An overview of blood tests in respiratory illness

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Pneumonia
Pneumonia

• Full blood count (FBC)

• WCC
  – Usually high (but may be normal)
  – Low with viral infection or severe sepsis
  – Neutrophil count high in bacterial infection
  – Low lymphocyte count may point to viral infection
Pneumonia

- Full blood count (FBC)

- WCC
  - < 4.0 or > 12 indicates SIRS/sepsis
  - Should improve as pneumonia resolves
Pneumonia

• Haemoglobin (Hb)
  – Can get a Coombs positive haemolytic anaemia with Mycoplasma pneumonia
    • Blood film

• Platelets
  – Can increase with infection (reactive thrombocytosis)
  – May be low with severe sepsis
Pneumonia

• Urea and electrolytes
  – high urea / creatinine if patient dehydrated
  – Urea > creatinine

  – Urea part of CURB-65 score
    • Confusion
    • Urea > 7.0
    • Respiratory rate > 30
    • Blood pressure systolic < 90; diastolic <60
    • Age 65 or over
Pneumonia

- **Urea and electrolytes**
  - **Sodium**
    - Low sodium (hyponatraemia)
    - Syndrome of inappropriate ADH secretion (SIADH)
    - Especially with *atypical* pneumonia
  - High sodium (hypernatraemia)
    - If patient very dehydrated e.g. sweating/vomiting
Pneumonia

• Urea and electrolytes
  – Potassium

  – Low potassium (hypokalaemia) may suggest legionella pneumonia

  – Low potassium also seen with IV piperacillin-tazobactam, steroid therapy and nebulised salbutamol
Pneumonia

• Liver profile

  – “liver function tests”

  – Raised ALT, GGT and alkaline phosphatase not unusual in patients with viral pneumonia and atypical pneumonia
Pneumonia

- C reactive protein (CRP)
  - “acute phase reactant”
  - Usually high with acute infection, and falls as infection improves
  - Good marker of improvement
Pneumonia

- **Lactate**
  - Usually produced when cells go into anaerobic metabolism
  - Indicates significant sepsis
  - > 2.0 ---- sepsis
  - > 4.0 ---- severe sepsis

- “Sepsis six”
Pneumonia

• Blood culture

  – Should be done if pneumonia suspected or diagnosed

  – Streptococcus pneumoniae (90% of pneumonia)
Pneumonia

• Cold agglutinins
  – May be present in Mycoplasma infection
Pneumonia

• Arterial blood gas
  – PO2
  – PCO2
  – pH
  – lactate
Other blood tests

• Serology for atypical pneumonia
  – Mycoplasma
  – Legionella
  – Chlamydia
  – Acute and convalescent serum

• ESR ??

• Quanteferon test if suspected TB
Case

- Mr RC

- FBC: WCC 16  Hb 9.5  Plts 478
- U&E: Na 132  K 3.7  urea 15.0  creatinine 112
- Liver ALT 66  GGT 112
- CRP 135
- Lactate 3.6
- Blood C&S streptococcus pneumoniae sensitive to co-amoxycyclav
Acute exacerbation of COPD
COPD

• Full blood count

• WCC: raised with infection or steroids

• Hb: may actually be high in smokers or COPD patients with low oxygen levels
  – Reactive polycythaemia
COPD

• Urea and electrolytes

• Urea / creatinine: dehydration

• Monitor potassium !!
  – potassium is lowered by steroids, nebulisers, piperacillin-tazobactam
  – Low potassium may cause respiratory muscle weakness
COPD

- CRP

- Increased in infective exacerbations
- Useful in monitoring progress
COPD

- Nutrition
- Albumin levels
- Iron, B12, folate
COPD

- Pro-BNP
- Brain natriuretic peptide
- Increased in heart failure
- Some patients with COPD get right heart failure (cor pulmonale)
Blood tests specific to COPD

- Alpha 1 antitripsin level
- Genetic deficiency
- Alpha 1 antitripsin deficiency causes early onset emphysema
- Can be given replacement therapy
Asthma
Useful blood tests in asthma

• **Eosinophil level** high in atopic asthma especially in acute exacerbation

• **IgE level** high in atopic asthma
  – Very high in allergic bronchopulmonary aspergillosis (ABPA)
Useful blood tests in asthma

• Serology for *aspergillus* may be useful in ABPA
  – Antibody test

• **RAST testing** or **FEIA**
  (fluorenymeimmunoassay)
  – Specific IgE testing for allergies


