Abstract Sore throat is one of the common reasons for outpatient and emergency visits among children. It could be because of several etiologies; of these bacterial pharyngitis is the most important. Major challenge for the clinician is to diagnose group A beta hemolytic streptococcus (GABHS) pharyngitis and diphtheria, which are associated with serious complications. Throat swab smear with culture and rapid antigen tests are useful for making the diagnosis but the later may not be available in resource poor settings. Many clinical scores have been devised to diagnose GABHS with variable success but usually clinical features, epidemiological criteria and expert clinical judgment with or without supportive investigations indicate need for antibiotics. A child with sore throat and toxic look may have diphtheria or parapharyngeal/retropharyngeal abscess, and therefore should be hospitalized.

Introduction

Upper Respiratory tract infections are seen with great frequency in both children and adults and have remarkable economic impact, related to the frequent prescription by physicians of antibiotics, even when the causative agents of infection are not bacteria. About one-fourth of children with sore throat have bacterial pharyngitis and about half of the families with index case have a secondary case [1].

Identification and adequate antibiotic treatment of group A streptococcal sore throat is important for primary prevention of acute rheumatic fever, as it carries approximately 3% risk of development of acute rheumatic fever.

Definition

Soreness is generally described by the patient as pain in the throat without the effort of swallowing and also a painful swallow [2]. **Sore throat** is primary symptom of pharyngitis. The terms “sore throat” and “pharyngitis or pharyngotonsillitis” are often used interchangeably. **Pharyngitis** refers to objective evidence of inflammation of the pharynx, such as exudates, ulceration, or definite erythema. Redness of the throat may occur as part of the general redness of all mucous membranes in a patient with fever. A diagnosis of pharyngitis is justified only when the pharynx is redder than the rest of the oral mucosa.

Etiology

Most sore throats are caused by viruses. Less often, sore throats are due to bacterial infections.

Viral Infections

- Corona virus, rhinovirus, adeno virus, influenza and parainfluenza are the commonest etiological agents and usually presents as common cold.
- Other viral infections that can present with sore throat are Ebstein Barr (EB) virus and HIV which can present as a sore throat in initial course of illness.
- Recurrent sore throat can occur due to cytomegalovirus or fungal infections in immunosuppressed patients.
Bacterial Infections

- Group A beta-hemolytic streptococcus (GABHS) is the most common cause of bacterial sore throat. It accounts for 15–36% of cases of acute pharyngitis in children in west [1], and 13.4% of cases in India, according to one study done at PGIMER [3].
- Streptococcus type C and G
- Diphtheria—is an important cause in India and many developing countries.
- *H influenza*, *Staphylococcus aureus*, *Mycoplasma, Chlamydia pneumoniae, Moraxella catarrhalis* and *Yersinia* are some uncommon bacterial causes.
- *Fusobacterium necrophorum* infection. This uncommon infection which starts as fever and sore throat, can complicate into Lemierre’s syndrome. (Positive blood culture, clinical or radiographic evidence of internal jugular vein thrombosis, and at least one metastatic focus.)

Other Causes

- **Peritonsillar, Retropharyngeal and Lateral Pharyngeal abscesses**—usually due to spread of infection from local site like bacterial tonsillitis. Along with fever and sore throat, other features like painful swallowing, drooling, trismus, visible swelling below mandible and deviation of uvula to opposite side may be present.
- **Allergies**—especially when complicated by postnasal drip.
- **Irritants**—Dust, tobacco smoke (in teenagers) or chemicals (occupational hazard for children/adolescents working in factories). Sore throat in such patients is usually chronic.
- **Muscle strain**—talking in loud noise without rest for long period.
- **GastroEsophageal Reflux Disease (GERD)**
- **Psychogenic**

### Approach to the Patient

Majority of the times, history and clinical examination gives clue to etiology (Table 1). The major challenge is to diagnose GABHS infection, because the signs and symptoms of GABHS pharyngitis overlap with other infections and untreated GABHS can cause serious complications. No single element of the history or physical examination reliably confirms or excludes GABHS pharyngitis.

Several scoring systems have been developed to predict which patients will have GABHS. Use of these does improve quality of care but none of these systems, however, is totally reliable in identifying children who need treatment [4]. A clinical scoring system has been designed in India but it has to be validated for local use. This scoring system uses variables such as age, season, fever, erythema of pharynx, size of tonsil, pharyngeal exudates; lymphadenopathy and pain in throat, and scores are assigned according to throat culture positivity in association with the same. Cut off value of 15 predicts GAS infection with 91% sensitivity and 98% specificity [3].

