UROLOGY

BPH

Cause/ RF

Old age
- In **transitional zone**

Sx

- LUTS = FUN WISE
- **DRE – smooth, symmetrical soft with central sulcus**
- **Abdo exam**

Ix

- Urine freq. volume chart (pre and post void bladder USS)
- Urine dipstick

PSA – glycoprotein enzyme that thins thick semen into liquid consistency after ejaculation

High false positive elevation in:
- Prostate cancer
- Prostatitis
- UTI
- BPH
- Saddle inj (rigorous cycling)
- Recent ejaculate
- Prostate trauma (IDC)

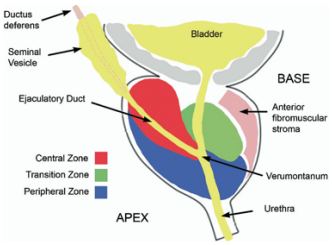


Fig. 1. Sagittal view of prostate gland that specifically illustrates

Mx

Conservative – if mild symptoms
- Void before sleep
- Reduce fluid PM intake
- Reduce EtOH, caffeine
- Remain calm
- Avoid double voiding
- Minimise meds (e.g. anti-histamine, decongestants)

Medication
- **Alpha-blockers (tamsulosin/Flomax)**- relax SMC (rapid Sx improvement) → **risk of postural HypoTN (check lying and standing BP)**
- **5A-reductase inhibitors (finasteride/Proscar)** – reduce prostate size taken 6/12 for effect→ **sexual dysfn (↓ DHT)**
- **Duodart (combined)**

Surgery:
- **TURP** – resectoscope inserted into urethra and removed using diathermy loop
- **HoLEP** – Holmium laser enucleation of prostate
- **Robotic or open prostatectomy**

Complications of surgery:
- **General**: Bleeding, Infection, failure to resolve symptoms
- **Specific:** Urinary incontinence, ED, retrograde ejaculation, urethral strictures

Recommended follow-up timeline after BPH treatment

Treatment modality	First year after treatment			Annually thereafter
	6 weeks	12 weeks	6 months	
Observation and review	X	X	✓	✓
5α-reductase inhibitors	X	✓	✓	✓
α-blockers	✓	X	✓	✓
Surgery or minimal invasive treatment	✓	✓	✓	✓

Prostate cancer

Cause/ RF
- Advanced age
- FHx
- Tall stature
- Anabolic steroids
- Black African or Caribbean

Types of prostate cancer:
- Acinar AC
- Ductal AC
- Urothelial carcinoma

In **peripheral zone**

Sx

Asymptomatic
- FUN WISE
- Haematuria
- ED
- Sx of metastatic disease (e.g. UWL, bone pain, cauda equina)
- **DRE – firm, hard, asymmetrical, craggy with loss of central sulcus**
- **Abdo exam**

Ix
- **Urine dipstick**
- **PSA –** elevated due to epithelial cells
- **1st line = Multiparametric MRI (PI-RADs) from 1-**5 (1 = very low suspicion, 5 = definite cancer)
- **Prostate biopsy (if PI-RADS ≥ 3) transrectal US guided biopsy OR transperineal biopsy**
  - **General risk** = pain (lower abdo, rectal, perineal) , bleed (stools, urine, semen), infection
  - **Specific risks** = Urinary retention, ED
- **CT-PET (PSMA)⟶ Most common mets sites = Lymph nodes and bones**
- **Isotope bone scan (bone scintigraphy)** = bony mets (IV radioisotope injection → wait 2-3 hrs → gamma camera)
- **Gleason grading system (what is best Rx)**
  - **1st number** = most prevalent pattern in biopsy
  - **2nd number = 2nd most prevalent in biopsy**

Risk category	Low	Intermediate	High
Stage	T1/2	T1/2	T3/4
Gleason grade	2-6	7 (3 +4 lower risk than 4+3)	8-10
PSA	<10	10-20	> 20
Mortality in 10-15y	< 15%	15-50%	> 50%

- **TNM staging**

T (tumour)	N (nodes)	M (mets)
• Tx – cannot assess size • T1 = too small to see • T2 = contained within prostate • T3 = extends out of prostate • T4 = spread to nearby organs	• Nx = cannot assess nodes • N0 = NO nodal spread • N1 = spread to LN	• M0 = no mets • M1 = mets

Mx

Surveillance or watchful waiting in early prostate cancer
- If early prostate cancer
- Asymptomatic

