

## Prevalence of Group A Beta-Hemolytic Streptococcus Isolated from School Children with Acute Pharyngotonsillitis: Reported from a Single Medical Center in Shanghai

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### ABSTRACT

**Background:** Clinical signs and symptoms cannot distinguish accurately between viral and group A beta-hemolytic streptococcus pharyngotonsillitis and a significant proportion of those seen especially in general practice received antibiotics not recommended by guidelines, an inadequate length of treatment or no prescription.

**Material and methods:** One hundred and seventy, 6 to 16 years old school children suffered from pharyngotonsillitis were recruited in this study. Throat swab culture with blood agar culture medium was used in all participants and amoxicillin/clavulanate 40 mg/kg/day administered twice daily for 10 days if the culture result showed GAS infection.

**Results:** 18.2% (n=31) schoolchildren showed *Streptococcus pyogenes* growth in the throat culture and 14 children (45.2%) of those present with clinical features of scarlet fever. The efficacy of amoxicillin/clavulanate treatment was effective and safety in 93.5% (n=29) in group A streptococcal pharyngotonsillitis. However, among the 31 cases, there were 15 cases not coming back to follow up and 4 of them were scarlet fever cases.

**Conclusion:** This study confirms that the administration of amoxicillin/clavulanate 10 days eradicated group A streptococcal pharyngotonsillitis effectively, but most of the patients did not follow the treatment guideline and inadequate length of treatment is the key factors of increasing carrier rate.

**Keywords:** Beta-hemolytic, Streptococcal pharyngotonsillitis, Amoxicillin/clavulanate

### INTRODUCTION

Group A Streptococcus (GAS) is the most common bacterial cause of acute pharyngotonsillitis (APT), implicated in 20% to 30% of pediatric health care visit for sore throat. Along with the sudden onset of throat pain, GAS pharyngotonsillitis symptoms include fever, headache and bilateral tender cervical lymphadenopathy. Accurate diagnosis and management of GAS pharyngotonsillitis is critical for limiting antibiotic overuse and preventing rheumatic fever, but distinguishing between GAS and viral pharyngitis clinically is challenging [1]. In clinical practice, practitioners often used the rapid antigen detection or throat swab culture for GAS in everyday clinical practice to identify individuals with APT needing antibiotic therapy [2]. However, there are different recommendations from international guidelines for the management of APT; also the optimal management continues to be debated. In the twelve national guidelines, the North American, Finnish and French guidelines recommend performing one timely

microbiologic investigation in suspected cases and prescribing antibiotics in confirmed cases to prevent suppurative complications and acute rheumatic fever. According to the remaining European guide line, however, acute sore throat is considered a benign, self-limiting disease.

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Microbiologic tests are not routinely recommended by these latter guidelines and antibiotic treatment is reserved for well-selected cases [3]. More important, one in five of children presenting to general practice with a positive throat swab and complete prescription data did not receive treatment according to national guidelines [4]. In the Asia countries, treatment guidelines are not always followed, especially in the private practice practitioners. Antibiotics are useful in cases of severe APT, increased risk of complications or a peritonsillar infiltration. The antibiotic of choice is narrow spectrum penicillin; however, amoxicillin/clavulanate is indicated in patients with peritonsillar infiltration [5]. Improper prescription of antibiotics for treatment of APT predisposes to emergence of a carrier state and antibiotic-resistant strains of GAS. According to the above information, to evaluate APT caused by GAS is critical needed.

**MATERIALS AND METHODS**

We analyzed retrospectively the data on microbiological studies and throat swab culture done, and data on prescribing of antibiotics, of 170 children visit our outpatient clinic for pharyngotonsillitis from September 1, 2016 to August 31, 2017. The schoolchildren enrolled in the study were 6 to 16 years of age. Throat swab culture with blood agar culture medium was used in all participants for microbiological agent detection. An amoxicillin/clavulanate 40 mg/kg/day were given twice daily for 10 days if the culture result showed GAS infection (Table 1).

**Table 1.** Demographic data of school children with APT in study.

<b>Number of school children enrolled</b>	<b>170</b>	
Mean age (year)	6.5	Range 6-16
No. male	93	54.7%
No. female	77	45.3%
Tonsil enlarged	133	78.2%
Tonsillar exudates	35	20.5%
Pharyngeal erythema	121	71.2%
Fever	95	55.9%
Cough	113	66.5%
Rhinorrhea	88	51.8%
Headache	63	37.1%
Sore throat	125	73.5%
Acute otitis media	34	20%
Tender arterial cervical LNs	110	64.7%
Abdominal pain	63	37.1%
Scarlet in form rash	35	20.6%

APT: Acute Pharyngotonsillitis; LNs: Lymphanodes

**RESULTS**

After the clinical diagnosis of pharyngotonsillitis, throat swab culture for GAS identification was done in all cases. Thirty-one in one hundred seventy (18.2%) APT children have GAS infection, among them 45.2% (n=14) has present with scarlet fever clinical features. Antibiotics were started and the efficacy of amoxicillin/clavulanate treatment was effective and safety in 93.5% (n=29) of GAS infection. Anti-streptolysin O antibody follow up showed 3 cases increased higher than 200 KIU/L but patient did not have any complications during that time. Among the 31 GAS infected cases, there were 15 cases did not coming back follow up and 4 of them were the scarlet fever cases (Table 2).

