URINARY CATHETERS & INSTRUMENTS

د علي وفاء الوفي

اختصاصي جراحة الكلى والمسالك البولية والتناسلية والعقم

الجامعة المستنصرية – كلية الطب

History

Urinary catheters have been known for more than 3500 years. The term 'catheter' is derived from the Greek word kathie´nai meaning to let down into, or send down. Romans named it syringa.

- Catheterizations were reported to have been accomplished with reeds, straws and curled-up palm leaves.
- The Sumerians, may even have used gold to make catheters.
- The next significant step forward was a flexible, more malleable catheter by Avicenna in 1036. Avicenna designed catheters
- Joseph Frederick Benoit Charriere, a French instrument maker developed the French scale, still the most widely used today, based on the metric system.
- Most indwelling catheters were taped or tied, and they were sometimes sewn to the urethral orifice in women
- In 1929 Dr Frederick Foley ordered Bard to make catheter for him, to which he attached an inflating tube and a balloon

- **The Anode Company, with the help of Dr Foley, produced a practical balloon catheter, now known as the 'Foley'.**

Catheter Characteristics

Urinary catheters can be divided into two categories:

1. **indwelling catheterization : permanent**
2. **intermittent catheterization: like in CIC (clean intermittent catheterization)**

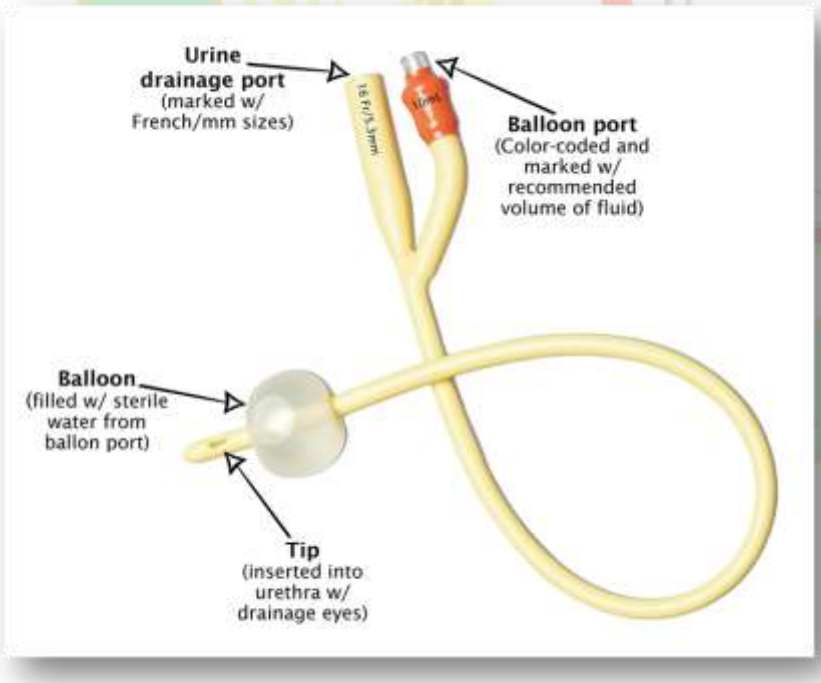
Types of Folleys catheter

<u>One way catheter</u>

have one lumen and no balloon. used in CIC

<u>Two ways catheter</u>

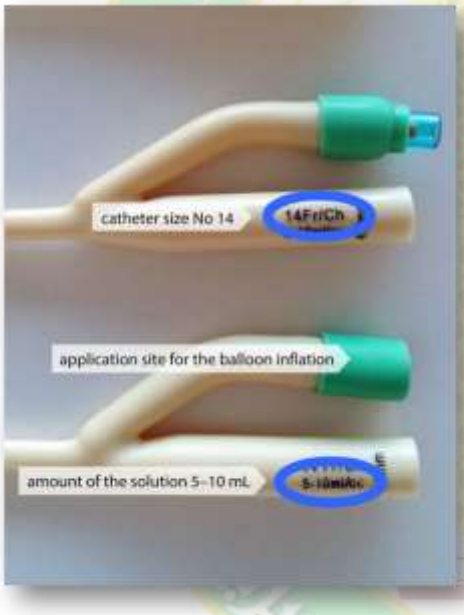
The central port for urine draining. the other with the valve for inflation/deflation of the balloon



Three ways catheter

Three ways catheter for continuous bladder irrigation to prevent clot formation and clot retention

The foley is labeled with the size of the balloon and the size of the catheter.

