X-Ray Diagnosis in Urinary Tract infection

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INTRODUCTION

Since repeated upper urinary tract infection may be due to underlying abnormalities, simple radiological techniques play an important role in diagnosis as summarised in Tables I, II, and III, and illustrated by radiographs taken over a four months period (November 1974 to February 1975) at District Hospital, Taiping.

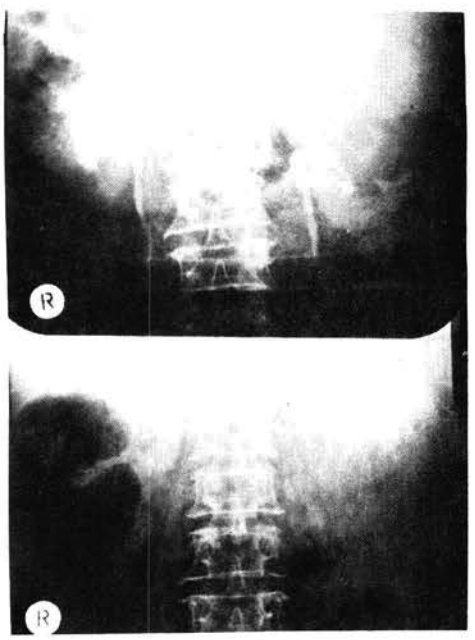

Fig: 1

Dystrophic Calcification in (L) Hypernephroma Destroying and Displacing Calyces.

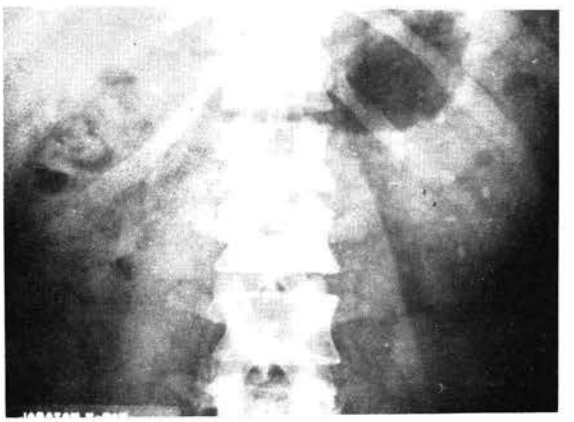

Fig: 2

Large (L) Kidney (Medullary Sponge) With Pyramidal Nephrocalcinosis.

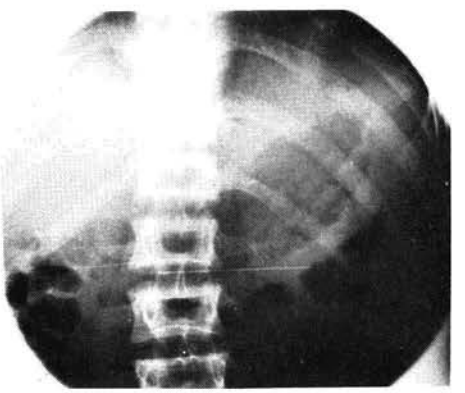

Fig: 3

Bilateral Nephrocalcinosis in Kidneys of Normal Size. Codfish Vertebrae

Fig: 4

(L) Staghorn Calculus>Bone Density
(R) Faceted Gall Stones (Similar appearance in Calyceal Diverticulum)

