BLOOD PRESSURE REDUCTION AS AN AID TO RENAL ANGIOGRAPHY IN HYPERTENSIVE PATIENTS

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RENAL ANGIOGRAPHY is becoming an important technic in the diagnosis of hypertension of renal origin.[1] However, satisfactory renal angiograms often are difficult to achieve in the presence of arterial hypertension. At high intra-aortic pressures, the injected contrast medium is diverted from the orifices of the renal arteries into the central aortic stream. This is primarily because high arterial pressure resists satisfactory occlusion of the iliac arteries by external compression, so that the medium does not pool in the aorta and disperse laterally. The resultant inadequacies in visualization cannot be safely overcome by the use of large doses of medium, since the possible nephrotoxic effects of contrast media[2] are feared in patients with pre-existing renal disease, such as is common in hypertensive patients. However, temporary reduction of blood pressure with vasodepressor drugs permits satisfactory lateral streaming and facilitates iliac compression, so that adequate renal angiograms can be obtained with small volumes of injected medium. The present report describes the application of this principle in two cases.

TRANSLUMBAR AORTOGRAPHY AS USED FOR RENAL ANGIOGRAPHY[3,4]

The patient is given premedication to allay apprehension and discomfort and is placed prone on the roentgenographic table. A narrow, thick pad is placed under the lower abdomen for compression of the iliac arteries; a wide strap is then drawn snugly over the lumbosacral area. Novocain is injected into the area below the left twelfth rib and just lateral to the sacrospinalis muscle. The special aortogram needle is inserted into the aorta in the vicinity of the renal arteries. With the patient holding his breath (this is especially important because of the prolonged film exposure), a preliminary film is made while a small quantity of dilute medium is being rapidly injected. If the test film indicates that the needle is in a satisfactory position, 10 cc. of concentrated medium is injected as the exposure is made. Then abdominal compression immediately is released. The quantity of concentrated solution injected usually is only 10 cc. and seldom is more than 20 cc. Such volumes are considerably less than the amounts that are known to produce renal damage. We have used 70 per cent

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Urokon* as the contrast medium, but we are now testing 50 per cent Hypaque**; the roentgenographic visualization provided by each medium is comparable. However, Hypaque when used for intravenous urography has resulted in a much lower incidence of side reactions than has any other agent previously utilized.[5] Thus far, in contrast to Urokon, it has caused no unpleasant sensations in patients undergoing aortography under local anesthesia.

Modification of Technic in Hypertensive Patients

Various vasodepressor agents have been utilized to reduce the blood pressure. Angiography may be done while the blood pressure is controlled by chronic oral administration of Apresoline† or Ansolysen††. The effects of each of these drugs are prolonged and the aortogram can be made without supplemental medication or close observations of the blood pressure, in those patients who respond by decreases of pressure to nearly normal levels.

Intravenous infusions of sodium nitroprusside[6] or Arfonad§ Camphorsulfonate are effective means of temporarily reducing the blood pressure in patients who are not under chronic treatment with oral vasodepressor drugs or who do not respond to such treatment. Dilute solutions (Arfonad, 1 mg./ml.; sodium nitroprusside, 200 micrograms/ml.) are prepared. The rates of administration are adjusted to the individual requirements of each patient as determined by close observation and frequent determinations of blood pressure. The advantage of the infusion method is that the blood pressure can be reduced to a desired normotensive level; however, a person experienced in the use of these agents must supervise their administration. The effects of Arfonad or sodium nitroprusside are rapidly dissipated as soon as the infusion has been discontinued.

CASE REPORTS

Case 1. In 1950, a 40-year-old woman began to have symptoms of scleroderma involving chiefly the upper extremities. Treatment was begun in 1952 with isonicotinic acid hydrazide, and her condition gradually improved.

Blood pressure readings in June 1953 and in August 1953 were 110/70 and 140/90 mm. Hg, respectively. In June 1954, four years after initial examination, she was seen again because of failing vision and headaches. The blood pressure was 250/130 mm. Hg. The eye grounds revealed sclerosis, constriction of the retinal arteries with hemorrhages, exudates, and papilledema. Administration of Ansolysen was begun in July 1954; the blood pressure was reduced to 160/90 mm. Hg and the eye grounds improved.

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* *Urokon sodium, Mallinckrodt Chemical Works, St. Louis, Missouri.*

** *Hypaque sodium, Winthrop-Stearns, Inc., New York, New York.*

† *Apresoline, Ciba Pharmaceutical Products, Inc., Summit, New Jersey.*

†† *Ansolysen, Wyeth, Inc., Philadelphia, Pennsylvania.*

§ *Arfonad, Hoffman-La Roche, Inc., Nutley, New Jersey.*

Although she continued to take Ansolysen, six months after the initiation of treatment the blood pressure was 224/126 mm. Hg supine and 106/84 mm. Hg while standing. The fundi showed constriction and sclerosis, but no hemorrhages, exudates, or papilledema. Blood urea at that time was 48 mg. per 100 ml. An intravenous urogram showed diminution of renal function with poor visualization of the upper urinary tract. On retrograde pyelography the left kidney was normal but the right kidney appeared to be slightly contracted.

