Value of routine intravenous pyelography in the investigation of hypertension

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Introduction

Bright in 1836 first described the course of chronic nephritis, and Mahomed in 1874 in his Paper entitled 'The Pre-albumenuric Stage of Bright's Disease' drew attention to the association of this disease with high arterial tension. It has since been well established that renal disease of many kinds predisposes to arterial hypertension (Longcope and Winkenweider, 1933; Pickering and Heptinstall, 1953; Wilson and Byrom, 1941; Goldblatt, 1938) and so the assessment of renal function is now routine in the management of patients presenting with hypertension. This traditional approach usually includes intravenous pyelography as well as examination of the urine, and estimation of the blood urea. The natural aim of these investigations is to disclose a potentially remediable cause for the hypertension, but with the improvements in medical treatment of hypertension in recent years, there has been less emphasis on surgical correction of renal abnormalities, particularly renal artery stenosis (Rees, 1966; Sheps *et al.*, 1965). In the light of this change of attitude we have reviewed the results of routine intravenous pyelography, in patients presenting with hypertension, to reassess the value of this investigation.

Patients and methods

The intravenous pyelograms of 333 consecutive unselected hypertensive patients (216 females, 117 males) were reviewed. All the patients were attending a Hypertension Clinic and intravenous pyelography had been performed purely as a routine procedure as part of the investigation of the hypertension in those patients between the ages of 40 and 65 who

maintained a casual diastolic standing pressure of at least 110 mmHg, and those under the age of 40 who maintained a casual standing diastolic pressure of over 90 mmHg. The urine was also examined for the presence of protein, casts, abnormal numbers of epithelial cells, leucocytes, and red blood cells. The initial blood urea level was also reviewed.

Results

Fifty-nine (18%) of the 333 patients had abnormal intravenous pyelograms. There were thirty-six females and twenty-three males, reflecting the proportion of females to males in the total sample.

Chronic pyelonephritis was the commonest radiological diagnosis and was seen in thirty-four (58%) of the cases. The criteria for this diagnosis were blunting of calyces (twenty-eight patients) and/or loss of renal cortex, or cortical scarring (twelve patients). Seven of these showed impaired dye concentration. Appearances suggestive of renal artery stenosis were seen in ten (17%) patients. After this came hydronephrosis (seven patients), renal calculi or calcification (six patients), renal cysts (five patients), unilateral non-functioning kidney (four patients), congenital abnormalities (two patients), appearances suggesting tuberculosis (one patient), and retroperitoneal fibrosis (one patient). Some of the patients had more than one abnormality.

These findings are listed in Table 1, together with the initial blood urea and urine content. Twenty-one (36%) of the patients with abnormal intravenous pyelograms had a normal blood urea and urine when first seen.

As a result of these findings, certain of the patients underwent further investigation, and in some of these the subsequent treatment was modified in view of the pyelographic appearances. This information is contained in Table 2 alongside the subsequent effect on control over the hypertension. Thus eight patients

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TABLE 1. Type of renal abnormality, initial blood urea and urinalysis

Abnormality and no. of patients	No. of patients with normal urine and blood urea (%)	No. of patients with raised blood urea greater than 40 mg% (%)	No. of patients with abnormal urine (%)
Appearances consistent with chronic pyelonephritis (N=34)	10 (30%)	7 (21%)	21 (62%)
Evidence of renal artery stenosis (N=10)	5 (50%)	1 (10%)	4 (40%)
Hydronephrosis (N=7)	3 (43%)	2 (29%)	4 (57%)
Calculi or calcification (N=6)	2 (33%)	2 (33%)	4 (66%)
Renal cyst or cysts (N=5)	1 (20%)	4 (80%)	4 (80%)
Non-functioning kidney (N=4)	1 (25%)	1 (25%)	3 (75%)
Congenital abnormality (N=2)	0	1	2
Tuberculosis (N=1)	1	0	0
Retroperitoneal fibrosis (N=1)	0	0	1
All abnormalities (N=59)	21 (36%)	17 (29%)	31 (52%)

TABLE 2. Action taken as result of i.v.p. findings and effect on blood pressure

	Action taken as result of i.v.p. findings							
Type of abnormality and no. of patients	Cystoscopy	Renal arterio- gram	Neph- rectomy	Operation on renal artery	Anti- biotics	Other investi- gation	None	Effect on blood pressure
Chronic pyelonephritis (N=34)	5	1	1		4	1	21	None None None None None None
Evidence of renal artery stenosis (N=10)		4		1		2	4	None None None None None
Hydronephrosis (N=7)		1	1				6	None None None None
Calculi or calcification (N=6)	1					1	5	None None None
Renal cyst or cysts (N=5)		1	1				4	B.P. lowered for 2 years None None None
Non-functioning kidney (N=4)	1	1	2				2	None None None
Congenital abnormality (N=2)							2	None None
Tuberculosis (N=1)						1		
Retroperitoneal fibrosis (N=1)						1		None
All abnormalities (N=59)	6	8	4	1	4	7	41	None None B.P. lowered for 2 years None None None

underwent renal arteriography, eight underwent cystoscopy and four patients had a unilateral nephrectomy. One patient with renal artery stenosis was treated surgically. In none of the patients referred for surgical operation was there any permanent lowering effect on the blood pressure, and all of them required continued drug therapy.

Discussion

The aim of any investigation should be to disclose abnormalities which themselves require treatment, or amend existing or contemplated treatment. In this series there were four patients who required nephrectomy and one who underwent correction of renal artery stenosis but in none of the patients did these procedures result in any permanent reduction of blood pressure making drug control unnecessary. The only benefit in this respect was observed in one patient whose blood pressure returned to normal for 2 years after nephrectomy and then rose to levels requiring treatment.

On the other hand, if the aim of the investigation is to disclose the presence of previously unsuspected renal disease rather than to influence the course of the hypertension, then the intravenous pyelogram assumes greater significance. Thus of 333 patients in the present series, fifty-nine (18%) were shown to have a renal abnormality which in four unquestionably demanded nephrectomy and which in the remaining fifty-five might conceivably lead to some impairment of renal function.

Unfortunately, as twenty-one (36%) of these patients showed neither a raised blood urea nor abnormality in the urine, further refinement of the selection of hypertensive patients in an attempt to

increase the yield of abnormal pyelograms is unrewarding.

We conclude that the value of routine intravenous pyelography in these patients lies in the disclosure of incidental renal disease rather than in the demonstration of a potentially remediable lesion, which might influence the course of the hypertension.

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