The evaluation of patient should include the following:

**History**

- Onset and duration
- Fever—degree (doesn’t help much to differentiate)
- Associated cough, coryza, conjunctivitis (more with viral); headache, myalgia (more with GABHS)
- Any breathing difficulty especially new onset snoring at night or stridor (a likely sign of developing abscess)
- History of rash, diarrhea, allergy
- History of regurgitation, epigastric or retrosternal pain usually indicates GERD
- History of sore throat in family in past 2 wks.
- Similar complaints in past, with vaccination history

| Table 1  | Clues towards etiological diagnosis of sore throat |
|----------|--------------------------------------------------|
| Enterovirus | Summer, pharyngeal vesicle/ulcer, rash, diarrhea |
| EBV(infectious mononucleosis) | Teenagers, tender posterior cervical lymphadenopathy, tender hepatomegaly, splenomegaly, petechial rash, edema of eyelids, supported by thrombocytopenia, >10% atypical lymphocytes on peripheral smear and positive monospot test or IgM antibody against Viral Capsular Antigen (VCA). |
| Adenovirus | Preschoolers, conjunctivitis, follicular hyperplasia of tonsils |
| Diphtheria | Unvaccinated child, shallow ulceration of upper lips and external nares, neck swelling, characteristic pseudomembrane |
| GastroEsophageal Reflux Disease | Retrosternal burning/epigastric pain, lump in throat, no fever |
| Fungal | Oral thrush, common in neonates and infants <9 months. Immunocompromised/HIV |
Examination

Look oral cavity with a good light for-

- **Exudates**: White/gray scum on the surface of the tonsils or pharynx, readily wiped off without producing bleeding is more likely with bacterial pharyngitis.
- **Ulcer**
- **Membrane**: Exudates of bacterial pharyngitis may organize as gray-white layer of materials that can be peeled from the pharynx.
  - A membrane is seen with infectious mononucleosis, diphtheria and sometimes streptococcal infection. *Arcanobacterium hemolyticum* and tularemia are rare causes of membranous pharyngitis.
  - Gray to black adherent membrane, with extension beyond the faucial area (esp. soft palate and uvula), dysphagia, and relative lack of fever suggest a diagnosis of diphtheria.
  - Oral thrush seen in neonates and infants which can have pseudomembrane (curd like plaques), removal of which may cause mild punctuate bleeding.

- **Bulging of oropharynx or uvula displacement** are suggestive of parapharyngeal or peritonsillar abscess.
- **Painful vesicular lesions on pharynx and tonsils** are characteristic of herpangina. Herpes simplex produces painful vesicles confined to anterior mouth which may sometimes extend to anterior tonsillar pillars.
- **Lymphadenopathy**: Look for anterior (tonsillar) and posterior cervical lymph nodes. Tender anterior lymphadenopathy favors bacterial sore throat. Tender posterior or cervical and/or generalized lymphadenopathy favours Ebstein Barr (EB) virus infection.
  - Examine for neck swelling, conjunctivitis, auscultatory abnormalities and hepatosplenomegaly.
  - Vital signs, including blood pressure, should be recorded. Poor quality of the heart sounds raises the possibility of diphtheritic myocarditis. Absence of a heart murmur or dependent edema should be noted for their relevance to rheumatic fever and glomerulonephritis.

Common signs and symptoms of streptococcal pharyngitis include sore throat, temperature ≥38.3°C, tonsillar or pharyngeal exudates and cervical lymphadenopathy. Cough, coryza and diarrhea are more common with viral pharyngitis. Differentiating features between streptococcal pharyngitis and viral pharyngitis are given in Table 2.

**Investigations**

A major concern in emergency room for a child with sore throat is not to miss diagnosis of diphtheria and GABHS pharyngitis.