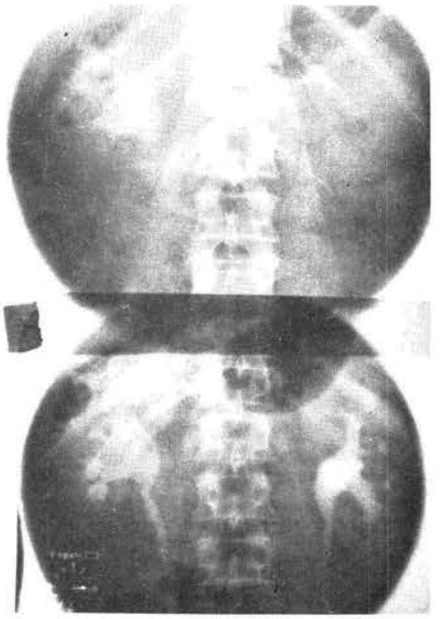

Fig: 5

(R) Staghorn Calculus<Bone Density

TABLE I

STONES AND BONES

PLAIN X-RAY ABDOMEN

NEPHROCALCINOSIS

Cortical — Acute cortical necrosis and chronic glomerulonephritis.

Medullary

1) Hyperparathyroidism — Small kidney size
2) Renal Tubular Acidosis — Normal " "
3) Medullary Sponge Kidney — Large " "
(often unilateral)
4) Oxalosis

CALCULI

	Opaque	Non-Opaque
1) Staghorn.		
(a) Density greater than bone	= Phosphate	1) Uric Acid
(b) Density less than bone	= Cystine	2) Xanthine
2) Oval		
(a) Smooth	) Silicon Dioxide (From excess Magnesium Trisilicate)) Calcium Phosphate	
(b) Spiky	Calcium Oxalate	
3) Faceted	Calyceal Diverticulum	
4) Milk of Calcium	(a) Calyceal Diverticulum. (b) Hydronephrosis.	

DYSTROPHIC CALCIFICATION.

1. (a) Papillary Necrosis (b) T.B. (c) Hydatid
2. (a) Haematoma (b) Infarct (c) Amyloid
3. (a) Cyst (b) Carcinoma
4. Prostatic

OSTEOMALACIA

1) Codfish Vertebrae
2) Bowing.
3) Looser's Zones
e.g. pubic rami, ribs, long bones, lateral scapula.

RENAL OSTEODYSTROPHY

Sandwich or Rugger Jersey Spine.

HYPERPARATHYROIDISM

Pepper Pot Skull and Loss of Lamina Dura of Teeth and Dorsum sellae

Primary	Secondary
1) Brown Tumours/Cysts/Transradiancies e.g. Pelvis, Long Bones, Skull.	1) Subperiosteal, Subchondral and Subtendinal Resorption. e.g. Phalanges, Sacroiliac joints, Pubic Symphysis, Proximal Femur and Humerus, outer end of Clavicle.
2) Metastatic Calcification. e.g. Chondrocalcinosis, lungs, skin.	2) Metastatic Calcification. e.g. Vessels.

NEUROSPINAL LESIONS.

1) Spina Bifida
2) Meningomyelocole
3) Diastematomyelia.
(Calcified spur and widened interpedicular distance)

TABLE II

SCARS AND BARS

I. V. U.

CORTEX

IRREGULAR CONTRACTION.

1) Poles — Chronic Pyelonephritis
2) Middle — Infarct

3) Indefinite — Trauma, T.B.

SMOOTH CONTRACTION. — ISCHAEMIA; POST OBSTRUCTIVE. PAPILLARY NECROSIS.

CALYCES

1) Uniform Ballooning — Post Obstructive
2) Irregular — Chronic Pyelonephritis
3) Excavation — T.B. Papillary Necrosis

URETERS.

1) Retrocaval — Sudden medial deviation
2) Retroperineal Fibrosis
3) Diverticulae
4) Filling Defects
5) (a) Ureterocoele (b) Megaureters.
6) Fistulae from bowel
7) Strictures e.g. Tuberculosis, Trauma, Radiation, Malignancies.