Androgen deprivation therapy- Hormone therapy
- *REDUCE androgen levels to minimise cancer growth*
  - Used in combination with RT or alone
- Androgen receptor blockers (e.g. bicalutamide)
- GnRH agonists (e.g. goserelin – Zoladex or leuprorelin -Prostap)
- *Comp. = hot flush, sexual dysfn, gynacomastia, fatigue, OP*
- *1st line OP prevention = resistance exercise + vitamin D level*
- *2nd line OP Rx = bisphosphonate 1/52 and denousmab 6/12 injection*

	MoA	Effect	A/E
α-blocker (minipress/ *prazosin or tamsulosin*)	Block a-1a adrenoceptor [ORAL].	• Relax prostate SMC • relax bladder neck	• Post. hypoTN + palpitations • N/V, headache • Blurred vision & oedema
Anti-muscarinic (*oxybutynin*)	M3(ACh) [ORAL or patches]	• Inhibit detrusor contraction = relax bladder	• ANTI-SLUDGE • High PVR (acute urinary retention) • Cognitive impairment (beware in old)
5a-reductase inh. (*finasteride*)	Stop TT -> DHT (active) [ORAL]. **Take 6/12 for effect**	• Reduce prostate size • Check PSA before starting	• ED • Reduced libido • Tender breasts
Combined therapy	a-blocker + 5a-reduct inh. (duodart) [ORAL].	• More effective + reduce risk of urinary retention	• Postural HypoTN • Retrograde ejaculation • ED, impotence, altered libido

External beam radiotherapy directed at the prostate
- *Complications = proctitis = pain, altered bowel habits, PR beleed, discharge*
- Rx: prednisolone suppositories to reduce inflammation

Brachytherapy
- Radioactive metal "Seeds" into prostate (targeted)–**iodine, Cs, Strontium**
- Alternative = **injectable radionucleotides using**
  - **Radium 223 if bony mets)**
  - Lutetium 177 – highly specific therapy – irradiates cells with PSMA – only for high grade cancers
- *Comp. = inflammation of adjacent organs (e.g. cystitis, proctitis)*
- *A/E = ED, urinary/faecal incontinence + ↑ ↑ risk of bladder or rectal cancer*

Surgery
- Radical prostatectomy (robotic vs open)
- *Comp. = ED + urinary incontinence*

Prostatitis

Cause/ RF

Inflammation of prostate due to:
- Sexual ejaculation
- STI / UTI
- Saddle injury

Sx
- Pelvic pain
- LUTs
- Sexual dysfn
- Painful bowel movements
- **Acute bacterial** = fever, myalgia, nausea, fatigue and sepsis
- **DRE – enlarged, tender and warm**
- **Abdo exam**

Ix
- **Urine dipstick** – confirm inefection
- **Urine M/C/S** – identify causative organism
- **C+G NAAT testing** (1st pass urine) if STI suspected

Mx

Acute bacterial prostatitis
- **Admit if septic or unwell**
- **Oral Abx** (quinolones, trimethoprim) typically for 2-4 weeks
- **Analgesia (NSAID)**
- **Laxatives** (for pain during bowel movements)

Chronic bacterial prostatitis
- Alpha blockers (tamsulosin)
- Abx (trimethoprim or doxy for 4-6 weeks) if < 6/12 of symptoms
- **Analgesia**
- **Laxatives** (for pain during bowel movements)

Main complications:
1) Sepsis
2) Prostate abscess
3) Acute urinary retention
4) Chronic prostatitis

Genitourinary Tumour – PROSTATE CANCER

- Mr. BA 68 sees GP for routine medical check up
- CABGS x 3 10 years ago, on daily aspirin. Otherwise well.
- No FHx of prostate cancer

What would you recommend regarding prostate cancer screening?

A. Don't mention prostate screening as it is currently not recommended by National guidelines

B. After discussion (must inform), perform PSA as part of routine blood checks after age 50

C. **After discussion** perform PSA and DRE after age 50 **(DRE = NON-specific test → only do if PSA is high)**

D. Other

Choice to screen depends on pt's choice = hence need discussion!

- He elects to have a PSA which was elevated at 8.6 (normal PSA = 5)
- DRE normal. Mild LUTS.

What is your recommended management?

A. Do nothing. Repeat PSA 1 year.

B. Give antibiotics and repeat PSA in 2-3 months

C. Recommend biopsy

D. Start treatment

*Borderline elevated PSA - insufficient data points to increase suspicion of prostate cancer (**no trend**)

*Begin ABx to treat for possible prostatitis + review (**check if PSA drops**)

- Has 2 weeks of antibiotics
- Then repeat PSA performed 3 months later
- PSA elevated at 8.8.

What would you do?