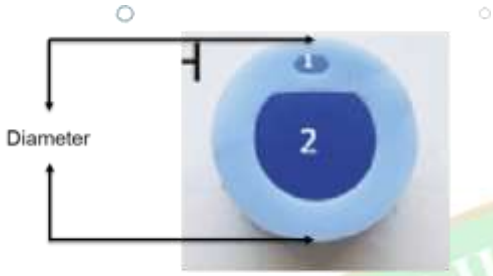


Catheter size

The accepted measurement unit for catheters is the French catheter scale, French gauge (Fr or F) or Charriere (Ch) based on the cross-sectional diameter of the catheter in millimeters.

The French size of urinary catheter is equal to three times the diameter of its cross section

For example, a 30 Fr catheter is 10 mm in diameter. As the size of the catheter increases, the diameter of the catheter lumen increases.



Cross section in a foley catheter

Recommendation is to use the smallest size catheter that will drain adequately. Catheter sizes are color-coded at the balloon inflation lumen for easy identification

Color	Size French	Size Millimeter
Green	6	2.0
Blue	8	2.7
Black	10	3.3
White	12	4.0
Green	14	4.7
Orange	16	5.3
Red	18	6.0
Yellow	20	6.7
Purple	22	7.3
Blue	24	8.0
Black	26	8.7

Saline, air, or Glucose water should not be used to inflate the balloon

Use distill water only.

Catheter length: standard length is 40 to 45 cm

Catheter Type and Material

1. **Rubber/Latex**
2. **Polytetrafluoroethylene (PTFE)**
3. **Polyvinylchloride (PVC)**
4. **Silicone-coated latex**

5. Silicone (100%)
6. Last 2 types are most commonly used

Catheter coatings

1. Non coated
2. Coated (e.g., silver alloy, hydrophilic)

INDICATIONS FOR USE OF URINARY CATHETERS

1. Diagnostic
2. Therapeutic

or

1. Short-term
2. Long-term

SHORT-TERM CATHETERIZATION

1. Acute urinary retention
2. Urine collection (Urine measurements, residual volume)
3. Urologic surgery
4. Surgery on contiguous structures
5. Urine output (medical, surgical)
6. Urodynamic studies
7. Radiology (cystogram)
8. Installation of antibiotics, chemotherapy, immunotherapy etc

