

INTRAVENOUS UROGRAM IN ACUTE RENAL FAILURE

AIDA ROHANA BT. MD. GHAZALI
ABU BAKAR SULEIMAN
AHMAD KAMAL MD. ALIF
A. THILLAKANU

SUMMARY

Thirty-four case notes of patients in acute renal failure on whom intravenous urograms (IVU) were performed, were reviewed. All patients received high doses of Conray 420 or Urotrast. Delayed films up to 48 hours were routinely done in patients suspected of having obstruction.

There were no side effects of the intravenous urogram examination. IVU with high dose contrast material and nephrogram are helpful in differentiating the cause of the acute renal failure, and in excluding outflow obstruction.

INTRODUCTION

Intravenous urogram (I.V.U.) was considered to be hazardous in renal failure in the 60's. Schwartz (1963) showed that urograms could be safely performed in renal failure. Brown *et al.*, (1970)

Aida Rohana bte Md. Ghazali MBBS (MAL)
Department of Radiology,
Faculty of Medicine,
Universiti Kebangsaan Malaysia.

Abu Bakar Suleiman MBBS (MON), M.Med., FRACP,
Department of Nephrology,
Institute of Urology and Nephrology,
General Hospital, Kuala Lumpur.

Ahmad Kamal Md. Alif MBBS (MAL), DMRD (LON),
FRCR (LON), FFRRCS (IRELAND),
Department of Radiology,
Faculty of Medicine,
Univeristy Kebangsaan Malaysia.

A. Thillakanu MBBS, DMRD (LON), FRCR (LON), A.M.,
Department of Radiology,
General Hospital, Kuala Lumpur.

showed that urograms could be safely done even in patients with oliguric renal failure.

Our experience with 34 consecutive cases of urograms performed in acute renal failure were reviewed.

CLINICAL MATERIALS AND METHODS

Intravenous urographic examinations were performed in 34 patients clinically diagnosed to be in acute renal failure (ARF) admitted to the Nephrology Unit in General Hospital, Kuala Lumpur, between 1976 and 1979. Their ages ranged between 4½ months to 70 years with a mean age of 39.7 years. There were 24 male and 10 female patients. On admission 13 patients were non oliguric, 11 were oliguric (less than 400 mls of urine per day) and 10 were completely anuric. Intravenous urograms (I.V.U.) were performed when the patient's clinical conditions had been stabilised. Eight patients required haemodialysis, 22 had peritoneal dialysis performed, while 2 had both peritoneal dialysis and haemodialysis. Seven did not require dialysis. Serum creatinine prior to I.V.U. exceeded 8 mg% in 25 patients, was between 4 and 8 mg% in 7, and less than 4 mg% in 2. Clinical chemistry was performed daily in all cases.

TECHNIQUE

Patients were well hydrated prior to the I.V.U. Preliminary film was routinely done. 100 mls. bolus dose of the contrast media (Conray 420 or Urotrast 70%) was given intravenously in adults and 1.5 ml/kg. in children. Films were normally taken immediately after injection, at 5 minutes, 10

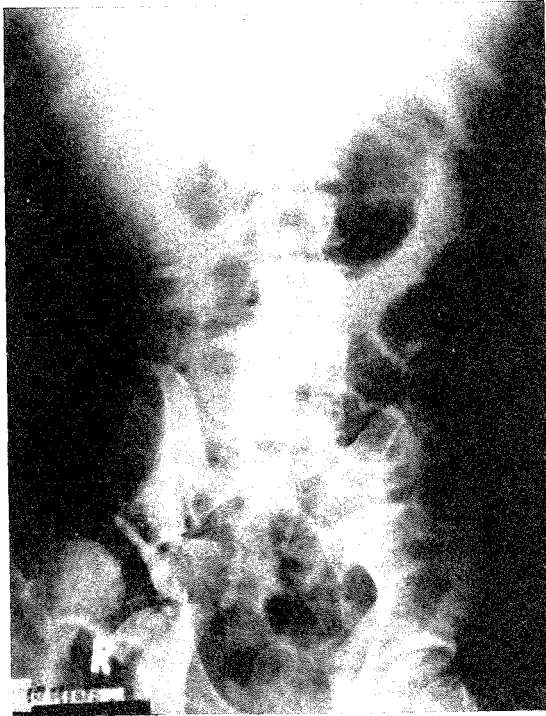


Fig. 1a 10 minute film showing faint nephrograms.

