

# MODERN MANAGEMENT OF URINARY TRACT STONES

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# EPIDEMIOLOGY

- ▣ Most painful urological disorder.
- ▣ ↑ incidence in renal stone disease.
- ▣ ↓Age of onset of symptomatic stones
- ▣ Peak incidence: 30s-40s(previously 40s-50s)
- ▣ 1.6 male : 1 female. (3 :1 in 1975).
- ▣ Life-time risk
  - 10% in UK, 15% in USA, 20% in SA,
- ▣ Recurrence rate
  - 10% at 1yr, 35% at 3yrs & 50% at 5yrs

# Surgical management of urinary tract stones

- ▣ Asymptomatic stones
- ▣ Treatment of symptomatic renal, ureteric & bladder stones
- ▣ Acute ureteric colic
- ▣ Rigid & flexible ureterorenoscopy
- ▣ Bladder procedures
- ▣ Advances in stone management
- ▣ New endourological management options

# Asymptomatic kidney stones

- ▣ 77% of untreated asymptomatic stones will lead to complications, a quarter will require surgery due to persistent severe pain or kidney blockage

J Endourol 2004 Aug; 18(6):534-9

# Treatment of renal stones

- ▣ ESWL
- ▣ Flexible ureterorenoscopy & laser stone removal (FURS)
- ▣ Percutaneous nephrolithotomy (PCNL)

# ESWL

- ▣ Dornier studied effects of shock waves on tissue 1969
- ▣ Dornier HM3 Lithotripter 1980
- ▣ FDA approval 1984
- ▣ Non-invasive first line Rx for stones < 2cm
- ▣ Overall stone-free rates were 76% (RP), 69% (UC), 68% (MC) and 59% (LC)



# ESWL

- ▣ 2<sup>nd</sup> and 3<sup>rd</sup> generation lithotriptors more user-friendly
- ▣ Efficacy not surpassed HM3
- ▣ Higher stone recurrence rate in ESWL compared to PCNL
- ▣ ESWL 22% and PCNL 4% at 1 year



# ESWL



- ▣ ESWL success can be predicted by stone density measured on non-contrast CT KUB
- ▣ CT Hounsfield unit  $> 1000$  suggest very hard stone and ESWL failure

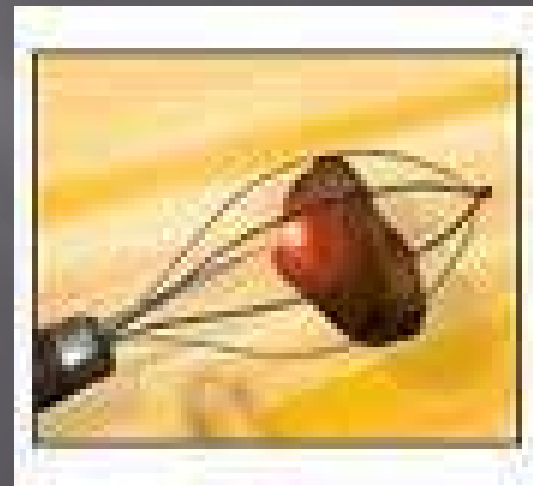
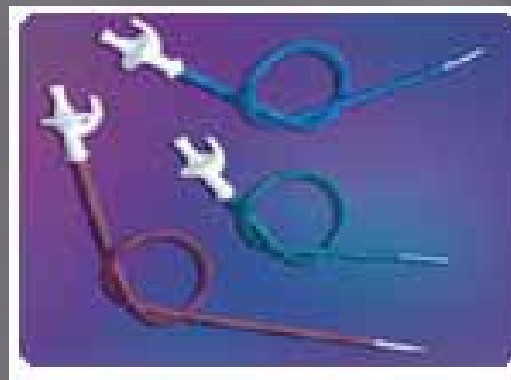


# Flexible ureterorenoscopy

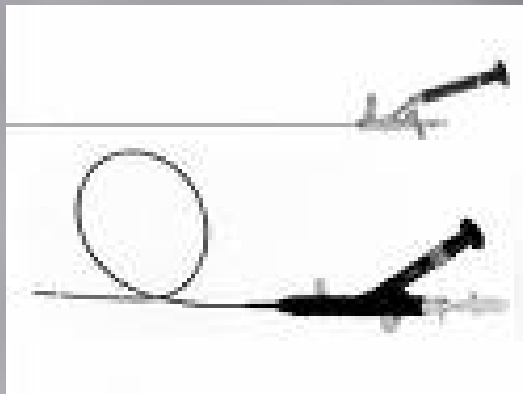
- ▣ 1964 Marshall 3mm fibrescope passed transurethrally via a 26F cystoscope into ureter
- ▣ 1971 Takagi 2mm flexible ureterosocpe 75cm long & 2.5 cm angulating tip
- ▣ Modern day digital fibreoptic imaging bundle, working channels and dual-direction active deflection

