In case of *renal failure* with high blood urea, dose of dye is increased to 2ml/Kg (600 mg/Kg) body weight to get a better film *Infusion* IVU. Often diuretics are used in these patients to have better secretion.

Compression over lower abdomen for 10 minutes can be done to have better definition of calyces; but not done in children and patients with abdominal aortic aneurysm.

Minute IVU- In case of renal artery stenosis, within first minute many films are taken to see nephrographic (proximal convoluted tubules are seen) shadow—where a small, concentrated kidney is seen.

Upper part of ureter is visualised in supine films whereas lower part in prone films.

Nonvisualisation of kidney: Here no contrast is seen in the film even after 12 hours.

grade Pyelography (RGP)

tions

ilure of showing any secretions in an IVU late as in 72 hours film.

Fig. 4.121: Left-sided RGP-normal study.

Fig. 4.122: Note the ureteric catheter with injection of dye into the ureter

2. Urinary tuberculosis.
3. Urothelial tumours from the renal pelvis.

Procedure

Under G/A cystoscope is passed. Ureteric orifice is visualised. Ureteric catheter is passed. Dye, sodium diatrizoate is injected. Patient is put in 15° head down position to allow the dye to reach upper urinary system. X-ray is taken.

Advantages

a. Prior to dye injection selective urine sample can be taken from each ureter.
b. Brush biopsy from suspected urothelial tumours of upper urinary tract can be taken.
c. Better-delineation of anatomy (due to more concentration of dye).

Disadvantages
Anaesthesia is required and is laborious.

RENAL ANGIOGRAM

Procedure:
Retrograde Seldinger technique: Through femoral artery, selective angiogram is done to visualize tumour vascularity, narrowing or anomalies.

Therapeutic embolisation, transluminal balloon angioplasty for renal artery stenosis can also be done. Translumbar approach can also used for angiogram (through aortogram).

Renal angiogram

Indications
1. Renal artery stenosis
2. Renal artery atheroma
3. Renal artery aneurysm
4. Occasionally renal cell carcinoma
5. Arterial anomalies

Complications
a. Paraplegia
b. Embolism
c. Dissecting aneurysm
d. Bleeding
e. Renal tubular necrosis

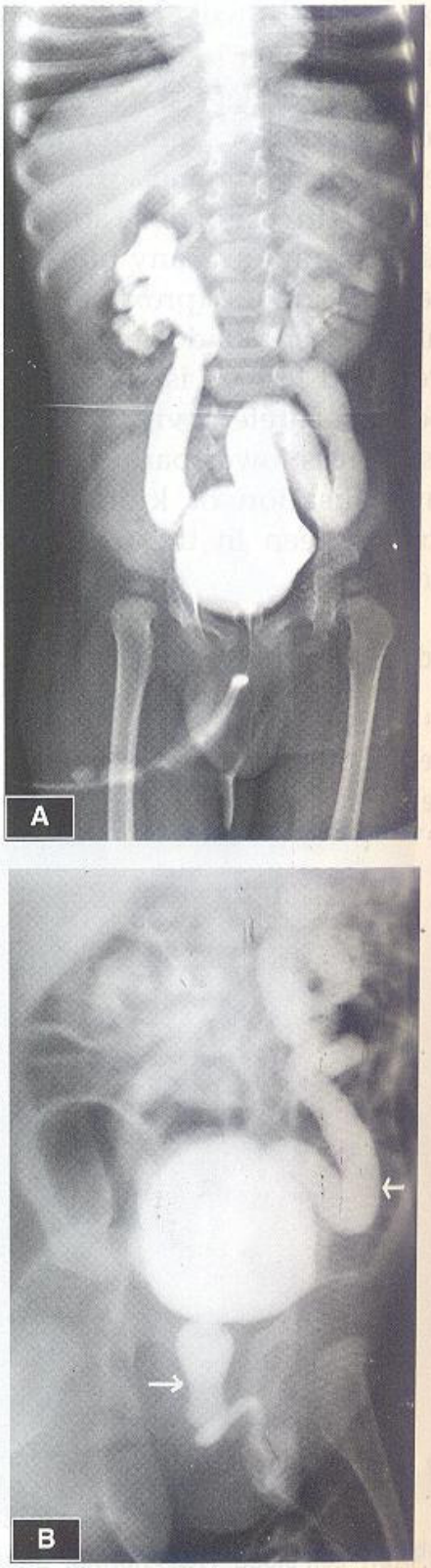
Renal pharmacoangiogram: Noradrenalin is injected along with the dye. Normal vessels will constrict in response to noradrenalin. Since tumour is autonomous, vessels in renal cell carcinoma do not respond to noradrenalin and so *tumour blush* is seen.

