

GROUP A STREPTOCOCCAL INFECTIONS

(Streptococcus pyogenes)

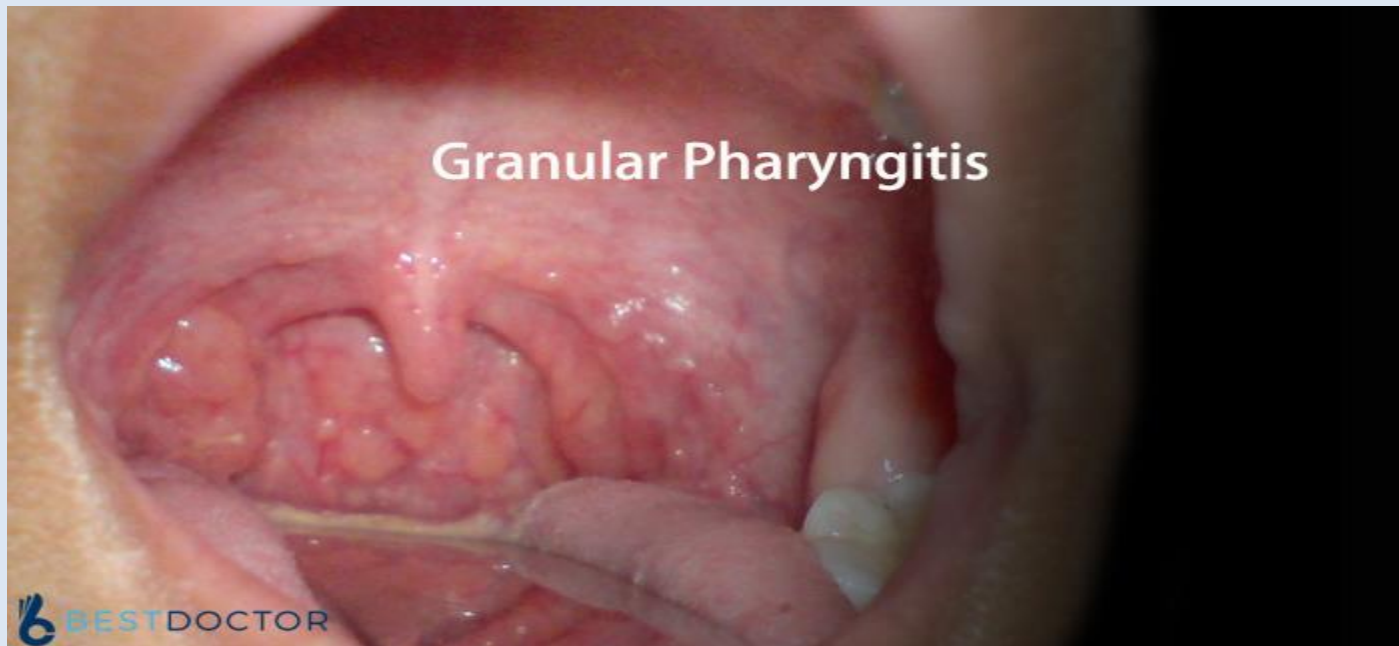
INTRODUCTION

- Group A *Streptococcus pyogenes* (GAS) is a gram-positive bacterium that grows in pairs or chains and causes complete or -hemolysis when cultured on sheep blood agar.
- GAS cause a broad spectrum of disease, from primary upper respiratory tract and skin infections to secondary complications such as acute rheumatic fever (ARF) and glomerulonephritis, as well as severe invasive illness, including toxic shock syndrome (TSS) and necrotizing fasciitis which may involve almost every organ system.

PHARYNGITIS

- GAS pharyngitis, the most common GAS infection, occurs most often in school-age children and accounts for 15% to 30% of all cases of pharyngitis in this age group.

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- Transmission results from contact with infected respiratory tract secretions and is facilitated by close contact in schools and child care centers.
- The rate of GAS transmission from an infectious case to close contacts is approximately 35%.
- The incubation period for GAS pharyngitis is 2 to 4 days.

