into the hilum of the kidney where it was found to trifurcate. Each branch was carefully dissected out, and surrounded with a No. 1 silk ligature. By alternatively tightening and releasing the ligatures it was found that the posterior branch of the renal artery supplied the fistula, because, when occluded,

the thrill and bruit disappeared. The posterior branch was doubly ligated in continuity. Because of its short extrarenal length, it was considered wiser not to divide it. The postoperative course was entirely uneventful.

**Progress.** The haematuria and pain disappeared early. The patient was discharged on the 12th postoperative day. Follow-up examinations after 6, 12 and 18 months postoperatively revealed no evidence of hypertension.

**Postoperative selective right renal angiography** was carried out 4 weeks after the operation and the following features were seen: no shunting of blood from renal artery to vein; no evidence of the previously detected arteriovenous fistula; no visualisation of the posterior branch of the renal artery; the inferior capsular artery well visualised (and probably forming a collateral circulation); slight diminution in renal substance at the upper pole and medial margin of the kidney (Fig. 3).



**Fig. 3. Postoperative renal angiogram. Fistula no longer present. Posterior branch of the right renal artery not visualised.**

### DISCUSSION

Intrarenal arteriovenous fistula may be classified as congenital or acquired. The latter may result from aneurysmal rupture, blunt and penetrating trauma, nephrolithotomy, needle biopsy, and neoplasms. Pathophysiological manifestations are caused by a chronic high output circulatory state and diastolic hypertension. The local lesion may cause pain, haematuria, bruit and a renal tumour.

Not all intrarenal arteriovenous fistulae require surgical treatment. Spontaneous closure of these fistulae has been described.<sup>9</sup> If the arteriovenous fistula causes persistent pain and haematuria, surgery for hypertension or congestive cardiac failure is indicated. A further indication for

surgery would appear to be calcification in the fistula. Of 5 patients reported with calcification in intrarenal arteriovenous fistulae, 2 suffered spontaneous rupture with life-threatening exsanguination.<sup>10</sup>

Conservative renal surgery is obviously feasible, and a knowledge of the anatomy of the renal vasculature is of considerable assistance. Surgery directed towards conserving the kidney has taken 3 forms: partial nephrectomy, aneurysmorrhaphy or vascular ligation. A review of the literature reveals only 7 other cases in which correction of an intrarenal arteriovenous fistula without nephrectomy was possible (Table I). It has been shown that renal artery branches represent end arteries, each branch supplying a well-defined segment of the kidney.<sup>21</sup> There is no significant intrarenal anastomosis of arteries. Inter-

ruption of the arterial supply to an arteriovenous fistula is considered inadequate treatment. However, where there is an end-artery arrangement to an organ, ligation of the feeding artery can obviously be effective in curing the condition.

In this patient, by alternate occlusion and release of each of the three main branches at the renal hilum, and by auscultation with a sterile stethoscope, it was possible to determine that the posterior segmental artery supplied the fistula. After ligation of this vessel there was no appreciable discoloration of the kidney, indicating that arterial perfusion was adequate. This was confirmed by postoperative renal angiography. Proximal ligation is an effective and simple means of correcting the haemodynamic disturbance due to an intrarenal arteriovenous fistula. There is no evidence that this form of treatment is followed by the development of hypertension.

TABLE I. CONSERVATIVE RENAL SURGERY IN INTRARENAL ARTERIOVENOUS FISTULAE

Operation	Site of lesion	Report
Partial nephrectomy	Lower pole	Boijesen and Kohler <sup>7</sup>
Partial nephrectomy	Lower pole	
Proximal ligation	Mid-zone	
Aneurysmorrhaphy and proximal ligation	Upper pole	Twiggs <sup>5</sup>
Aneurysmorrhaphy	Mid-zone	Waterhouse <i>et al.</i> <sup>4</sup>
Proximal ligation	Mid-zone	State <i>et al.</i> <sup>6</sup>
Aneurysmorrhaphy	Upper pole	Flax <sup>8</sup>

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