- Obtain *throat swab* for bacterial smear and culture including Albert stains for diphtheria. A provisional diagnosis of diphtheria is suggested if typical drum stick organisms are seen in the smear. However, a definitive diagnosis requires growth of *C. diphtherium* in culture as diphtheroids are commensals in throat.
- **Rapid Antigen Diagnostic Tests (RADTs)** for GABHS [5, 6]: It is based on nitrous acid extraction of group A carbohydrate antigen from organisms obtained by throat

### Table 2  Clinical clues to differentiate viral infection from those of Group A beta-hemolytic streptococcus (GABHS)

|                  | GABHS                        | Viruses          |
|------------------|------------------------------|------------------|
| **Age**          | 5–11 years                   | All ages         |
| **Season**       | Late winter/early spring     | All              |
| **Symptoms**     | Sudden onset                 | Onset varies     |
|                  | Severe sore throat           | Mild sore throat |
|                  | Absent cough*                | Present          |
|                  | Fever ≥38.3°C*              | Varies           |
|                  | Absent coryza                | Present          |
|                  | Headache, myalgia            | +/-              |
|                  | Throat pain                  |                  |
| **Signs**        | Severe pharyngeal erythema   | Mild             |
|                  | Pharyngeal exudates*         | No exudate       |
|                  | Palatal petechie*            | Enanthem         |
|                  | Anterior cervical nodes*     | Varies           |
|                  | Tonsillar exudate            | Absent           |
|                  | Tonsil enlargement large/moderate | Normal   |
|                  | Scarlentiform rash*          | Exanthem         |
|                  | H/o streptococcus exposure in past 2 wks | Present* | Absent |

*High sensitivity for GABHS [1]

*High specificity for GABHS [1]
swab. It is highly specific (>95%), and provides immediate results, but has variable sensitivity. Throat culture confirmation of a negative RADT is recommended to increase sensitivity. Confirmation of positive test is not recommended because of very high specificity.

- **Other investigations** to be done according to clinical possibility.
  - Complete blood count
  - Peripheral blood smears for atypical lymphocytes.
  - EB virus serology (IgM antibody against VCA (viral capsular antigen))
  - Streptococcal antibody titre is not useful for diagnosis of streptococcal pharyngitis and is not routinely recommended.

### Table 3 Antibiotic choice for streptococcal pharyngitis

| Drug                  | Route | Dosage                                      | Duration |
|-----------------------|-------|---------------------------------------------|----------|
| Penicillin V          | Oral  | <27 kg–250 mg 2–3/day                       | 10 days  |
|                       |       | ≥27 kg–250 mg 3–4/day or 500 mg 2/day       |          |
| Amoxicillin*          | Oral  | 40 mg/kg/day in 3 divided doses             | 10 days  |
| Penicillin G benzathine| IM    | <27 kg–6 lac unit                          | Single dose |
|                       |       | ≥27 kg–12 lac unit                         |          |
| Options for patients allergic to penicillin |       |                                             |          |
| Erythromycin ethylsuccinate | Oral | 30–50 mg/kg/day in 2–4 divided doses        | 10 days  |
| Erythromycin estolate  | oral  | 20–40 mg/kg/day in 2–4 divided doses        | 10 days  |
| Cefadroxil             | Oral  | 30 mg/kg/day in 2 divided doses             | 10 days  |
| Cephalexin             | Oral  | 25–50 mg/kg/day in 2 divided doses         | 10 days  |

* Amoxicillin is equally effective as penicillin V and is more palatable

The following medications are FDA (U.S. Food and Drug Administration) approved, but are not recommended by guidelines for primary GABHS therapy: azithromycin, clarithromycin, cefpodoxime, cefditoren, and cefdinir.

**Note:** antibiotics are indicated in any child who is looking sick and/or suspected to have complications.

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**Fig. 1 Clinical decision guideline for suspected streptococcal pharyngitis**

- For membrane take throat swab and act according to clinical possibility
- a-cervical lymphadenopathy
- b-fever ≥38.3°C
- c-absent cough

- Antibiotics, if any of a, b or c present
- Antibiotics, if any two of a, b or c present
- Only a/b/c present
- H/o streptococcus infection contact
- Take throat swab and give antibiotics
- Take throat swab and wait for the result
incidence of rheumatic fever by more than two third [8].

Management

GABHS pharyngitis is self-limiting illness. Antibiotic treatment provides acute symptom relief, prevent suppurative (otitis media, sinusitis, quinsy) and non suppurative complications, and reduce communicability. Antibiotics reduce incidence of rheumatic fever by more than two third [8].