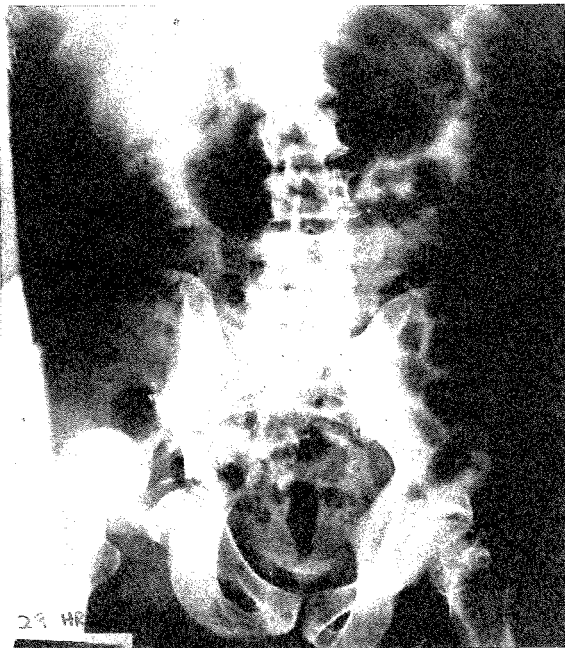


Fig. 1b 29 hours film showing increasingly dense nephrogram. This patient is a case of ATN and did not have any out flow tract obstruction.

TABLE I
INTRAVENOUS UROGRAM PATTERNS IN
17 PATIENTS WITH ACUTE RENAL FAILURE
(DUE TO CAUSES OTHER THAN OBSTRUCTION)

AETIOLOGY	NO. OF PATIENTS	NEPHROGRAM			PYELOGRAM		
		Bil.	Unilat.	Absent	Bil:	Unilat.	Absent
I Acute Glomerulonephritis	4	4	-	-	2	-	2
II Acute Tubular Necrosis							
(a) Septicaemia	6	4	2	-	3	1	2
(b) G & PD with Acute Haemolysis	2	2	-	-	1	-	1
(c) Trauma	1	1	-	-	-	-	1
(d) Unknown cause	2	2	-	-	1	-	1
III Pre-Eclampsic Toxaemia	1	1	-	-	1	-	-
IV Interstitial Nephritis	1	1	-	-	1	-	-
TOTAL	17	15	2	-	9	1	7

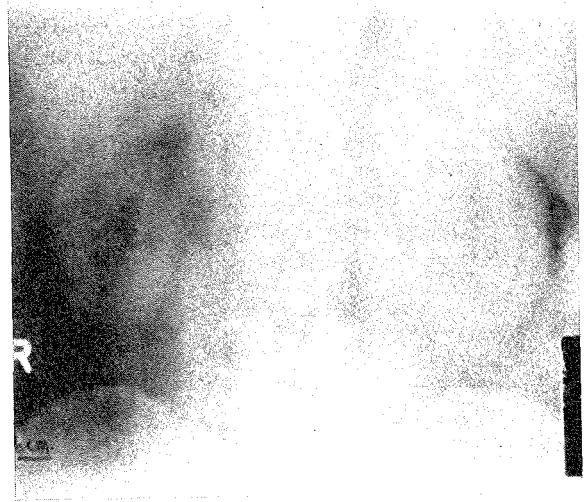


Fig. 2a Nephrotomograms showing:-
Faint (R) Nephrogram with negative pyelogram and normal (L) nephrogram.

minutes with or without compression. Films were then reviewed and further views (obliques, prone, erect) done when required. Release and post-micturition films were also done. Delayed films were taken in cases with features suggestive of obstruction. Nephrotomograms were routinely done from 1978 onwards. Films were reviewed by A.R. with either A.T. or A.K.

RESULTS

Of the 34 examinations, bilateral nephrograms were seen in 28 cases and unilateral nephrograms in 6 cases.

Four patients with acute glomerulonephritis (AGN) showed faint bilateral nephrograms, 3 of which were persistent and one became increasingly dense

TABLE II
UNEQUAL NEPHROGRAMS IN 5 PATIENTS
WITH OBSTRUCTIVE ACUTE RENAL FAILURE

Abnormal nephrogram followed by abnormal pyelogram

PATIENT NO.	NEPHROGRAM	PYELOGRAM
1.	Normal -----	Normal
	Faint	
	Staghorn Calculus -----	Not seen
2.	Normal -----	Normal
	Faint -----	Not seen
3.	Normal -----	Normal
	Faint -----	Faint, dilated calyces, Obstruction at S.I.joint.
4.	Normal -----	Normal
	Faint -----	Dilated calyces.
5.	Normal -----	Normal
	Faint, persistent -----	Faint, dilated calyces and ureter obstruction at level of L ₄ vertebra.

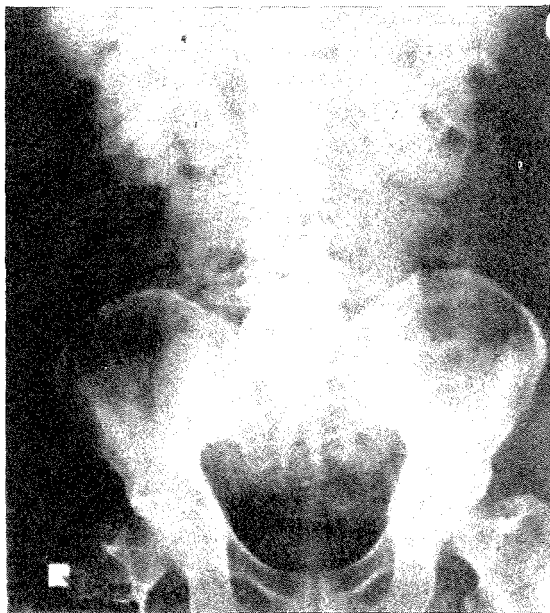


Fig. 2b Increasingly dense (R) nephrogram showing dilated collecting system and ureter and obstruction at the level of L₂ L₃ vertebrae.
(L) Nephrogram was faintly seen in the 24 hours film.