**Table 2.** Antibiotics treatment outcome of pharyngotonsillitis.

<b>Clinical features</b>	
<b>Subsided except scarlet in form rash and cervical LNs</b>	
Throat culture showed GAS	18.2% (n=31)
Efficacy for GAS	93.5% (n=29)
Scarlet fever cases	8.2% (n=14)
ASLO>200 KIU/L	9.7% (n=3)
<b>In scarlet fever cases</b>	
GAS treatment guideline, undertreated	48.4% (n=15)
Scarlet fever, undertreated	28.6% (n=4)

Antibiotics: Amoxicillin/clavulanate 40 mg/kg/day for 10 days

LNs: Lymphanodes; GAS: Group A Streptococcus; ASLO: Anti-Streptolysin O Antibody

**DISCUSSION AND CONCLUSION**

Group A streptococcus is the most frequently identified bacterium in children with APT, although group B, C, F and G have also been associated with APT. In Leao [6] study, higher APT incidence was observed in the female gender and tonsillar exudates were observed with group A and C predominant. To assess the utility of clinical features for diagnosis of APT with GAS in pediatrics with throat cultures showed that clinical presentation should not be used to confirm APT because its performance as a diagnostic test is low. It also pointed out that coryza absence, conjunctivitis absence; pharyngeal erythema, pharyngeal exudate, and tonsillar swelling were significantly associated with streptococcal pharyngotonsillitis. The highest clinical score, characterized by coryza absence, pharyngeal exudate, and pharyngeal erythema had 45.6% sensitivity, 74.5% specificity, and a likelihood ratio of 1.79 for streptococcal pharyngotonsillitis [7]. All guidelines agree that narrow-spectrum antibiotic is the first choice of antibiotic for the treatment of APT and penicillin and amoxicillin are the first

choice antibiotics in the case of a child with the proven presence of GAS infection, however, the number of orally administered doses and 10 days of therapy considerably lower the compliance [3,8]. In opposite, the length of the treatment was the aspect found to be most deficient in lot of APT patients [9]. As mentioned above, some European guidelines only recommend antibiotic treatment in certain high-risk patients, while many others, including all American; still advise antimicrobial treatment for all children with GAS pharyngitis, given the severity and re-emerging incidence of complications. Moreover, the severity and the possibly increasing incidence of complications in school-aged children suggests that testing and treating proven GAS pharyngitis can still be beneficial [10].

Molecular analysis of GAS isolated from patients with APT showed macrolide resistance mediated by themef(A) gene and due to the high levels of macrolide resistance observed, GAS isolates from individuals with penicillin allergies need be isolated and their antimicrobial susceptibility tested, rather than automatically giving the patient a macrolide [11]. The inadequate penetration of penicillins into the tonsillar tissues and tonsillar surface fluid and microbiologic interactions between GAS and other pharyngotonsillar bacterial flora can account for their failure in eradicating GAS pharyngotonsillitis. These interactions include the presence of beta-lactamase producing bacteria (BLPB) that shield GAS from penicillins [12]. Another current study proposed that the presence of  $\beta$ -lactamase in non-typeable *Hemophilus influenzae* and *Moraxella catarrhalis* produced from outer membrane vesicles, which may contribute to the treatment failures seen in GAS pharyngotonsillitis [13]. Thus, administration of amoxicillin/clavulanate can eradicate both aerobic and anaerobic BLPB, as well as GAS and that is why we chose to use this antibiotic in the study. In this current study, we confirmed administered amoxicillin/clavulanate 40 mg/kg/day for 10 days can eradicate GAS pharyngotonsillitis effectively. However, routine throat culture for GAS in children with APT is necessary since 18.2% of the patients were found to have GAS infection and anti-streptolysin O antibody was found increased higher than 200 KIU/L in 3 cases, thus, complications might occur. The other important finding is that most of the patients did not come back to follow up even we proved GAS infection and inadequate length of treatment is the critical point of increasing the carrier rate. In the future study, multi-centers, large number of participants and long-term complications follow up should be applied.

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