# Flexible ureterorenoscopy

- ▣ Holmium laser
- ▣ Tipless baskets
- ▣ Access sheaths



# Flexible ureterorenoscopy

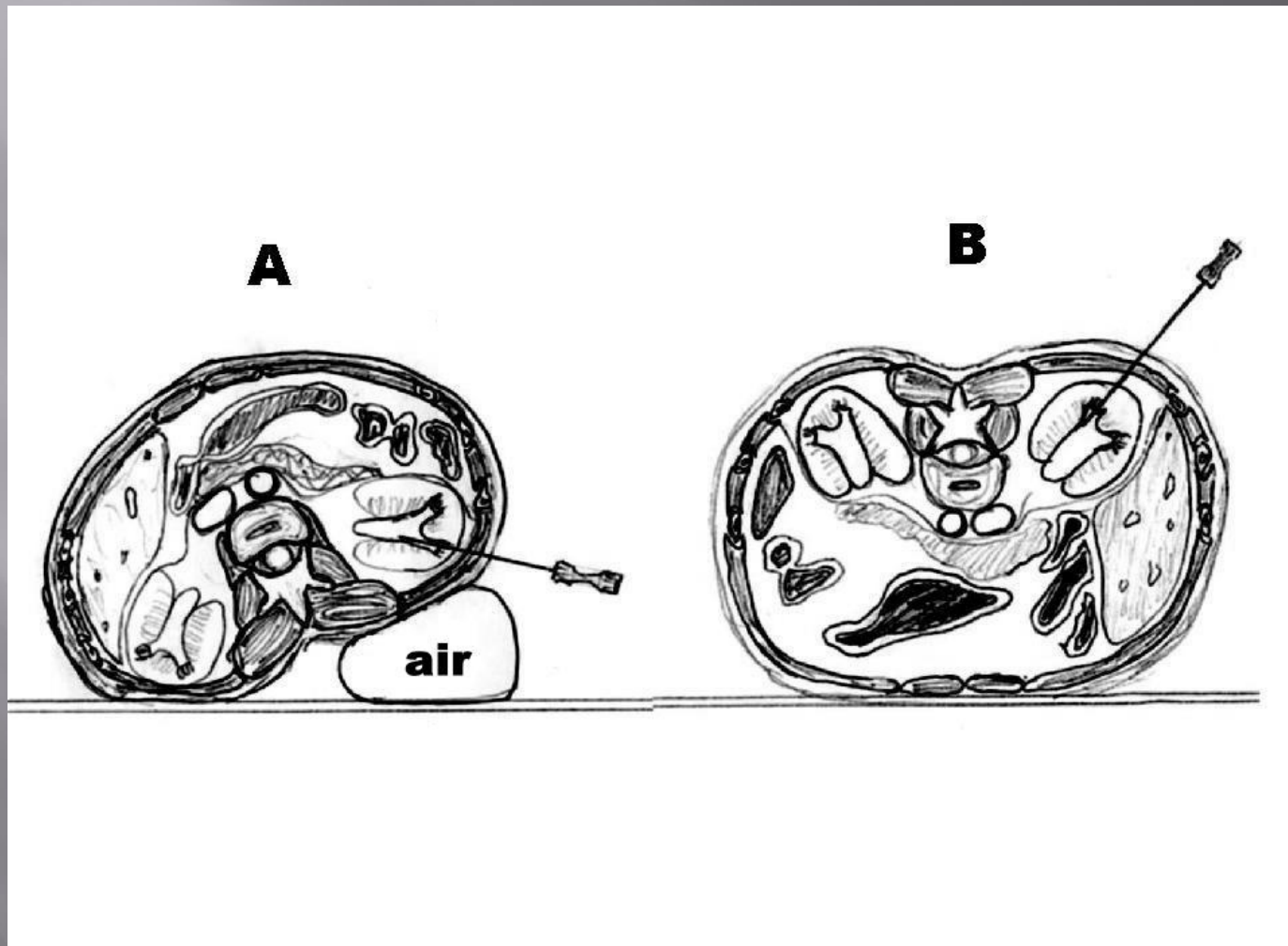


- ▣ Visualisation of intra-renal collecting system
- ▣ Laser disintegration of kidney stones
- ▣ Laser widening of pelvi-ureteric junction obstruction
- ▣ Laser treatment of upper tract TCC

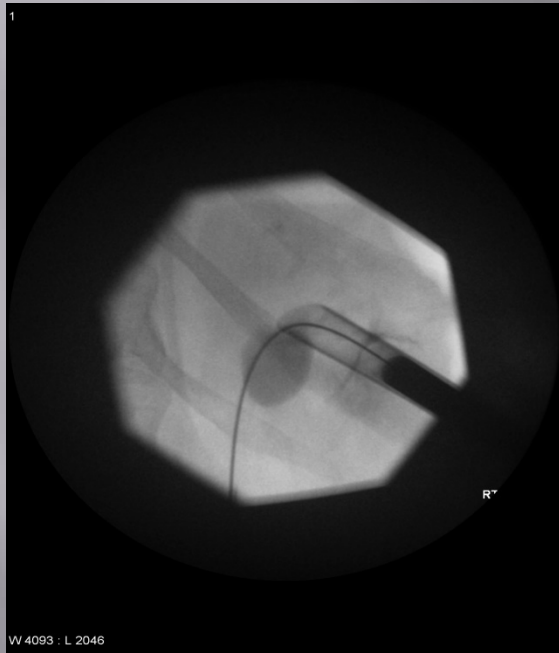
# Percutaneous nephrolithotomy

- ▣ 19<sup>th</sup> century, not acceptable to operate directly on kidneys
- ▣ Conservative measures include ostrich egg shell & scorpion oil
- ▣ 1879 Heinecke Pyelolithotomy
- ▣ 1881 Nephrolithotomy
- ▣ 1976 Fernstrom Percutaneous access
- ▣ 1980 Wickham & Kellett, Alken PCNL

# PCNL approaches



# Percutaneous nephrolithotomy



- ▣ Treatment of large kidney stones, dilated PC system
- ▣ Lower pole renal stones
- ▣ Calyceal diverticulum
- ▣ PUJ or ureteric obstruction
- ▣ Ileal conduit, neobladder
- ▣ Stone-free in single op
- ▣ Large upper ureteric stones
- ▣ Encrusted stent
- ▣ Large prostate, rapid encruster



# Lower pole renal stones

Size (mm)	ESWL	PCNL	p value
0-10	67%	100%	0.017
11-20	21%	92%	0.0001
21-30	14%	100%	0.033
Overall	35%	96%	<0.001

# Percutaneous nephrolithotomy



- ❑ Encrusted Double-J stent
- ❑ Combined Cystolitholapaxy, laser ureterolithotomy and PCNL
- ❑ Swiss Lithoclast Master reduced operating time by half

