RADIOPHGRAPHIC INVESTIGATION IN ACUTE RENAL FAILURE

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Radiographic investigation of patients presenting with acute renal failure of uncertain aetiology is commonly confined to plain films of the abdomen, possibly supplemented by tomography. These may reveal the presence or absence of opaque calculi but often fail to demonstrate adequately the renal outlines. However, a more aggressive radiological approach often gives information of value in the diagnosis and management of such patients.

The methods used include drip infusion pyelography, arteriography and venography.

Drip infusion pyelography

This is now a routine procedure in the investigation of patients with chronic renal failure but many authors consider oliguria to be a contra-indication to its use (Schencker, 1964). We have used infusion pyelography extensively in acute oliguric renal failure and have found no obvious evidence of any deleterious effect. Information of considerable diagnostic and prognostic value has been obtained despite severe oliguria or even anuria. Further, such information has often obviated the need for retrograde pyelography with its attendant risks and has on occasion made renal biopsy unnecessary.

Method

250 ml. 25% Hypaque (Bayer Products) or 30% Urografin (Schering AG, Berlin) is infused intravenously over a period of about 5 minutes, without prior dehydration. Tomography is carried out 15 to 30 minutes after the end of the infusion. A denser nephrogram on one side compared with the other suggests an obstructive element and in these patients, late films should be taken up to 12 or 24 hours after the infusion, since accumulation of contrast medium above the obstruction may eventually be shown.

Information obtained

A slight but definite nephrographic effect can almost always be detected on tomography and its presence may be taken to indicate continuing glomerular filtration (Sherwood et al., 1967). Normal renal outlines suggest that there is no antecedent renal disease whereas small scarred kidneys indicate chronic pyelonephritis (Fig. 1) and bilateral enlargement, polycystic disease. A relatively translucent renal mass suggests a cyst (Fig. 2). The absence of a nephrogram and of any detectable renal outline suggests agenesis or an ectopic kidney.

A pyelogram is very seldom obtained but close scrutiny of the tomograms may occasionally reveal faint calyceal filling, sufficient to confirm or exclude hydronephrosis or to suggest chronic pyelonephritis or cystic disease. Ureteric obstruction may be detected by a faint accumulation of dye in the ureter which may only appear many hours after the injection (Fig. 3).
Fig. 1. Oliguric renal failure. Infusion pyelogram following peritoneal dialysis. Slight nephrograms show contracted scarred renal outlines indicating chronic pyelonephritis.

Fig. 2. Acute or chronic renal failure. Infusion pyelogram shows enlarged left renal outline with translucent area suggesting a cyst. Right renal outline shows scarring and the pyelogram indicates chronic pyelonephritis.
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Fig. 3. Acute renal failure with anuria. Infusion pyelogram (8 hour film) shows dilated lower end of left ureter indicating obstruction. The adjacent opacity does not represent a calculus.

Arteriography

When infusion pyelography fails to give sufficient information, aortography may be of value in demonstrating renal agenesis or hypoplasia, polycystic disease or changes suggestive of chronic pyelonephritis.

Method

Retrograde aortic catheterisation is carried out under local anaesthesia and a mid-stream injection made. We consider it advisable to limit both the volume and concentration of the injected medium to 20 ml of 45% Hypaque or 60% Urografin, in view of the nephrotoxicity of large doses of contrast media in experimental animals (Killen and Lance, 1960).

On only rare occasions have we found selective renal arteriography to be necessary. There is no doubt that this procedure carries considerable risk of renal damage (Edling et al., 1959), and should be avoided if possible in patients with renal failure. If it is considered essential, a small volume of low concentration medium should be injected through a small calibre catheter and the catheter should be left in position in the renal artery for a minimum period of time.

Venography

In patients with suspected caval thrombosis with involvement of renal veins, inferior vena
cavography should be carried out. If femoral vein occlusion is likely, pertrochanteric intramuscular injections are made under general anaesthesia using 30 ml. of contrast media on each side. This procedure will show the presence or absence of venous obstruction but may demonstrate neither the upper limit of the thrombosis nor the degree of involvement of the renal veins. Additional information may be gained by retrograde catheterisation of the inferior vena cava and when the catheter can be advanced no further, an injection will show the upper limit of the thrombus. If necessary, selective renal venography may be carried out to assess the patency of the renal veins (Fig. 4).

Safety

It must be accepted that contrast media have a certain degree of nephrotoxicity, but Hypaque and Urografin have been found to be safer than others (Berg et al., 1958), and provided large volumes of high concentration medium are not delivered directly to the kidneys, the risks are probably slight. Our personal experience of these techniques of intensive radiographic investigation in patients with acute renal failure requiring dialysis does not indicate any untoward effects despite severe azotaemia, oliguria or anuria.

Value

The information gained from these procedures has facilitated diagnosis, indicated prognosis, influenced management and has obviated the need for retrograde pyelography and for renal biopsy.
REFERENCES


