

INVASIVE GROUP A STREP

Including Strep Toxic Shock Syndrome and Necrotizing Fasciitis

DISEASE AND EPIDEMIOLOGY

Clinical Description:

Invasive Disease:

The most common presentation of this organism is sore throat or superficial skin infections. Invasive disease, where the organism is found in a sterile site such as tissue, blood, CSF, or body fluids, is fortunately rare but can be very severe. The most common types of invasive disease include bacteremia, cellulitis, pneumonia, and meningitis. Invasive strep diseases have a rapid onset and progression.

Strep Toxic Shock Syndrome (STSS):

This is characterized by abrupt onset of severe pain. 20% have flu-like symptoms. 80% have soft tissue infection and 70% proceed to surgical debridement, fasciotomy, or amputation. Shock and renal dysfunction are apparent within 4-8 hours in virtually all patients.

Necrotizing Fasciitis:

This is a deep-seated infection of subcutaneous tissue that destroys fascia and fat but may spare skin and muscle. Disease leads to rapid development of tissue destruction and gangrene.

Causative Agent:

Group A streptococci are gram-positive aerobic bacteria. They are beta-hemolytic (completely lyse red blood cells). They can be referred to as Group A beta hemolytic strep, GAS, GABHS, or *Streptococcus pyogenes*.

Differential Diagnosis:

Many invasive bacterial diseases, such as *Streptococcus pneumoniae*, Group B streptococcus, *Haemophilus influenzae*, etc. can have a similar presentation. For necrotizing fasciitis, the differential diagnosis can be *Staphylococcus aureus*, *Bacteroides fragilis*, *Vibrio vulnificus*, or *Clostridium perfringens*.

Laboratory identification:

This organism is easy to culture and identify in most clinical laboratories. It is important to note that tests that are positive for “Toxic Shock Syndrome Antibody, MAID” do NOT indicate the presence of Toxic Shock Syndrome; rather, they preclude the possibility because individuals that have the antibody are protected from the disease.

UPHL: The Utah Public Health Laboratory does NOT perform routine cultures for streptococcal diseases.

Treatment:

Invasive Group A streptococcal disease is a serious disease. The majority of patients will be hospitalized. Appropriate antibiotic therapy is necessary, along with supportive care. Much of the damage caused by these organisms is done by toxins or inflammatory processes.

Treatment regimens may include clindamycin, penicillin, cefazolin, cefotaxime, ceftriaxone, and/or vancomycin.

Case fatality:

Invasive Disease: Overall approximately 15%

Strep TSS: Pediatric 5-10%, adult 30-80%

Necrotizing Fasciitis: 30-80%

Reservoir:

Humans are the only reservoir. Individuals who are colonized or infected with Group A streptococcal in the pharynx are the likely source of the organisms. About 2-3% of adults and 15-20% of school children are colonized.

Transmission:

Group A strep is transmitted via large respiratory droplets as well as direct and indirect person-to-person spread through infected secretions.

Incubation period:

The incubation period for invasive disease is unknown.

Period of communicability:

In untreated cases of pharyngitis, patients can be communicable for weeks to months, but highest transmission is seen during the first 2-3 weeks, but with adequate treatment, transmissibility usually ends within 24 hours.

Epidemiology:

The incidence of invasive GAS disease is 3.6 cases/100,000 population. Persons over 65 have the highest incidence (8.9/100,000), followed by children under 1 (5.8/100,000). The incidence has increased over the past decade. It is thought that there are shifts and drifts in the pathogenicity factors of GAS that result in pandemics of invasive GAS. In Utah, this disease is more prevalent between September and March.