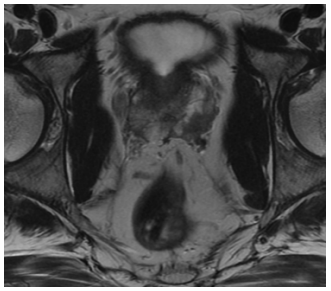
A. Proceed straight to biopsy

B. MRI scan

C. Continue to observe with regular PSA's

All equally valid – MRI = Non-invasive imaging for possible mass

Can also continue to check PSA before proceeding with MRI then biopsy



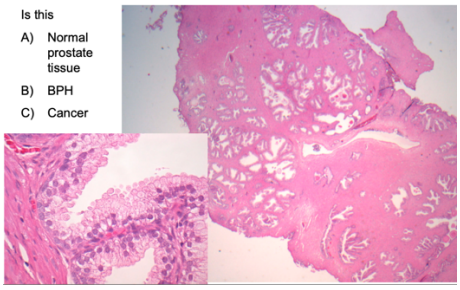
Proceeded with T2 MRI prostate

- Bladder = top
- Rectum = bottom

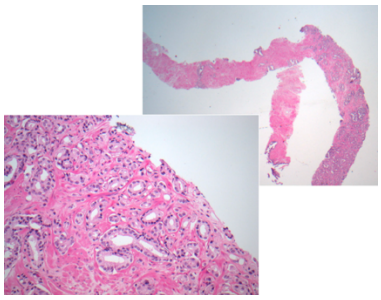
Proceeded to do a transrectal U/S and prostate biopsy

- Need to 1st core biopsy multiple areas
- Possible spread of the cancer

*Nb: *Mildly increased PSA* – prostatitis, BPH, prostate cancer, trauma

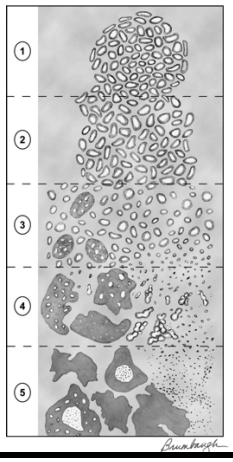


- **Benign gland area– multiple glands**
  - Normal + BPH
- Left image – flat myoepithelial cells present as second layer = indicates benign
- Prostate cancer – NO myoepithelial cells
- BPH = overgrowth of normal tissue



In same specimen = prostate cancer:

- Small glands + fibrous tissue → important for Gleason grading
- Some glands are fusing together causing disrupted architecture
- PROSTATIC acinar carcinoma

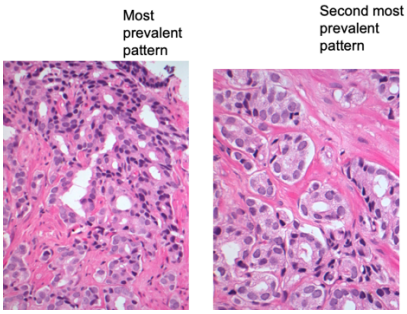


Gleason grading (from 3-5)

- Grade 1/2 = do not exist
- Lowest grade = 3 (cancer) = separation of glands by fibrous tissue
- Grade 4 =glands fusing together
- Grade 5 = solif growth and single cell infiltration in adjacent parenchyma

Prostate cancer:

- ➢ No myoepithelial
- ➢ Small glands only



Gleason grading = most prevalent pattern (primary grade) + 2nd most prevalent (2nd grade)

- Grade 4 + Grade 3= 7 ➔ Overall grade group 3 (glands fusing) + (glands not fused)

Problems with Gleason grading system:

- People can have same Gleason grade score **BUT** have different prognosis
- i.e. 3+4 is better than 4+3
- Can scare patients (as lowest score is 6)

Changed gleason grade into a risk group:

- Grade Group 1 is 3+3=6
- Grade Group 2 is 3+4=7
- Grade Group 3 is 4+3=7
- Grade Group 4 is 4+4=8
- Grade Group 5 is Gleason 9 or 10 (4+5, 5+4 or 5+5)

1) Easier understanding for pts

2) Help delineate & stratify prognosi

- **Mr BA was found to have a Gleason 4+3=7** (risk group 3) carcinoma in 6 of 12 cores all from left lobe.
- bPSA 8.8 and no disease palpable on rectal exam

What staging investigations would you recommend?

A. Bone scan

B. CT abdo/pelvis

C. PSMA scan

D. A+B+C

Minimise dosage

- ➢ Most high yield = CT abdo/pelvis (as 4+3) has moderate risk of mets compared to 5+5
- ➢ **Nb: if grade 5 = do all above Ix**

What treatment would you recommend if Mr BA (T1c/Gl 4+3=7/bPSA=8.6)?

