Scarlet Fever

Scarlet fever is an acute infectious disease, characterized by lesions of oropharynx with submaxillary lymphadenitis, fever toxemia, punctiform rash and then desquamation.

TABLE 121-1 Classification of Streptococci

Lancefield Group	Representative Species	Hemolytic Pattern	Typical Infections
A	*S. pyogenes*	β	Pharyngitis, impetigo, cellulitis, scarlet fever → ARF, PSGN
B	*S. agalactiae*	β	Neonatal sepsis and meningitis, puerperal infection, urinary tract infection, diabetic ulcer infection, endocarditis
C	*S. equisimilis*	β	Cellulitis, bacteremia, endocarditis
D	Enterococci: *E. faecalis*; *E. faecium*	Usually nonhemolytic	Urinary tract infection, nosocomial bacteremia, endocarditis
	Nonenterococci: *S. bovis*	Usually nonhemolytic	Bacteremia, endocarditis
G	*S. canis*	β	Cellulitis, bacteremia, endocarditis, septic arthritis
Variable or nongroupable	Viridans streptococci: *S. sanguis*; *S. mitis*	α	Endocarditis, dental abscess, brain abscess
	Intermedius, *milleri*, or *anginosus* group: *S. intermedius*, *S. anginosus*, *S. constellatus*	Variable	Brain abscess, visceral abscess
	Anaerobic streptococci: *Peptostreptococcus magnus*	Usually nonhemolytic	Sinusitis, pneumonia, empyema, brain abscess, liver abscess

Etiology

- The pathogen of scarlet fever is a **β-hemolytic *Streptococcus group A.***
- The streptococcus produces exotoxins, which cause toxemia.
- Erythrogenous exotoxin (scarlet fever streptococcal toxin) is principal among them.
- The pathogen produces streptolysin, leukocidin, enterotoxin, enzymes (hyalonidase, streptokinase).
- Stable antitoxic immunity is acquired against erythrogenous toxin.

Etiology

- Bacterial antigenes of streptococcus and antibodies against them are **typospecific**.
- **Antibacterial immunity is not stable**. If the child has had scarlet fever, he will be able to contract other streptococcal infections (tonsillitis, nasopharyngitis, erysipelas) or will become bacteriocarier.
- Streptococci have considerable stability to the influence of physical factors. They survive drying and freezing well, but they rapidly perish under the influence of antibiotics especially penicillin.

Epidemiology

- The **source of infection** is a people of all ages with **scarlet fever (**typical, attenuated forms **or with other forms of streptococcal infection**.
- The patients become infectious from the onset of the disease.
- Children from 3 to 10 years old get scarlet fever most frequently.
- One-year-old babies have the disease rarely. This fact can be explained by the presence of transplacental immunity and physiologic are activity of 1-year-old babies to the influence of streptococcal toxin.

Epidemiology

- **Duration of infectious period may fluctuate from some days to several weeks or sometimes months.** These facts are determined by the quality of treatment and presence of chronic disease in nasopharynx. Antibiotics lead to rapid delivery of the patient from hemolytic Streptococcus and absolute removal bacteriocarriage in convalescence period. In children the duration of bacteriocarriage is usually long, up to 2-3 or even 6 months.

Epidemiology

- The principal route of scarlet fever - **air-droplet** one. Hemolytic streptococci are scattered from the source of infection no more than 2.5 m, that is why close contacts of the patient with other persons is necessary for dissemination of scarlet fever.
- Infection through toys and other things used by the patient may be caused in preschool institutions.

