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- [Reports Manager](#)
- [PLAB1-PLAB2 NOTES](#)
- [Administration](#)
- [Sign Out](#)

Resource view

Resource name	Nephrology PLAB 1 Notes
Resource description	Nephrology
Resource content	

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NEPHROLOGY LECTURE NOTES 2014

FUNCTION OF THE KIDNEYS:

1. To excrete the end products of the metabolic processes in the body like urea
2. To maintain the acid balance in the body.
3. It produces hormones like:
 - Renin
 - Erythropoietin
 - Prostaglandins
 - Vitamin D
1. Some hormones act on the kidney:
2. Antidiuretic hormone (ADH or vasopressin)
3. Aldosterone
4. Atrial natriuretic peptide
5. Parathyroid hormone

INVESTIGATION IN NEPHROLOGY

1. **URINE DIPSTIX OF MID-STREAM URINE:**

HAEMATURIA

- A. **Painful haematuria**
- B. **Painless haematuria**

Causes of Painful Haematuria

1. Urinary Tract Infection

- Dysuria
- Frequency
- Fever
- \pm abdominal pain
- Positive nitrates on urine dipstick

1. Renal Calculi

- No fever
- Right or left iliac fossa pain radiating to the groin is ureteric colic and if loin pain then it's renal stones.
- Haematuria

1. Urological Trauma: e.g Urethral injury

There will be history trauma and signs of trauma like bruises in the perineum, \pm blood in the external meatus.

1. Honeymoon cystitis

History of painful sexual intercourse and recent onset of sexual intercourse or recently married.

It presents like UTI i.e dysuria, frequency and haematuria but MSU and urine dipstick are normal.

Causes of Painless Haematuria

1. Renal Tumour

- Palpable mass in the renal angle
- Signs of malignancy like weight loss, anaemia and anorexia.
- Confirmed by ultrasound scan or CT scan

1. Bladder Tumour: *Painless haematuria in an adult is bladder cancer until proven otherwise*

- Pelvic mass
- Pain in suprapubic area
- Haematuria
- Signs of malignancy (weight loss, anaemia and anorexia)
- Confirmed by cystoscopy

1. Bleeding Diathesis

- Bruises on examination
- History of being on anticoagulant therapy

1. Prostate Cancer

- Back pain
- PSA is raised (normal PSA: 0 - 4ng)
- Haematuria
- Nodular prostate on per rectal examination

1. Rhabdomyolysis

- History of crush syndrome i.e. history of lying on the floor for several hours under a heavy object
- Myoglobin colours urine red.

1. Haemolysis

- Haemoglobinuria
- Jaundice
- Anaemia

FBC = Shows \downarrow Hb (anaemia)

1. Polycystic Kidney Disease: Autosomal dominant (1:2)

- Hypertension
- Family history of polycystic kidney disease
- Haematuria

PROTEINURIA (Normal protein excretion < 150 mg/day)

Causes:

1. Urinary Tract Infection (please see haematuria)

1. Orthostatic proteinuria (after standing for a long time – occupations like security guard)

1. Glomerulonephritis (proteinuria, hypertension and haematuria)

1. Hypertensive nephropathy (history of longstanding high blood pressure)

1. Diabetic nephropathy (history of diabetes mellitus)

1. Myeloma (elderly age >60 years, ESR ↑, back pain, anaemia and high ESR)

GLUCOSURIA

Usually due to diabetes mellitus, there might be ketones in the urine as well.

↑ WHITE CELL COUNT

Usually due to infection.

KETONES

Usually in diabetic ketoacidosis, starvation or dehydration. There might be glucosuria.

NITRATE

A sign of infection, the commonest causes are E.coli, Proteus and Klebsiella. So there will be fever.

MICROSCOPY OF MID-STREAM URINE:

1. ↑ **Leukocytes:** common cause is urinary tract infection
2. ↑ **Red cells:** means haematuria
3. **Casts:** these are cylindrical aggregates formed in the distal tubules or collecting ducts.