A. Active surveillance/watchful waiting (only if low risk)

B. **Maximal TUR** – NO (As you might miss margins and other areas e.g. LN, seminal vesicles) → reserved only for BPH

C. *Radical prostatectomy* **–** as Mr BA has med risk of prostate cancer → more info about any LN, neural invasion

Risk of : Urinary incontinence, Erectile dysfunction

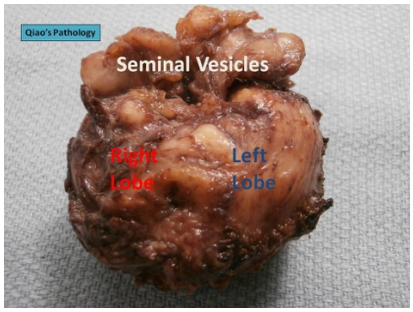
D. *Seed Brachytherapy* → direct therapyfor high grade cancers if surgery not applicable or older pt w/ no benefit from prostatectomy

E. *External beam radiotherapy* → if no METs (to bone, colon)

Pathology report needs to include 10 things.

What are they?

1. Tumour type
2. Location to correlate with what was found on radiology
3. Size & Volume
4. Margins
5. Vascular & LN invasion
6. Perineural invasion (not specific as 80% show neural invasion)
7. stage
8. grade (gleason score)
9. Outside prostate:
   - Seminal vesicles
   - LN involvement (pelvic + inguinal)
10. **Diagnosis (most important finding)**

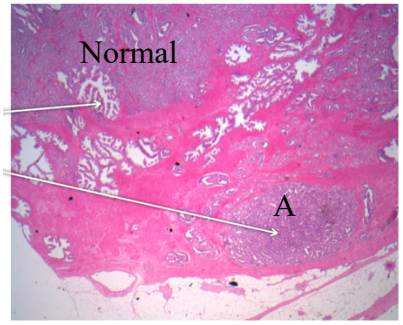


Gross specimen of resected prostate gland

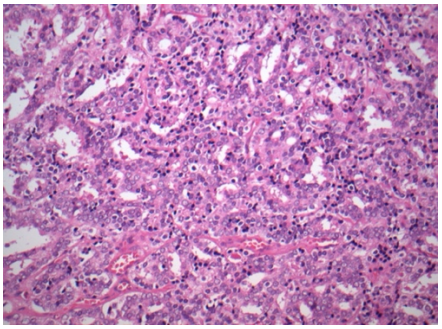
- Vas deferens = tubes entering either side of seminal vesicles

A/E of radical prostatectomy:

- ➢ Erectile dysfn + urinary incontinence
- ➢ Infection, bleeding, pain

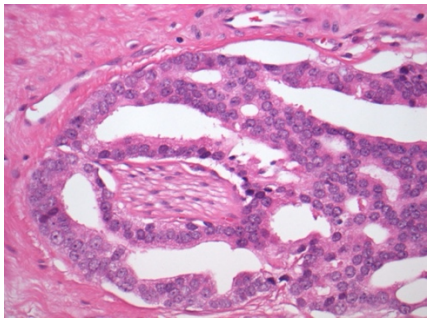


Prostate cancer located in A



What gleason grade?

Gleason grade 4 (fusion of glands with no single cell solid tumours)

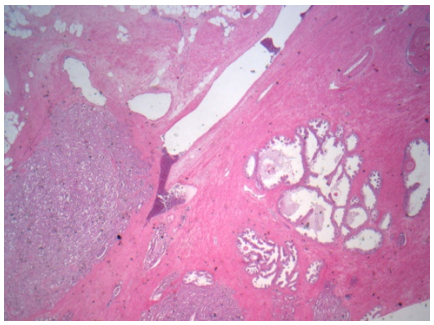


What does this slide show?

PNI (as axons present) with carcinoma around schwann cells

NO vascular invasion as no cells inside vessels

He sees surgeon 6 weeks after RP. Surgeon informs him that he has removed all obvious cancer though it was a larger size growing outside of the prostate and involving SV's. Post op PSA 0.01.



Arrows marking outside of prostate:

A. Gleason grade 3 cancer
B. Vascular invasion
C. Extra prostatic extension (poorer prognosis)
D. Other

Pathology report:

- Radical prostatectomy: Prostatic adenocarcinoma
- Gleason score 4+3=7 (Grade group 3)
- Left posterior quadrant
- Focal extraprostatic extension at base
- Seminal vesicles involved.
- Margins positive
- Right and left **pelvic & inguinal lymph nodes**: 0/2 nodes involved
- TNM stage: PT3b, No, MX. (staging after surgery)
- Overall stage: III

Would you recommend any further treatment?