LONG-TERM CATHETERIZATION

1. Refractory urine retention

not correctable medically or surgically

2. Neurogenic bladder
3. Incontinence

non-responders to specific treatment. terminally ill, severely impaired

CONTRAINDICATIONS

1. Local urethral sepsis.

2. Applying with pressure in urethral stricture.

3. Applying with pressure in suspected urethral injury.

4. Traumatic injury to the lower urinary track, like urethral tear.

5. High riding or detached prostate.

Method of CATHETERIZATION

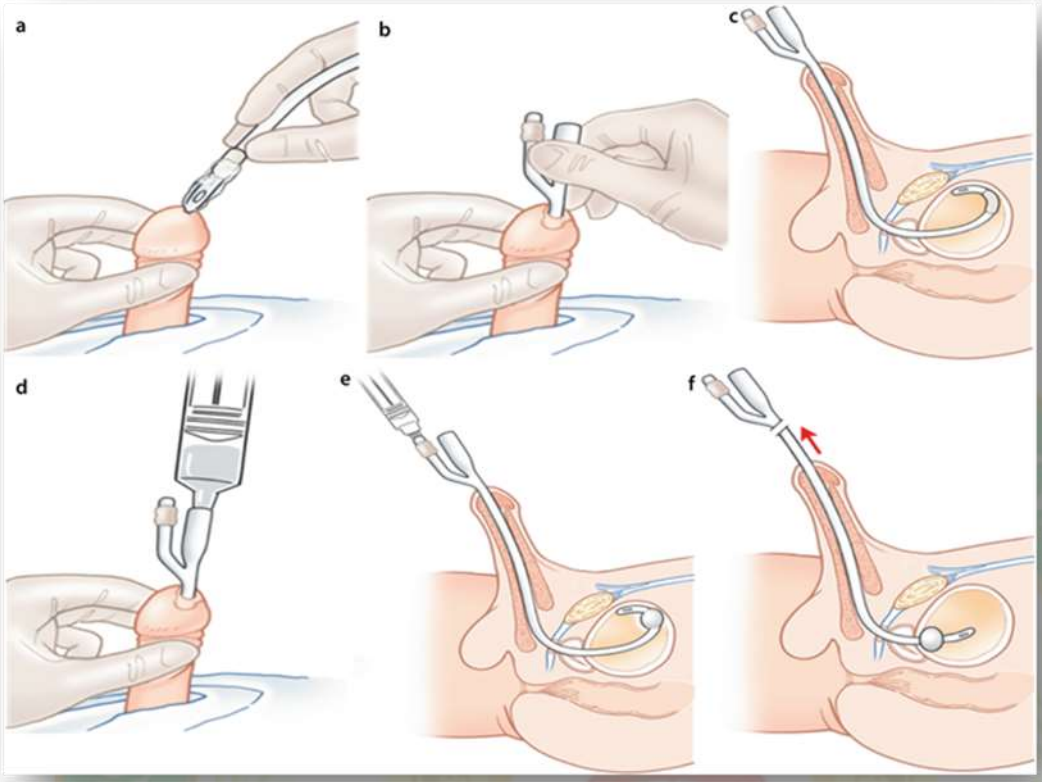
Place catheter all the way and wait for urine to come out of the drainage port.

Inflate balloon (10ml standard in adults)

Gently pull back on catheter till it stops.

Position bag below bladder level to facilitate drainage by gravity

Don't forget to retract foreskin to prevent paraphimosis



DURATION OF CATHETERIZATION

7-10 days for latex and 1 month for the silicone catheter.

COMPLICATIONS

1. **Inability to catheterize.**
2. **Infection, which may be introduced by the catheter.**
3. **Urethral injury, Urethral stricture**
4. **Psychological trauma.**
5. **Paraphimosis,**
6. **Hematuria .**
7. **Stone and encrustation**

8. Allergy or sensitivity to latex

9. Bladder cancer (only after long-term indwelling catheter)

CONDOM CATHETERS

Condom catheters can be used by men with incontinence. There is no tube placed inside the penis. A tube leads from this device to a drainage bag. The condom catheter must be changed every day.