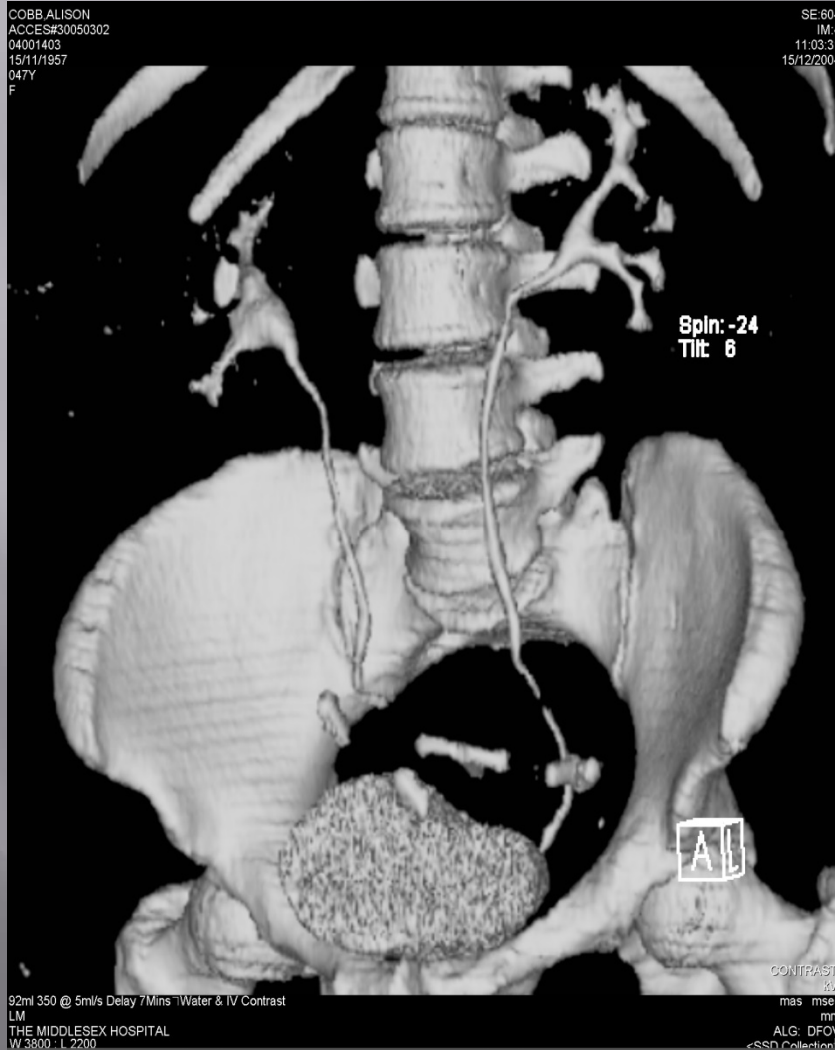




# Acute ureteric colic

- ▣ Analgesia - Diclofenac 100 mg pr and/ or Pethidine and antiemetic
- ▣ Alpha-blocker eg. Tamsulosin 400 µg od  
?increases spontaneous stone passage rate by 29% (Medical Expulsion Therapy - MET)
- ▣ Primary endoscopic laser ureterolithotomy
- ▣ Emergency stenting and stent symptoms

# CT imaging and planning



- ▣ Increasing use of CT for diagnosis of acute ureteric colic
- ▣ CT useful in planning for treatment of complex stone cases

# CT Imaging and Diagnosis

- ▣ Non-contrast CT KUB
- ▣ Rapid diagnosis
- ▣ No side effects of contrast
- ▣ Abdominal abnormalities



# ESWL and URS

- ▣ Overall for stones in Proximal Ureter, no significant difference b/t ESWL & URS
- ▣ Proximal Stones <10mm, ESWL↑
- ▣ Proximal Stones >10mm, URS sig↑
- ▣ Distal Stones, URS↑ ≤10mm & >10mm(sig)
- ▣ Mid Stones, ns between ESWL & URS (sig)

# Rigid ureteroscopy

- ▣ 1912 Hugh Hampton Young  
Rigid cystoscope into  
dilated  
ureter
- ▣ 1960 Invention of Rod-lens  
system
- ▣ 1977 Goodman 9.5Fr  
paediatric cystoscope into  
distal ureter in women
- ▣ 1979 Wolf 23cm, 13 to 16 Fr



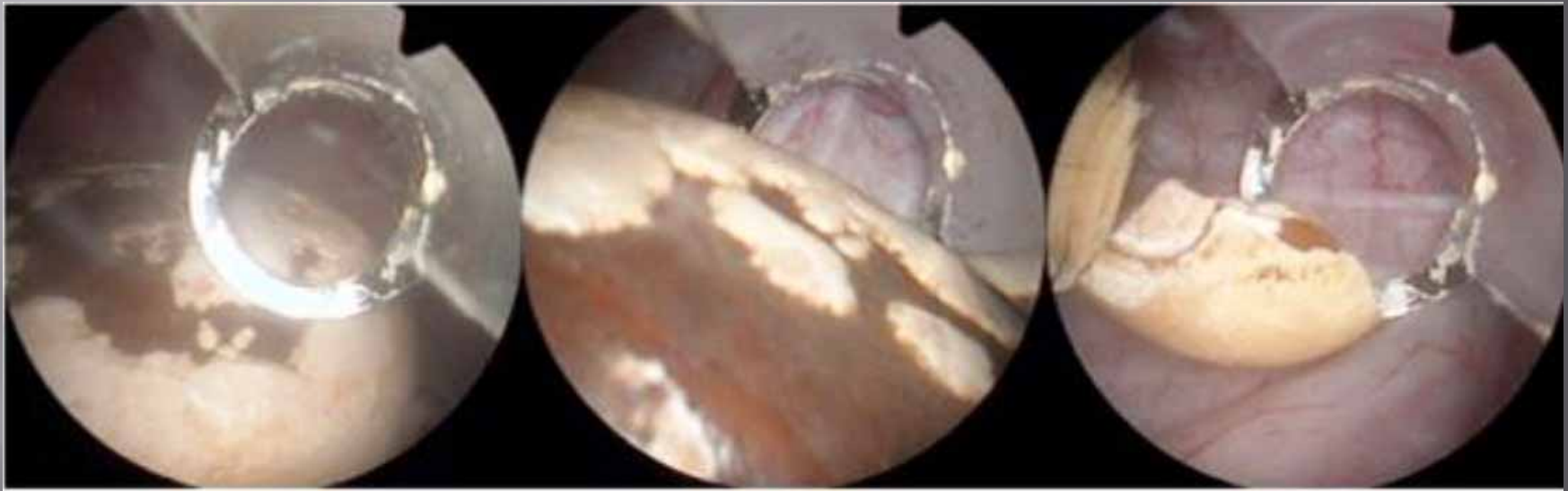
# Bladder Stones

- ▣ Traditionally open cystolithotomy +/- retropubic prostatectomy
- ▣ Cystolitholapaxy +/- TURP
- ▣ Lasertripsy