There are different types:

- a. Hyaline casts and fine granular casts are normal findings. Hyaline casts are mainly protein.
 - b. Red cell casts indicate glomerulus bleeding, usually due to glomerulonephritis.
 - c. White cell casts suggest acute infection, usually bacterial (pyelonephritis).
 - d. Fatty casts can occur in nephrotic syndrome.
 - e. Tubular cell casts occur in acute tubular necrosis (ATN).
-
4. **Crystals:** OXALATE - indicate predisposition to form calculi
CYSTINE - diagnostic of cystinuria
-
5. **Glomerular Filtration Rate:**
Normal is 120 ml/min, if it falls below 30 ml/min then it causes urea and creatinine to accumulate in the body. High levels of creatinine indicates renal failure.
-
6. **Immunological Investigation:**
 - a. Anti-Neutrophil Cytoplasmic Antibodies (ANCA) - suggests vasculitis
 - b. Anti-Glomerular Basement Membrane Antibodies - suggest Goodpasture's Syndrome.
 - c. Anti-Nuclear antibodies and Double Stranded DNA for antibodies and low Complement levels -suggests SLE.
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7. **Ultrasound Scan:** Good for evaluation of renal masses, hydronephrosis and for any renal masses e.g. tumour or polycystic kidney disease.
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8. **KUB (x-ray Kidney Ureter and Bladder):** the initial investigation for all renal stones and it can detect 99% of all radio-lucent stones. Radio-opaque stones like urate stones are not visible on KUB.
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9. **Intravenous Urography (IVU) or Excretory Urograph:** the investigation of choice for all renal stones.
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10. **Renal Biopsy:** is used for chronic and acute renal failure, nephrotic syndrome and glomerulonephritis if the cause is not known.
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11. **Retrograde Pyelography:** is used to determine the lower level of obstruction after IVU or ultrasound scan has shown obstruction.
-
12. **Cystoscopy:** is the investigation of choice in bladder tumour.

13. **CT KUB:** can be used instead of IVU for evaluation of renal stones. NICE guidelines recommend IVU. So if you have both of them in the options choose IVU.

14. **Antegrade Pyelography:** Percutaneous injection of contrast into the pelvi-calyceal system and ureter. It is used when ultrasound scan has shown dilated pelvi-calyceal system in a patient with suspected obstruction. It is used when a draining catheter is need to be placed i.e nephrostomy. Also, if a stent needs to be put if there is a Ureter Stricture.

15. **Micturating Cystourethrography (MCU):** This investigation is done to look for vesicoureteric reflux, It is an investigation which is done in children only to look for vesicoureter reflux. If reflux is found in children surgery is usually done.

16. **Renal Arteriography:** is used in renal artery stenosis

17. **Dynamic Scintigraphy:** Uses Technium 99 (Tc99). Contrast is inserted into the veins and it is followed by a gamma camera. It allows to detect renal perfusion e.g. in renal stenosis.

Indications:

- a. Renal artery stenosis is suspected as a cause of high blood pressure.
- b. In severe oliguria e.g. post-trauma, post aortic surgery or after kidney transplant.

18. **Static Scintigraphy:** Tc99 is used to check for renal function. This substance is taken up by tubular cells according to their function. This is done to identify ectopic kidneys and pseudo-tumours.

N.B. Dynamic and Static Scintigraphy are also called Isotope Scans. They are used for investigating kidney damage caused by urinary tract infection in children.

URINARY TRACT INFECTION (UTI):

1. Bacteriuria: presence of bacteria in the urine. It can be symptomatic and asymptomatic.
2. Urethritis: infection of the urethra
3. Cystitis: bladder infection
4. Pyelonephritis: infection in the kidney
5. Prostatitis: infection in the prostate
6. Epididymo-orchitis: infection of the testes and epididymis

RISK FACTORS

1. Female
2. Sexual intercourse
3. Pregnancy
4. Menopause
5. Immunosuppression
6. Diabetes Mellitus
7. Urinary obstruction due to stones or tumour, faecal impaction, malformation and catheterization.

A recurrent urinary tract infection is a further infection with a new organism. Common in females. Usually 2 or more infection in a year with different organisms.

A relapse is a further infection with the same organism. Usually 2 or more infection within a year.

Uncomplicated UTI: is when you develop urinary tract infection with normal renal function and normal GU tract anatomy.

Complicated UTI: This is UTI in the presence of abnormal GU tract or abnormal renal function e.g. urinary obstruction.

N.B: Assume all UTI's in men and children (whether boy or girl) without any risk factors as complicated.

UTI in a catheterised patient: The urine may turn **purple** in the catheter bag due to breakdown of urine substances into pigments by bacterial enzymes

Common causes of UTI are as follows and in this order:

1. E.Coli
2. Proteus
3. Klebsiella
4. Pseudomonas.

Symptoms:

- Cystitis: frequency, dysuria, urgency, haematuria, suprapubic pain
- Acute Pyelonephritis: high fever, vomiting, loin pain
- Prostatitis: flu-like symptoms, lower backache, swollen or tender prostate on per rectal examination.
- Epididymo-orchitis: swollen, painful testes.