A. **Nil** (as there has been EPE + stage 3)
B. **Hormone therapy** (if prostatectomy not needed esp. if mets) – won't treat anything if PSA is low
C. **Chemotherapy** (less specific therapy – many other complications → reserved for mets)
D. Radiotherapy/brachytherapy -Targeted EBRT is BEST for EPE and margins were involved
E. **Radiotherapy and hormone therapy** – no as HRT not used for adjunctive therapy

After given adjunctive RT, his PSA values were:

- 12 months – PSA 0.08 /
- 24 months PSA 0.16 /
- 36months PSA 0.40

What do you tell Mr BA?

A. His cancer has come back
B. Nothing to worry about
C. Many causes for PSA rising in this situation
D. Needs further tests + Ix (e.g. FBC, CRP - ?prostatitis)

PSA doubling every year (quite slow) = observing reasonable as we want to determine if there has been mets BUT reasonable to do further Ix

Mr BA is observed and PSA rises to 3.2 at 48 months and 7.6 at 60 months post surgery. Repeat bone scan and CT scan clear.

What do you recommend?

A. **Continued observation** - Sig. rising PSA is concerning
B. **Hormones** - reasonable as there is something to target w/ hormones
C. **Chemotherapy** – too extreme?
D. **Radiotherapy** – nothing to target!! Clear bone and CT scan
E. Other

?Returning cancer w/ rising PSA after prostatectomy
Target outside = androgen deprivation therapy (LHRH agonist e.g. goserelin)

He is started on hormonal therapy. Is the likelihood of a "response" (ie PSA falling)

- Also found 5 small bone mets on PSMA
- Nb: PSMA scan only offered if high-risk

A. Very high – greater than 90%
B. Good 70-90%
C. Moderate 40-70%
D. poor <40%

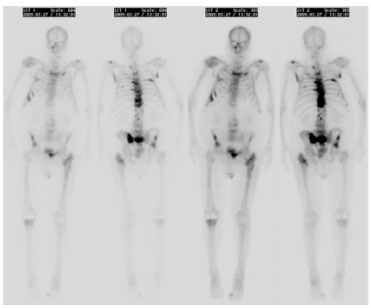
Does this treat offer a potential to be "cured" of his cancer

A) Yes

B) No – as this treatment is only suppressing prostate cancer but never eliminates as prostate cancer can become unresponsive to hormonal therapy over time

He is started on hormonal therapy which removes his testosterone and causes hot flushes and mood changes.

- After 3 years his PSA starts climbing.
- By 6 years his PSA is 72 and a bone scan shows multiple metastases which is causing pain.



Why is bone mets so common in mets prostate ca?

Venous plexus system between prostate cancer and spine – easy travel for met cells from prostate to vertebral spine

A medical oncologist recommends chemotherapy.

What Is the aim of chemotherapy?

~~A. To improve quality of life (chemo many A/E e.g. PN, N/V/D, headache, weakness)~~
B. To improve survival
C. Offers a small chance of cure ➔ we are never going to cure prostate cancer
D. To improve financial situation of medical oncologist!