The most common invasive GAS syndromes are:

	% of invasive GAS cases	% mortality
Cutaneous/soft tissue	37%	
Bacteremia	28%	15%
Pneumonia	12%	24%

Arthritis	11%	
Necrotizing fasciitis	7%	20%
TSS	6%	44%

M Types 1 and 3 cause the majority of invasive disease. However, these are also commonly isolated from asymptomatic carriers or those with pharyngitis only. Pyrogenic exotoxins, M proteins type 1 and 3, and toxic-shock toxins may act as superantigens. A hypothesis is that HLA class II allelic variation contributes to differences in severity of invasive strep infections.

People at increased risk of invasive disease include individuals with chronic pulmonary, cardiac, liver, and kidney disease, diabetes, injecting drug users, immunocompromised, recent surgical procedures, or women who have recently given birth. Increasing age, disease syndrome (pneumonia, meningitis, TSS) and *emm* types 1 and 3 are independent predictors of mortality.

STSS: Affects people of all ages, most do not have underlying disease. This disease is rarely preceded by strep pharyngitis. More likely portals include surgical procedures and vaginal delivery. Also, infection can begin at a site of minor local trauma that does not have to result in a break in the skin. There is rapid development (24-72 hours) from minor non-penetrating trauma such as hematoma, deep bruises, or muscle strains. Viral infections can also provide a portal. Non-steroidal anti-inflammatory drugs (NSAIDs) can mask early symptoms or predispose patients to more severe infection. These are usually sporadic cases and not related to clusters or epidemics.

Note: Toxic shock syndrome can be caused by two different organisms, one is Group A strep and one is Staph aureus. STSS (or Strep toxic shock syndrome) is generally not related to tampon usage. Please review the TSS (Toxic shock syndrome) disease investigation plan for further information.

✓ PUBLIC HEALTH CONTROL MEASURES

Public health responsibility:

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Recommend routine immunization against varicella. Varicella is an important risk factor for invasive GAS disease.
- In any case of invasive GAS, attention should be paid to assure that all contacts with varicella are carefully managed.
- Identify clusters or outbreaks of this disease.
- Identify potential post-surgical or post-partum infections that may be traced to carriers involved in direct patient care.

Prevention:

- Following a case of invasive GAS disease, the risk to close cases in schools and childcare facilities is low and chemoprophylaxis is not indicated in these settings UNLESS there is a concomitant association with varicella.
- There may be an increased risk of invasive GAS disease among household members and chemoprophylaxis may be considered. Severe invasive GAS disease outbreaks HAVE occurred in some closed environments such as military bases, nursing homes, and hospitals. Things to consider when contemplating chemoprophylaxis are:
 - Extent of contact with index case
 - Underlying conditions in contacts which may potentiate risk (advanced age, immunosuppression, diabetes, varicella)
 - Costs and potential side effects of chemoprophylaxis

Chemoprophylaxis:

The method of chemoprophylaxis is controversial. Rifampin alone does not eradicate GAS from the pharynx. Possible regimens include rifampin plus intramuscular benzathine penicillin or a 10-day course of a second generation cephalosporin or clindamycin. No data is available to demonstrate the usefulness of throat cultures or antigen detection tests to identify those who may be at increased risk of secondary infection.

Vaccine:

No vaccine is currently available.

Isolation and quarantine requirements:

Isolation: People with strep pharyngitis or other streptococcal illness should take appropriate antibiotic treatment for a minimum of 24 hours prior to returning to work.

Hospital: Standard body substance precautions.

Quarantine: Not applicable.

CASE INVESTIGATION

Reporting:

- Isolation of Group A streptococcus (*S. pyogenes*) from any normally sterile site, such as CSF, blood, tissue, or body fluids.
- Any cases of necrotizing fasciitis, regardless of whether an organism was identified from a sterile site.
- Any cases of toxic shock syndrome, regardless of whether an organism was identified from a sterile site. (If no organism is identified, it will be classified as “toxic shock syndrome” and investigated using the TSS form. If Group A streptococcus is identified in ANY site – even a non-sterile one, it will be classified as “streptococcal toxic shock syndrome” and investigated using the STSS form.)

