

Septic Shock

"Endotoxic Shock"

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Definition

Impaired tissue perfusion results in disturbed cellular metabolism.

Classification of shock

1. Hypovolemic "oligemic" shock:

- due to diminished blood volume.

2. Cardiogenic shock:

- due to inefficient myocardial function.

3. Distributive shock:

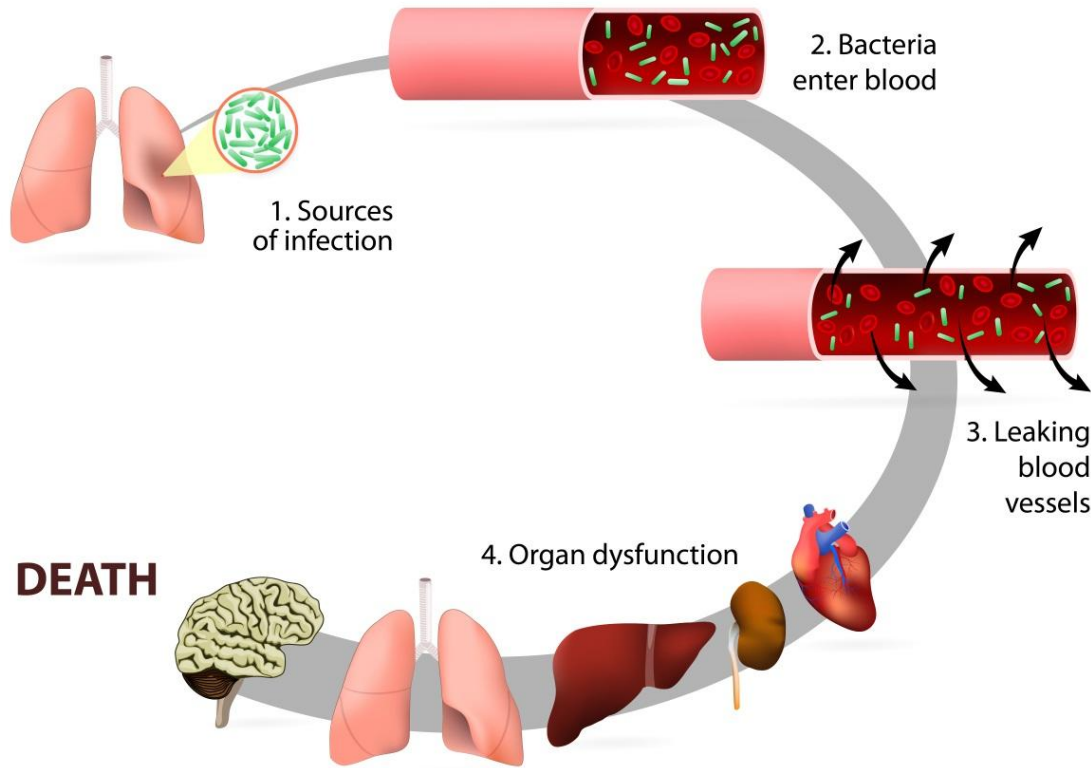
- Septic shock, Neurogenic shock, Anaphylactic shock, Endocrinal shock.

4. Obstructive shock:

- Cardiac tamponade ,pulmonary embolism , tension pneumothorax.

Septic Shock "Endotoxic"

Sepsis



Etiology

1. Causative organisms.
2. Source of infection.
3. Predisposing factors.

1-Gausative organisms:

- 1- Gram -ve bacilli (E.Coli)“the commonest”.
- 2- Staphylococci.
- 3- Candida.