RENAL STONES, BLADDER CANCER AND RENAL CELL CARCINOMA

	Renal Stones	Bladder Cancer	Renal Cell Carcinoma
Cause/ RF	**Promotors** ➢ Previous Stone ➢ Dehydration ➢ Raised Ca = MM, HPTH, ➢ ++purine diet /gout (**uric acid stones**) ➢ Carbonated drinks (contain phosphoric acid = ↑**Ca oxalate**) **Inhibitors** ➢ Citric acid ➢ Hydration	➢ Advanced age ➢ Smoking ➢ **Aromatic amines (dye, rubber**) – carcinogens ➢ Schistosomiasis = SCC ➢ Cyclophosphamide ➢ Irradiation	➢ Smoking ➢ Obesity ➢ Hypertension ➢ End-stage renal failure ➢ Von Hippel-Lindau Disease ➢ Tuberous sclerosis
Types	➢ **Calcium** (80%) o Ca oxalate (more common) o Phosphate ➢ **Infection** ➢ **Uric acid** [NOT seen on KUB XR] ➢ **Struvite (bacteria – infection)** -staghorn calculus ➢ Other (<1%) = cystine (AR disease)	➢ **Urothelial carcinoma** (90%) ➢ **SCC** (5% - higher in area of Schistosomiasis) ➢ Rare = sarcoma, AC	**RCC = most common type of kidney tumour** arising from renal tubules ➢ ***Clear cell*** (around 80%) – VHL gene ➢ ***Papillary*** (around 15%) – trisomy 7 ➢ ***Chromophobe*** (around 5%) – best prognosis
Sx	Classical Sx • **Renal – colic pain** (as stone moves and settles) • **Unilateral loin-groin pain** ("worse than childbirth" • Restlessness General Sx ➢ Haematuria ➢ N + V ➢ Oliguria ➢ Signs of sepsis	• **Painless haematuria (key symptom)** 2-4 week referral if: • Aged > 45 with ***unexplained visible haematuria***, either without a UTI or persisting after treatment for a UTI • Aged > 60 with ***microscopic haematuria*** (not visible but positive on a urine dipstick) **PLUS:** o ***Dysuria*** or; o ***Raised white blood cells*** on a full blood count • > 60 yo w/ recurrent unexplained UTI	Asymptomatic BUT **classic triad of Sx**: ➢ Haematuria ➢ Vague loin/flank pain ➢ Palpable renal mass on exam ➢ Non-specific sx (UWL, Fatigue, anorexia, NS) **Paraneoplastic features**: • ***Polycythaemia*** – XS secretion of unregulated ***erythropoietin*** • ***Hypercalcaemia*** – secretion of PTHrP • ***Hypertension*** –increased renin secretion,+ polycythaemia + physical compression • ***Stauffer's syndrome*** – abnormal LFTs (raised ALT, AST, ALP and bilirubin) **without** liver metastasis
Comp.	• **Urinary tract obstruction** – hydronephrosis – post-renal AKI • **UROSEPSIS** – obstructive pyelonephritis	• Urinary tract obstruction – hydronephrosis • **Metastasis: lymph nodes**	**Metastasis:** ➢ **Brain, skin (melanoma), thyroid, breast, lung**
Ix	• **Bloods**: • FBC • EUC • CMP (hyperCa) – HPTH, MM, XS Ca supp. • CRP • **AXR** (Ca-based stones) • **Urine dipstick** • **Urine MSU M/C/S** • **USS KUB** (mainly for pregnant women and children) • Non-contrast CT KUB (**gold-standard**)	o Urine dipstick o Urine MSU M/C/S o Flexible cystoscopy + biopsy **TNM staging system** Non-muscle invasive BC: • ***Tis/carcinoma in situ*: cancer cells only affect the urothelium and are flat** • ***Ta***: cancer only affects urothelium and into bladder • ***T1***: cancer invades CT layer beyond the urothelium, but NOT the muscle layer Muscle invasive BC: T2-4 PLUS ➢ Any LN or mets spread	o Urine dipstick o Urine MSU M/C/S o Flexible cystoscopy + biopsy o CT thorax, abdomen and pelvis **TNM staging system** specific to RCC • Stage 1: < 7cm and confined to the kidney • Stage 2: > 7cm but confined to the kidney • Stage 3: Local spread to nearby tissues or veins, but not beyond Gerota's fascia • Stage 4: Spread beyond Gerota's fascia, including metastasis
Mx	**Acute Mx:** ➢ Analgesia (NSAID w/ meals) ➢ Anti-emetics (*metoclopramide, cyclizine)* ➢ Abx – if infection present ➢ +/- tamsulosin (relax SMC) – help passage of stone < 5mm: Watch and wait (50% chance will pass w/o interventions) > 5mm: Extracorporeal shock wave lithotripsy under XR guidance – to make stone smaller and easier to pass > 10mm: Percutaneous nephrolithotomy using nephroscope **How to manage recurrent stones?** ➢ 1st stone = increases risk of another ➢ **Hydrate** (2.5-3L/day) ➢ Maintain normal Ca diet ➢ Add **fresh lemon juice** to water ➢ Avoid **carbonated drinks** ➢ **Low salt diet** (<6g /day) **Specific Mx:** ➢ Ca stones – reduce oxalate rich foods (e.g. spinach, nuts, black tea, beetroot) ➢ Uric acid stones – reduce purine rich food (e.g. kidney, liver, sardines, spinach) **Medications that reduce risk of recurrent stones** (if Ca oxalate stones and ↑↑ urine Ca) ➢ Thiazides (indapamide) – ➢ K citrate	MDT discussion ➢ ***Transurethral resection of bladder tumour*** (***TURBT***) during cystoscopy → for non-muscle-invasive bladder cancer ➢ ***Intravesical chemotherapy*** (via catheter) usually after a TURBT procedure to reduce the risk of recurrence. ➢ ***Intravesical Bacillus Calmette-Guérin (BCG)*** – stimulate the immune system, which in turn attacks the bladder tumours. ➢ ***Radical cystectomy*** - remove entire bladder and create synthetic drainage (using options below) • **Urostomy with an ileal conduit** (most common) – drainage into urostomy bag tightly fitted around urostomy to prevent urine skin irritation and damage • **Continent urinary diversion** – ileum pouch within abdomen connected to ureters and stoma on skin → • **Neobladder reconstruction** – using section of ileum (connect to both ureters) → need intermittent self-cath • **Ureterosigmoidostomy** – attach ureters to sigmoid colon w/ recto-sigmoid pouch to prevent urine reflux into ureters **Chemotherapy* and ***radiotherapy*** may also be used	MDT discussion **1st line = surgical resection** • ***Partial nephrectomy*** (removing part of the kidney) • ***Radical nephrectomy*** (removing the entire kidney plus the surrounding tissue, lymph nodes and possibly the adrenal gland) **2nd line (if not suitable for surgery)**: less invasive procedures can be used to treat the cancer: • ***Arterial embolisation***, cutting off the blood supply to the affected kidney • ***Percutaneous cryotherapy***, injecting liquid nitrogen to freeze and kill the tumour cells • ***Radiofrequency ablation***, putting a needle in the tumour and using an electrical current to kill the tumour cells **Chemotherapy* and ***radiotherapy*** may also be used