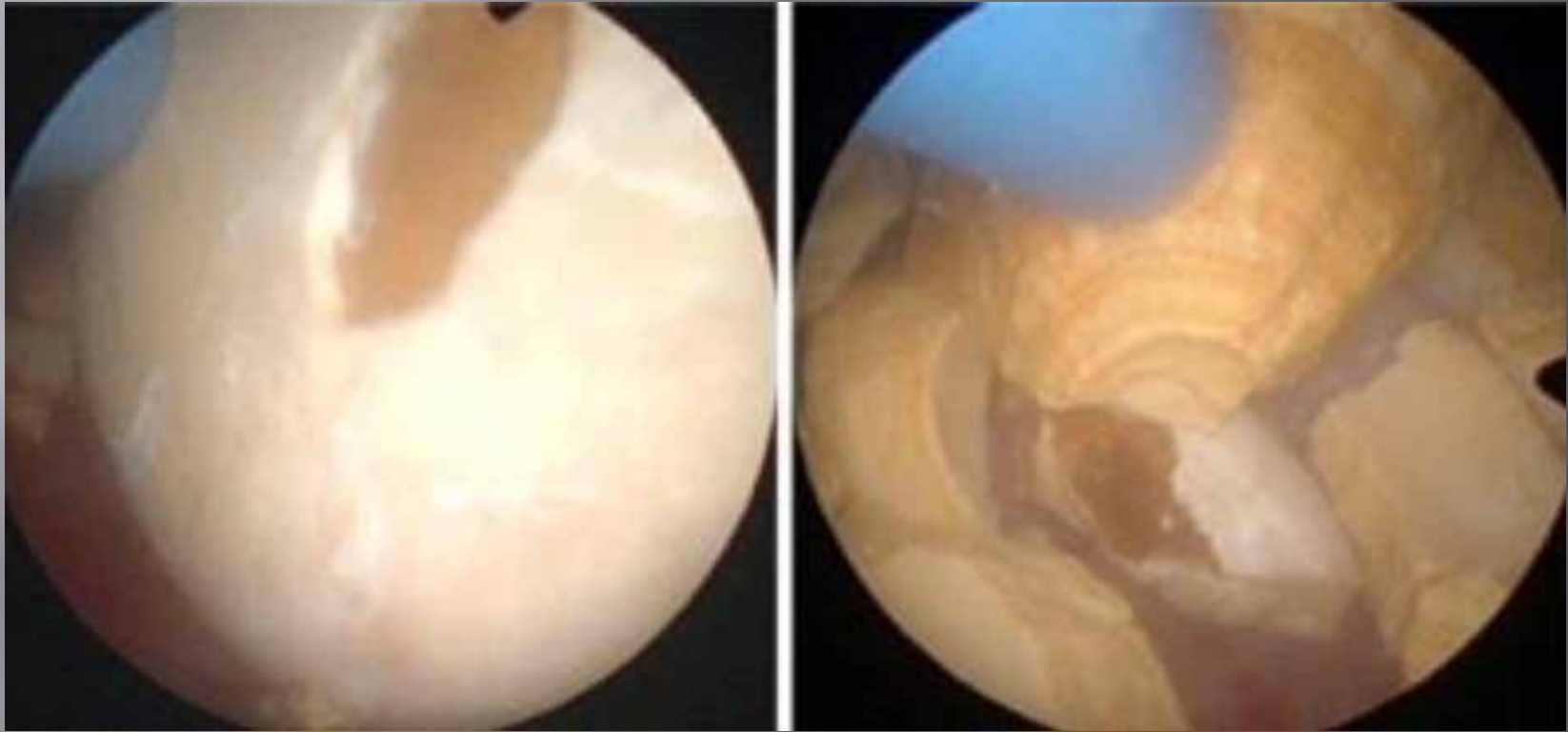
## ▣ Images



# Stone punch



# Electrohydraulic Lithoclast





# Lasertripsy



# Stent symptoms



- ❑ Bladder irritation
- ❑ Urinary frequency
- ❑ Painful micturition
- ❑ Haematuria
- ❑ Loin pain
- ❑ Dipstick urine will show WBC and RBC
- ❑ Encrustation

# Conclusion 1

## Modern instruments



- ❑ Fibreoptics, digital cameras and chip-on-tip
- ❑ Imaging 3-D CT urogram
- ❑ Smaller rigid ureteroscopes 4.5 Fr
- ❑ Flexible ureterorenoscopes
- ❑ Stone cone and nitinol baskets
- ❑ Holmium lasers

## Conclusion 2

### Successful management

- ▣ Rapid imaging & diagnosis CT or IVU
- ▣ Multiple modalities to treat kidney stones
- ▣ ESWL, Laser ureterolithotomy, Flexible renoscopy & lasering, Percutaneous nephrolithotomy, Nephrostomy tube insertion
- ▣ Ability to respond to urgent / emergency cases
- ▣ MDT approach
- ▣ Prevention

## Conclusion 3

### New advances

- ▣ Asymptomatic kidney stones should be treated
- ▣ Alpha-blocker increase spontaneous stone passage rate by 29%
- ▣ Stone density can be measured by Hounsfield unit (HU) on CT
- ▣  $HU > 1000$  very hard stone and ESWL failure

## Conclusion 4

### New advances

- ▣ Paediatric stone management
- ▣ Renal sparing ureterorenoscopy to laser remove TCC in ureter & collecting system
- ▣ Ureteroscopic laser widening of PUJ obstruction
- ▣ Rendezvous procedure to manage ureteric injuries and avoid open repair
- ▣ Endoscopic laser removal of TVT bladder erosion

## Conclusion 5

- ❑ Stone is merely a symptom of underlying disease
- ❑ Surgical intervention treat stones but do not solve underlying disease or prevent stone recurrences
- ❑ MDT approach

# New endourological management

- ▣ Endoscopic laser vapourisation of upper tract TCC
- ▣ Endoscopic laser widening of PUJ obstruction
- ▣ Flexible renoscopy and laser widening of calyceal diverticulum & stone removal
- ▣ Laser removal of eroded TVT into bladder
- ▣ Rendezvous procedure for ureteric injuries



