

Tonsillitis: Time to Think Outside the Box

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Abstract

Tonsillitis is one of the most frequent health problems worldwide. It is more common in children. The diagnosis is clinical and/or laboratory bases. Besides bacterial causes, other pathogens can cause tonsillitis, like Epstein Bar virus, Cytomegalovirus, Human immunodeficiency virus, Hepatitis A, Rubella, Toxoplasmosis in addition to some fungal infections. The most common bacterial infection to cause tonsillitis are group A *Streptococcus* and *Staphylococcus aureus*. We report a case of tonsillitis in a healthy child without any risk factors caused by *Pseudomonas aeruginosa*.

Keywords: Tonsillitis; *Pseudomonas*; Chronic; Recurrent; Fever; Antibiotics; Bacterial; Infection; Sore Throat

Abbreviations

URTIs: Upper Respiratory Tract Infection; CBC: Complete Blood Count; SARS-Cov-2 PCR: Severe Acute Respiratory Syndrome Covid 2 Polymerase Chain Reaction; WBCs: White Blood Cells; CRP: C-Reactive Protein; EB Virus: Epstein Barr Virus; MIC: Minimal Inhibitory Concentration

Introduction

Tonsillitis is an inflammation of the tonsils. It is a common type of upper respiratory tract infections (URTIs) which is mostly caused by viral, bacterial or fungal infection [1]. Clinical symptoms usually are fever, sore throat, malaise, headache, cervical lymphadenopathy and erythematous and enlarged tonsils with exudates. If tonsillitis is not treated adequately it can lead to several complications including trismus, neck stiffness, severe odynophagia, peritonsillar abscess or nasal voice [2].

There are 3 types of tonsillitis, acute, recurrent and chronic. Acute tonsillitis is defined as inflammation of the tonsils caused by bacteria or virus with odynophagia [3]. Recurrent tonsillitis is defined as 7 culture-positive episodes of tonsillitis in one year, five in two consecutive years, or three in three consecutive years. In such conditions, the pause of the antibiotic leads to another bout of the bacterial infection within few weeks [4,5]. The chronic type is associated with chronic sore throat, in which the infection causes recurring tonsillitis. In this type, bad breath and persistent tender cervical nodes are usually present [6].

The furrowed tonsil and the oral cavity are considered a reservoir for multiple pathogens including viruses, bacteria, parasites and fungi [7,8]. These organisms are sometimes considered transient oral flora [9]. Most commonly isolated bacteria in the acute tonsillitis in

children are *Streptococcus* (30%), followed by *Haemophilus influenzae* and *Neisseria* [9]. However, mixed infections (both bacterial and viral) may have similar clinical features [10]. *Pseudomonas aeruginosa* can cause ear and sometimes sinus infections in immunocompetent patients. It is considered an occasional finding in tonsil smears as part of normal microbial flora, but it rarely produces suppurative tonsil infection [11].

Case Report

A previously healthy 6-year-old child presented to the outpatient clinic of HMS Mirdif hospital with complaint of high-grade fever and sore throat for 2 days. He is the 1st of two children of a non-consanguineous marriage of healthy parents, with no family history of hereditary, metabolic, or immunological disorders. On examination, he was an average-built child with a sick-looking appearance. His examination was completely normal apart from tonsillar hypertrophy (+4) with extensive erythema and white exudates. He also had pharyngeal erythema and cervical lymphadenopathy. This is his third presentation of tonsillitis. His previous episodes were one month apart and treated with antibiotics (Both first and second episodes were treated with Amoxicillin), throat cultures were negative in previous presentations. SARS-Cov-2 PCR and rapid streptococcal antigen test were negative. Complete blood count (CBC) showed leukocytosis, thrombocytosis, and neutrophilia (Hemoglobin-9.8 g/dl, WBC count 30.1 k/ μ L with neutrophils 75%, lymphocytes 12%, Platelets 503 k/ μ L) with a CRP of 120. The throat culture was sent, and he was started empirically on Amoxicillin. The patient returned to the emergency department 2 days later for continued fever. In ER, he received a single dose of ceftriaxone and paracetamol injection, and he was discharged on amoxicillin-clavulanate. A panel of investigations included Influenzas’ A, B types, EB virus, and *Mycoplasma pneumonia* were requested and all reported negative. His initial throat culture was negative, so another throat culture was sent. He remained afebrile for 2 days, but he started to have high fevers again. He was seen in the clinic again and his exam showed the same picture as before with an enlarged inflamed both tonsils with pus spots. Repeat CBC and CRP showed a rising trend of CRP to 189 mg/L with persistent leukocytosis, thrombocytosis and neutrophilia. Throat culture came positive for *Pseudomonas aeruginosa* and the sensitivity was shown in figure 1. He received intramuscular Ceftriaxone for 7 days, his fever curve improved, and the tonsillitis resolved. Although he had no recurrence of symptoms, tonsillectomy was performed few weeks later.

