PATHOPHYSIOLOGY OF SEPSIS

Donna Higgins
Clinical Nurse Educator
Surgery & Critical Care
Diana Princess of Wales Hospital, Grimsby.
AIMS & OBJECTIVES...

- Define the term sepsis
- Understand the effects of sepsis
- Compare the old and new Sepsis 6
- Quiz with a star prize of QUALITY STREET!!
DEFINITION

‘Life threatening organ dysfunction caused by a dysregulated host response to infection’

Surviving Sepsis Campaign (2016)
SURVIVING SEPSIS CAMPAIGN

- The Surviving Sepsis Campaign is a joint collaboration of the Society of Critical Care Medicine and the European Society of Intensive Care Medicine committed to reducing mortality from severe sepsis and septic shock worldwide.

- Initiated in 2002
- Evidence-based guidelines
- *Implementation of a performance improvement program*
- Analysis and publication of data from more than 30,000 patient charts collected around the world.
INCIDENCE OF SEPSIS...

- Sepsis can be triggered by any infection, but most commonly occurs in response to bacterial infections of the lungs, urinary tract, abdominal organs or skin and soft tissues.

- **52,500** People lose their lives to sepsis annually

- **£2 billion** Is the estimated amount that sepsis costs the NHS annually
DEVELOP A HIGH LEVEL OF SUSPICION….

- Caught early, outcomes are excellent. Untreated risks septic shock, multi-organ failure and death.

- Increasing awareness and developing a high level of suspicion will save lives.
HOW TO SPOT SEPSIS IN ADULTS

Slurred speech or confusion
Extreme shivering or muscle pain
Passing no urine (in a day)
Severe breathlessness
It feels like you are going to die
Skin mottled or discoloured

Sepsis Trust UK (2019)
HOW TO SPOT SEPSIS IN HOSPITAL

- Early warning score trigger
- Looks ill to a health professional or an unusually concerned relative
- Has any signs of infection

Sepsis Trust UK (2019)
RED FLAGS

- Responds only to voice or pain / unresponsive
- Acute confusional state
- Systolic B.P. ≤ 90 mmHg (or drop > 40 from normal)
- Heart rate > 130 per minute
- Respiratory rate ≥ 25 per minute
- Needs oxygen to keep SpO2 ≥ 92%
- Non-blanching rash, mottled / ashen / cyanotic
- Not passed urine in last 18 h / UO <0.5 ml / kg / hr
- Lactate ≥ 2 mmol / l
- Recent chemotherapy
SO WHAT PROBLEMS DO WE SEE OUR PATIENTS DEVELOP....

- Hypotension
- Acute lung injury
- Acute kidney injury
- Coagulopathy
- Cerebral dysfunction
- Limb loss
- Reduced functional capacity
- Death
**Pathophysiology of Sepsis**

At the cellular level, sepsis is characterized by changes in the function of:

- endothelial tissue (the *endothelium* forms the inner surface of blood vessels)

- in the coagulation process

- blood flow.
Pathophysiology of Sepsis...

- The pathophysiology of sepsis is complex and results from the effects of circulating bacterial products, mediated by cytokine release, caused by sustained bacteraemia.

- Cytokines are primarily responsible for the clinically observable effects of the bacteraemia in the host.
Pathophysiology of sepsis...

- The substances, which include short-lived regulatory proteins known as *cytokines* interact with endothelial causing injury to the endothelium and possibly the death of endothelial cells.

- These interactions lead to the activation of coagulation factors.
Pathophysiology of sepsis...

- In very small blood vessels the coagulation response, in combination with endothelial damage, may impede blood flow leading to blood vessels becoming leaky and clot formation.

- As fluid and microorganisms escape into the surrounding tissues, the tissues begin to swell in the lungs can lead to pulmonary oedema, manifesting as shortness of breath.
Pathophysiology of sepsis...

- If coagulation proteins become exhausted, bleeding may ensue.

- Cytokines also cause blood vessels to dilate (widen), producing a decrease in blood pressure.

- Nitrous oxide which is key to blood pressure regulation is produced in an excessively, contributing to the widespread hypotension seen.

Pathophysiology of sepsis...

- **Bacterial endotoxin**
  - Widespread leucocyte activation
  - Diffuse cerebral dysfunction
  - Increased leucocyte oxygen consumption
  - Febrile response
  - Increased whole-body metabolic rate
  - Acute lung injury

- **Massive cytokine release**
  - Vasodilation and increased capillary permeability
  - Impaired cardiac contractility due to impaired metabolite use

- **Hemodynamic collapse**
  - Hypoxic respiratory failure
  - Shock
  - Acute renal failure
  - Disseminated intravascular coagulation
  - Coagulopathy

- Poor hepatic synthetic function
- Widespread complement and coagulation cascade activation
- Decreased renal function due to direct cytokine effects
- Microvascular damage
- Coagulation factor consumption
SEPTIC SHOCK

‘Septic shock should be defined as a subset of sepsis in which particularly profound circulatory, cellular, and metabolic abnormalities are associated with a greater risk of mortality than with sepsis alone.’

Gomes et al (2016)
Original sepsis 6

- Blood cultures
- Urine output
- Fluids
- Antibiotics
- Lactate
- Oxygen

UK Sepsis Trust (2005)
SEPSIS 6 REVISED 2019

- Ensure a Senior Clinician Attends
- Oxygen if required
- Obtain IV Access / take bloods
- Give IV Antibiotics
- Give IV fluids
- Monitor

Sepsis Trust UK (2019)
ANY QUESTIONS?
NOW FOR MY QUESTIONS...
REFERENCES


Sepsis Trust UK (2019) [https://sepsistrust.org/](https://sepsistrust.org/)