COMMONWEALTH OF AUSTRALIA

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Renal stones and urological haematuria

Mr Owen Niall
Learning objectives

By the end of this session students should be able to

• describe the various types of stones and risk factors for their formation
• appropriately investigate a patient presenting with an acute stone episode
• describe the various management options including medical expulsive therapy, extra-corporeal shock wave lithotripsy and endoscopic management
• recognize and appropriately manage obstructive pyonephrosis
• identify strategies to prevent stone recurrence
• understand the clinical significant of microscopic and gross haematuria
• identify common causes and complicating factors
• describe appropriate investigation.
Scenario

Peter, a 45 year old bank manager, presents with four hour history of right loin pain of moderate intensity associated with nausea and urinary frequency.

What further history and examination would you take? What do you need to exclude?
Acute Stone Episode

- **History**
  - Pain characteristics (DDx ruptured AAA, testicular/ovarian torsion, appendicitis etc.) and ?sepsis
  - Previous stone episodes and outcome
  - Complicating factors: pregnancy, renal impairment
  - Pain score
  - FHx (if young)

- **Physical exam**
  - Temp
  - Rule out other causes of pain
  - Usually no peritonism
Scenario

• Peter has been otherwise well. He has no family history or past history of stone disease, and is on no regular medications

• On examination he is afebrile, pulse rate of 80, BP 135/85 and mild right iliac fossa tenderness

• Urinalysis – microscopic haematuria, otherwise nad

What investigations will you arrange for Peter?
Stones

• Types
  – Calcium oxalate (70%)
  – Uric acid (radio-lucent)
  – Magnesium ammonium phosphate (struvite/infection stones)
  – Cystine (cystinuria- autosomal recessive disorder)
  – Other: matrix, proteases inhibitor stones (radiolucent)

• 90% are radio-opaque

• Risk factors
  – Dehydration
  – Diet (↑ animal protein, ↑ sodium)
Acute Workup

- FBE, U&E, creatinine
- Serum calcium and uric acid
- MSU
- CT-KUB (or CT-IVP)
  - AND plain KUB
- Stone usually ureteric
- Renal stones not usually associated with acute presentation
What would be the indications for intervention?
How will you manage Peter?
Indications for Intervention

• Infection/Sepsis
• Renal Impairment
• Bilateral obstructing calculi
• Solitary kidney (anatomical or functional)
• Inability to control Sx
  – Refractory pain (repeat presentations)
• Prolonged obstruction
  – In dogs, complete obstruction -> permanent renal damage by 4/52 (Early referral!)
• Unlikely to pass spontaneously
Acute Management

• Pain relief
  – NSAIDS
  – Opioids
  – Paracetamol

• Hydration

• Does patient require acute intervention?
  – Yes: admission
  – No: surveillance/MET with early f/u
Obstructive Pylonephrosis

• Urological emergency
• Usually GNB (E.Coli)
• High rates of SIRS/shock
• Management
  – IV Abs (G-ve AND Enterococcus coverage)
  – Urgent decompression (nephrostomy, stent)
  – Supportive care (fluids, monitoring, ICU if necessary)
Expectant Mx

- Spontaneous passage depends on:
  - Max size in transverse plane
  - Location
  - PHx of stone passage

- Appropriate if:
  - Size < 5-7 mm
  - Renal Fx adequate
  - No signs of infection
  - Adequate pain control and oral intake

<table>
<thead>
<tr>
<th>Width (mm)</th>
<th>% passed</th>
<th>Mean time</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>90%</td>
<td>8 days</td>
</tr>
<tr>
<td>2</td>
<td>85%</td>
<td>8 days</td>
</tr>
<tr>
<td>3</td>
<td>83%</td>
<td>12 days</td>
</tr>
<tr>
<td>4</td>
<td>77%</td>
<td>22 days</td>
</tr>
<tr>
<td>5</td>
<td>56%</td>
<td>22 days</td>
</tr>
<tr>
<td>6</td>
<td>41%</td>
<td>22 days</td>
</tr>
<tr>
<td>7</td>
<td>30%</td>
<td>?</td>
</tr>
<tr>
<td>8</td>
<td>21%</td>
<td>?</td>
</tr>
<tr>
<td>9</td>
<td>3%</td>
<td>?</td>
</tr>
</tbody>
</table>
Medical Expulsive Therapy

• Ureteric wall contains $\alpha_1$ adrenergic receptors that mediate smooth muscle contraction