Specimen: THROAT SWAB	
Organism Isolated:	Growth/Colony/ml:
1.PSEUDOMONAS AERUGINOSA ISOLATED	1.PROFUSE GROWTH
ANTIBIOTIC SENSITIVITY	
Antibiotics	Sensitivity
	Min. Zone
	1 2 3 4
AMPICILLIN	R
AMOX WITH CLAV ACID	R
AZITHROMYCIN	R
AMIKACIN	S
CIPROFLOXACIN	S
CEFUROXIME	R
CEFTRIAZONE	R
CEFTAZIDIME	S
CEFIXIME	R
CEFIPIME	S
CEFAZOLIN	R
CEFTOLOZANE-TAZOBACTAM	S
ERTAPENEM	R
GENTAMICIN	S
IMIPENEM	S
LEVOFLOXACIN	S
MEROPENEM	S
PIPERACILLIN/TAZOBACTAM	S
TIGECYCLINE	R
TRIMETHOPRIM-SULFAMETHOXAZOLE	R
* S - Sensitive R - Resistant I - Intermediate MS - Moderately sensitive	

Figure 1

Results and Discussion

Pseudomonas aeruginosa is not a common pathogen in tonsillitis and many laboratories do not report it as a true pathogen, considering it environmental contaminant because the *Bacillus* is also found commensally on the skin, throat and intestinal flora of healthy individuals [12]. In our case, we believe that recurrent tonsillitis was caused by *Pseudomonas aeruginosa* pathogen because the child was symptomatic, the recurrent disease course, negative cultures of the other common organisms, no response to oral antibiotics, and the dramatic improvement in clinical status after antibiotic change.

Pseudomonas aeruginosa rarely cause suppurative disease of the tonsils, especially in immunocompetent patients. Although the throat culture and sensitivity showed that the isolated *Pseudomonas aeruginosa* is resistant to ceftriaxone, we continued it due to the improvement in fever curve and clinical status. This discrepancy is bacterial sensitivity between *in vitro* results and *in vivo* response is well documented phenomena and known as “*in vitro-in vivo* paradox” [13].

The issue of “*in vitro-in vivo* paradox” remains despite the improvements in antimicrobial susceptibility tests. This discrepancy is related to the complex interaction between the drug, the host and the microorganism. Failure of *in vitro* tests is due to its limited ability to estimate the pharmacokinetics and pharmacodynamics between the drug, the immuno-modulatory effects of the antibiotic, as well as host changes in the drug’s activity and bacteria [14].

Furthermore, the correlation between blood level MIC (minimal inhibitory concentration) and *in vivo* antibacterial activity is not clear. Attempts to develop precise and generally applicable mathematical predictive relationships between blood levels and MIC are not justified. For instance, Polymyxins appear to be *in vitro* active against *Pseudomonas aeruginosa*, but these antibiotics are virtually inactive against *Pseudomonas aeruginosa* at physiological calcium concentration despite the Calcium doesn’t inhibit the effect of Polymyxins on *Pseudomonas aeruginosa* [15].

Compared to a previously published case report by Danielides., *et al.* 2001, the definitive eradication was achieved only through tonsillectomy. In our case despite clinically improved the throat culture was not repeated due to patient in compliance but tonsillectomy was done upon parental concern about recurrence few weeks after complete cure [16].

Conclusion

We recommend keeping *Pseudomonas aeruginosa* tonsillitis in the differential diagnosis of recurrent tonsillitis or resistant tonsillitis irrespective to antibiotics even in the absence of risk factors. Always to consider the relations between blood levels and minimal inhibitory concentrations of antimicrobial medications cannot be applied as criteria of sensitivity and the management always to be kept in parallel to the clinical correlation. In addition, Tonsillectomy is to be considered as a radical treatment in such conditions. Finally, further studies are needed to evaluate the risk factors, management choices and if tonsillectomy is needed in all cases diagnosed with recurrent *Pseudomonas aeruginosa*.

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Statement of Ethics

Written consent was taken from the parents.

Disclosure Statement

There is no conflict of interest of any of the authors with the results of this case study.

Author Contributions

Dr. Ahmed Elmelhat: Conception, data acquisition, manuscript drafting, critical analysis, final approval. Dr. Znar Osso: Analysis, review, design, critical analysis, final approval.

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