Investigation:

1. Urine dipstick will show nitrates, white cells or there is presence of blood
2. Mid stream urine for microscopy, culture and sensitivity
3. Cystoscopy if bladder cancer is suspected eg. in an elder patient with recurrent UTI
4. Ultrasound scan for UTI in children, men and if recurrent in women in order to look for predisposing factors.

- In young men and women, the most likely cause is renal stones so investigate with IVU
- If IVU is normal perform an ultrasound scan and vice versa
- In children perform an ultrasound scan first
- Suspect bladder cancer in elderly patients with recurrent UTI so perform Cystoscopy
- In children, UTI can cause kidney damage and lead to kidney fibrosis which may cause hypertension when they grow up so perform an isotope scan to check for any damage.

Treatment:

1. **Bacterial UTI in women:** Trimethoprim, nitrofurantoin or cefalexin. 2nd line is co-amoxiclav.
2. **Acute Pyelonephritis:** Co-amoxiclav
3. **Bacterial UTI in men:** Levofloxacin

NB. In pregnant women with UTI, use amoxicillin and cefalexin

DIFFERENTIATING SEXUALLY TRANSMITTED INFECTIONS FROM UTI

1. Gonorrhea: purulent discharge, symptoms usually appear 2-3 days after unprotected sexual intercourse. Short incubation period of gonorrhea (<1 week).
2. Chlamydia: mucoid discharge and is the commonest sexually transmitted disease in the UK. There might be travel history for a holiday e.g. Thailand or change of sexual partners (PID).
3. Hemophilus Ducreyi: there will be intense dysuria and on examination there are multiple ulcers and tender inguinal lymphadenopathy.
4. Syphilis: transient painless ulcer, there might be history of unprotected sex over several months. It can be as long as 3 months, due to long incubation period.

PROPHYLAXIS:

1. **Antibiotic prophylaxis:** if given continuously or post-coital it decreases infection rates in women with recurrent UTI or immunocompromised patients with recurrent UTI.
2. **Local oestrogen** in post-menopausal women.
3. **Hygiene and double voiding** in honeymoon cystitis.

NEPHROTIC SYNDROME (Heavy Proteinuria):

Nephrotic syndrome is a triad of Proteinuria (>3.5g/24hr, Hypoalbuminaemia <25g/L and Oedema.

Nephrotic syndrome is not a diagnosis. >80% are due to Glomerulonephritis, DM, Amyloidosis, SLE and Drugs.

Complications:

1. Increased risk of infections due to loss of immunoglobulins.
2. Thromboembolism e.g. deep vein thrombosis/pulmonary embolism, renal vein thrombosis - due to increased clotting factors.
3. Hyperlipidaemia- increase cholesterol and triglycerides production by the liver in response to low oncotic pressure.

Investigation: Renal Biopsy to find out what type of glomerulonephritis it is.

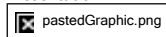
Treatment:

1. **Reduce oedema with loop diuretic e.g. Furosemide**
2. **Reduce proteinuria ACE inhibitor or Angiotension receptor blocker (ARB) should be started.**
3. **Treat the underlying cause**

GLOMERULONEPHRITIS: (inflammation of the glomeruli)

Is a common cause of End Stage Renal Failure

Presentation:

**Investigation:**

1. ANA
2. ANCA
3. ASOT
4. Anti-ds DNA
5. Anti-aBM
6. Urine for proteinuria and haematuria
7. Renal Biopsy

TYPES OF GLOMERULONEPHRITIS

1. **Thin basement membrane nephropathy:** It is an autosomal dominant disease. It is benign persistent microscopic haematuria in children. Reassure.

2.Minimal change disease: common cause of nephrotic in children. On light microscopy looks normal but on electron microscope shows Fusion of Podocytes.
Treatment: Cyclophosphamide

3.Membranous Nephropathy: presentation usually is Nephrotic Syndrome. It is associated with SLE, Malignancy, Gold, Penicillin, Rheumatoid Arthritis. Renal Biopsy- shows thickened basement membrane, Rx: Steroids + Cyclophosphamide

4.Ig A Nephropathy (Berger's Disease): typically presents as Macro or Micro-Hematuria and is typically in a young male child with hematuria 1-2 days after URTI, Treatment: Cyclophosphamide

5.Focal Segmental Glomerulosclerosis: associated with HIV, Hepatitis, Ig A Nephropathy and it can be Idiopathic. Renal Biopsy shows some glomeruli have scarring of certain segments.
Treatment: Steroids, cyclophosphamide, cyclosporin.