Differential Features of Group A Streptococcus (GAS) and Viral Pharyngitis

Findings Suggestive of GAS Infection

- SYMPTOMS
 - Sore throat
 - Dysphagia
 - Fever
 - Headache
 - Abdominal pain
 - Nausea/vomiting
- SIGNS
 - Soft palate petechiae
 - Anterior cervical lymphadenopathy
 - Scarlet fever rash

Findings Suggestive of Viral Infection

- SYMPTOMS
 - Cough
 - Running nose
 - Hoarse voice
 - Diarrhea
- SIGNS
 - Stomatitis
 - Conjunctivitis

Scarlet fever

- Scarlet fever, characterized by a diffuse, erythematous.



- Scarlet fever is caused by erythrogenic toxin-producing strains of GAS and may manifest desquamation after the rash starts to fade.
- Exudative pharyngitis may occur, but this finding also is common with viral pharyngitis.
- In children younger than 3 years, an atypical symptom complex like nasal congestion, rhinorrhea, low-grade fever, and anterior cervical lymphadenopathy.
- In infants, the only symptoms may be low-grade fever, and decreased feeding.

DIAGNOSIS OF GAS

- Serologic testing: may be used to confirm GAS pharyngitis.
 - The antibody response occurs 2 to 3 weeks after the onset of infection, it is not useful for the diagnosis of acute GAS pharyngitis
 - Serologic testing consists of measurements of antistreptococcal antibody titers, such as antistreptolysin O and antideoxyribonuclease B.
- Rapid antigen detection test (RADT):
 - RADT is suggested for initial use in patients who are likely to have GAS pharyngitis and in those whose throat culture results will not be available for more than 48 hours.
 - RADT has a specificity of 95% and greater and a sensitivity of 65% to 90%.
- Throat Culture

TREATMENT GOALS

- Treatment of GAS pharyngitis has several goals:
 - reducing the incidence of suppurative and non suppurative complications,
 - reducing the duration and relieving symptoms and signs of infection,
 - and reducing transmission to others.

TREATMENT

Antibiotic	Dose	Duration
Penicillin V K	250 mg bid or tid if <27 kg (60 lb); 500 mg bid or tid if >27 kg (60 lb)	10 d
Amoxicillin	50 mg/kg, maximum 1 g, once daily	10 d
Benzathine penicillin G	600,000 U if <27 kg (60 lb); 1,200,000 U if >27 kg (60 lb)	Single dose
For penicillin-allergic patients:		
Cephalexin	25 to 50 mg/kg per day divided bid; maximum 1 g/d	10 d
Cefpodoxime	5 mg/kg, maximum 100 mg, bid	5 d
Cefdinir	7 mg/kg bid, maximum 600 mg/d	5 d
Clindamycin	20 mg/kg per day divided tid; maximum 1.8 g/d	10 d
Azithromycin	12 mg/kg, maximum 500 mg, once daily	5 d
Clarithromycin	15 mg/kg per day divided bid; maximum 250 mg/dose	10 d

SKIN INFECTIONS

- Skin is the second most common site of GAS infection.
- In general, the characteristic features of GAS skin infection are profuse edema, rapid spread through tissue planes, and dissemination through lymphatic or hematogenous routes.
- The common skin disorders observed are: **impetigo, erysipelas and cellulitis.**

impetigo, erysipelas and cellulitis



Streptococcal Non Suppurative Complications

- These include:
 - **Rheumatic fever**
 - Post-streptococcal Glomerulonephritis
 - Streptococcal Toxic Shock Syndrome
 - Pediatric Autoimmune Neuropsychiatric Disorder Associated With Group A Streptococci
 - Necrotizing Fasciitis

Streptococcal Non Suppurative Complications



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RHEUMATIC FEVER

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Necrotizing Fasciitis



Streptococcal Toxic Shock Syndrome



Toxic Shock Syndrome

Signs & Symptoms of Toxic Shock Syndrome

- 1) High fever which comes on suddenly is one of the many symptoms of toxic shock syndrome.
- 2) Hypotension or low blood pressure.
- 3) Diarrhea or vomiting.
- 4) Patient suffering from toxic shock syndrome develops a rash which looks like a sunburn, especially on the palms and soles.
- 5) Disorientation.
- 6) Muscle pains/aches.
- 7) Redness in the eyes, mouth and throat.
- 8) Headaches.
- 9) Seizures.

RHEUMATIC FEVER

- ARF is caused by previous GAS pharyngeal infection, with a latent period of 2 to 4 weeks.
- The disorder is most common among children ages 5 to 15 years.
- Currently, most cases of ARF occur in developing countries.

