Arteriovenous Fistula of the Renal Vessels
A Case Report

By Jon R. Myhre

Hematuria presents an urgent problem in differential diagnosis. A patient was observed with hematuria for renal colic with characteristic radiation in whom an arteriovenous fistula due to vascular erosion by adenocarcinoma of the kidney was found. This condition has been reported only rarely. Previous reports of this condition are reviewed and the findings discussed.

Up to 1953 only 4 proved cases of arteriovenous fistula of the renal vessels had been reported.1 An additional case is described here, in which aortography also revealed small shunts in the liver and the pulmonary artery; the involved renal vein and the hepatic vein were catheterized.

Case History

A 66-year-old woman was admitted to the hospital in October 1955, suffering from hematuria that had started a few hours earlier. Previously she had enjoyed good health. The hematuria was followed by severe right renal colic with typical localization and radiation of the pain.

The height was 161 cm., the weight 51.7 Kg., the blood pressure 140/70 mm. Hg. There were no signs of cardiac enlargement. A grade II systolic murmur was heard at the apex. In the right hypochondrium there was a definite systolic-diastolic thrill and murmur. The values for hemoglobin, red blood cell count, and blood urea were normal. Massive hematuria was found.

Because of the murmur and thrill, an arteriovenous fistula of the renal vessels was assumed to be present.

After a few days the pain gradually disappeared, and after a week no trace of blood could be found in the urine.

An X-ray film of the chest gave no indications of augmented pulmonary circulation. The cardiac shape and size (350 ml./sq.M. by the formula of Jonsell2) were normal. The electrocardiograms were also normal. The cardiac output (from catheterization data of the pulmonary artery and the Fick principle) was somewhat high, being 7.1 and 7.6 L./min. on 2 subsequent determinations, and the mean cardiac index was 4.8. The arteriovenous oxygen difference was 34 ml./min./L. The pressures in the pulmonary artery were 27/10 mm. Hg, with a mean of 15 mm. Hg, slightly higher than usual; the zero position was taken as 10 cm. above the dorsal surface. The blood volume determined with Evans blue was normal, 2.5 L./sq.M.

The glomerular filtration rate (inulin) and the renal plasma flow (para-aminohippuric acid) were respectively 79 ml./min. and 363 ml./min., when corrected for a body surface area of 1.73 sq.M. The concentration test of Addis and Shevky resulted in a urinary specific gravity of 1.024.

Urography showed delayed and reduced excretion from the right kidney and a distortion of the renal pelvis, indicating an expanding hilar process (fig. 1). Transfemoral aortography revealed a large arteriovenous communication of the renal vessels on the right side and also some smaller shunts in the liver (fig. 2). Catheterization of the liver veins did not, however, show a high oxygen content in 2 blood samples from these vessels, the saturation being respectively 66 and 67 per cent in 2 different positions in the right lobe of the liver. The first position was not far from one of the shunts, as judged from the frontal view, while the second position was more centrally placed. Catheterization of the right renal vein revealed an abnormally high oxygen content in the blood samples, the saturation being respectively 90, 94, and 94 per cent in blood from 3 different positions. The first result was derived from the most lateral position. The oxygen saturation in samples from the femoral artery was 96 per cent. The pressures registered in the right renal vein were not higher than usual (systolic 7, diastolic 2, mean 4 mm. Hg), and the pressure gradient between the renal vein and the inferior caval vein was not appreciably raised.

Surgical intervention was discussed. Since the patient did not wish any operation except as a last resort, and since the finding of multiple aneurysms suggested a congenital condition, it was decided to avoid surgical treatment unless recurring hematuria or evidence of overloading of the heart should necessitate it. She left the hospital after a stay of 4 weeks, feeling completely well. On control examination 10 weeks later, the urine was normal, and the size and shape of the heart were unchanged.

1 From the Department of Medicine, University Clinic, Bergen, Norway.
Fig. 1. Urogram showing a reduced excretion of the right kidney and distortion of the right renal pelvis.

Fig. 2. Aortogram. Transfemoral method. The hepatic, splenic, and superior mesenteric arteries, both renal arteries, the large arteriovenous communication in the right kidney, and the smaller shunts in the liver.