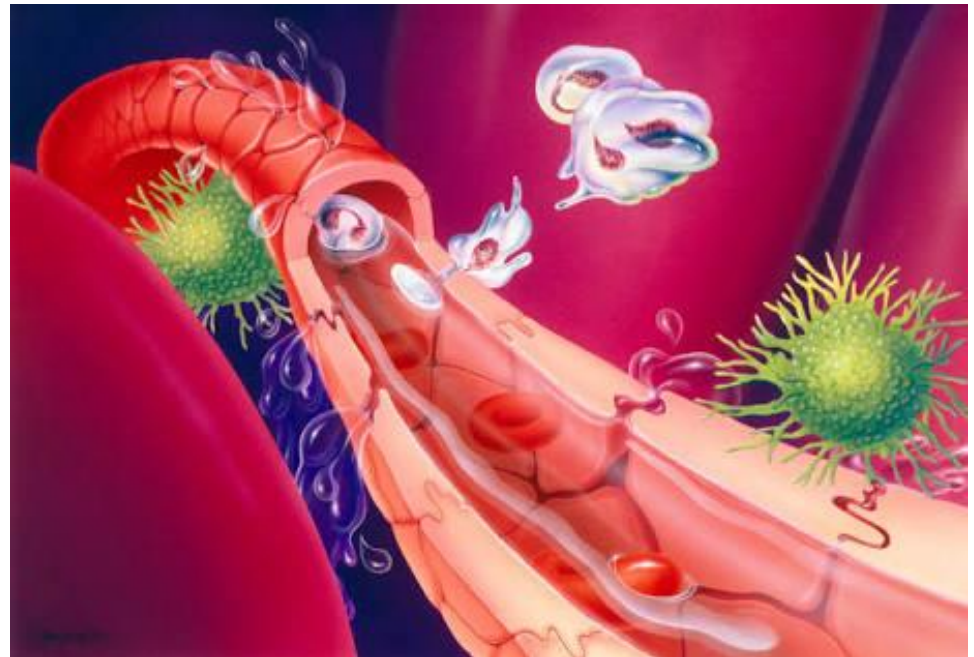
2-Source of infection :

1 - **Peritonitis** :

- caused by perforated viscus , gangrenous bowel or leaking anastomosis.

2 - **Cholangitis** or genitourinary infections.

3 - **Infected** central venous catheter.