OBSTRUCTIVE UROPATHY (POST-RENAL AKI)

	Upper urinary tract obstruction:	Lower urinary tract obstruction:
CAUSE	• **Kidney/ureteral stones** • **Tumours pressing on the ureters** • **Ureter strictures** (due to scar tissue narrowing the tube) • **Retroperitoneal fibrosis** (scar tissue in the retroperitoneal space) • **Bladder cancer** (blocking the ureteral openings to the bladder) • **Ureterocele** (ballooning of the most distal portion of the ureter – this is usually congenital) • ***Idiopathic hydronephrosis*** – narrowing at ***pelviureteric junction*** (***PUJ***) – swelling of renal pelvis and calyces	• BPH (benign enlarged prostate) • Prostate cancer • Bladder cancer (blocking the neck of the bladder) • Urethral strictures (due to scar tissue) • **Neurogenic bladder** ○ Ms ○ T2DM ○ Stroke ○ Parkinson's ○ Brain / SCI ○ Spina bifida
Sx	• ***Loin to groin*** or ***flank*** pain on the affected side (due to stretching and irritation of ureter and kidney) • Oliguria • **Non-specific systemic symptoms**, such as vomiting	• **Difficulty or inability to pass urine** (e.g., poor flow, difficulty initiating urination or terminal dribbling) • **Urinary retention,** with an increasingly full bladder
Ix	• ***EUC = deranged, +++ Cr*** • ***KUB USS*** • ***CT KUB*** • ***IV pyelogram (***x-ray with IV contrast collecting in the urinary tract)	

Complications of Obstructive Uropathy

- **Pain**
- **AKI** (post-renal)
- **CKD**
- **Infection** (from bacteria tracking up urinary tract into areas of stagnated urine)
- **Hydronephrosis** (swelling of the renal pelvis and calyces in the kidney)
- **Urinary retenti**on and bladder distention
- **Overflow incontinence** of urine

Management – remove OR bypass obstruction

1) ***Percutaneous nephrostomy*** = insert tiny tube through the skin and kidney into the ureter to bypass obstruction in **upper urinary tract** . under XR guidance → drain urine out of the body into a bag
2) ***Urethral (inserted via urethra)*** or ***suprapubic (inserted via skin) catheter*** bypass obstruction in **lower urinary tract**)

URINARY CATHETERS

Indications

- ***Acute urinary retention*** → lower urinary tract obstruction
- ***Neurogenic bladder*** (e.g., intermittent self-catheterisation in MS
- ***Surgery*** (during and after)
- ***Output monitoring*** in acutely unwell patients (e.g., sepsis or intensive care)
- ***Bladder irrigation*** (e.g., to wash out blood clots in the bladder)
- ***Delivery of medications*** (e.g., chemo to treat bladder cancer)
- ***Post-void bladder scan > 500ml***

Types

1) ***Intermittent catheters*** – simple catheters used to drain urine, then immediately removed
2) ***Foley catheter*** (***two-way catheter***) – the "standard" catheter with an inflatable balloon to hold it in place
3) ***Coudé tip catheter*** – has a curved tip to help BYPASS an obstruction during insertion (e.g. BPH)
4) ***Three-way catheter*** – has three tubes used for inflating the balloon, injecting irrigation and drainage
5) ***Suprapubic catheter (last resort)*** -inserted under local anaesthetic

Trial without catheter (TWOC)

- REMOVE catheter
- Monitor UO + TOV
- Bladder scan = post void residual check

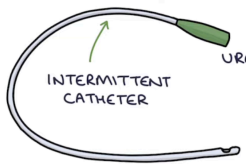
Complications

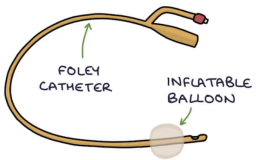
Infections – sample directly from catheter NOT from bag (which may be contaminated)