NEPHROGRAM

DIRECT (Chronic)		INDIRECT (Acute)
1) Rims & Transradiancies	— Polycystic.	1) Increasing Density. — Acute Obstruction — Severe underperfusion e.g. Hypertension. ischaemia, A.G.N.
2) Soap Bubbles & Cresents	— Hydronephrosis.	
3) Round Transradiancy & Claw	— Cyst	
4) Vasular Dense Nephrogram Then Transradiant area.	— Tumour	2) Persistent Density. — A.T.N. — Acute Suppurative Pyelonephritis.
5) Isthmus	— Horse shoe kidney	
6) Nil	— Congenital Multicystic Kidney Xanthogranulomatous Pyelonephritis.	3) Faint. — Infarction — C.G.N. — Bilateral Cortical Necrosis. — Phenindione Nephritis
7) Perihilartransradiancy	Fibrolipomatosis.	

PYELOGRAM.

1) (a) Tubular Ectasia — Medullary Sponge Kidney
(b) Medullary opacification in infants — Medullary Necrosis
2) Drooping Flower — Duplex
3) Filling Defects (a) Lumen — Sloughed papillae, papilloma, stones. clots, fungus ball.
(b) Wall — Pyeloureteritis Cystica, Carcinoma.
(c) Extrinsic — Anomalous vessels — Cysts, Tumours.
4) Mucosal striation — recent obstruction & infection; reflux
5) Hydrocalicosis — congenital valves or Achalasia Nephrogenic Diabetes Insipidus
6) Extravasation — acute renal colic.

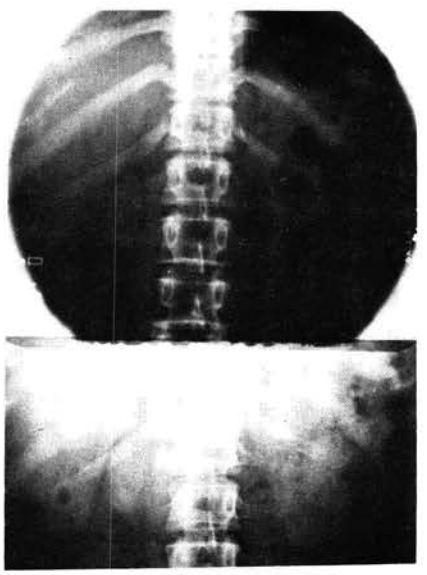

Fig: 6
(R) Ischaemic Smooth Contracted Kidney

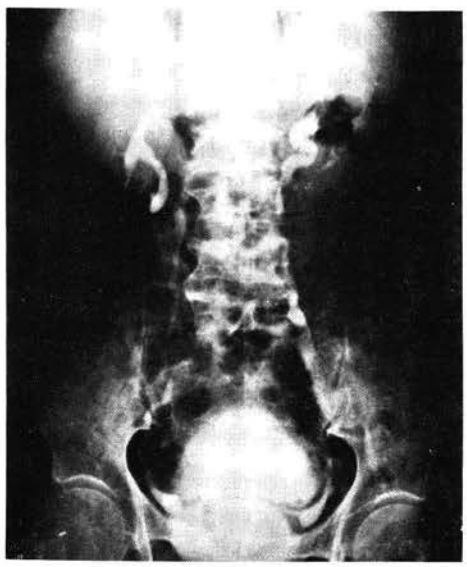

Fig: 7
Vesical Calculus Bladder Diverticulum and Post Obstructive Atrophy Both Kidneys.

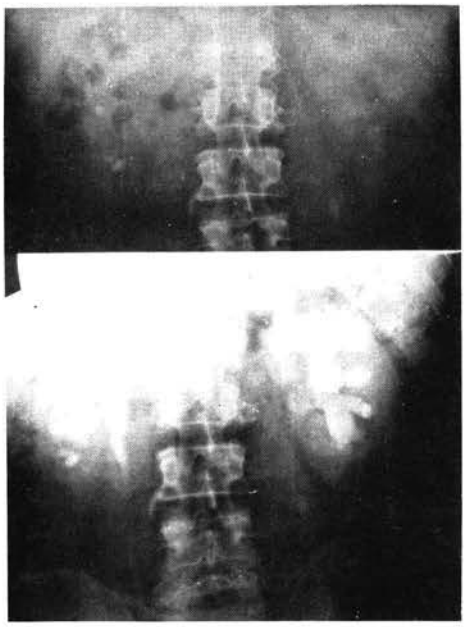

Fig: 8

Papillary Necrosis
(R) Calyceal Excavation and papillary calcification
(L) Hydronephrosis due to Calculus