Epidemiology

- **Alimentary route**, i.e. through food, which can be contaminated by the patient or bacteriocarriers, plays an insignificant part, because streptococci do not multiply in food at room temperature. Milk is an exception, and is a good nutrition medium for hemolytic streptococci under certain conditions.
- Susceptibility to scarlet fever depends on absence of antitoxic immunity against erythrogenous exotoxin of hemolytic streptococcus. The contagious index is about **40 %.**

Pathogenesis

- The principal portal of entry in scarlet fever is **mucous membrane of oropharynx**.
- The infection may penetrate through damaged skin (in burns or injuries) or mucous membranes of the genitals (extrabuccal scarlet fever). After entering the human body hemolytic streptococcus leads to a complex pathologic process which may be presented in the form of three lines of pathogenesis (or syndromes): **toxic, septic** and **allergic**.

The toxic syndrome

- is the result of influence of the toxic substances produced by the hemolytic streptococcus in the human body. It occurs in the first hours of the disease and is characterized by the signs of toxemia in the form of fever, rash, headache, and vomiting.
- In the most severe cases the following hemodynamic disorders may occur: hemorrhages into adrenal cortex, brain edema, dystrophic changes in the myocardium, lesions of the vegetative nervous system leading occasionally to sympathicoparesis and lethal outcome with clinical signs of collapse.

The septic syndrome

- This syndrome includes primary inflammation in the portal of entry and microbial streptococcal complications.
- There is catarrhal inflammation, which is characterized by a tendency to rapid transition to a purulent,

  pyonecrotic one and spreading of hemolytic streptococcus from the primary focus to the surrounding tissue and through lymphatic and blood vessels.
- Clinically it is accompanied by the appearance of such complications as necrotic tonsillitis, sinusitis, otitis media, mastoiditis, adenophlegmon. In necrotic otitis media, the pathologic process may spread over to bone tissue, dura mater.

The allergic syndrome

- is caused by the sensitizing substances of hemolytic streptococcus which are proteins. In scarlet fever allergization is specific, it occurs from the first days of the disease and develops in parallel with developing of antistreptococcal immunity. It reaches its peak on the **2nd-3rd week** of illness.
- Clinically allergic syndrome is manifested by various eruptions on the skin, myocarditis, glomerulonephritis, synovitis. “Allergic waves” are accompanied by unmotivated rise of body temperature.

Clinical Manifestations

- The incubation period for scarlet fever is **2 to 7 days**, with a range of **1 to 7 days**.
- The disease is ushered in abruptly by ***fever, headache, chills, malaise, sore throat and vomiting.***
- Within **12 to 36 hours after onset**, the **typical rash** appears.
- The significant findings are **fever, enanthem and exanthem.**

Toxic syndrome

- ***Fever*** in typical cases the temperature rises abruptly to 38-39°C and reaches its peak by about the second day.
- It then gradually falls to normal within **5 or 6 days**.
- Severe cases have a higher and more protracted temperature course, which may be accompanied by ***sleepiness, mental confusion, convulsions, meningeal signs***.
- In mild scarlet fever, the temperature may be subfebrile (under 38°C) or normal.

Enanthem

- The enanthem includes **lesions on the tonsils, pharynx, tongue and soft palate.**
- The **tonsils** are enlarged, edematous, reddened and covered with patches of exudate.
- The **pharynx** also is edematous and beefy red in appearance. Hyperemia spreads on tonsils, palatal arches, uvula, soft palate. The upper border of hyperemia is on the anterior palatal arches and on the base of the uvula (**delimited hyperemia**). In severe forms of the disease it may reach hard palate. The soft palate is usually covered with erythematous punctiform lesions and occasionally with scattered petechiae.

Tonsillitis - **is a typical sign of scarlet fever**.

- Scarlatinal tonsillitis may be **catarrhal, follicular, lacunar or necrotic**, which occurs on the 2nd-4th day of the disease. Depending on severity of the disease necrosis may be superficial in the form of patches, or deep, locating on the tonsils. It can spread beyond the borders of the tonsils on the palatal arches, uvula, soft palate, lateral and back walls of oropharynx. Necrosis has a dirty-grey or greenish color. It disappears slowly in **7-10 days.**
- **Catarrhal and follicular tonsillitis** disappears in 4-5 days (in mild cases), lacunar or necrotic – later.
- Tonsillitis is accompanied by **lymphadenitis**. Regional lymph nodes become enlarged, dense, tender. If adipose tissue, surrounding the lymph nodes is affected, periadenitis, adenophlegmon will occur.