Acute asthma

- CRP ---- if suspected infection

- **Potassium**: vital to monitor if on steroids/nebulised salbutamol
Sarcoidosis
Useful tests in sarcoidosis

- Serum angiotensin converting enzyme
  - Serum ACE
  - May be useful in disease monitoring

- Serum calcium
  - hypercalcaemia

- Urea and electrolytes

- Liver profile
  - Granulomatous hepatitis

- Antinuclear antibody (ANA) may be high
  - Non-specific
Bronchiectasis
Useful tests in bronchiectasis

- CRP
- FBC
- ESR
- **Immunoglobulin levels:** IgG, IgM
  - IgG subtypes
- IgE level: ABPA
Useful test in bronchiectasis

- ANA, RF
- Genotyping for **cystic fibrosis (CF)**
- Alpha 1 antitripsin level
- Aspergillus precipitens test
Pulmonary embolism
D-dimer

• When clinical prediction rule results indicate that the patient has a low or moderate pre-test probability of pulmonary embolism, D-dimer testing is the usual next step

• Negative results on a high-sensitivity D-dimer test in a patient with a low pretest probability of PE indicate a low likelihood of venous thromboembolism and reliably exclude PE
D-dimer

- D-dimer testing should **not** be used when the clinical probability of PE is **high**, because the test has low negative predictive value in such case.

- Because of the poor specificity, **positive** D-dimer measurements are generally **not helpful** in diagnosis.
D-dimer

- In a 2012 prospective cohort study, a Wells score of ≤4 combined with a negative qualitative D-dimer test was shown to safely exclude pulmonary embolism in primary care patients
Hereditary factors predisposing to PE

- Antithrombin III deficiency
- Protein C deficiency
- Protein S deficiency
- Factor V Leiden mutation (most common genetic risk factor for thrombophilia)
- Plasminogen abnormality
- Plasminogen activator abnormality
- Fibrinogen abnormality
- Resistance to activated protein C
Fibrotic lung disease
Fibrotic lung disease may be caused by

- Idiopathic interstitial pneumonias
- Hypersensitivity pneumonitis
  - Farmers lung
  - Pigeon fanciers lung
- Connective tissue disease
- Vasculitis
- Drug induced
- Sarcoidosis
- Asbestosis
- Silicosis
Bloods which may be useful in fibrotic lung disease

- ESR and CRP may be raised
- Antinuclear antibodies (ANA)
- Rheumatoid factor (RF) in RA
- Anti ds-DNA in SLE
Bloods which may be useful in fibrotic lung disease

- Anti-centromere antibodies and Anti-SCL-70 antibodies: scleroderma
- Anti RNA polymerase: diffuse scleroderma
- c-ANCA and anti-myeloperoxidase (MPO) antibodies in vasculitis / granulomatosis with polyangiitis
Bloods which may be useful in fibrotic lung disease

• Serum ACE *may* be raised in sarcoidosis

• Farmer’s lung antibodies
  – IgG antibodies against [thermophilic actinomycetes](https://en.wikipedia.org/wiki/Thermophilic_actinomycetes)
(Wegener’s granulomatosis)
Granulomatosis with Polyangiitis
Blood tests in Granulomatosis with Polyangiitis

• ESR and CRP may be high

• FBC: eosinophil count may be high

• RF positive in 2/3 of patients

• ANA may be positive

• Antineutrophil cytoplasmic antibodies (ANCA)
  – c-ANCA
  – Anti- MPO and anti-PR3 antibodies
Blood tests in Granulomatosis with Polyangiitis

- Renal function may be impaired
  - Do urea and electrolytes

- Churg-Strauss vasculitis
  - Anti-p-ANCA antibodies
  - High eosinophils

- Microscopic polyangiiitis
  - Anti-p-ANCA antibodies
  - Anti-MPO antibodies
Bronchial carcinoma
Blood tests in lung cancer

• FBC: may become anaemic
• ESR: non-specific, may be high
• Calcium: may be high with **squamous** cell carcinoma
• Sodium: may be low with **small cell** carcinoma
• **Bone** profile: **metastatic** disease
• **Liver** profile: **metastatic** disease
• Nutrition: albumin
Phlebotomist

It's a bloody job,
but someone has to do it.
“Hold still, Mrs. Brown while I draw your blood.”
Apologies for the lame joke and.....
Any questions?