Septic Shock

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What is sepsis?

- 1914 Schottmueller
- Septicaemia is a state of microbial invasion from a portal of entry into the blood stream which causes signs of illness
- Good definition but....
- 30-50% pts have +ve blood cultures
- Also not all bacteremic pts have sepsis
- Sepsis and septicaemia not identical
- Realised that it is the host defence mechanism response
What is shock?

- Shock is when volume replacement fails to increase BP to acceptable levels
- Inadequate perfusion of major organ systems
- Leads to progressive organ failure and death
- 4 kinds of shock
  - Hypovolemic
  - Obstructive
  - Cardiogenic
  - Distributive
Distributive Shock

- Characterised by decreased resistance or increased venous capacity from vasomotor dysfunction
- Patients have high cardiac output
- Hypotension
- Large pulse pressure
- Low diastolic pressure
- Warm extremities good cap refill
So

• Is that it?
Sepsis or Systemic Inflammatory Response Syndrome (SIRS)

- Sepsis is defined as SIRS in response to infection
- Need 2 from 4 findings
  - T>38 or <36
  - HR>90
  - RR>20
  - WBC>12 or <4 or 10% immature forms
- Can have severe sepsis or septic shock without SIRS

(American College of Chest Physicians and Society of Critical Care Medicine, Bone et al, 1992)
Amended Definition

- 2001 everyone ACCP SCCM ESICM ATS SIS
- Sepsis is now presence of infection in association with SIRS
- Sepsis needs 1 of
  - Alteration mental state
  - Hypoxia
  - Elevated lactate
  - Oliguria
- Severe sepsis now above +organ dysfunction
- Septic shock circulatory failure, hypotension despite fluids, lactate >4
Incidence

• General population severe sepsis 0.5 per 1000 population per year (Padkin et al, 2003)
• Haematological malignancy 66 per 1000 (Williams et al, 2004)
• Acute leukaemia 275 per 1000 (Williams et al, 2004)
Mortality

- Considerable challenge
- Often do not mount appropriate inflammatory response
- Vigilance essential
- Large scale trials excluded immunosuppressed, malignancy and/or BMT patients (PROWESS trial Bernard et al, 2001)
- Gradual improvements over the past few years
- Mortality is approx 36%-45% in haematology
- compares to 25% in non cancer patients with severe sepsis

Solid tumour patients 37% (Williams et al, 2004)
Mortality

• Historically difficult patients for ITU to take
• Some series report 99% mortality once intubated post HSCT (Soubani, 2006)
• Currently 20% of post HSCT patients will leave ITU
• Outcome prediction is notoriously difficult
• Need to be frank discussion with treating team and relatives
• Early aggressive goal directed resus shown to work
Muddy Water

• Graft versus host disease
• Differentiation syndrome
• Tumour lysis syndrome
• Tumour related fever
• Antibiotic or other medication related fever e.g. cytarabine
Pathophysiology

- Cytokine storm
Aetiology

• Most have a predisposition
  • Elderly >70 more at risk
  • Pre morbid conditions like diabetes, COPD, alcoholic
  • Immunocompromised, steroids
  • Malignancy
  • Chronic liver disease
  • Chronic renal failure
  • Major surgery, trauma, burns
  • Indwelling catheters
  • Previous antibiotic treatment
  • Prolonged hospitalisation
What should we look for then?

- Hypotension is cardinal sign of septic shock
- Is a poor sign of oxygen delivery
- HR
- Temperature
- Respiratory rate
- Capillary refill time
- Urine output
- Blood lactate
- Blood gas oxygen
Diagnostic Criteria for Sepsis

• General variables
  • Fever (core temp >38.3)
  • Hypothermia (core temp <36)
  • HR >90 bpm or >2 SD above normal range for age
  • Tachypnoea
  • Altered mental status
  • Significant oedema or +ve fluid balance >20ml/kg/24hrs
  • Hyperglycaemia >7.7 in absence of diabetes
Diagnostic Criteria for Sepsis

- Inflammatory variables
  - Leucocytosis (WCC > 12x10^9/l)
  - Leucopenia (WCC < 4x10^9/l)
  - Normal WCC with >10% immature forms
  - CRP >2 SD above normal range
  - Procalcitonin >2 SD above normal range
Diagnostic Criteria for Sepsis

• Haemodynamic variables
  • Arterial hypotension (SBP <90mmHg, MAP <70 or an SBP decrease >40mmHg)
  • SO2<70%
  • Cardiac index <3.5l/min/m2
• Tissue perfusion variables
  • Hyperlactataemia (>1mmol/l)
  • Decreased capillary refill or mottling
Diagnostic Criteria for Sepsis

- Organ dysfunction variables
  - Arterial hypoxaemia (PaO2/FIO2 <40)
  - Acute oliguria (urine output <0.5ml/kg/h for at least 2h)
  - Creatinine increase >44umol/l
  - Coagulation abnormalities (INR >1.5 or aPTT>60s)
  - Ileus (absent bowel sounds)
  - Thrombocytopenia <100
- Hyperbilirubinemia >70umol/l (Levy et al, 2003)
History and examination

- Mouth
- ENT
- Eyes
- GI
- Respiratory
- Perineum
- Diarrhoea
- Skin lesions
- Genito-urinary
- Vascular access
Treatment

• Resuscitate with supportive measures to correct
  • hypoxia, hypotension, tissue oxygenation
  • identify source of infection
  • maintain adequate organ function
Treatment Cardiovascular

• Rapid correction of hypovolaemia
• Restoration of oxygen
• Delay causes poor outcome
• Hartmanns preferred to saline
• Little evidence for colloid
• Immediate 20ml/kg
• CVP monitor 8-10cmH2O
• May need to use vasopressors if fluid alone not enough to achieve MAP 65-90mmHg
Treatment Respiratory

- Maintain airway
- Correct hypoxia
- Early non invasive ventilation
Principles to follow

- Early recognition
- Early and adequate antibiotic therapy
- Source control
- Haemodynamic resus and continued support
- Tight glycemic control
- Ventilatory management if in ARDS
Pathway for patients with suspected sepsis – to achieve one hour to antibiotics administration.

Patients who have received systemic anticancer treatment in the last 6 weeks and has one of the following:
- Temperature >38°C
- Temperature <36°C but unwell i.e. sign of infection, rigors, acutely altered mental status

Patients presenting with systemic inflammatory response syndrome (SIRS) characterised by a sign of infection and two or more of the following:
- Temperature >38°C or <36°C
- Heart rate > 90/min
- Respiratory rate > 20/min
- White cell < 4 or > 12 x 10⁹/L
- Acutely altered mental status
- Hyperglycaemia (>6.6 mmol in the absence of diabetes)

Suspected neutropenic sepsis
Suspected sepsis

Comence the one hour to antibiotic proforma.

Medical review a priority. Care of the patient to be managed in accordance with the Guidelines for the Management of Sepsis 2010.

Patients who are not proven to be neutropenic may be converted to alternative antibiotics as clinically appropriate (Antimicrobial Guidelines for Common Infections, v2.4, 2010).
Thank you, questions?

- Big wave