Case definition:

Invasive Group A Strep (1995):

Clinical Description

Invasive GAS infections may manifest as any of several clinical syndromes, including pneumonia, bacteremia in association with cutaneous infection (e.g. cellulites, erysipelas, or infection of a surgical or nonsurgical wound), deep soft-tissue infection (e.g. myositis or necrotizing fasciitis), meningitis, peritonitis, osteomyelitis, septic arthritis, postpartum sepsis (i.e., puerperal fever), neonatal sepsis, and nonfocal bacteremia.

Laboratory Criteria

Isolation of GAS by culture from a normally sterile site (e.g., blood or CSF, joint, pleural, or pericardial fluid).

Case Classification

A case that is laboratory confirmed.

Strep Toxic Shock Syndrome (TSS) (1996):

Clinical Description

The following occurs within 48 hours of hospitalization or illness:

- Hypotension defined by a systolic blood pressure less than or equal to 90 mm Hg for adults or less than the fifth percentile by age for children aged less than 16 years.
- Multi-organ involvement characterized by two or more of the following:
 - *Renal impairment*: Creatinine greater than or equal to 2 mg/dL (greater than or equal to 177 umol/L) for adults or greater than or equal to twice the upper limit of normal for age. In patients with preexisting renal disease, a greater than twofold elevation over the baseline level.
 - *Coagulopathy*: Platelets less than or equal to 100,000/mm³ (less than or equal to 100 x 10⁶/L) or disseminated intravascular coagulation, defined by prolonged clotting times, low fibrinogen level, and the presence of fibrin degradation products.
 - *Liver involvement*: Alanine aminotransferase, aspartate aminotransferase, or total bilirubin levels greater than or equal to twice the upper limit of normal for the patient's age. In patients with preexisting liver disease, a greater than twofold increase over the baseline level.
 - *Acute respiratory distress syndrome*: defined by acute onset of diffuse pulmonary infiltrates and hypoxemia in the absence of cardiac failure or by evidence of diffuse capillary leak manifested by acute onset of generalized edema, or pleural or peritoneal effusions with hypoalbuminemia.
 - A generalized erythematous macular rash that may desquamate.
 - Soft-tissue necrosis, including necrotizing fasciitis or myositis, or gangrene.

Lab Criteria for Diagnosis:

Isolation of Group A Streptococcus.

Case classification:

Probable: a case that meets clinical case definition in the absence of another identified etiology for the illness and with isolation of Group A Strep from a nonsterile site.

Confirmed: a case that meets the clinical case definition and with isolation of Group A Strep from a normally sterile site (blood, CSF, joint, pleural, pericardial fluid).

Necrotizing Fasciitis

Clinical Description:

Necrosis of soft tissues with involvement of the fascia PLUS

Serious systemic disease including one or more of the following:

- Death
- Shock (systolic blood pressure <90 mm of Hg)
- Disseminated intravascular coagulation

Lab Criteria for Diagnosis:

Isolation of Group A Streptococcus

Case Classification:

Suspect: a case that meets clinical case definition plus either:

- Serologic confirmation of GAS by 4-fold rise in titer against Streptolysin O or DNase B or
- Histologic confirmation or
- Gram-positive cocci in a necrotic soft tissue infection (presumably not viable)

Confirmed: a case that meets clinical case definition plus isolation of GAS from tissue.

Case Investigation Process:

- Fill out a morbidity form
- Determine if disease meets the criteria of:
 - Invasive disease
 - Streptococcal toxic shock syndrome
 - Necrotizing fasciitis

Outbreaks:

An outbreak will be defined as 3 or more cases occurring at a hospital, school, or childcare in a 30 day period.

Identification of case contacts:

School and day care children should be checked to assure that they are immunized against varicella.

Household contacts and other close adult contacts may be screened for potentiating factors (see PREVENTION above) and chemoprophylaxis recommended on a case-by-case basis.

Case contact management:

Case-by-case basis.

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