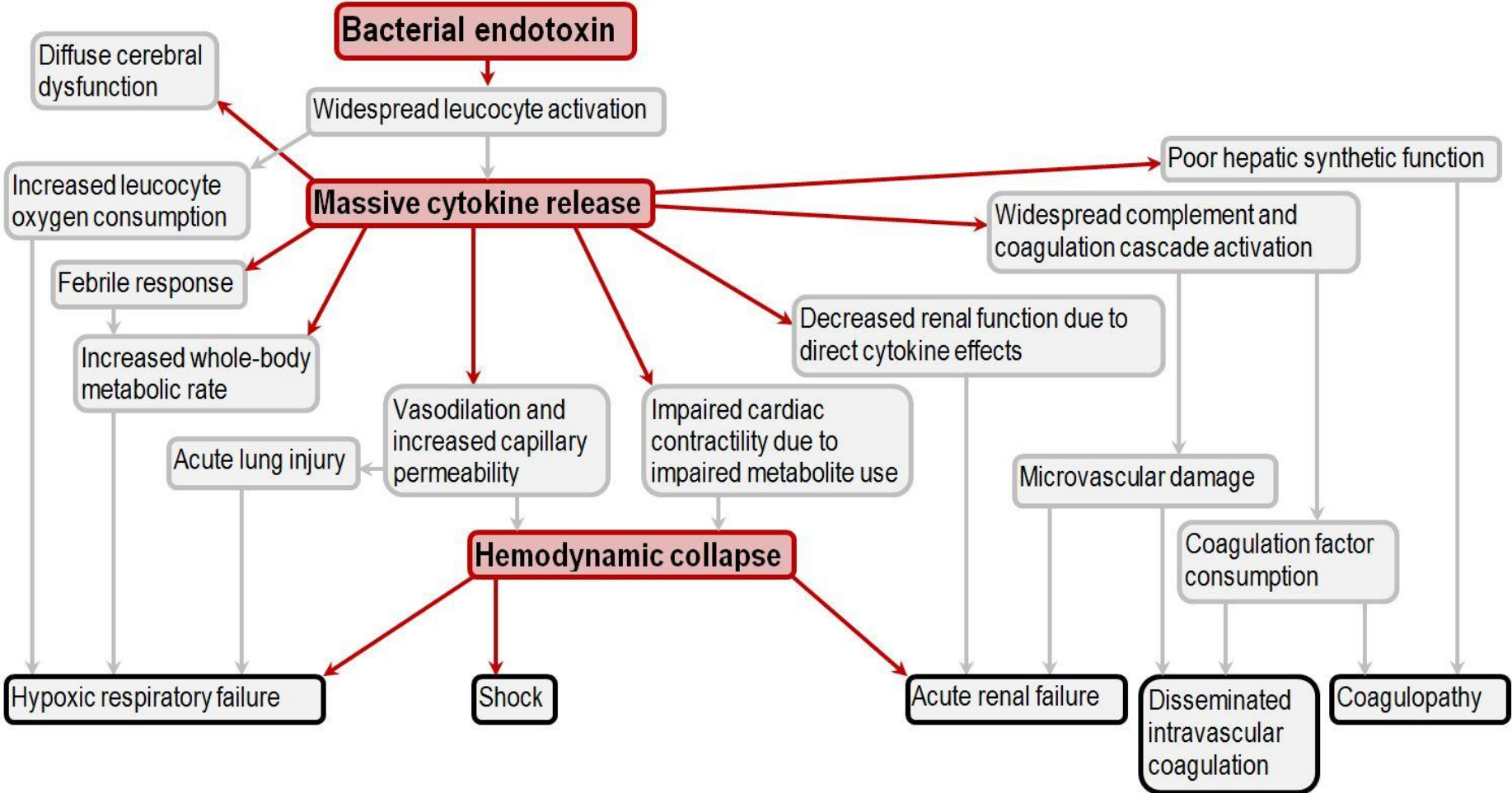


3-Predisposing factors (low immunity)

- 1- Extremes of age.
- 2- Diabetes mellitus.
- 3- Malignancy, malnutrition.
- 4- Chemotherapy, corticosteroids or immunosuppressant



Pathophysiology



SEPSIS STEPS

SIRS

T: >100.4 F
< 96.8 F
RR: >20
HR: >90
WBC: >12,000
<4,000
>10% bands
PCO2 < 32 mmHg

SEPSIS

2 SIRS

+

Confirmed
or suspected
infection

SEVERE SEPSIS

Sepsis +

Signs of End
Organ Damage

Hypotension
(SBP <90)

Lactate >4 mmol

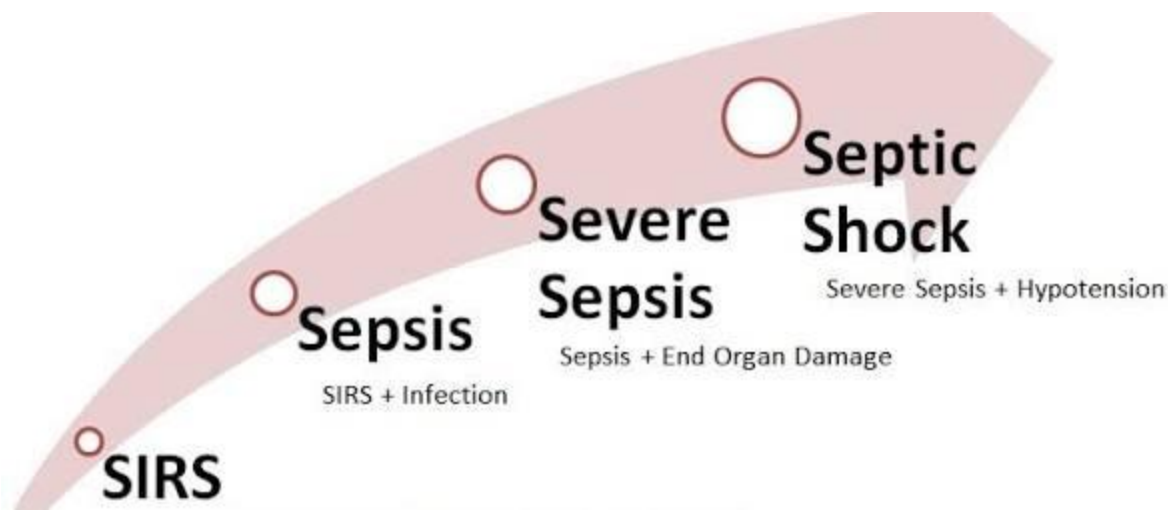
SEPTIC SHOCK

Severe Sepsis
with persistent:

Hypotension

Signs of End
Organ Damage

Lactate >4 mmol



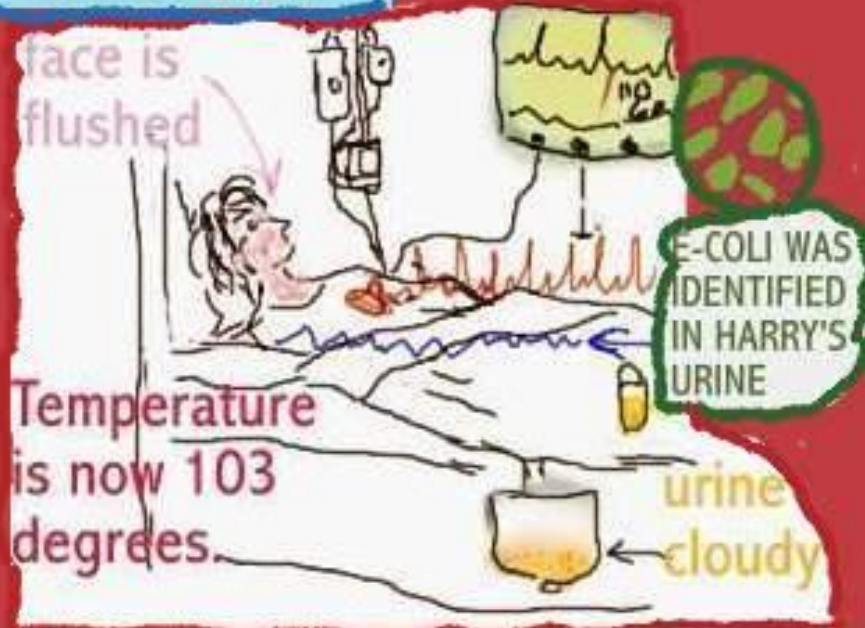
Clinical Picture

1. Hyper-dynamic "warm" septic shock (Early phase)
- 2- *Hypodynamic "cold" septic shock (late phase)*

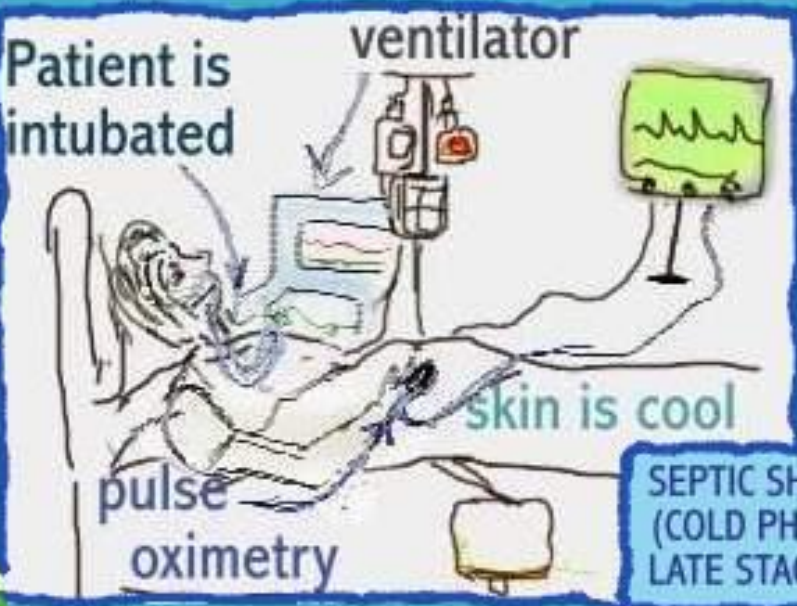
SEPTIC SHOCK A CASE STUDY



HARRY IS IN EARLY SEPTIC SHOCK (WARM PHASE)



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SEPTIC SHOCK (COLD PHASE) LATE STAGE

1. Hyper-dynamic "warm" septic shock (Early phase) :

Diagnosis is Difficult and high index of suspicion is required to detect it at early stage.

1- Restless & confusion.

2- Skin: flushed, warm & dry.

3- vital data :

a- Fever $>38.C$ + Chills.

b- Mild decrease in ABP

c- Tachycardia

d- Tachypnea

4- high cardiac output

5- oliguria



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Suspect
SEPSIS



Save Lives

2- Hypodynamic "cold" septic shock (late phase)

If the treatment is not effective or diagnosis is late the patient passes to cold phase

1-Skin: cold clammy

2- Vital data:

- SBp < 90mmHg .
- Tachycardia.
- Tachypnea.

3 - Oliguria.

4- Multi-organ failure starts at this stage.