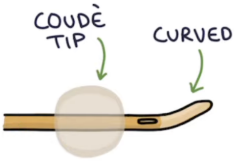
- Other = haematuria, discomfort

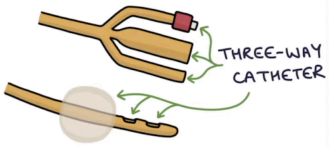
Acute Mx

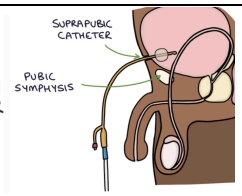
- Change catheter
- Patients w/o symptoms → no antibiotics needed
- Patients w/ symptoms → 7 day antibiotics PO or IV











RENAL DIALYSIS

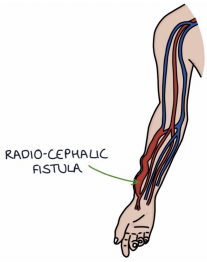
Indications

Acute dialysis

- Acidosis
- Electrolyte (hyperK)
- Intoxication
- Oedema
- Ureamia

Long-term dialysis

- ESKD (stage 5) eGFR <15
- Any acute indication



Types

AIM: removing excess fluid, solutes and waste products

1. ***Continuous Ambulatory Peritoneal Dialysis***
   - Requires tenckhoff catheter
   - Dialysis soln in peritoneum at all times
2. ***Automated Peritoneal Dialysis***
   - Requires tenckhoff catheter
   - 8-10 hours
   - Machine replaces dialysis fluid in abdomen overnight
3. ***Haemodialysis (4hrs/day x3/week)***
   - **Tunnelled cuffed catheter** – tube inserted via subclavian or IJV w/ tip in SVC or RA
     "dacron cuff" = *surrounds catheter to promote healing and adhesion to enable longevity of catheter*
   - **AV fistula –** artificial connection b/w artery and vein to bypass capillary system (allow blood to flow under high pressure and easy access)

Peritoneal Complications

- ***Bacterial peritonitis***. Infusions of glucose solution make the peritoneum a great place for bacterial growth.
- ***Peritoneal sclerosis*** = thickening and scarring of the peritoneal membrane.
- ***Ultrafiltration failure*** = when patient starts to absorb the dextrose in the filtration solution. This reduces the filtration gradient making ultrafiltration less effective over time.
- ***Weight gain*** = absorb the carbohydrates in the dextrose solution.
- ***Psychosocial effects***. = need to change dialysis solution and sleep with a machine every night.

AV fistula complications

- **Aneurysm**
- **Infection**
- **Thrombosis / clots**
- **Stenosis**
- **STEAL syndrome** – inadequate blood flow to limb distal to AV fistula (distal ischaemia)
- **High output heart failure** – due to rapid venous return

RENAL TRANSPLANT

Process

- **Indications** = ***end-stage renal failure***
  - **A –** acidosis (pH < 7.1)
  - **E –** electrolyte (hypeK)
  - **I –** ingestion of drugs
  - **O –** overload fluids
  - **U –** ureamic encephalopathy
- **Prognosis** = adds 10 years of life compared with just dialysis + sig. improves QoL

Preparation

- Patients and donor kidneys are matched based on the ***human leukocyte antigen*** (HLA) type A, B and C on ***chromosome 6***
- ***If living donor → recipients may receive de-sensitising treatments***

Procedure:

1) Patient's own kidneys are left in place.
2) ***"hockey stick" incision*** is used
3) donor kidney blood vessels are connected (***anastomosed***) with the pelvic vessels, usually the ***external iliac vessels***.
4) Ureter of the donor kidney is anastomosed directly with the bladder.
5) Donor r kidney is placed **anteriorly** in the abdomen and can usually be palpated in the iliac fossa area.

Complications

Complications relating to the transplant:

- Transplant rejection (hyperacute, acute and chronic)
- Transplant failure
- Electrolyte imbalances

Complications related to immunosuppressants: (needed to reduce risk of transplant rejection)

- IHD)
- Infections are more likely, more severe and may involve unusual pathogens
- Non-Hodgkin lymphoma
- Skin cancer (***seborrhoeic warts and SCC***)
- ***Tacrolimus*** *causes a tremor*
- ***Cyclosporine*** *causes gum hypertrophy*
- ***Steroids*** *cause features of Cushing's syndrome*

Unusual infections can occur secondary to immunosuppressant medication, such as:

- Pneumocystis jiroveci pneumonia (PCP/PJP)
- Cytomegalovirus (CMV)
- Tuberculosis (TB)