# Modern instruments

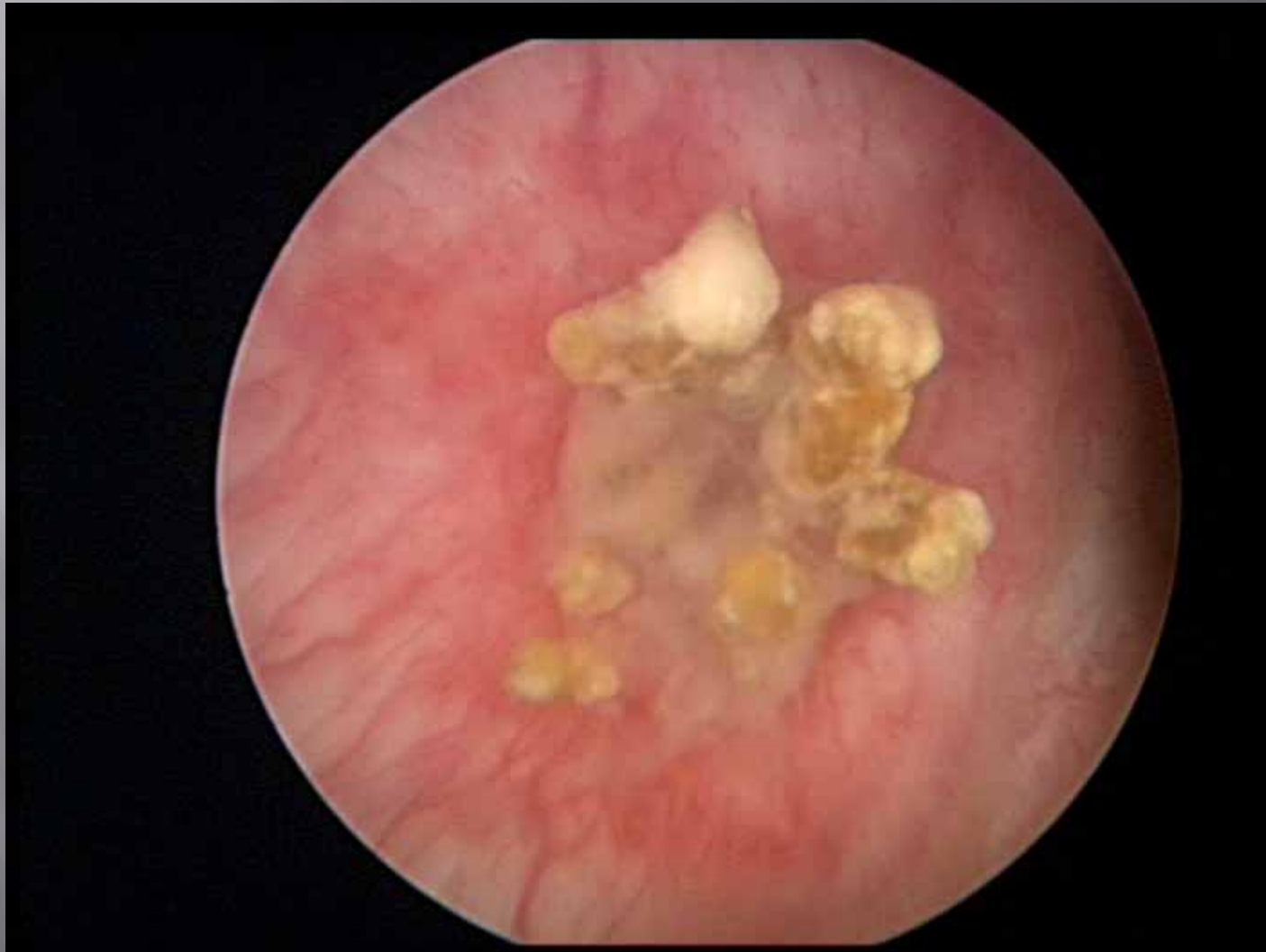


# Upper tract TCC

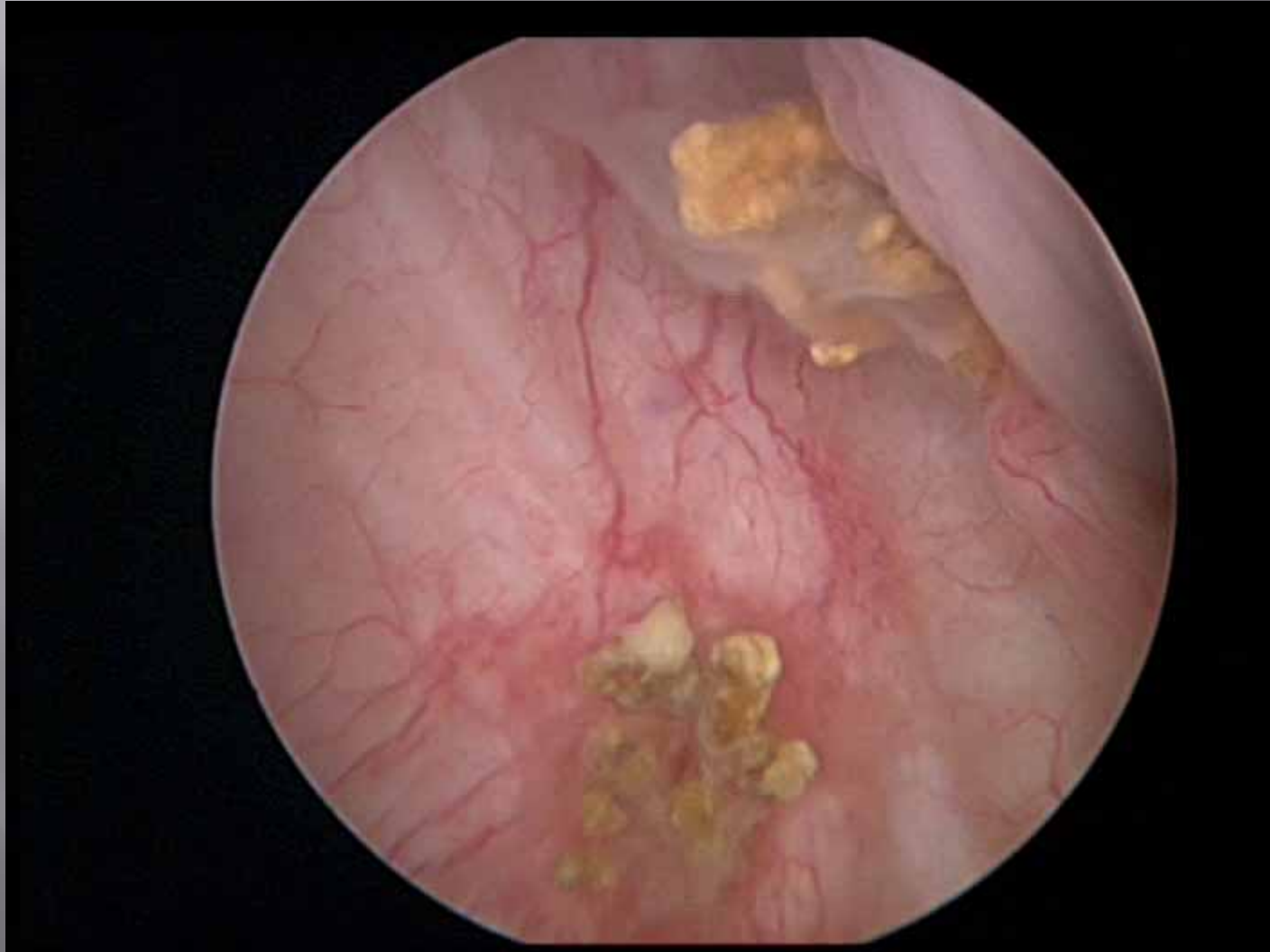


- ▣ Nephroureterectomy for upper tract TCC
- ▣ Endoscopic laser treatment effective and safe for low grade TCC
- ▣ Renal sparing