Micturating Cystourethrography (MCU)

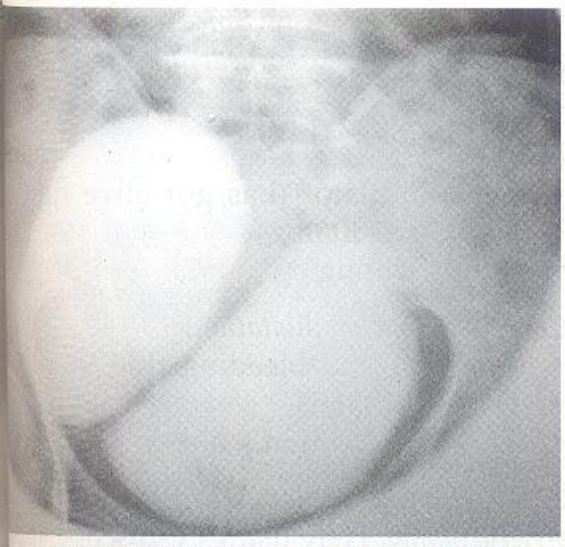
Indications
a. Vesico ureteric reflux.
b. Posterior urethral valve.

Procedure: Catheter is passed into the bladder. Dilute iodine dye is infused. X-ray is taken during micturition. Free reflux is looked for. X-ray is taken following applying pressure over the suprapubic region. Pressure reflux is studied.

Vesicoureteric reflux is graded depending on severity of the reflux as—
I. Ureters seen.
II. Ureters and pelvis are seen.



Figs 4.123A and B: Micturating cysto-urethrogra showing concomitant existence of posterior urethral val (causing dilatation of proximal urethra) and vesico-urete reflux (left side) *(By Dr NC Shetty, Radiologist, Mangalo*



123C: MCU showing large bladder diverticulum. diverticula may be congenital which is full thickness ulum with muscle layer or may be acquired (common) is only mucosal and occurs due to chronic tion. Diverticula may be traction or pulsion type. is required for large diverticula.

Ureters, pelvis, cayces are seen.
Calyces grossly distended.
Tortuous elongated serpentine ureters.
can be unilateral or bilateral. Often it is ated with posterior urethral valve. It is often icated by infection, pyonephrosis and renal e.

gations: MCU, IVU, ultrasound, blood urea erum creatinine.

ent: Tailoring of ureter with reimplantation.

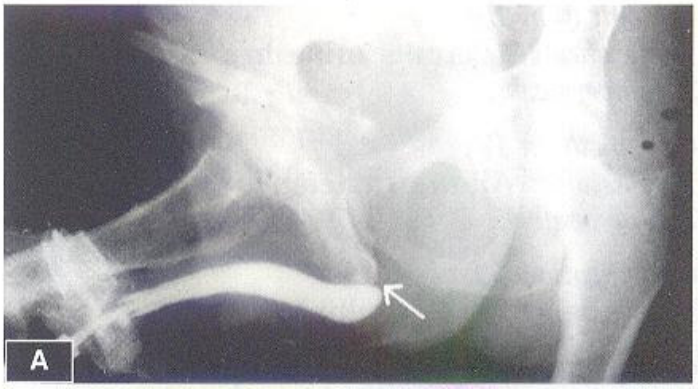
nding Urethrogram

e investigation of choice for *stricture urethra*. ber catheter is passed through the external us. Water soluble iodine dye is injected gh the catheter. Oblique X-ray films are to visualise the urethra. Site, size, extent icture and extravasation can be seen.