Hematuria recurred in April 1956 and the kidney was removed. In it was found an adenocarcinoma, which partly surrounded the grossly dilated hilar veins and produced a communication by erosion between these vessels and a branch of the renal artery. Tumor tissue protruded as a solid mass far into the dilated renal vein. There were no congenital vascular abnormalities. The vascular abnormalities demonstrated in the liver were then considered to be incidental, unrelated lesions, most likely hemangiomas.

DISCUSSION

It is believed that 3 of the earlier reported cases\(^5\) of arteriovenous fistula of the renal vessels were due to congenital aneurysms; in the fourth case,\(^1\) a neoplastic erosion of the vessels had taken place. Most recently 2 additional cases of arteriovenous fistula of the renal vessels have been reported.\(^6,7\) In 1 of these cases, a traumatic fistula in a 6-year-old girl, a blood pressure of 146/110 mm. Hg was registered. In the other case, which probably was of congenital origin, the blood pressure was 150/60. Garritano and associates have also traced still another case in the literature in which, however, the blood pressure values or other clinical data were not reported.\(^8\)

It has been maintained that the arteriovenous fistula of the renal vessels holds a unique position in being the only such communication causing hypertension. Neither the case of Pearse and MacMillan\(^3\) nor our case, however, was hypertensive, and in one of the remaining cases the blood pressure was only 160/80 mm. Hg.\(^5\) The blood pressure in the case of Hamilton, Getz, and Jerome\(^1\) was 170–168/100–92 mm. Hg, and before hospitalization a blood pressure of 180/110 had been recorded. This is certainly a noteworthy finding in a case of arteriovenous shunt, especially since the age of the patient was only 29 years. A more severe hypertension, 220/120 mm. Hg, has been found only in the case of Rieder.\(^9\)

Absence of definite enlargement of the heart in our case tallies well with the fact that the size of the heart may sometimes remain normal into old age in cases of persistent ductus arteriosus with a similar moderate degree of shunting.

SUMMARY

A case of arteriovenous fistula of the right renal vessels in a 66-year-old woman is de-
scribed. The right kidney was removed after recurrent hematuria and adenocarcinoma was found, which produced the arteriovenous fistula by erosion of the vessels. The blood pressure was 140/70 mm Hg; the size of the heart was normal, but the output was high, with a cardiac index of 4.8. The oxygen saturation in blood samples from the right renal vein varied from 90 to 94 per cent.

Aortography demonstrated the shunt well and also revealed smaller shunts in the liver, but the oxygen saturation in blood samples from the liver veins was not higher than normally found.

**Summario in Interlingua**

Es describite un caso de fistula arteriovenose del vasos dexterorenal in un femina de 66 annos. Le ren dextere eseva abferite post recurrente hematuria; e adenocarcinoma eseva trovate le qual produceve le fistula arterio-venose per erosion del vasos. Le pression sanguine eseva 140/70 mm Hg. Le corde eseva de dimensiones normal, sed le rendimento eseva alte; le indice cardiac eseva 4.8. Le saturation oxygenic in specimenes de sanguine ab le vena dexterorenal variava ab 90 a 94 pro cento.

Le shunt eseva aortographicamente ben demonstrabile. Le examine aortographic etiam revelava plura shunts de extension minor in le hepate, sed le saturation oxygenic in specimenes de sanguine ab le venas hepatic non excedeva constatationes normal.

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Of 37 patients with recent Stokes-Adams attacks, 25 required resuscitation with an external electric cardiac pacemaker. It resuscitated them repeatedly from ventricular standstill and maintained an adequate circulation for as long as 5 days during persistent standstill. Ten survived 1 to 24 months after resuscitation. From these experiences a program for the treatment of Stokes-Adams disease has been developed, combining the use of drugs with the electric pacemaker.

External electric stimulation was also effective repeatedly in resuscitating 5 patients with ventricular standstill, syncope, and convulsions due to reflex vagal stimulation. Ventricular standstill due to digitalis or procaine amide was terminated by external cardiac stimulation in 4 patients. In 5 patients the external pacemaker resuscitated the heart from unexpected circulatory arrest due to ventricular standstill. In 7 other patients it was ineffective in the presence of ventricular fibrillation or myocardial unresponsiveness due to anoxia from delay in treatment. Prompt external application of the electric pacemaker should be carried out in these emergencies before one resorts to thoracotomy and cardiac massage.
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