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- ARF presents as an acute febrile illness, with clinical manifestations that include arthritis, carditis or valvulitis, skin lesions, and neurologic disturbances.
- The arthritis, occurring in 75% of patients who have ARF, is a polyarthritis, affecting several joints in rapid succession, most commonly larger joints.
- Treatment with nonsteroidal anti-inflammatory drugs (NSAIDs) or salicylates may lead to resolution.

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- The diagnosis of ARF is based on the Jones criteria, which were published initially in 1944 and later revised by Jones and subsequently the American Heart Association, with the most recent revision published in 2002.
- The rate of isolation of GAS from the oropharynges of patients who have ARF is only between 10% and 20%.
- Serologic testing, which demonstrates either elevated antibody titers or rising titers with serial testing, is used more often for confirmation of infection.
- The streptozyme test measures five streptococcal antibodies:
 - antistreptolysin O (ASO),
 - antihyaluronidase(AHase),
 - antistreptokinase (ASKase),
 - Antinicotinamideadenine dinucleotidase (anti-NAD),
 - and antideoxyribonuclease B (anti-DNase B) antibodies.

Contd.

- The carditis of ARF is a carditis that occurs in 50% of patients.
- Symptoms and signs include chest pain, and heart failure.
- cardiomegaly may be noted on chest radiographs.
- Echocardiography may show a variety of findings, including stenosis, chamber enlargement or dysfunction, and pericardial effusion.

TREATMENT OF ARF

- Treatment of ARF focuses on eradication of acute disease manifestations, and prophylaxis against future GAS infection to prevent recurrent ARF.
- Eradication of GAS requires the same antibiotic regimens that are used to treat GAS pharyngitis.
- In addition, household contacts should have throat cultures performed and be treated if the cultures are positive for GAS.
- Aspirin, administered at 80 to 100 mg/kg per day and continued until all symptoms have resolved, is the major anti-inflammatory agent used for symptom relief.

Post streptococcal Glomerulonephritis

- Poststreptococcal glomerulonephritis (PSGN) is the most common cause of acute nephritis worldwide.
- PSGN is caused by previous throat or skin infection with nephritogenic strains of GAS.
- Although the exact mechanism is unclear, antigens of nephritogenic streptococci are believed to induce immune complex formation in the kidneys.
- The latent period is 1 to 3 weeks following GAS pharyngitis and 3 to 6 weeks following GAS skin infection.
- Deposition of GAS nephritogenic antigens within the glomerular subendothelium leads to glomerular immune complex formation, which triggers complement activation and subsequent inflammation; deposition within the glomerular subepithelium leads to epithelial cell damage and subsequent proteinuria.

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- The clinical presentation of PSGN ranges from asymptomatic microscopic hematuria to a nephritic syndrome consisting of hematuria, proteinuria, edema, hypertension, and elevated serum creatinine values.
- Gross hematuria is present in up to 50% of patients. Edema occurs because of sodium and fluid retention, which may lead to secondary hypertension.
- Decreased glomerular filtration rate results in increased serum creatinine concentration; acute renal failure requiring dialysis is possible.
- Urinalysis shows hematuria with or without red blood cell casts, proteinuria, and often pyuria.
- Serum C3 complement values are low due to activation of the alternative complement pathway, and C4 and C2 values are normal to mildly decreased.

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- Diagnosis requires clinical findings of acute nephritis in the setting of a recent GAS infection.
- If throat or skin cultures are negative, confirmation of a recent GAS infection may be obtained through serologic testing.
- Low C3 is characteristic of, but not specific to, PSGN.

Pediatric Autoimmune Neuropsychiatric Disorder Associated With Group A Streptococci

- GAS infection in a susceptible host is believed to lead to an abnormal immune response, with production of autoimmune antibodies that cross react with brain tissue, which leads to central nervous system manifestations.

Streptococcal Toxic Shock Syndrome

- GAS TSS is a form of invasive GAS disease associated with the acute onset of shock and organ failure.
- The pathogenesis of GAS TSS is believed to be mediated by streptococcal exotoxins that act as super antigens, which activate the immune system.
- The resultant release of cytokines causes capillary leak, leading to hypotension and organ damage.
- GAS TSS typically presents with fever and the abrupt onset of severe pain, often associated with soft-tissue infection such as cellulitis.
- GAS TSS also may present in association with other invasive GAS diseases such as necrotizing fasciitis, bacteremia, pneumonia, osteomyelitis, myositis, or endocarditis.