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Scarlet Fever

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Introduction

Scarlet fever is a rash most commonly associated with bacterial pharyngitis in school-age and adolescent children. It is a blanching, papular rash that is classically described as a “sandpaper” rash. The causative bacteria is *Streptococcus pyogenes*, which generates an endotoxin mainly responsible for the skin manifestation of the infection. This is further classified as group A and referred to as Group A Strep (GAS). Alone, the rash is not dangerous but is a marker for GAS infection which has suppurative and non-suppurative complications. Therefore, treatment of the acute infection is warranted to prevent these complications. The first-line treatment of choice is penicillin. Those allergic to penicillin can be treated with a first-generation cephalosporin. The spread of infection is promoted by mucosal transfer of bacteria to others via an environment of close proximity found in classrooms and similar workplace settings.[1][2][3]

Etiology

The causative agent in scarlet fever is GAS, a gram-positive coccus that grows in chains. Scarlet fever is caused by the release of endotoxins. The bacteria also is classified as a beta hemolytic strep which can cause complete red cell destruction (GABHS). The bacteria is the causative agent of strep throat, impetigo, erysipelas, cellulitis, and necrotizing fasciitis.[4]

Epidemiology

Scarlet fever is a disease of childhood due to ease of transmission in the classrooms and nurseries. It is most commonly associated with bacterial pharyngitis caused by GAS or strep throat. Wounds and burns infected with GAS also can cause scarlet fever. It has been reported that strep throat is the responsible for 15% to 30% of all pharyngitis in children aged 5 to 15 years old. In adults, the rate is 5% to 15%. Non-school-aged children in contact with school-aged children in the same household are also at risk. There is no gender preference for scarlet fever. [3][5][6]

Multiple studies have reported the emergence of scarlet fever coinciding with the initiation of the school year and the colder temperatures as winter approaches. A decrease in the rate of infection can be attributed to times when school is not in session during the spring and warming temperatures. The difference in rates between children and adults is likely due to the presence or absence of immunity. The prevalence is higher in undeveloped countries. This is probably due to the more likely presence of crowded living quarters. An article on the epidemiology of scarlet fever in Hong Kong reported an increase in the incidence of disease from 3.3/10,000 to 18.1/10,000. Similar increases have been reported in Great Britain. The increase has not been explained, but resistant strains of GAS are suspected.

Pathophysiology

Scarlet fever is a rash resulting from an infection caused by GAS. The exotoxin produced by the bacteria causes the classic “sandpaper” rash. The toxins cause a local inflammatory response on the skin and are referred to as erythrogenic toxins.

Histopathology

There are no specific histological changes in scarlet fever. One will observe neutrophilic infiltrate with spongiosis and parakeratosis in the epidermis.

History and Physical

Typically, scarlet fever is associated with an acute pharyngitis. As a result, fever, sore throat, pain with swallowing, and cervical adenopathy is present. If there is no pharyngitis, the source of infection can be a wound or burn which is infected with GAS. The two vectors of infection can both cause scarlet fever and are not distinguishable from one another. The rash itself is a blanching, papular rash. It is distinguished from the macular rash found an allergic reaction by its insidious emergence and lack of confluence of the lesions. This lack of confluence is the primary reason it feels like sandpaper. Also of note, there are no vesicles or pustules present. Vesicles are more associated with the “dew on a rose petal” appearance of chicken pox in its initial stages. Pustules are more indicative of a local infection such as impetigo or erysipelas. The rash develops within 2 to 3 days after infection but can be delayed up to 7 days. The trunk, underarms, and groin are affected first, and then it spreads to the extremities. Usually, the palms and soles are spared. The circumoral area is also spared, making it pallor-like. The “strawberry tongue” begins with a white coating of the tongue with hyperplastic papillae. As the white coating resolves, the papules remain, giving the appearance of a strawberry. Pastia lines are found in the folds of the skin such as the neck, antecubital fossa, and groin. This appears as a linear accumulation of papules around pressure points. After the initial rash begins to resolve, a period of desquamation can occur and last up to two weeks in some cases.

Evaluation

When evaluating a person suspected of having scarlet fever, there are several things to consider. After carefully taking a history and physical, the next steps of the evaluation can be considered. In cases associated with pharyngitis, lack of a cough, exudates, cervical nodes, temperature, and age (less than 15 years) help determine the likelihood of strep throat. This is known as the CENTOR criterion.[7][8][9]

Testing available to the clinician includes throat culture and the rapid strep test. Both test for the presence of GAS. The throat culture takes longer (days) and is more specific, and the rapid test is immediate (minutes) and less specific. The use of the rapid strep test with older persons (greater than 45 years) is controversial since they are more likely to be a carrier state and have lower prevalence in that age group. This combination may increase exposure to inappropriate antibiotics and increased resistance.