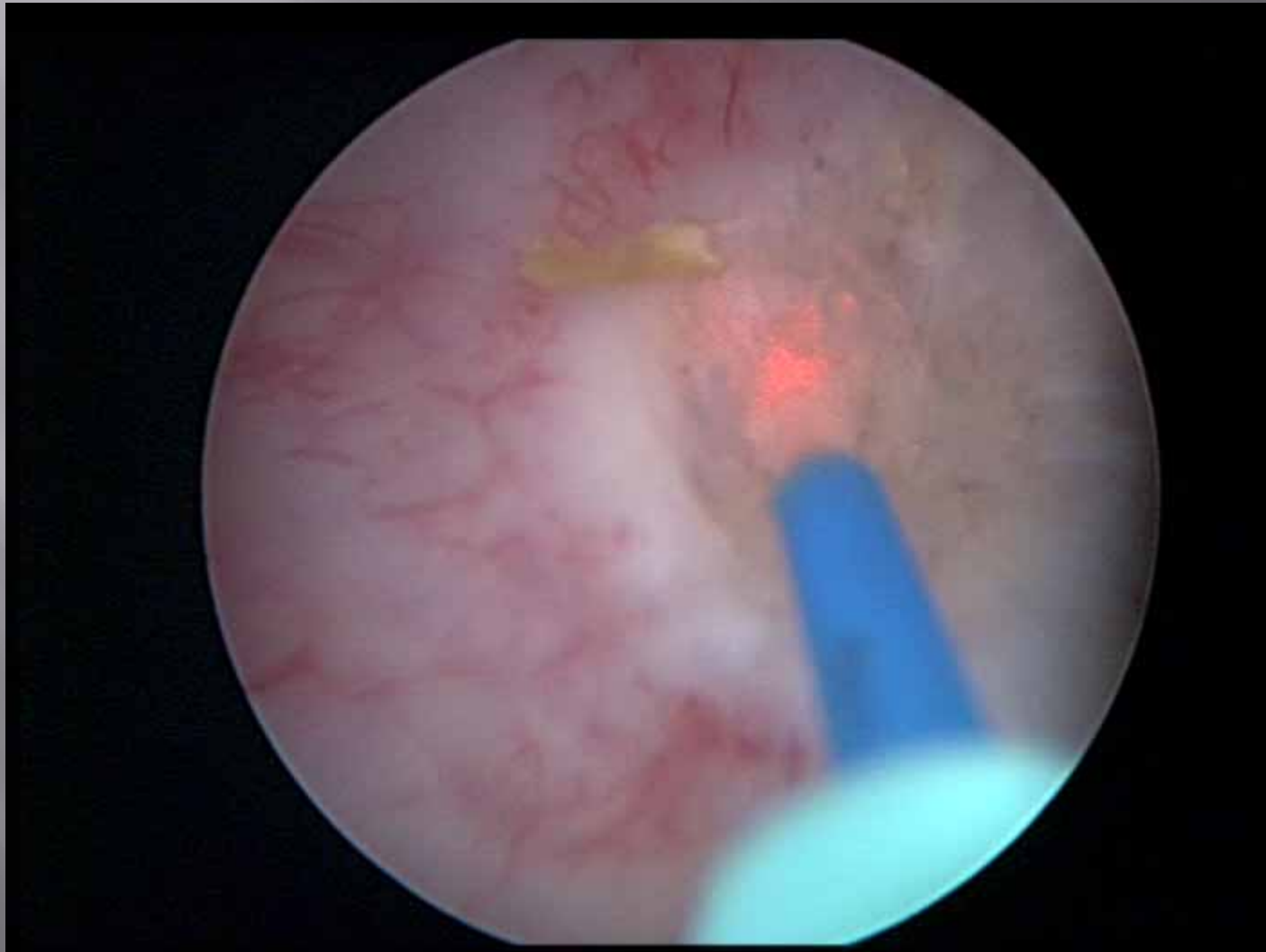
# Eroded TVT with stone formation



# Eroded TVT with stone formation

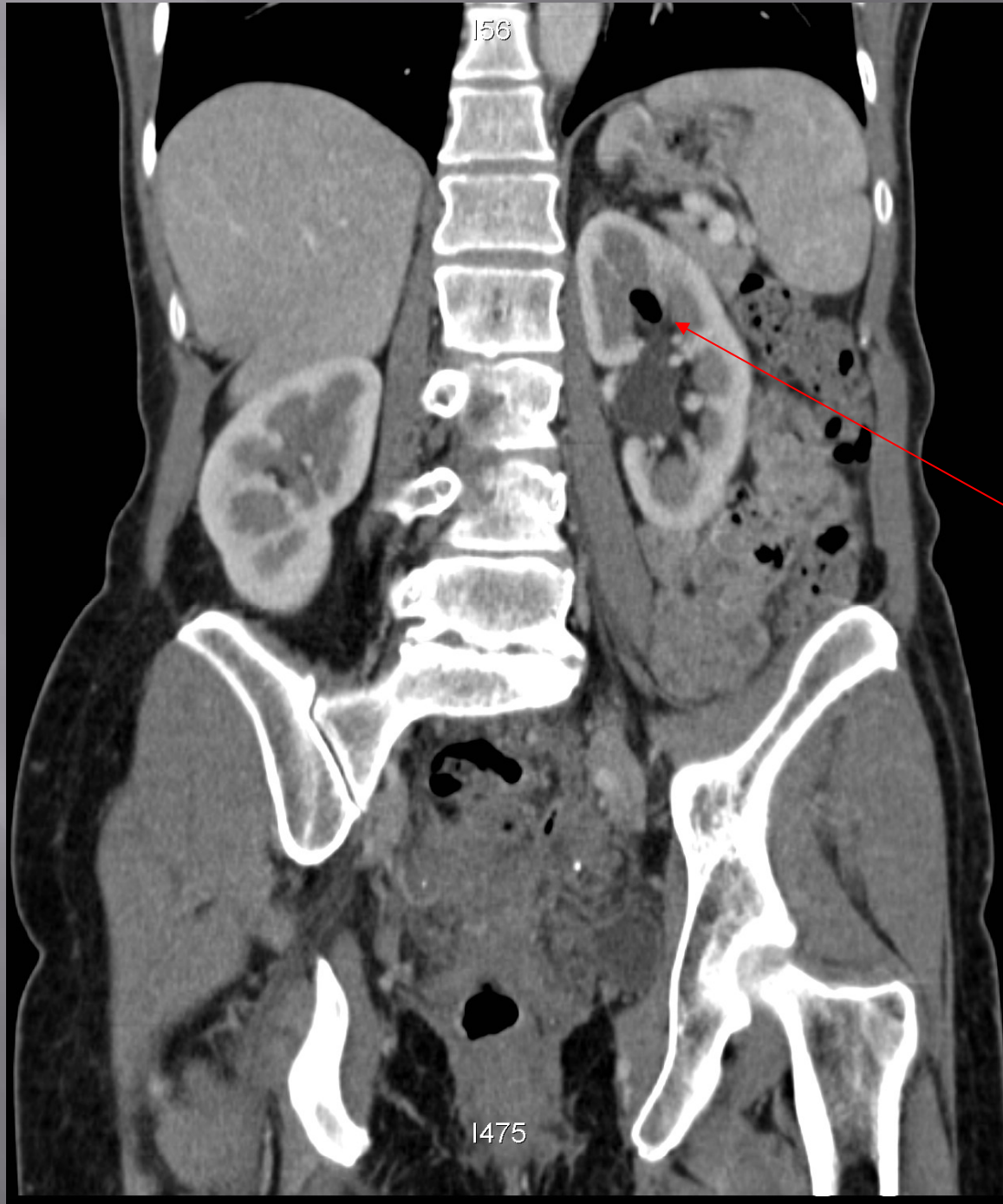


# Laser removal of Eroded TVT



# Post-lap-hysterectomy





Air in kidney