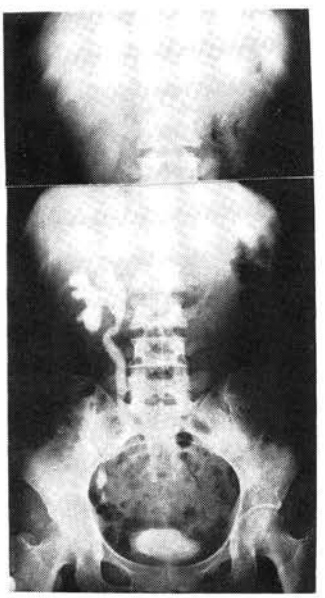

Fig: 9

(R) Hydronephrosis due to TB stricture lower ureter. Irregular Contracted poorly functioning (L) Kidney.

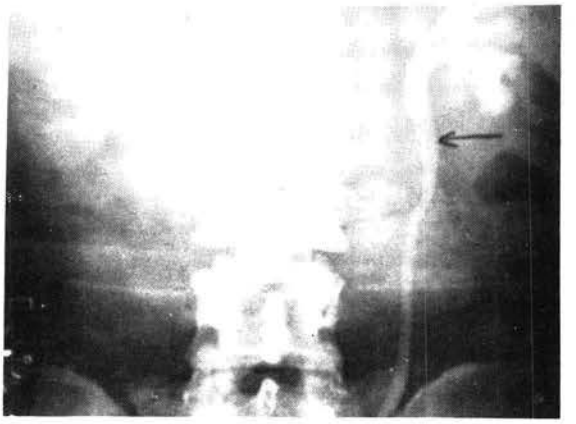

Fig: 10

Calculus (Bar Shape)
Filling Defect. (L) ureter arrowed.

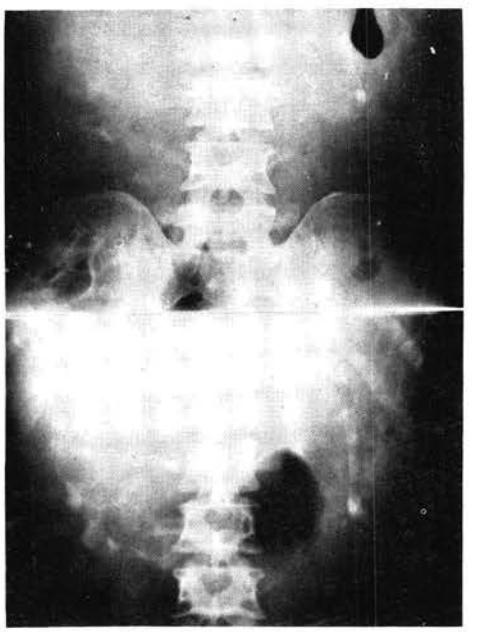

Fig: 11

Bilateral Polycystic Kidneys
Upper– Rim Nephrogram
Immediate film
Lower– Stretched "Spider" Calyces in 4 hour (delayed) film.

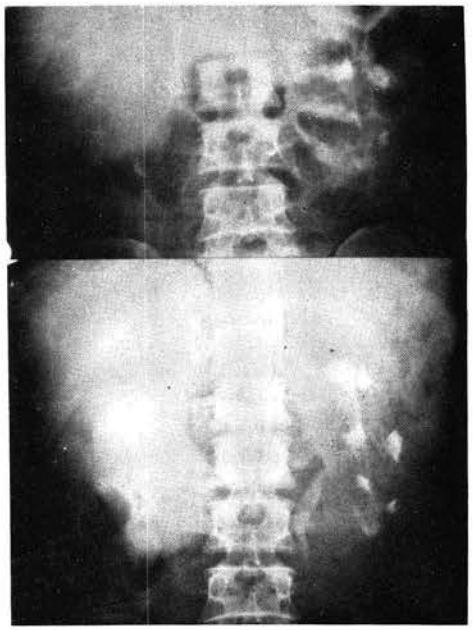

Fig: 12

Upper Cresents with transradiant areas on Nephrogram after double dose.
Lower– (R) Hydronephrosis on 24 hour film.