6.Proliferative Glomerulonephritis: the chief cause is Post- Strep glomerulonephritis. Typically 1-12 weeks after sore throat (URTI). Presentation is Nephritic Syndrome which consists of Hematuria, Proteinuria and Hypertension. It is the same as acute glomerulonephritis. Treatment: Supportive

7.Rapidly Progressive Glomerulonephritis: There are many causes, especially anti-glomerular basement membrane (Goodpasture's, SLE, IgA) Renal biopsy shows Crescent (macrophage) in Bowman's Capsule. Treatment: high dose steroids and Cyclophosphamide.

8.Mesangiocapillary Glomerulonephritis- Biopsy shows proliferation of the mesangial cells and presents as Nephrotic Syndrome, Rx- Steroids

9.Henoch-Schönlein Purpura- is a systemic variant of IgA nephropathy causing small vessel vasculitis. Symptoms are Purpuric rash on extensor surface typically on legs, abdominal colic, polyarthritis and GN.

ACUTE KIDNEY INJURY

The term acute renal failure has now changed due to acute kidney injury.

It is defined as deterioration in renal function occurring over hours or days. Biochemically is detected by raising Urea and Creatinine.

Causes:

Commonest causes are ischaemia, sepsis and nephrotoxins. The causes can be classified as:

- 1. Pre-Renal:** Renal hypoperfusion due to hypovolaemia (vomiting, dehydration, diarrhea or bleeding), sepsis (causing systemic vasodilatation), liver failure, renal artery stenosis.
- 2. Intrinsic renal:** ATN damage to tubular cells due to ischaemia or nephrotoxins such as haemoglobin, drugs (antibiotics, NSAIDs or ACEI), Myoglobin.
- 3. Post-Renal:** Caused by urinary tract obstruction. Common causes of obstruction are benign prostatic hypertrophy, stones or stricture.

MANAGEMENT: Treat the underlying cause

Prerenal: Correct volume depletion, treat sepsis if present

Intrinsic Renal: Refer early to nephrology.

Post-renal: Catheterise and consider CT of renal tract. Refer to urology if obstruction is likely.

When deciding treatment of renal injury find out if it is chronic or acute as the treatment is different.

Is the injury acute or chronic?

Suspect chronic injury if the following are present:

- The kidneys are small (<9cm) on ultrasound
- Anaemia
- Low Ca
- High PO₄

NB. The only definite sign of chronic disease is previous blood results showing high creatinine/low GFR

TREATMENT OF COMPLICATIONS OF ACUTE RENAL FAILURE

- 1. Hyperkalemia:** may cause arrhythmia or cardiac arrest

Treatment:

1. 10ml of 10% Calcium Gluconate is cardio protective since it stabilizes myocytes
2. I.V. Insulin with 50ml of 50% glucose. (shifts potassium into the cells)
3. Nebulized Salbutamol (shifts potassium into the cells)

2.Pulmonary Oedema:

- High flow O₂ is the initial treatment.
- Furosemide is the main treatment (Intravenously)
- Vasodilators like Morphine
- If not responding to furosemide then dialysis

- 3.Bleeding:** There can be impaired hemostasis due to increased urea.

- If there is renal failure and active bleeding then give fresh frozen plasma and platelets
- Blood Transfusion to maintain Hb >10
- Desmopressin to increase Factor VIII activity

INDICATION OF DIALYSIS IN ACUTE RENAL FAILURE:

1. Refractory Pulmonary Oedema (not responding to IV furosemide)
2. Persistent Hyperkalemia >7mmol/l (not responding to insulin or salbutamol)
3. Severe Metabolic Acidosis pH <7.2
4. Uraemic Encephalopathy (headache, confusion)
5. Uraemic Pericarditis, if there is Pericardial Rub
6. Drug overdose eg. Lithium, salicylates, etc.

CHRONIC KIDNEY DISEASE (CKD): is a long standing and irreversible reduction in GFR. It is caused by DM, Hypertension, chronic urinary retention, glomerulonephritis, pyelonephritis, polycystic kidney disease and vasculitis.

Causes: Diabetes, hypertension, glomerulonephritis, pyelonephritis, cause may be unknown

Symptoms: fatigue, weakness, anorexia, vomiting, anaemia and ankle swelling.