# Contrast in sigmoid from fistula





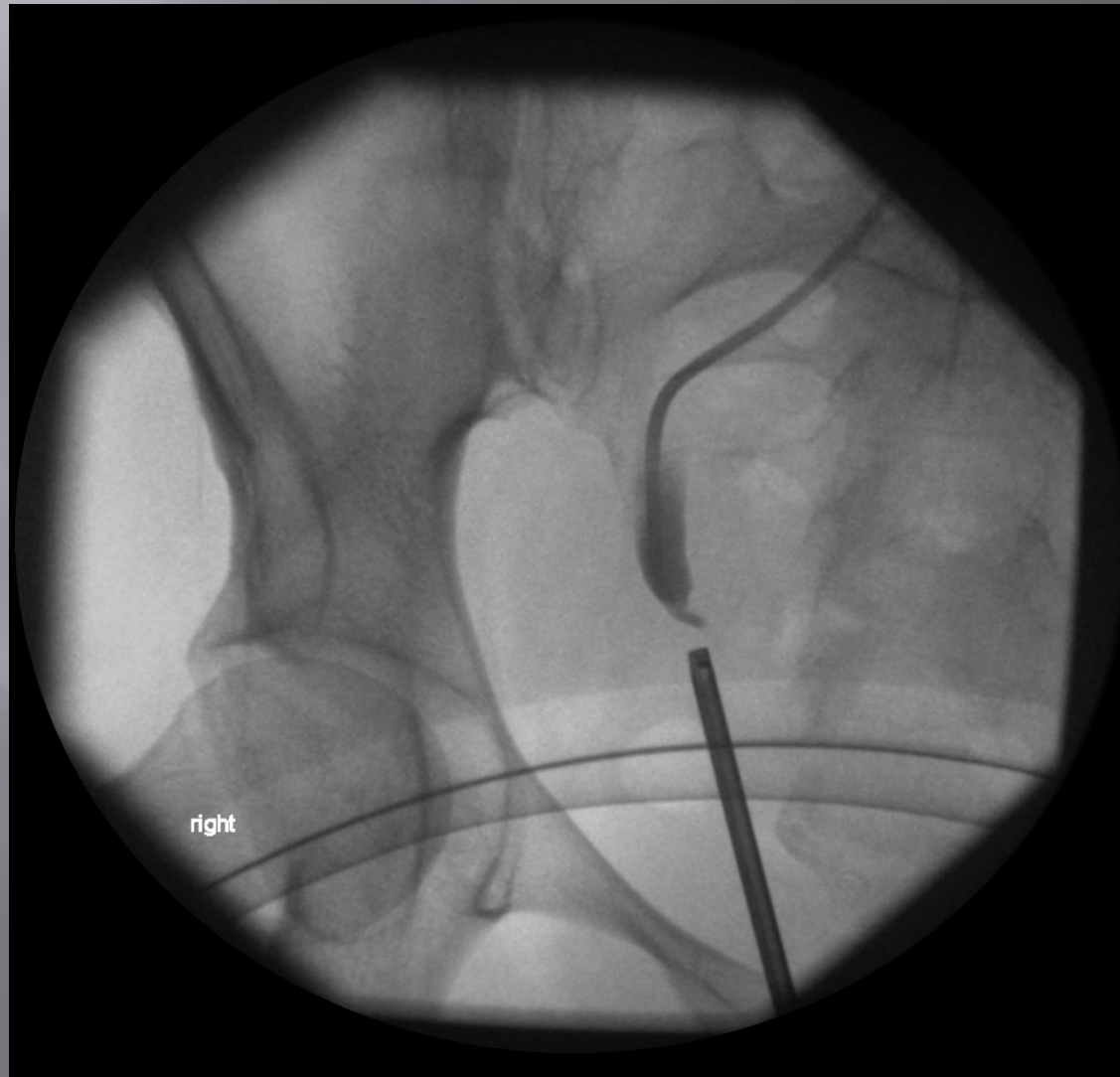
# Fistula into sigmoid and vagina



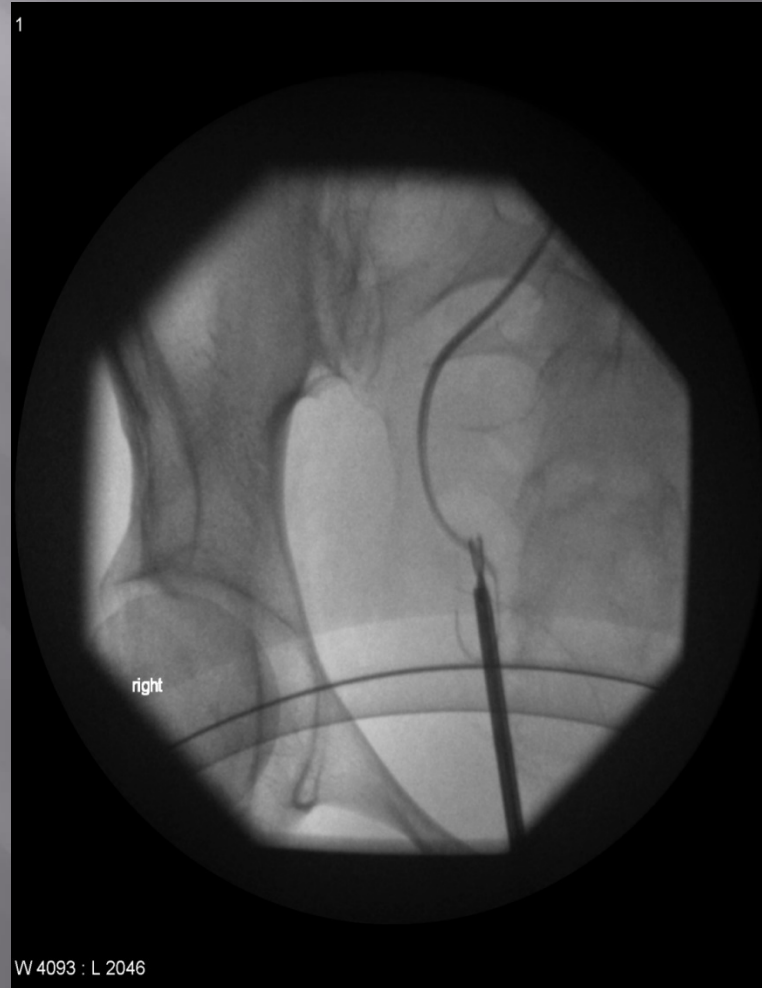
Contrast in sigmoid

Leak in vagina

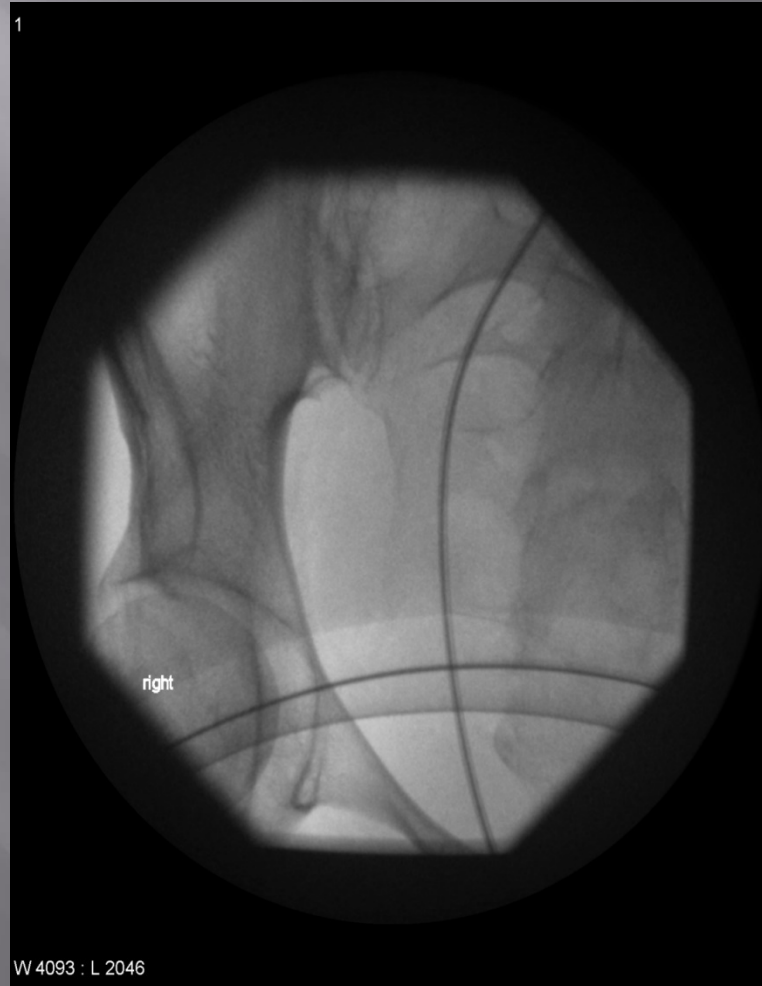