- The **tongue changes** in appearance as the disease progresses. During the **first 1 or 2 days** the dorsum has a white “fur coat”, and the tip and edges are reddened.
- By the **4 or 5 day** the white coat has peeled off. The red, glistening tongue, studded with prominent papillae, presents the appearance of raspberry (“raspberry tongue”). This sign remains up to the **9th-10th day** of the disease.

Exanthem

- The rash usually appears within 12 hours after onset of the illness; occasionally it may be delayed for 2 days. The rash is an erythematous punctiform eruption that blanches on pressure. Elements of rash are **roseolas of 1-2 mm diameter**, closely situated with each other. The exanthem has the following distinctive features:
- It becomes generalized very rapidly, usually within 24 hours, first on the neck and upper part of the breast, then on all the trunk and the limbs.
- **Patient face** appearance is typical in scarlet fever. His cheeks are red, smooth and flushed, and the area around the mouth is pale (circumoral pallor). His lips are crimson.

- Rash is more intense in skin folds such as the axillae, cubital, inguinal, popliteal, and also on skin of the neck, breast, abdomen, buttocks. Tiny petechiae may occur due to mechanical injuries of skin vessels.
- They occur in the creases of the folds of the joints, particularly in the antecubital fossae. These lesions form transverse lines (**Pastia's sign**) persist after the rash has faded.
- Rash usually remains for **4-5 days**.
- It desquamates several days later.

Desquamation

- is one of the most characteristic features of scarlet fever. The extent and duration of the desquamation are directly proportional to the intensity of the rash.
- It becomes apparent initially on the face on die second week as fine branny flakes. Then it spreads to the trunk and finally to the extremities. The desquamation skin of the trunk comes off in larger, thicker flakes.

- The hands and feet usually are the last to desquamate, becoming involved between the second and third weeks after onset. The tips of the fingers characteristically show splitting of the skin at the free margins of the nails. In severe cases an epidermal cast of the fingers, hands or feet may be shed.
- In mild cases of scarlet fever the progress of desquamation may complete in 3 weeks; in severe cases it may persist for as long as 8 weeks. Sometimes a retrospective diagnosis may be made on the basis of peeling skin and a history of a sore throat associated with a rash several weeks before.

- In acute period of scarlet fever cardiovascular changes are characterized by tachycardia, increased blood pressure.
- Bradycardia, arrhythmia, decreasing of blood pressure, dull heart sounds, systolic murmur occur by the 4th-5th day of illness (“scarlatinal heart”). Cardiovascular transient changes usually remain for 2-4 weeks, sometimes longer (up to 3-6 months).
- There is leukocytosis, neutrophilia, increased ESR.

Classification

- **Typical forms:**

✓mild,

✓moderate,

✓Severe: ***toxic, septic, toxico-septic***

- The indices of severity of the disease are signs of toxemia and local changes (lesions of the tonsils and the lymph nodes).

Atypical forms

- **Attenuated forms** are atypical because all symptoms are feebly manifested and transitory, some of them may be missing.
- **Extrabuccal forms** (burn, injury) are considered atypical too. They are characterized by a shorter incubation period, absence of mild tonsillitis. Rash appears near the portal of entry, it is more intensive there.
- **Hypertoxic** In those cases the disease has an abrupt onset and a lethal outcome occurs before the appearance of scarlet fever typical signs. Such patients usually die in 1-2 days in the condition of a collapse.