Investigations:

- FBC will show anaemia due to deficiency of erythropoietin.
- Ultrasound scan will show small kidneys and will exclude obstruction.
- Renal biopsy if the cause is unclear.

Treatment:

1. If Hypertension - ACEi is the first choice drug (not to be given if creatinine is >200)
2. Hyperlipidemia – Statins
3. Pulmonary oedema - Furosemide
4. Anemia – Erythropoietin
5. Acidosis - consider sodium bicarbonate

Urea and creatinine will be increasing as number of glomeruli decreases so treat hyperkalemia.

If hyperkalemia in chronic renal failure then treat with insulin and glucose.

Long term treatment of chronic renal failure is different from treatment of acute renal failure. In chronic renal failure urea and creatinine will be increasing and it is not a major concern as we know it will be increasing.

1. Long term dialysis (in end stage renal failure)
2. Kidney transplant.

URINARY TRACT STONES

Causes:

1. Hyperparathyroidism: Increased parathyroid hormone leading to increased serum calcium levels leading to formation of bilateral renal stones or recurrent renal stones. Investigation: serum calcium and parathyroid hormone
2. Idiopathic Hypercalcaemia
3. Sarcoidosis there is increased serum calcium and increased ACE
4. Increased vitamin D leads to hypercalcaemia
5. Gout: Increased uric acid forms urate stones which are radiolucent on KUB. Urate stones are common conditions like gout, myeloma and tumour lysis syndrome
6. Familial metabolic causes e.g cystinuria, hyperoxaluria, hyperuricuria
7. Infection predisposes to stones and stones predisposes to infection.
8. Obstruction of urinary tract e.g. stricture on ureter
9. Diet: tea, spinach, and rhubarb predisposes to oxalate stones if all biochemical and imaging in normal check dietary history.
10. Dehydration in long distance runners and also in people who work in hot climate.

TYPE OF RENAL STONES

1. Calcium stones usually combined with phosphates or oxalate.

1. Triple phosphates stones (struvite) consists of magnesium, ammonium and calcium. They are also called Staghorn.

1. Urate stones normally associated with gout and myeloma or after Tumour Lysis Syndrome.

Tumour Lysis Syndrome: Radiotherapy/chemotherapy to break down the cancer cells, causes increased urate, forming stones.

Gout Symptoms: red, swollen, painful joints especially the big toe.

Myeloma usually present with back pain, increased ESR, proteinuria and anaemia.

Renal stone symptoms:

1. Renal stones: renal colic which is pain in the loin, +/- Haematuria.
2. Ureteric stones: ureteric colic which is right /left iliac fossa pain radiates to the groin +/- haematuria
3. Bladder stones: pain in the suprapubic area plus haematuria.

INVESTIGATIONS IN RENAL STONES:

1. Initial is KUB X-ray (can visualise 99% of stones, except urate stones which are radio-lucent)
2. IVU is the investigation of choice in all renal stones whether it is in the ureter or kidney.
2. Mid-stream urine if there is fever because that means there is infection caused by pre-existing stone.
3. If recurrent stones or bilateral stone's and pancreatitis think of hyperparathyroidism Investigation is serum calcium and then parathyroid hormone.
- 4.If symptoms of obstruction then ultrasound scan to check for hydronephrosis.

URINARY RETENTION: (common in men)

1. **BENIGN PROSTATE HYPERPLASIA:** is the commonest cause (due to poor stream of urine) Symptoms: frequency, nocturia and dribbling. But there is haematuria in BPH.
2. **CLOT RETENTION:** Usually elderly or middle aged male. The patient is usually with bladder cancer. The tumour bleeds and clots block the urethra. Remember, painless haematuria in an elderly patient is always bladder cancer until proven otherwise.
3. **SPINAL CORD COMPRESSION:** There is usually sudden onset of urinary retention and bowel symptoms like constipation, incontinence and lower limb weakness or sensory loss.
4. **FAECAL IMPACTION:** Typically in elderly patient or young child with history of constipation. On examination there can be palpable mass in the abdomen usually left iliac fossa. Faecal impaction presses on the Urinary Tract --> Urinary Retention --> UTI --> Confusion in elderly. There may be overflow diarrhea.

Treatment: Quick evacuation of the faecal impaction with a phosphate enema per rectal if it is causing UTI.

5. **MULTIPLE SCLEROSIS:** Typically in a patient with already diagnosed multiple sclerosis.

Treatment: Intermittent self catheterisation.

6. In children **Meningocele:** is the herniation of meninges like dura and arachnoid or meningocele and there is cord involvement.