A translumbar aortogram was obtained on February 27, 1955, at which time she was under the influence of Ansolysen, with a resting blood pressure of 116 mm. Hg systolic. Ten cubic centimeters of contrast medium was injected into the aorta in the vicinity of the renal arteries, and showed excellent filling of these structures (Fig. 1). The vascular system of the right kidney appeared entirely normal; however, the left kidney showed tortuosity of the main branches of the renal artery. A small filling defect was present on the wall of the right renal artery close to the aorta. This was not considered sufficient to cause the hypertension.

Subsequently, vasodepressor drugs did not adequately control this patient's blood pressure, and a bilateral sympathectomy was performed. A left renal biopsy specimen

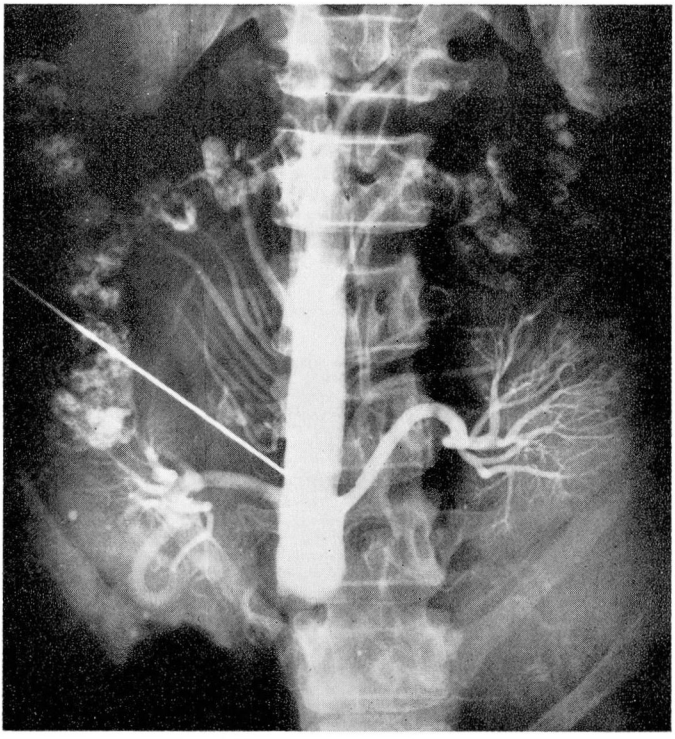

Fig. 1. (Case 1) Aortogram obtained by injection of 10 cc. of 70 per cent Urokon. The blood pressure was 116 mm. Hg systolic as a result of the administration of the vasodepressor Ansolysen. The medium is trapped in the aorta by iliac compression. Note the minor filling defect in the right renal artery close to the aorta.

was secured which showed malignant nephrosclerosis, the blood vessels revealing onion-peel changes. No necrotizing lesions or evidence of vascular changes characteristic of scleroderma was apparent in the specimen.

Comment: Renal angiography was utilized to evaluate the possibility that a renal arterial lesion might be a cause of this patient's hypertension. Under normotension, secured by Ansolysen, translumbar aortography was uneventfully accomplished. An excellent outline of renal vasculature was obtained by utilizing only 10 cc. of 70 per cent Urokon. A minor defect was shown in one renal artery but not considered significant.

Case 2. The patient was first seen in 1951 when she was 17 years of age, with a nephrotic syndrome that had been present for one year. The condition had not responded to nitrogen-mustard therapy. Subsequently, bilateral renal denervation was performed in the hope of controlling the nephrotic syndrome. At the time of denervation of the left kidney, no pulsation of the left renal artery could be palpated. Translumbar aortography was attempted at that time but could not be accomplished satisfactorily.

The nephrotic syndrome gradually disappeared during the next two years. She was readmitted to the hospital in December 1954, three years after initial examination, with a six-month history of malignant hypertension. She complained of headaches and blurring of vision. On admission the blood pressure was 240/130 mm. Hg. The fundi revealed grade III constriction and sclerosis of the retinal arteries, edema, hemorrhages, and papilledema.

The intravenous urogram showed excellent excretion of medium from both kidneys with no visible abnormalities—findings similar to those on previous urograms.

A translumbar aortogram was attempted on December 23, 1954. The blood pressure at that time was 230/120 mm. Hg. A normal right renal artery was demonstrated, but there was no visualization of the main left renal artery on two injections, although a small artery to the lower pole could be demonstrated (Fig. 2A).