SUPRAPUBIC CYSTOSTOMY CATHETER

INDICATIONS

1. Failed urethral catheterization
2. Urethral disruption
3. Long-term bladder drainage

CONTRA-INDICATIONS

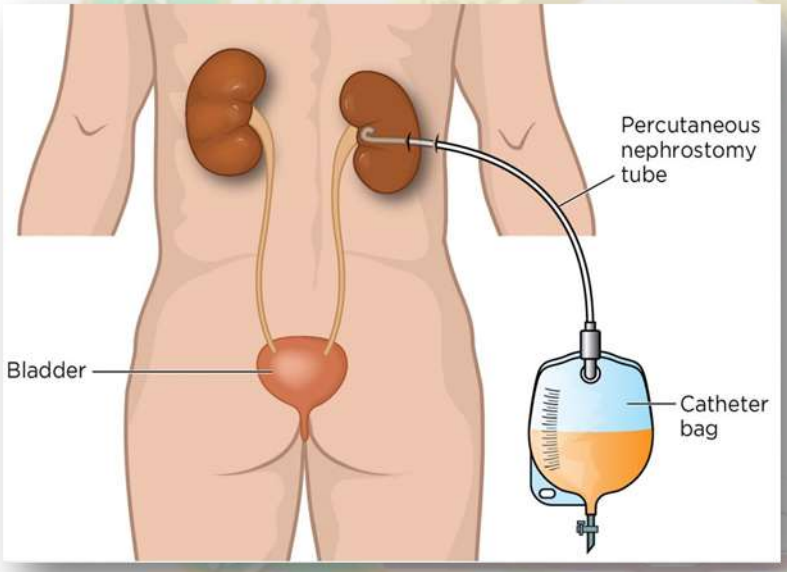
1. Non-palpable bladder

2. Previous lower abdominal surgery
3. Coagulopathy
4. Known bladder tumour
5. Clot retention

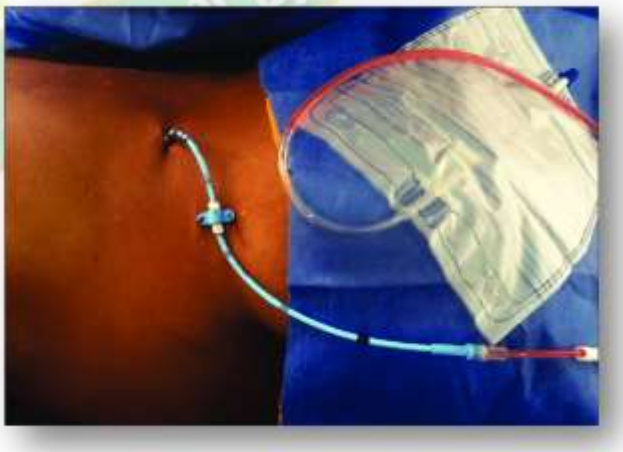
Percutaneous nephrostomy

A nephrostomy tube is a narrow-gauge pigtail drain inserted into the renal pelvis for the purpose of draining urine .

The percutaneous nephrostomy tube diverts urine away from the ureter and bladder into an externalized drainage bag



Indications for nephrostomy



- **<u>obstruction with</u>**

1. Rising creatinine
2. Acute renal failure
3. Loin pain
4. Urosepsis

- **<u>urinary diversion</u>**

1. Following a ureteral injury
2. Haemorrhagic cystitis

- **access for therapeutic interventions, such as:**

1. Stone removal
2. Antegrade stent insertion
3. Removal of foreign body, such as a broken ureteric stent
4. Delivery of medications
5. Ureteral biopsy

- **diagnostic testing**

1. Antegrade pyelography
2. Ureteral perfusion tests

JJ stents

These are hollow tubes with a coil at each end, which are inserted through the bladder (usually) into the ureter, and thence into the renal pelvis.

Indications and uses

1. Relief of obstruction: from ureteric stones; benign (i.e. ischaemic) ureteric strictures; malignant ureteric strictures.
2. Prevention of obstruction: post-ureteroscopy
3. Ureteric injury.
4. Large residual stone burden.
5. pre-ESWL

6. Passive' dilatation of the ureter prior to ureteroscopy.
7. Post-renal surgery to ensure antegrade flow of urine (e.g. pyeloplasty)