S

Shivering,
fever,
or very cold

E

Extrême
pain or
general
discomfort
("worst
ever")

P

Pale or
discolored
skin

S

Sleepy,
difficult
to wake
up,
confused

I

"I feel
like I
might
die"

S

Short of
breath

Criteria for Diagnosis

To diagnose septic shock, the following two criteria must be met:

1. Evidence of infection, through a positive blood culture.
2. Refractory hypotension (despite adequate fluid resuscitation & cardiac output).

In addition to the two criteria above, two or more of the following must be met:

1. Hyperventilation (high respiratory rate) > 20 breaths per minute.
2. ABGs: $\text{PaCO}_2 < 32$ mmHg.
3. WBC count < 4000 cells/mm³ or > 12000 cells/mm³

Complications

- **Multiorgan failure:**
 - 1- ARDS
 - 2- Acute renal failure
 - 3-hepatic dysfunction
- **DIC**
- **Acute erosive gastritis(stress ulcer)**

Investigations

1-Assessment of general condition

2-For the cause & source.

3-For complications .

1-Assessment of general condition

(should be done serially for follow up)

a - CBC:

- Marked leucocytosis (or leucopenia, late) & thrombocytopenia.

b - ABG:

- PO₂, PCO₂, pH (hypoxia & hypercapnia in ARDS)

c - Electrolytes & Blood sugar (for dehydration).

2-For the cause & source:

A- Isolation of organisms from source of infection & blood

**Cultures: should be done on anaerobic aerobic media.

** Blood cultures

B- Location of septic focus:

** X-Ray: Abdomen & Chest.

** U/S & CT scan.



3-For complications

A- KFTs & LFTs. (MOF)

B- ECG monitoring. (IHDs)

C- Coagulation profile. (DIC)

Treatment

- 1- Treatment should be started as soon as possible
- 2- Patient is admitted to ICU
- 3- The most important components are:
 - A) supporting body systems
 - B) fighting infections
- 4- Monitoring is essential for guidance of treatment

1-Resuscitation (supporting body systems)

- 1- Circulatory support:
- 2- Respiratory Support
- 3- Renal Support
- 4- DIC



1- Circulatory support

1 –fluid replacement

Till CVP is 10-12 cm H₂O

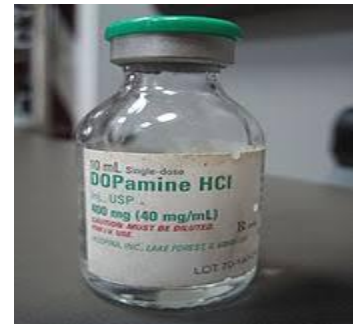
-By ringer lactate

-If low Hct: packed RBCs or whole blood transfusion.



2- Drugs:

-Inotropes & vasopressors : dopamine & dobutamine are given if the patient remains hypotensive despite adequate fluid replacement



2-Respiratory Support

- by O₂ mask.
- If pO₂ < 60 mm Hg mechanical ventilation



3- Renal Support

- Adequate circulatory support improves renal blood flow.
- Hemodialysis is required in acute renal failure, until the kidneys recover.

4-DIC

Fresh frozen plasma.



2- Fighting Infection

a-Eradication of sepsis:

- Drainage of huge abscess or peritonitis.
- Resection of gangrenous bowel.

b- Antibiotics:

- Parenteral, combined, broad spectrum started early without waiting for culture & sensitivity results (3rd generation cephalosporin + Amnioglycosides + Metronidazole).
- Then changed according to culture & sensitivity.



3- Continuous monitoring

- 1- Vital signs (temperature, pulse, BP and RR) and ECG.
- 2- Urine output.
- 3- ABGs, repeated blood culture, CBC, coagulation profile & organ profile.
- 4- CVP, arterial line .



4- Strict control of **blood sugar** has been proved to increase survival.

5- Prophylaxis against **DVT** and **stress ulcers**.

Prognosis

High mortality rate range from 25% up to 90% due to late diagnosis and late treatment.

Reference

- Bailey.Loves.Short.Practice.of.Surgery.26th.Edition.chapter 2.

A purple rectangular tag with a hole on the left side is the central focus. The words "Thank you!" are written on it in a black, cursive font. The tag is placed on a light brown, textured surface, possibly burlap. Three white daisies with yellow centers are scattered around: one in the foreground to the right of the tag, and two in the background, one slightly to the left and one to the right. A light-colored string is looped around the tag and extends towards the top left of the frame.

Thank
you!