Of all the 11 patients with acute tubular necrosis (ATN), 9 showed bilateral nephrograms and 2 had unilateral nephrograms. Three of the nephrograms were faint, 4 were persistent and 2 became increasingly dense. Two nephrograms were normal. The patients with pre-eclamptic toxemia and interstitial nephritis had normal I.V.U.

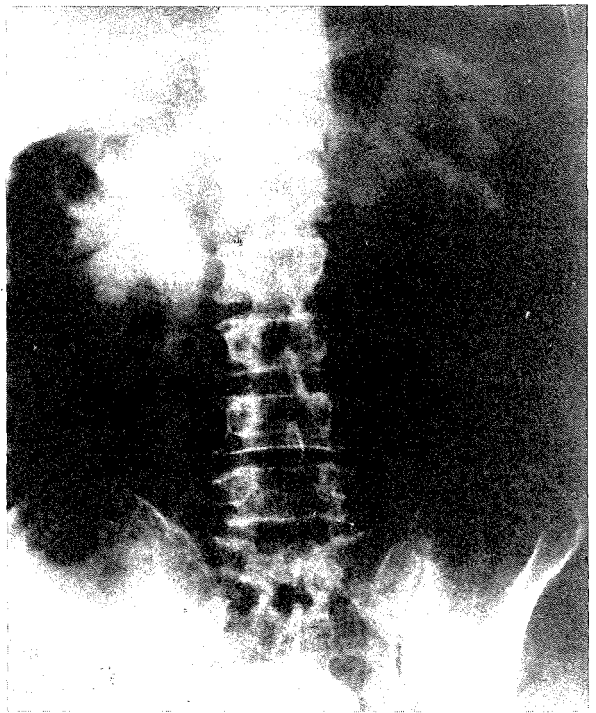


Fig. 2c Prone film done at 24 hours.

TABLE III
TYPES OF OBSTRUCTION SEEN IN
17 PATIENTS WITH OBSTRUCTIVE ACUTE RENAL
FAILURE

TYPE OF OBSTRUCTION	NO. OF PATIENTS
1. Bilateral Obstruction	6
2. Unilateral Obstruction	5
3. Obstruction in single functioning kidney	6
TOTAL	17

In 17 patients suspected of outflow tract obstruction, 6 showed bilateral faint nephrograms, 2 of which were persistent, and another one became increasingly dense. Five other patients who presented in complete anuria, showed unequal nephrograms. The side with normal nephrograms subsequently showed normal pyelogram. The side with abnormal nephrogram all revealed abnormal pyelogram.

Pyelograms were demonstrated in both sides in 9, and on one side in 8. Dilated calyceal pattern was seen in 16 cases, and dilated ureters were observed in 12, and not seen in 5. The site of obstruction was demonstrated in 11 patients. Retrograde pyelogram (RPG) were subsequently performed in 2 cases. One patient presenting in acute anuria showed - (L) staghorn calculus in a non-functioning kidney, and a normal (R) urogram.

Six patients had obstruction in a single functioning kidney.

Opaque calculi were observed in preliminary films in 8 cases, and 4 lucent calculi were detected in the I.V.U.

No adverse reactions to the procedure were observed and there were no adverse effects on the renal function detected by clinical chemistry.

DISCUSSION

Nephrograms were observed in all 34 patients.

Fry and Cattel (1972) have described patterns of nephrograms reflecting different abnormalities of renal function in patients with acute non-obstructive renal failure. In our limited experience, the nephrographic patterns observed in AGN, ATN and obstruction did not correlate with the clinical diagnosis. However, our numbers were too few to be conclusive. Radiological features of obstruction were seen in 16 out of 17 cases, and the level of obstruction was defined in 11. In one, who presented in complete anuria, there was a staghorn

calculus on the non-functioning (L) side and a normal urogram on the opposite side. This patient spontaneously diuresed and probably passed out the calculi from the (R) side prior to the I.V.U.

In the 5 patients presenting in complete anuria with unequal nephrogram, the side with abnormal nephrogram revealed obstructive features in the subsequent pyelogram. This was probably the result of spontaneous relief of obstruction on one side prior to the I.V.U., with persistent obstruction on the opposite side.

I.V.U. is a safe procedure in acute renal failure to exclude obstruction in patients whose clinical condition has been stabilised and the uremia controlled by dialysis. With the use of nephrotomograms and delayed films, the level of obstruction could be defined and retrograde examination was seldom required.

In our limited experience the pattern of nephrograms was useful but not conclusive in differentiating the cause of ARF. While examinations by ultrasonography and renography, particularly with the use of gamma camera, are valuable in diagnosing outflow tract obstruction, I.V.U. remains the examination of choice to exclude the presence of obstruction, define the level of obstruction and assess the structural damage where obstruction has occurred.

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