

## Sepsis and Infective Endocarditis

Michal Holub

Department of Infectious Diseases First Faculty of Medicine Charles University in Prague and University Military Hospital



## **Bacteremia and Sepsis**

bacteremia = presence of bacteria in the bloodstream

 <u>sepsis = life-threatening organ dysfunction caused by</u> <u>a dysregulated host response to infection</u>.

 sepsis is a life-threatening condition that arises when the body's response to an infection injures its own tissues and organs.



## Epidemiology

- statistically sepsis is the main cause of death in ICU
- high incidence of sepsis 900,000 cases annualy (USA)
- sepsis is 7th cause of death (USA, E.U.)
- morbidity of sepsis is growing aging of population, invasive therapy, immunosuppressive therapeutic procedures etc.



#### Septic shock

- septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality
- septic shock can be identified in a septic patient with persisting hypotension requiring vasopressors to maintain MAP ≥65 mm Hg and having a serum lactate level >2 mmol/L (18 mg/dL) despite adequate volume resuscitation



#### **Clinical stages**

• sepsis

septic shock



#### **Clinical picture**

- fever or hypothermia
- hypotension or tachycardia
- findings on the skin
- heart murmurs (endocarditis)
- alterations of mental status
- septic arthritis flebitides, erysipel, early infections, etc.



#### Diagnostics

- Blood cultures (two pairs for aerobic and anaerobic cultivation)
- inflammatory markers
- laboratory and clinical marks of DIC
- findings of infectious foci (chest X ray, ENT examination, abdominal ultrasound, CT and others)
- neurological examination  $\Rightarrow$  lumbar puncture in case of alteration of consciousness and meningeal irritation



#### Organ failure in sepsis

- MODS/MOFS: ALI/ARDS, acute renal failure etc.
- circulatory failure hypotension (syst. pressure <90 mm Hg)
- DIC Gram-negative sepsis
- GIT failure, hepatic failure
- damage of CNS septic encephalopathy



#### Treatment of sepsis and septic shock

 fluid therapy, oxygenotherapy, circulatory support, insertion of catheters, mechanical ventilation and others

antibiotics (!!!)

• source control - surgical evacuation of abscesses etc.

• corticosteroids, normoglycemia, normocalcemia etc.



## Sepsis – the major cause of death in ICU

- 20-50% of patients in ICU suffer from nosocomial infection
- ventilatory pneumonia
- catheter-related sepsis
- urosepsis
- decubital sepsis



#### Infective endocarditis

- life-theratening infectious disease
- presence of thrombus ("vegetation") on cardiac valve
- endocarditis on native valve
- endocarditis on valve implants







## Etiology

- <u>Staphylococcus aureus</u> may infect pathologically changed and healthy valves
- <u>coagulases-negative staphylococci</u> (S. epidermidis, S. haemolyticus, S. hominis) - have affinity to artificial surfaces
- viridans group streptococci (S. mitis, S. sanguis a S. mutans)
  in oral cavity and GIT
- <u>enterococci</u> are common in GIT
- <u>Gram-negative bacteria and fungi</u>



### Etiology of native valve IE

- streptococci 55% (S. viridans [sanguis, mutans, mitis], S. bovis, S. equinus, S. pyogenes - group A)
- staphylococci 30% (*S. aureus, S. epidermidis*)
- enterococci 6% (Enterococcus faecalis, E. faecium)
- bacteria of the group HACEK (<u>Haemophilus spp., Actinobacillus</u> actinomycetemcomitans, <u>C</u>ardiobacterium hominis, <u>E</u>ikenella spp., <u>K</u>ingella kingae)



### Etiology in injection drug users

- *S. aureus* ~50%
- streptococci and enterococci ~20%
- Candida sp. ~6%
- Gram-negative bacteria ~6%



#### Pathogenesis

#### S. aureus can attack intact valve

preexisting heart damage in 60-80% of patients

degenerative changes of valves (30-40%) post-rheumatic changes (<25%) inherted cardiac defects (6-25%) endothelial damage in catheterization (5-25%)



### **Clinical picture**

- sepsis with embolization into skin
- feverish condition in a patient with predisposing heart disease
- every feverish condition with isolation of viridating streptococci, *S. aureus*, enterococci and bacteria of the group HACEK from hemoculture
- migrating pneumonia
- unexplainable fever in intravenous drug users
- CVA picture associated with fever and increase of inflammatory parameters