Clinical decision guideline for sore throat is given in Fig. 1. Clinical features, epidemiological criteria and expert clinician judgment with or without supportive investigation usually indicate need for antibiotics. Currently used score for decision making in pharyngitis has been adapted by adding age to four components of original Centor score (absence of cough, swollen and tender anterior cervical nodes, temperature >38°C and tonsillar exudates or swelling) [9]. Each component is given 1 point; age of 3–14 years carries 1 point while that of 14–44 years, zero. Patients with a score of zero or 1 do not require testing or antibiotic therapy. Patients with score of 2 or 3 should be tested and prescribed antibiotics if found positive while patients with score of 4 or higher, are at high risk of streptococcal pharyngitis and should be given empiric treatment [10].

Antibiotics

Based on cost, narrow spectrum of activity, safety, and effectiveness, penicillin is the drug of choice [10, 11]. Shorter duration of treatment increases risk of bacteriological recurrence [12] Inappropriate use of macrolides for treatment of GABHS pharyngitis has been the main cause of resistant strains in western countries [13]. The various alternatives to penicillin and the dosage of antibiotics are given in Table 3.

Diphtheria Management

- Stabilize child (ABC...) (For details refer to section on upper airway obstruction).
- Diphtheria antitoxin: 50,000–120,000 U IV depending on extent of involvement.
- Antibiotics: Aqueous crystalline penicillin G 40,000 U/kg/dose 6 hourly IV or erythromycin 15 mg/kg 8 hourly (not to exceed 2 g/day) oral/IV for 14 days.

For prophylaxis to contacts same dose of erythromycin for 7 days or a single injection of benzathine penicillin G (600,000 U IM for <30 kg, 1,200,000 U IM for ≥30 kg.) is recommended.

Indication for Hospitalization

- Toxic looking child
- Not accepting orally well
- Suspected to having associated complications or diphtheria.

Conflict of Interest None.

Role of Funding Source None.

References

1. Ebell MH, Smith MA, Barry HC, Ives K, Carey M. The rational clinical examination. Does this patient have strep throat? JAMA. 2000;284:2912–8.
2. Linder JA, Bates DW, Lee GM, Finkelstein JA. Antibiotic treatment of children with sore throat. JAMA. 2005;294:2315–22.
3. Nandi S, Kumar R, Ray P, Vohra H, Ganguly NK. Clinical score card for diagnosis of Group A Streptococcal sore throat. Indian J Pediatr. 2002;69:471–5.
4. Wigton RS, Connor JL, Centor RM. Transportability of a decision rule for the diagnosis of streptococcal pharyngitis. Arch Intern Med. 1986;146:81–3.
5. Schwartz B, Marcy SM, Phillips WR, Gerber MA, Dowell SF. Pharyngitis-principles of judicious use of antimicrobial agents. Pediatrics. 1998;101:171–4.
6. Van der Veen EL, Sanders EAM, Videler WJM, van Staaik BK, van Benthem PPG, Schilder AGM. Optimal site for throat culture: tonsillar surface versus posterior pharyngeal wall. Eur Arch Otorhinolaryngol. 2006;263:750–3.
7. American Academy of Pediatrics, Committee on Infectious Diseases. Red Book, 26th edn. Elk Grove Village, Ill.: American Academ of Pediatrics; 2003. pp. 578–80.
8. Del Mar CB, Glassiou PP, Spinks AB. Antibiotics for sore throat. Cochrane Database Syst Rev. 2006;4:CD000023.
9. McIsaac WJ, Goel V, To T, Low DE. The validity of a sore throat score in family practice. CMAJ. 2000;163:811–5.
10. McIsaac WJ, White D, Tannenbaum D, Low DE. A clinical score for diagnosis of Group A Streptococcal sore throat. Indian J Pediatr. 2002;69:471–5.
11. Rimoin AW, Hamza HS, Vince A, et al. Evaluation of the WHO clinical decision rule for streptococcal pharyngitis. Arch Dis Child. 2005;90:1066–70.
12. Zwart S, Sachs APE, Ruis GHJM, Gubbels JW, Hoes AW, de Melker RA. Penicillin for acute sore throat: randomised double blind trial of 7 days versus 3 days treatment or placebo in adults. BMJ. 2000;320:150–4.
13. Hasenbein ME, Warner JE, Lambert KG, Cole SE, Onderdonk AB, McAdam AJ. Detection of multiple macrolide- and lincosamide-resistant strains of Streptococcus pyogenes from patients in the Boston area. J Clin Microbiol. 2004;42:1559–63.