Treatment: If the child is developing well and is old enough then intermittent self catheterization.

URINARY INCONTINENCE:

1. **Urge incontinence:** the cause is detrusor overactivity or instability. It is found both in nulliparous and multiparous women. Detrusor is the muscle of the bladder and it's overactivity causes a sudden desire to pass urine.
2. **Stress incontinence:** small quantities of urine escape as intra-abdominal pressure rises e.g. during sneezing or cough in the absence of bladder contraction.
3. **Mixed incontinence:** when there is incontinence of urine whether a patient laughs, sneezes or not.
4. **Overflow incontinence:** this happens when there is incomplete bladder emptying, there is dribbling of urine e.g. benign prostatic hypertrophy.
5. **Fistula:** Usually form after surgery eg. hysterectomy, or if there is an inflammatory condition eg. Crohn's disease, diverticulitis. Patients complain of constant leakage of urine. There may also be air or faecal matter in the urine.

N.B: In children incontinence is normal, all you need to use is incontinent pants

STRESS INCONTINENCE:

Continence in women is maintained by the proximal and distal sphincter which maintains the pressure in the urethra to be higher than that of the bladder. There are also other structures like pelvic muscles which supports the urethra and helps to maintain this higher pressure. This pressure is also higher than that of the intra-abdominal.

Factors that may contribute to incontinence:

1. Pregnancy: raises intra-abdominal pressure
2. Delivery: causes weakness of the pelvic muscles therefore lowers the pressure in the urethra.
3. Menopause: lack of oestrogen also weakens the closure of the sphincter, causing decreased pressure in the urethra.
4. Obesity: increases intra-abdominal pressure, therefore losing weight might help
5. Uterine prolapse

Cystocele: upper front wall of the vagina and bladder attached to it bulges into the vagina.

Urethrocele: lower anterior of the vagina wall bulges, this will displace sphincter and impaired sphincter mechanism causes decreased urethra pressure which leads to stress incontinence.

Enterocoele: small intestine bulges into the posterior wall of the vagina may contain intestine in the pouch of Douglas.

Uterine prolapse: there is a dragging sensation or feeling of something coming down which gets worse by day. Cystitis, frequency, stress incontinence and difficulty in defecation along with feeling of pressure in the perineum.

Rectocele: part of the rectum bulges into the posterior wall of the vagina.

Treatment of uterine prolapse:

1. Ring pessaries for temporary treatment or for very frail women who cannot undergo surgery.
2. Surgery

INVESTIGATIONS IN URINARY INCONTINENCE:

1. Mid-Stream Urine: if infection (dysuria, frequency, fever)
2. Filling urodynamic assessment
3. Voiding urodynamic assessment - The bladder is filled with normal saline and at the same time pressure in the bladder and intra-abdominal pressure is measured.

Bladder pressure will always be high during incontinence. The abdominal pressure during incontinence will differentiate between stress incontinence and urge incontinence.

- If the abdominal pressure is also high, then the diagnosis is stress incontinence.
- If the abdominal pressure is normal, then the diagnosis is urge incontinence or detrusor instability.

Voiding Urodynamic - is assessed during voiding. If the bladder is filled with 500ml saline and the patient urinated only 350ml it is regarded as abnormal. If the voiding speed is less than 15 ml/sec it is considered abnormal.

Treatment of stress incontinence:

1. Pelvic floor exercises
2. Oestrogen if post menopausal
3. Physiotherapy e.g.vaginal cones
4. Drugs e.g. duloxetine
5. Surgery for severe stress symptoms e.g. colposuspension or bladder neck surgery.

Treatment of detrusor instability:

1. Pelvic exercise
2. Avoid caffeine
3. Bladder training to increase time between voiding
4. Pelvic floor physiotherapy
5. Oxybutin

Fistula

Causes:

- Inflammatory conditions - usually diverticulitis and crohn's disease (inflammatory bowel disease)
- Malignancy - usually rectal carcinoma
- Iatrogenic - post surgery and radiotherapy

Types of fistulas:

- Enterovesical - e.g. colovesical usually presents with **pneumaturia** (gas in the urine) and **faecaluria** (fecal matter in the urine)
- Enterovaginal - eg colovaginal. Passage of stool or flatus via the vagina is pathognomonic of a colovaginal fistula. It may also present with frequent vaginal infections or copious vaginal discharge.

NB. Symptoms of the chronic disease causing the fistula may be present. These symptoms will help to determine the cause of the fistula.

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Back



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