

Infections in immunocompromised patients

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Principles

- *Immunocompromised patient has alterations of immune mechanisms leading to an increased risk of severe infections*
- *Infections can be caused by pathogens with a low virulence*
- *Course of infection due to virulent microorganism is usually severe*
- *Absence or alteration of immune response modifies clinical picture*
- *Rapid diagnostics is important because these infections can be fatal*

Specific patients' populations with secondary immunodeficiency

- Elderly, pregnant females, neonates
- Diabetics
- *Oncologic patients*
- *Patients with immunosuppressive treatment*
- Patients with asplenia or functional hyposplenism
- *Patients with transplant*

Overview of selected immunodeficiencies

Deficiencies of innate immunity

- *Neutropenia*
- *Complement deficiencies*
- *Splenectomy*

Deficiencies of adaptive immunity

- *T-cell deficiencies*
- *hypogammaglobulinemia (B-cell deficiencies or defects of antibody production)*

Principles of antiinfectious immunity

Innate Immunity:

- *Phagocytosis*
- *Intracellular killing*
- *Opsonization*

Adaptive Immunity

- *Cytotoxic T cells*
- *T helper cells*
- *B cells and antibodies*

Clinically important defects of innate immunity

- *Neutropenia*
- *Complement deficiency*
- *Asplenia*

Neutropenia and febrile neutropenia (FN)

- *Causes: drugs, leukemia, myeloma etc.*
- *Risk of infection with <500 neutrophils/ μL*
- *High risk of infection with <100 neutrophils/ μL*
- *Fever $>38^\circ\text{C}$ and <500 neutrophils/ μL = febrile neutropenia*

FN: Etiology and sources

- *20-30% of the infections are due to colonizing flora*
- *Etiology: *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Enterobacteriaceae* and fungi*
- *Source of infection: pneumonia, complicated urinary tract infection, blood-stream infection or catheter-related infection*

FN: examinations

- *Inflammatory markers, urinalysis, chest X-ray, abdominal ultrasound, CT scan*
- *Standard blood cultures (4-6 bottles!), PCR testing including multiplex PCR*
- *Hospital-acquired vs. Community-acquired infections*

FN: treatment and prevention

- *Treatment: empirical antibacterial therapy (i.v.); in case of fungal infection antifungal drugs*
- *Adjunctive therapy: colony stimulating factors - GM-CSF or G-CSF*
- *Prevention: isolation („life islands“), antibacterial, antiviral and antifungal prophylaxis*

Complement deficiencies

- *Inherited complement deficiencies - properdin, C6, C7, C8*
- *Acquired complement deficiencies - C3b (renal failure, SLE etc.)*
- *Clinical picture - recurrent infections due to meningococci, gonococci and pneumococci*
- *Outcome - good in C3 and C5 deficiencies vs. acquired deficiency of properdin, which is associated with 80% fatality rate of invasive meningococcal disease*

Asplenia

- *Splenectomy - after trauma or surgery for hematologic disease*
- *Functional hyposplenism - a condition accompanying alcoholic liver disease, hepatic cirrhosis, lymphomas etc.*
- *Complicating infections due to encapsulated bacteria (*S. pneumoniae*, *N. meningitidis*) and intracellular pathogens (*Salmonella* spp., *babesia* and *plasmodia*)*

Infectious diseases associated with asplenia

- *OPSI* – overwhelming postsplenectomy infection – fulminant pneumococcal sepsis
- Septicemia due to *Capnocytophaga canimorsum* after dog bite
- Spontaneous bacterial peritonitis
- Severe malaria and babesiosis in endemic regions or in travellers

Spontaneous bacterial peritonitis



- Translocation of bacteria from GIT
- Low-protein-concentration in ascitic fluid <10 g/l
- *E. coli*, *S. pneumoniae*, *Klebsiella* spp., *Enterobacter* spp. and *S. aureus*

Infections in asplenia: diagnosis, therapy and prevention

- History of splenectomy or complicating diseases
- Howell-Jolly bodies in peripheral blood
- Blood cultures, blood smears for malaria or babesia
- Bactericidal antibiotics i.v.
- Preventive immunization, oral bactericidal antibiotics for selfmedication

Infections in specific patients' populations

- Pregnant females
- Elderly
- Diabetics

Infections in pregnancy

- Enormous hormonal, circulatory, and mechanical alterations
- Reduced number and activation of T lymphocytes, establishment of allograft tolerance
- Enlarged uterus can impede the urine flow ⇒ increased risk of urinary tract infection
- Altered vaginal microbiota ⇒ reduced species diversity

Characteristic infections in pregnancy

- Higher incidence of urinary tract infections and candidal vulvovaginitis
- Higher incidence of respiratory and gastrointestinal tract infections
- More severe course of chickenpox, pandemic flu (pH1N1), tropical malaria, hepatitis E and pneumocystis jirovecii pneumonia in pregnant females with AIDS
- Increased risk of reactivation of latent tuberculosis

Varicella pneumonia in pregnant female



Infections in elderly

- *Gradual deterioration of the immune system with aging - „immunosenescence“*
- *Reduced capacity of vital organs*
- *Presence of underlying diseases*
- *Malnutrition*

Presentation in elderly

- *Different spectrum of pathogens*
- *„Small symptoms“*
- *Important signs are missing (e.g., fever)*
- *Decompensation of non-infected („fragile“) organs*

Characteristic infections in elderly

- *Respiratory infections, tuberculosis*
- *Gastrointestinal and intraabdominal infections*
- *Urinary tract infections (UTI), pyelonephritis, catheter-associated UTIs' (CAUTI)*
- *Skin infections - erysipelas, cellulitis and herpes zoster*

Disseminated herpes zoster in the elderly male



Infections in diabetics

- *Changes of body microflora*
- *Compromized tissue integrity due to microangiopathy and neuropathy*
- *Altered neutrophil functions with impaired phagocytosis and chemotaxis*

Charecteristic infections in diabetics

- Skin and mucous membranes infections
- Upper respiratory tract infections including acute external otitis due to *P. aeruginosa*
- Urinary tract infections including pyelonephritis and urosepsis
- Severe soft tissue infections, osteomyelitis and diabetic foot

Facial erysipelas in diabetic patient