Therefore, in young patients with a high CENTOR score, rapid strep is recommended to confirm the infection and treatment is initiated. Depending on your practice environment and follow up, your decision to treat may be influenced.

Treatment / Management

Since scarlet fever is due to an infection caused by GAS, it is treated with antibiotics. Penicillin or amoxicillin is the first-line treatment. If the affected person has an allergy to penicillin, a first-generation cephalosporin can be used. The use of antibiotics has reduced the morbidity and

mortality of scarlet fever when compared to the early 20th century when the mortality was approximately 30%. [10][11][12]

GAS has its reservoir in the nasal mucosa, adenoids, tonsils. Asymptomatic individuals who test positive for GAS are generally referred to as carriers. Current practice deters treatment of carriers with antibiotics.

Differential Diagnosis

The differential diagnosis of a fever and a rash are broad. In the clinical scenario of a sandpaper rash in the presence of a sore throat and fever, GAS infection should be seriously considered. Use of the CENTOR criteria and testing can be utilized. Pustules are more indicative of a local infection such as impetigo or erysipelas. Some viral illnesses which should be considered in the affected population are measles (rubeola), chicken pox (herpes zoster), and hand-foot-and-mouth disease (Coxsackie), which all have specific presentations that distinguish them from scarlet fever. Good immunization, travel, and medical history should be considered when a patient presents with fever and a rash.

Prognosis

When compared to the prognosis of scarlet fever in the early 20 century, the prognosis of scarlet fever is excellent. This mainly due to the introduction of antibiotics and hygiene. After the diagnosis is made and treatment is initiated, the patient can return to normal activity 24 hours after the fever has resolved. Left untreated, the prognosis decreases and the likelihood of complications stemming from group A strep infection increases. Suppurative and non-suppurative complications abscess near the local area of infection to kidney injury.

Complications

Historically, scarlet fever was a disease with a high complication rate and even death among children. With the development of antibiotics and treatment regimens, scarlet fever is now considered a relatively mild disease. However, complications from delayed or untreated GAS are significant. The complications fall into two categories, suppurative and non-suppurative. Typically, suppurative complications result from a worsening, an extension, or a spread of the original area of infection. As an example, a bacterial pharyngitis can spread to the ear, causing otitis media; the sinuses, causing a sinusitis; and then to the meninges, causing bacterial meningitis. Non-suppurative complications generally are mediated through an immune response after the original infection resolves. Rheumatic fever, a disease affecting the heart valves, is a complication of GAS infection that results in long-term morbidity.

Although not directly caused by scarlet fever, below is a partial list of complications due to GAS infection.

Suppurative

- Peritonsillar/pharyngeal abscess
- Otitis media
- Sinusitis
- Necrotizing fasciitis
- Streptococcal bacteremia
- Meningitis or brain abscess

- Jugular vein septic thrombophlebitis

Non-Suppurative

- Acute rheumatic fever
- Poststreptococcal reactive arthritis
- Streptococcal toxic shock syndrome
- Acute glomerulonephritis
- Pediatric autoimmune neuropsychiatric disorder associated with group A streptococci

Deterrence and Patient Education

Scarlet fever and most diseases which are transmitted via close contact can be avoided by using good hand hygiene, covering your coughs and sneezes, regular disinfection of shared fomites, and avoiding others when infected. Reminders in public areas in the form of posters and public service announcements in the media are some of the ways to increase these good hygiene practices. The public also should be aware of the risks associated with the overuse of antibiotic administration which may introduce resistant strains of GAS.

Enhancing Healthcare Team Outcomes

Scarlet fever is best managed by an interprofessional team. The key to treatment is patient education. The pharmacist should emphasize to the patient that full recovery occurs when antibiotic compliance is complete. In addition, the nurse should educate the patient on hand and personal hygiene to prevent transmission of the bacteria to others. Patients should be educated about the skin infection and the general exfoliation, and when to seek medical assistance. The skin symptoms are frequently relieved with the use of emollients and oral antihistamines.[13][14] (Level V)

Outcomes

For the majority of patients treated promptly, the outcome is excellent. Recovery is usually complete in 3-6 days but the skin symptoms may take 14-21 days to subside. In a few people, the infection can recur. In the era of antibiotics, mortality from scarlet fever is less than 1%. The morbidity of scarlet fever is most likely due to glomerulonephritis, rheumatic fever, sinusitis, and other infections. Complications, though, are rare.[15][2] (Level V)

Questions

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Figure

The fine, red, itchy rash caused by scarlet fever. This is my six-year-old daughter, Lexie, displaying the rash. Contributed by Wikimedia Commons, Alicia Williams (CC by 2.5) https://creativecommons.org/licenses/by/2.5/deed.en

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