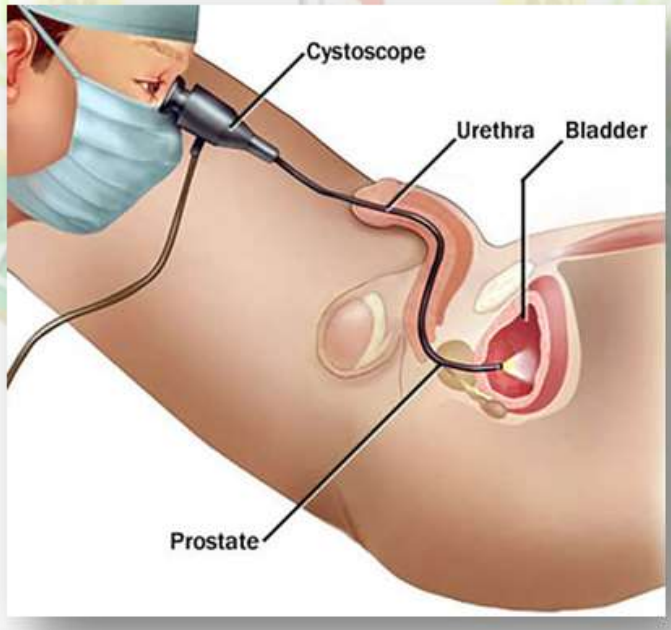
Symptoms and complications of stents

1. Suprapubic pain, loin pain
2. LUTS
3. Haematuria,
4. Inability to work
5. UTI
6. Stent migration
7. Forgotten stent, stone

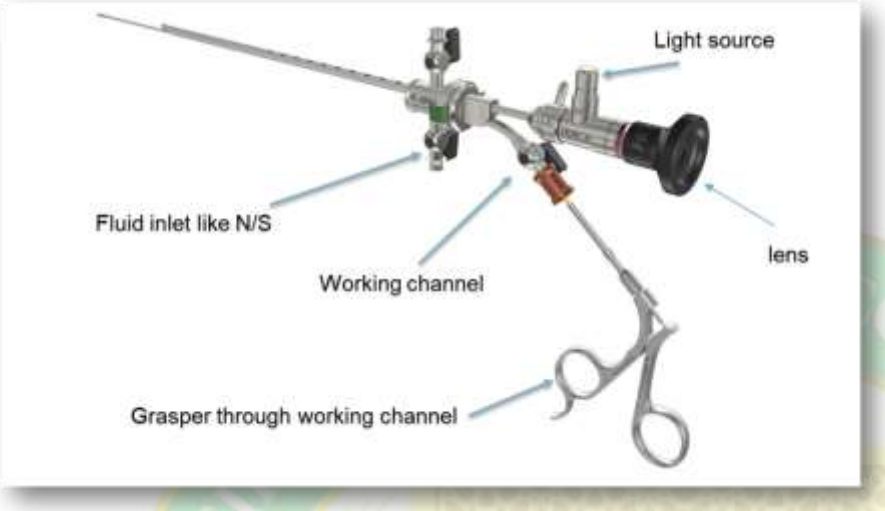
Cystoscopy

A basic skill of the urologist. Allows direct visual inspection of the urethra and bladder with necessary intervention

Flexible cystoscope

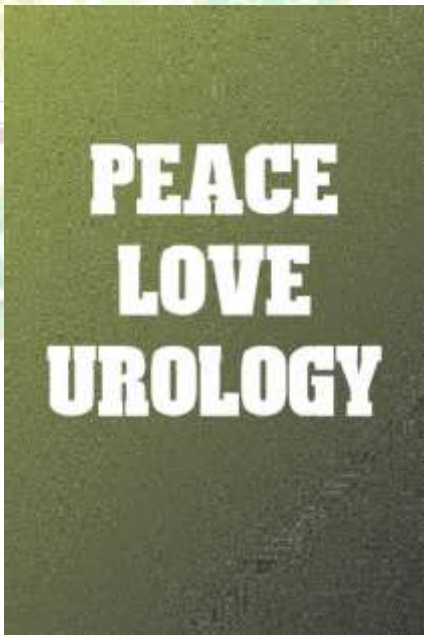


Rigid cystoscope



Important urology terms

- **TURT: Transurethral resection of bladder tumor**
- **TURP: transurethral resection of the prostate**
- **PCN: percutaneous nephrostomy**
- **PCNL: percutaneous nephrolithotomy**
- **Cystolitholapaxy: transurethral fragmentation of bladder stone**
- **Optical urethrotomy: incision of urethral stricture**
- **RIRS: retrograde intrarenal surgery**



Today, when a patient is given a sterile well packed disposable catheter, It is good to know and to appreciate how difficult and how painful catheterization of the bladder was until only a few decades ago.