Scarlet fever in 1-year-old babies

- Occurs rarely, because they have transplacental immunity, received from their mothers. This immunity disappears by 6 months. At this age the peculiarity of the disease is a mild expression of toxic syndrome, catarrhal tonsillitis, rash.
- “Raspberry tongue” and desquamation occur rarely.
- However, septic complications (otitis media, lymphadenitis) occur more frequently and septicopyemia with purulent foci in various organs may appear.
- The most unfavorable course of die disease is observed in concomitant ARVI and resulting in pneumonia.

Complications

Complications of scarlet fever may be divided into the **toxic**, **infectous (septic)** and **allergic** ones according to the stage of the disease: the **early** one (first week) and the **late** one (2nd-3rd week) according to the time of then appearance.

Toxic complications (in the first week of illness):

- **Myocarditis**
- **Hepatitis**
- **Nephritis**
- **Acute cerebral edema**

Septic complications

- Tonsillitis
- Periadenitis
- Lymphadenitis
- Adenophlegmon
- Otitis
- Sinusitis
- Endocarditis
- Purulent meningitis
- Bronchopneumonia
- Osteomyelitis
- Septicemie

Allergic complications

- Glomerulonephritis
- Myocarditis
- Synovitis
- Reumatic carditis
- Acute rheumatic fever

Laboratory investigations

- Blood analyses
- Urine analyses
- Oropharyngeal secretions from culture - hemolytic group A streptococcus
- Antistreptolizina O in the blood serum
- Electrocardiogram (if necessary)
- Ultrasound examination of the heart (if necessary)

Differential diagnosis

- *Kawasaki's disease*
- *Pseudotuberculosis*
- Yersiniosis
- *Staphylococal infection*
- *Dermatitis*
- *Measles, rubella*
- *Meningococcal infection (meningococemia)*
- *Enteroviral infection (exanthems)*
- *Chickenpox*
- *Hemorrhagic vasculitis*
- *Toxic shock syndrome*
- *Systemic allergic reactions (drug eruptions)*

Criteria for hospitalization

- **Severe forms of the disease.**
- **Complications.**
- **Children of age under 3 years.**
- **Children from socially vulnerable families**
- **Children in closed communities**

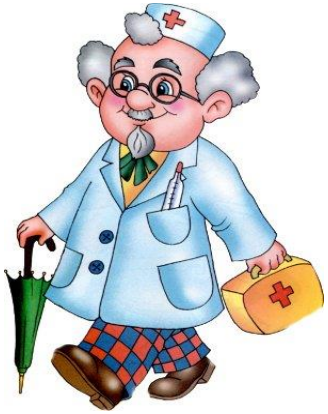
Antimicrobial therapy:

- ***Penicilin (Fenoximetilpenicilin, Vepicombin) - 50-100.000*** units/kg per day, ***in 3-4 prize.***
- ***Ampicilin (Amoxicilin, Amoxiclav) 50-100.000 Un/kg in 3-4 prize.***
- ***Cefalosporine (Duracef, Cefalexin, Cefatoxim, etc.) – 25-50mg/kg în 2-4 prize.***
- ***Eritromicin (Azitromicin, Vilprofen, Rulid, Spiramicin, etc.) – 20-50mg/kg în 2-4 prize.***

- ***Bicilin (Benzatinpenicilin G) – 600.000 Un (****1 prize* after antibiotic cure*)*.

Course of treatment:

- ✓ Mild - 7 days
- ✓ Moderate forms - 7-10 days
- ✓ Severe - 10 days and>



Criteria for discharge

- **Clinical recovery**
- **Absence complications**
- **Blood analysis and urine without pathological changes**
- **ECG**
- **Duration of hospitalization - 7-10 days.**

Prophylaxis

- Specific prevention of scarlet fever has not been devised.
- The patients with scarlet fever are isolated for **22 days** after the onset of the disease.
- The children who had contacts with the patient should be observed for **7 days** after the moment of the patient's isolation.
- In the focus of scarlet fever, the patients with tonsillitis (children and adults) should be isolated for **22 days** after the onset.