• $\alpha$-blockers relax ureteric wall
  – Increase stone passage by $\sim 30$
  – Decrease time to stone passage by 2-4 days
  – Decrease pain

• Calcium channel blockers and steroids not as effective

• Tamsulosin 0.4 mg OD x 2/52
Surgical Options

**Aims**
1. Relieve obstruction
2. Get rid of problematic stone
3. Deal with any other stones on the same side

**Options**
- JJ stent and delayed management
- Ureteroscopy and lithotripsy
  - Laser
  - Pneumatic
- Shock wave lithotripsy
  - ESWL
Radiolucent Stones

• Usually uric acid (or cystine)
• Form in acidic urine (pH < 6.0)
• Dissolve with urinary alkalinisation
  – Target pH > 6.5
  – Potassium citrate / sodium bicarbonate
  – Allopurinol if serum uric acid levels elevated
  – Monitor efficacy with urine pH strips
• High fluid intake
Follow-Up

- Home with PO analgesia (regular paracetamol & NSAID with opioid for breakthrough)
- Strain urine
- Arrange follow-up imaging (KUB if visible on plain film)
- **Early** follow-up (1-2/52)
  - Stone is progressing
  - Evidence of persisting obstruction
  - Return to ED if recurrent pain
Preventing Stone Recurrence

- Adequate fluid intake
- Dietary modification
- Urinary alkalinization
- Medical therapy
  - Allopurinol
  - Thiazide diuretics
- Cystinuria
# Urological Haematuria - Causes

<table>
<thead>
<tr>
<th>P</th>
<th>Period (cyclical haematuria)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Prostate (prostatitis, CaP, BPH)</td>
</tr>
<tr>
<td>O</td>
<td>Obstructive uropathy</td>
</tr>
<tr>
<td>N</td>
<td>Nephritis (IgA, interstitial)</td>
</tr>
<tr>
<td>T</td>
<td>Trauma</td>
</tr>
<tr>
<td>T</td>
<td>Tumour (renal, urothelial, CaP, urethral)</td>
</tr>
<tr>
<td>T</td>
<td>TB</td>
</tr>
<tr>
<td>T</td>
<td>Thrombosis (renal infarct, renal vein thrombosis)</td>
</tr>
<tr>
<td>H</td>
<td>Haematological (anticoagulation, bleeding diathesis, sick cell)</td>
</tr>
<tr>
<td>I</td>
<td>Infection/inflammation (radiation cystitis, cyclophosphamide, interstitial cystitis)</td>
</tr>
<tr>
<td>S</td>
<td>Stones</td>
</tr>
</tbody>
</table>
DDx

• Drugs causing ‘red’ urine
  – Pyridium
  – Nitrofurantoin
  – Ripampin
  – Ibuprofen
  – Phenytoin
  – L-DOPA
  – Chloroquine
  – “Beetroot”

• False positive dipstick
  – myoglobinuria
Clinical Significance

- 10-20% of patients presenting with gross haematuria have urological malignancy
- Rarely source of sufficient blood loss to cause haemodynamic instability
  - Post op/trauma
  - Radiation or chemical cystitis
  - Anti-coagulated
- 10-20% no cause identified
Emergency Management

• History
  – Initial / total / terminal?
  – Able to PU? Clots?
  – painful or painless?
  – Infective Sx? / LUTS
  – Trauma? / Recent surgery? / Anticoagulation?
  – PHx of urological conditions (RT, cancer, stones), smoking, DM, anticoagulation

• Physical Exam
  – PR/BP/Temp
  – Abdo (massses, tenderness, palpable bladder), Genital (urethral tumour), DRE
Work-up

- Bloods -> Hb, Clotting, Creatinine
- MSU/CSU -> M/C/S (confirm haematuria, check for infection, glomerular vs. non-glomerular
- Upper tract imaging
  - CT-IVP (gold standard)
  - US if low risk group
- Cystoscopy (at some stage)
- Other
  - Urine cytology?
  - PSA?
  - Analysis for “active” urine (red/white cell casts, proteinuria)
Management

• Admission?
  – Significant bleeding with clots or retention -> 3 way IDC (22 or 24F)
  – Manual bladder washout (>2-3 litres)
  – Continuous bladder irrigation (stop new clots forming, NOT to washout pre-formed clots)

• Stop anticoagulants if safe to do so

• ?Need transfusion

• Referral to urology