cture Urethra

sification I:

ological—
ongenital.
ammatory:



Figs 4.124A and B: First X-ray is ascending urethrogram showing failure of dye to pass into the bladder due to stricture near the bulbar urethra with a radiopaque Malecot's catheter inserted through suprapubic cystostomy (SPC). In second picture, urethrogram shows multiple strictures but dye has reached above to the bladder.

a. Post-gonococcal is commonest 70%.
   - Common in the bulb of urethra especially in the roof.
   - Here multiple strictures are common. Proximal stricture is the narrowest.

b. Tuberculous.
c Other infection (Urethritis).

3. Traumatic: Bulbous, Membranous.
4. Post-instrumentation: Catheter, dilator, cystoscope.
5. Postoperative: Prostate surgery, Urethrostomy.

Classification II: According to portion involved
1. *Proximal*: Common in *bulbous urethra*. (70%).
2. *Distal*: Congenital (in the external meatus).

Often following trauma, in children.

Classification III:
1. *Permeable*: Permits urine to pass.
2. *Impermeable.*

Classification IV:
1. *Passable*: Allows catheter to pass.
2. *Impassable.*

Classification V:
It can be single or multiple.

Classification VI: According to part involved. In the roof (commonest) or in the floor.

Clinical Features
- Poor urinary stream.
- Forking and spraying of the stream.
- Incomplete emptying.
- Frequency, dysuria.
- Retention and often with overflow.
- Pain, burning micturition, suprapubic tenderness.
- Thickening and button like feeling in bulbar urethra. (Clinically bulbous urethra is felt in midline in the perineum by lifting the scrotum).

Investigations
- Urine microscopy and culture.
- Blood urea and serum creatinine.
- IVU to see hydronephrosis and function of kidney.
- Ultrasound abdomen.
- X-ray of pelvis to see old fracture with history of trauma.
- *Ascending urethrogram* is an essential investigation: To see the site, type, extent and false passage. Dye is injected the into the bladder through suprapubic needle puncture and visualisation is done using C-ARM image intensifier.
- Urodynamic studies.
- Urethroscopy.

Treatment

1. *Intermittent dilatation:*
Gradual dilatation is done initially with thin dilators, later with thicker dilators of increasing size. Dilatation should be done in OT under aseptic precaution. One *should avoid forcible dilatation or over dilatation.*

Dilatation is done *'once a week for one ye once a month for one year, and later once a on his birthday.'*

Dilators used:
- Lister's dilator (has got olive tip (blis
- Clutton's dilator.
- Filiform bougies.

Complications of dilatation:
- Infection and bleeding due to trauma.
- False passage.
- Fistula formation.

2. *Visual internal cystoscopic urethrotomy stricturotomy:* Here using cystoscope, stricture visualised and is cut at 12 O' clock positi until it bleeds (fibrous tissue is cut complete After that Foley's catheter is passed and k in position for 48 hours.

3. External urethrotomy by open method. N commonly done presently as cystoscop urethrotomy is more popular. It is presently do as an initial stage surgery for urethroplas (*Wheelhouse's operation).*

4. Urethroplasty: Stricture is excised and urethr is reconstructed using prepuceal skin or scrot skin. (*Johanson's urethroplasty*).

Problems in urethroplasty—
- Staged procedure and so prolonged hospitalisation.
- Infection.
- Necrosis of skin flap.
- Leak and fistula formation.
- Re-stenosis.

Complications of stricture urethra
- Retention of urine
- Urethral fistula.
- Infection—urethritis, cystitis, pyelonephritis.
- Urethral diverticula.
- Periurethral abscess.
- Bilateral hydronephrosis.
- Stone formation.
- Renal failure.
- Due to straining—hernia, haemorrhoids, rectal prolapse.