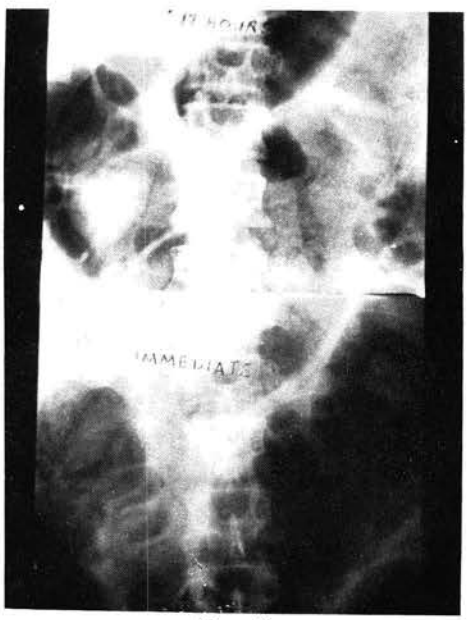

Fig: 13

Right– Dense Persistent Nephrogram (ATN)
Left– Increasing Density of Nephrogram
Blood Urea 185mg% (Ischaemia)

Fig: 14

Traumatic (R) Lower Pole Cyst with "claw sign" of Nephrogram

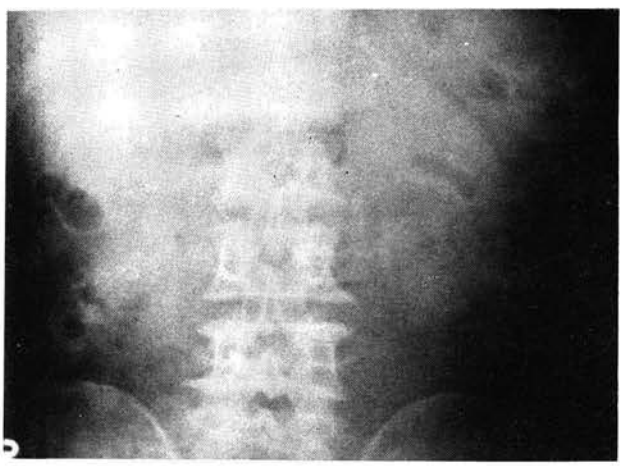

Fig: 15

Severe Renal Failure with excretion of contrast into bowel (24 hour film)

TABLE III

STASIS AND BASIS

MICTURATING CYSTO–URETHROGRAM.

Children	All Ages.	WOMEN.	
1) Reflux	1) Diverticulae	1) Pregnancy	) Due to hormonal, Uterine pressure
2) Urethral Valves	2) Pelvic Tumours	2) Pill	) and especially (R) iliac vessels.
	3) Neurogenic		
	4) Stricture	MEN	
		Prostate.	

Discussion

Maximum diagnosis without resort to repeat investigation and often without any need for fasting preparation (in urgent cases) and compression can be ensured by the new technique of *Intravenous Urography* based on renal physiology since modern contrast media are excreted by glomerular filtration.

Urine Concentration X Urine Volume =
(U) (V)
Plasma Concentration X Glomerular
(P) Filtration Rate (G.F.R)
$\therefore U \propto P \propto I/V \propto G.F.R$

Thus maximum urinary concentration is obtained by high plasma levels from rapid injection of high doses 300 mg Iodine/Kg Body Weight equivalent to 1 ml/Kg of contrast medium (Double Dose plus tomogram and no dehydration of patient if blood urea/creatinine raised) has been found to be the best because higher doses produce:–

(1) Hardly any improvement in radiographic contrast.