For the following five weeks, vasodepressor drugs were administered; the blood pressure gradually was reduced to approximately 160/115 mm. Hg, and there was improvement of the hypertensive vascular disease. On February 1, sodium nitroprusside was intravenously administered to lower the blood pressure to levels of about 120 mm. Hg systolic, and translumbar aortography again was done. The aorta was well filled with contrast medium; both renal arteries were demonstrated clearly. There was no abnormality of the left renal artery. The aortogram also showed increased spacing of the secondary branches of the renal arteries with absence of filling of many of the smaller (interlobular and arcuate) vessels.

Comment: Translumbar aortography performed while the patient was severely hypertensive showed absence of filling of the left main renal artery. The possibility of occlusion of a renal artery as a mechanism of hypertension was considered. Aortography subsequently was done with the blood pressure reduced to nearly normal levels by intravenous sodium nitroprusside; on this occasion a normal left renal artery was demonstrated.

SUMMARY

A technic is described for conducting translumbar aortography in patients who have severe hypertension. The method involves the reduction of blood pressure to normal or nearly normal levels by the use of vasodepressor agents. This modified technic produces improved renal angiographic visualization with

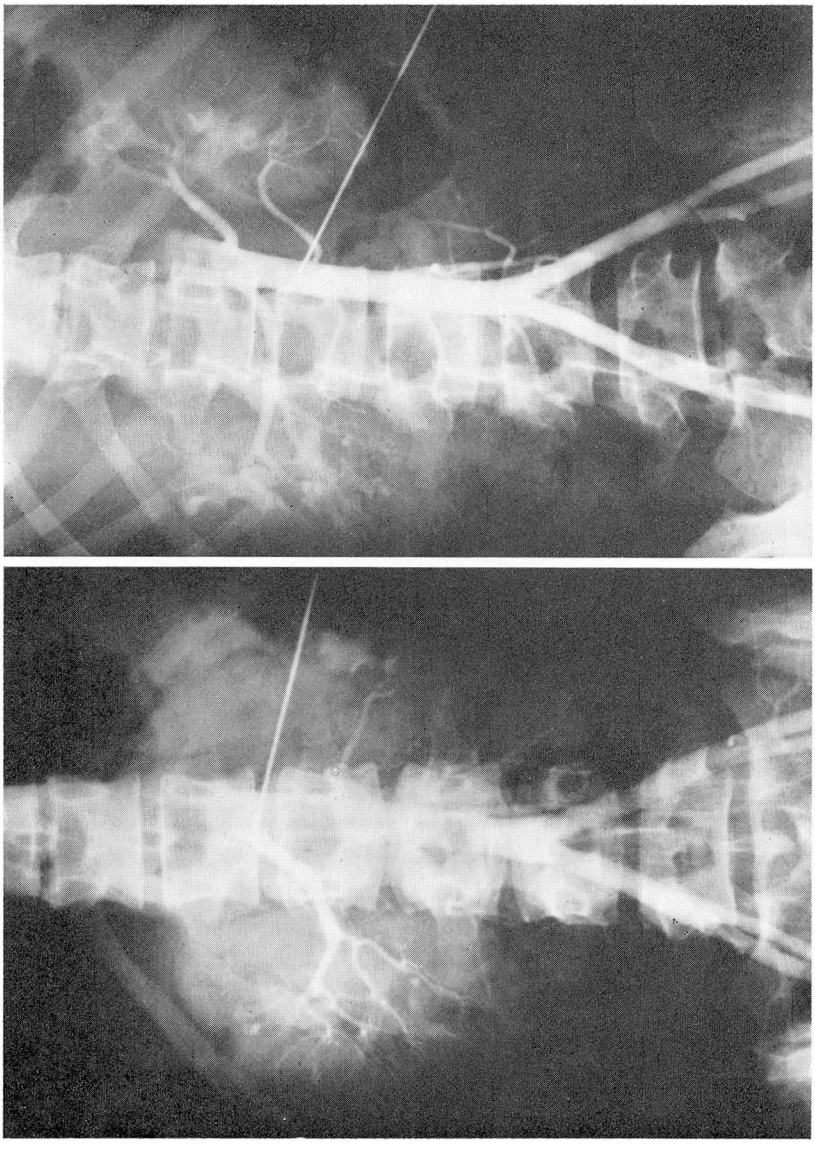

Fig. 2. (Case 2) A. Aortogram showing incomplete filling of the aorta, absence of left main renal artery, and an aberrant artery to lower pole of left kidney. Blood pressure was 230/120 at the time of the procedure (10 cc. of Urokon). B. Blood pressure was reduced by intravenously administered sodium nitroprusside to 120 mm. Hg systolic. Both main renal arteries and two aberrant renal arteries are demonstrated, in spite of the lower position of the needle (10 cc. of Urokon).

the use of only 10 cc. of contrast medium. Its application is described in two cases, in one of which a misleading renal angiogram was obtained when the examination was performed without reduction of blood pressure.

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