#### Diagnostics and therapy

echocardiography

hemocultivation

staphylococci – oxacilin (12-18 g/day) + adjunctive antibiotic

#### streptococci and enterococci – penicillin (10-20 mil IU/day) + adjunctive antibiotic

unknown etiology with subacute course - ampicillin/sulbactam + gentamicine

unknown etiology with acute course – vancomycin + adjunctive antibiotic



#### Life-threatening complications

- valve damage
- congestive heart failure
- spread of infection to subvalvular tissue
- septic embolisation of organs
- aneurysm of blood vessels
- multiple organ failure



#### Preventive measures and antibiotic prophylaxis for dental patients at risk for infection



# Dental procedures for which prophylaxis is reasonable

- manipulation with gingival tissue
- manipulation with periapical region of teeth
- perforation of the inflammed oral mucosa

## No prophylaxis

 anesthetic injections through non-infected tissue, dental radiographs, placement of orthodontic appliances, bleeding from trauma to lips or oral mucosa



# Recommendation for patients with cardiac condition

- daily oral hygine
- daily plaque removal
- daily flossing
- regular dental care



#### Patients with compromised immunity

- secondary immunodeficincies: HIV, neutropenia, cancer chemotherapy and hematopoietic stem cell or solid organ transplantation
- head and neck radiotherapy
- autoimmune diseases
- sickle cell anemia
- asplenism
- diabetes and chronic steroid usage



#### 1. LÉKAŘSKÁ FAKULTA UNIVERZITY KARLOVY V PRAZE

#### PRŮKAZ NEMOCNÉHO OHROŽENÉHO **INFEKČNÍ ENDOKARDITIDOU** Pacient Rodné číslo: Riziko (zaškrtnout): vysoké zví, chlopenní protezy, stav po infekční endokarditidě střední vétělma získaných i vtozených vad, hypertrofická obstrukční kardiomydpatie nizké (profylaxe neindikována): defekt septa síní typu: ostium secundum, nekalcifikované degenerativní vady Vydal MUDr: Adresa: Telefont Hydala Cenira termining ona sprinchnof w springrisa sa Spelectranti vetikovite serantiv CLS JP Benel J., Kvesticka J. Infektiv endokarditida. Cor Varia 2000; 42(2) ik 21 - 28.

Sekretania CKS, FIX U to Anny Peliatska 53, 656 91 Omt

#### PROFYLAXE PŘI VÝKONECH V OBLASTI DUTINY ÚSTNÍ, JICNU A KONEČNÍKU

(zäkroky spojené s krvácením: extrakce zubu, torzilektornie, gingivektornie, skterotizace variků apod.)

Alergie na PNC	amoxycilin	2g <sup>13</sup> p.o.	1 h. předem
	klindamycin	450 mg <sup>2</sup> p.o.	1 h. předem
Parenteraliné	ampicilin	2g² i.v., i.m.	před výkonem

#### PROFYLAXE PŘI CĚVKOVÁNÍ A JINÝCH INVAZIVNÍCH VÝKONECH NA MOČOVÝCH NEBO ŽLUČOVÝCH CESTÁCH

	amoxycilin	2g** p.a.	1 h. předem
Parenteraline	ampicilin	2g* i.v., i.m.	před výkonem
rebo	vankomycin	tig infuti trvajio	i 60 min

 a) při déle trvajícím výkonu nebo krvácení na za 4 h. poda jedné poloviční davka ATB b) u nerocných s vyodkým rízkem je vhodné zvýšiť davkování ATB o 50%

#### PROFYLAXE PŘI VYKONECH V OBLASTI INFIKOVANÉ KUŽE NEBO PODKOŽÍ

(incise abscesu, turunklu apod.) - pliklady ATB protytavn

oxacilin	2g <sup>1</sup> p.o., i.v., im.
cetalosporin	1. generace 2gt p.o., Lv.
klindamycin	450 (600) mg <sup>a</sup> p.o. (i.v.,i.m.)
vankomycin	tg intuzi trvajici 60 min.

Na infekční endokarditidu nutno pomýšlet u rizikových pacientů vždy při horočce nejasného původu, chľadnutí nebo závažném kardiologickém zhoršení včetně změn srdečních šelestů. Před nasazením antibiotik u horečnatých stavů neznámé etiologie je nutné odebrat alespoň 2 hemokultury!



#### Postoperative antibiotic therapy

- procedures involve infected tissues
- procedures on a patient with compromised immunity

### Post-procedural symptoms of acute infection

- fever
- malaise
- weaknes and lethargy