# Rendezvous



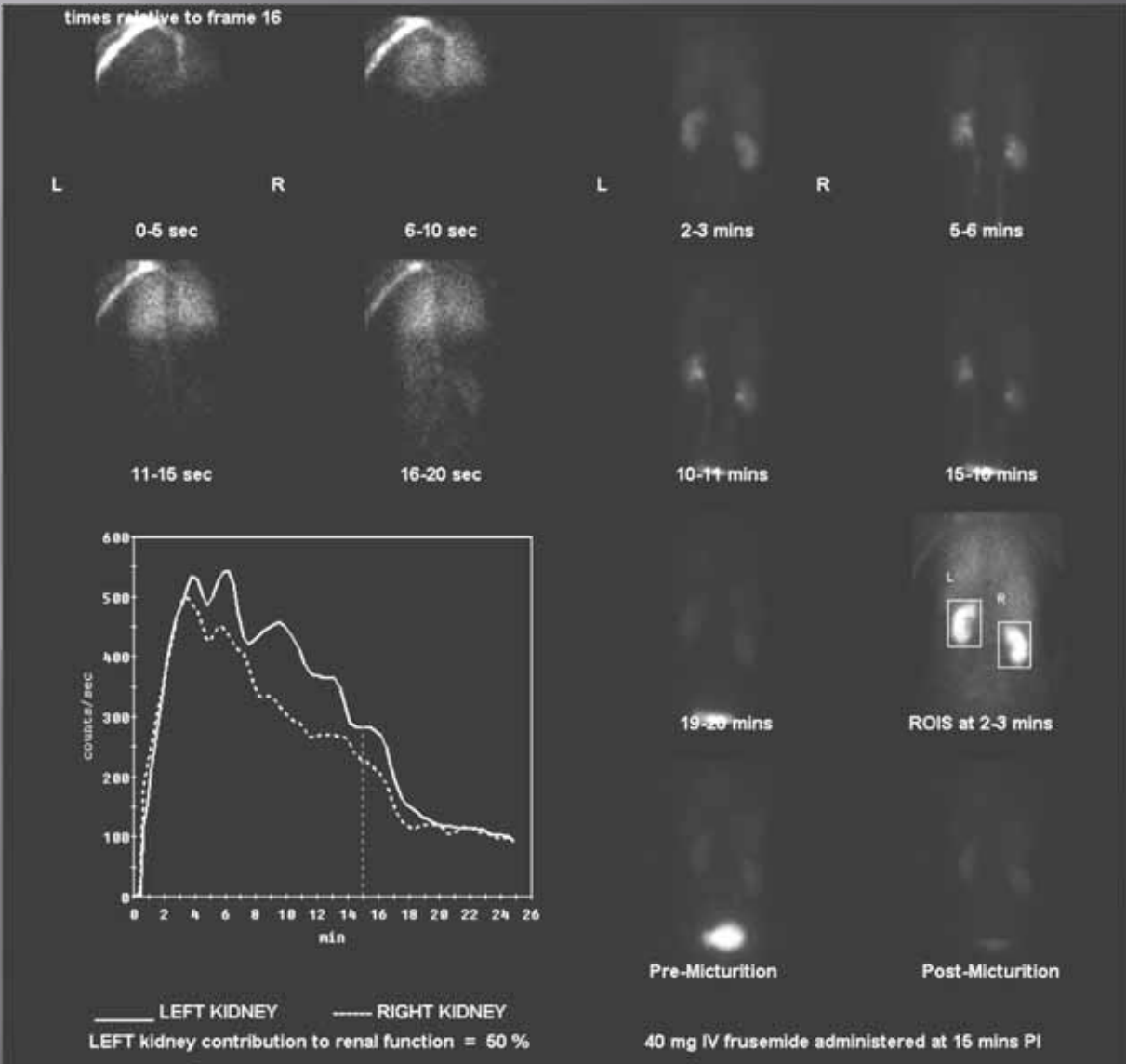
# Rendezvous



# Rendezvous



# MAG<sub>3</sub> renogram after 6 months



# Calyceal diverticulum



# Calyceal diverticulum



# Calyceal diverticulum





# Calyceal diverticulum



# Calyceal diverticulum