(2) Denser nephrogram may obscure calyces.

(3) Pyelogram may be less dense due to osmotic diuresis especially with meglumine as cation.

(4) Increased incidence of side effects.

Rapid injection is also important so that an immediate film can be taken for the nephrogram (uniform opacification of kidney due to proximal tubule effect) which is particularly useful in renal failure. The pyelogram appears later and is best seen at 10 minutes. The full length film followed by an after micturition radiograph are then taken – the latter may be helpful in showing up filling defects in the bladder.

Besides the usual bladder view a further view *(The perineal shot)* with the tube tilted 30° cephalad and centered 2 inches below the top of the pubic symphysis, demonstrates prostatic size during urography.

Due to the high incidence of reflux causing scarring and acending infection in children, they should all have micturating cystourethrograms. This procedure should also be done in adults with renal scars and dilated ureters (more than 7 mm width).

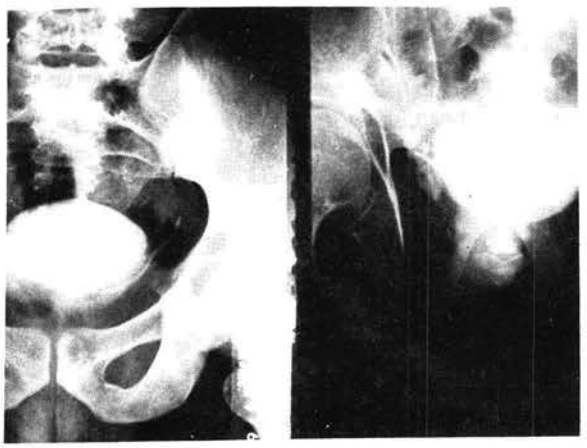

Fig: 16

Perineal shot – Normal: Convex Downwards

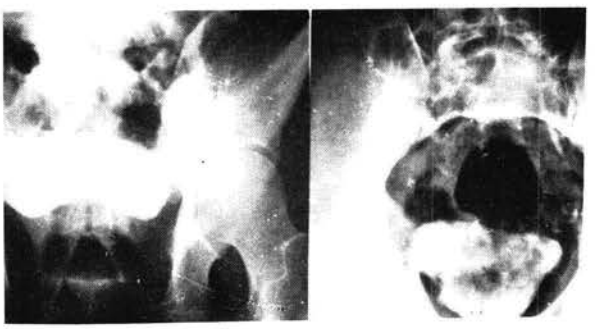

Fig: 17

Prostatic Impression Only Shown On Perineal Shot.

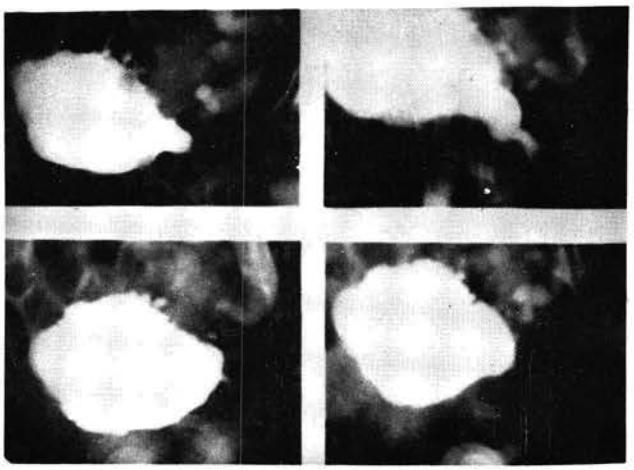

Fig: 18

Micturating Cystourethrogram shows urethral obstruction, trabeculated bladder, reflux up left ureter.

Fig: 19

Molar Pregnancy
Dilated (R) Collecting System
Duplex (L) " "

Acknowledgements

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