Clinical utility of a new rapid test for the detection of group A Streptococcus and discriminate use of antibiotics for bacterial pharyngitis in an outpatient setting

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Received 28 April 2007; received in revised form 9 July 2007; accepted 28 July 2007
Corresponding Editor: Timothy Barkham, Tan Tock Seng, Singapore

Introduction

Antibiotics have undoubtedly been highly effective in fighting bacterial infections. However, their value has been seriously threatened by the rapid emergence of multidrug-resistant...
bacteria, and this has been compounded by the lack of any new antibiotic structure since 1961.

The threat to the use of antibiotics has been thoroughly examined by the authorities on both sides of the Atlantic. Inappropriate use of antibiotics (about 50% in the developed world) has been cited as a major cause of bacterial resistance. Correlation between the use of antibiotics and bacterial resistance has been documented in both inpatient and outpatient settings, and more importantly, measures to reduce their use have led to a reduction in bacterial resistance rates.

In children, upper respiratory tract infections (URTs) are very common, and although the majority are viral in origin, antibiotics are frequently prescribed. Consequently, antibiotic use rates are highest for children, and approximately 75% of outpatient antibiotics have been provided for some form of URTI. Bacterial causes account for the minority of cases, where group A \( \beta \)-hemolytic streptococci (GAS) are the most common, affecting mainly school-aged children. Although children infected with GAS will recover without antibiotics, treatment is often recommended in order to prevent complications such as acute rheumatic fever, nephritis, and suppurative complications, and to hasten recovery and prevent transmission to close contacts.

Research confirms that antibiotics are not needed in the majority of children with URTIs, including those under two years of age with acute otitis media. At the national level, campaigns based on educating doctors and the public and applying evidence-based guidelines have been very effective in reducing antibiotic use. In the Netherlands, which adopted a ‘no initial antibiotics’ policy and the UK, where a ‘delayed prescribing’ policy has been practiced, a dramatic reduction in antibiotic use has been achieved.

At the personal practice level, because viral and bacterial URTIs are clinically indistinguishable and throat swab culture results take 48 hours, efforts have been concentrated on developing quick tests to detect GAS infections. The ideal test should be quick, simple, and accurate. Furthermore, adequate sensitivity is critical to ensure that such a test is cost-effective in the management of children with GAS infection. Previously tried rapid streptococcal antigen tests have suffered the major limitation of low sensitivity (ranging from 65.6% to 87.6%) requiring a back-up culture for those with a negative test result.

At Al-Zahra, we use a different rapid test — the Diaquick Strep. A-Test (SAT). It is a one-step thin-layer chromatography sandwich type immunoassay for rapid, qualitative detection of GAS antigen directly from throat swabs. According to the manufacturer (Dialab GmbH, Vienna, Austria), this SAT is 90.5% sensitive and 97.5% specific, and results are obtained within 5 minutes at room temperature. This prospective study was designed to evaluate and validate the use of this test in clinical practice, and to determine its effect on the use of antibiotics.

Patients and methods

This was a prospective study of children attending the outpatient clinics of one pediatrician (FA) at the Al-Zahra Hospital (AZH) and the Al-Zahra Medical Centre (AZMC). Children who were seen at these clinics and fulfilled the inclusion criteria of fever, acute catarrh, and acutely inflamed throat/tonsils with or without exudates, were included in the study. Children with clear viral infections like herpangina, herpetic stomatitis, and adenoviral rhinoconjunctivitis were excluded, as well as those who had received antibiotics during the preceding week. Paired throat swabs for SAT and culture were collected. No antibiotics were given before results were known. In all cases a verbal consent was obtained from parents before enrolment in the study, and they were subsequently kept informed about the lab results.

Results

Five hundred and five children (408 from AZH and 97 from AZMC) were included in the study over a two-year period (2004—2006). Two hundred and seventy-eight (55%) were boys and 227 (45%) were girls, while 409 (81%) were under five years of age and 96 (19%) were over five (Table 1).

Overall, the SAT was negative in 434 cases (86%) and positive in 71 (14%), whereas culture was negative in 425 cases (84%) and positive in 80 (16%), including nine cultures that grew bacteria other than GAS.

Both the SAT and culture were negative in 422 cases (84%) and positive in 68 cases (13%), and in 15 cases (3%) results were inconsistent (Table 2). In 12 cases where the SAT was negative, three cultures grew GAS (later received antibiotics), seven grew Staphylococcus aureus, one grew Streptococcus pneumoniae, and one grew coliform bacteria, but none received antibiotics. In the remaining three children the SAT was positive, and so antibiotics were given, but cultures grew no GAS. Overall, 71 children (14%) had GAS infection, defined as a positive throat culture.

In children with GAS pharyngotonsillitis, the positive predictive value of the SAT (the chance of a positive culture if the SAT is positive) was very high at 95.8% (68/71). The negative predictive value (the chance of a negative culture if the SAT is negative) for the whole group as well as for children under five years of age, was extremely high at over 99% (422/425 and 355/358, respectively). Furthermore, the SAT sensitivity was very high at 95.8%.

Finally, out of a potential 505 antibiotic prescriptions, only 74 children (15%) were given antibiotics, while a staggering 431 (85%) were not (Table 3). Antibiotics were provided to all 71 children with a positive SAT (96% of the antibiotic group) and to three children with a positive culture for GAS. The usual antimicrobial regimen used is one of the penicillins (amoxicillin, amoxicillin–clavulanate) or a second-generation cephalosporin (cefprozil, cefuroxime) or a macrolide (clarithromycin, azithromycin).

Discussion

The prevalence of multidrug-resistant bacteria has been increasing at an alarming rate, and has been identified as an increasing problem in pediatric practice as well as being a major threat to public health. They are seriously undermining the value of antibiotics in clinical medicine. Furthermore, bacterial resistance rates correlate well with the volume of antibiotic consumption in communities. Inappropriate use of antibiotics has been identified as a very important, potentially preventable factor in the development of multidrug-resistant bacteria.
In pediatric practice, URTIs are the most common reason for a child to see a doctor, and antibiotics are frequently prescribed unnecessarily in these cases. In order to reduce bacterial resistance, we simply need to use antibiotics less. In this context, children with URTIs have been targeted for a reduction in antibiotic use. In children, viral and bacterial pharyngitis are clinically indistinguishable, hence methods have been sought to identify bacterial cases prior to prescribing antibiotics. Unfortunately, antibiotics are frequently prescribed unnecessarily in these cases. The main indication for the use of antibiotics in these children is to treat GAS pharyngotonsillitis. Its use will allow the practicing of a ‘no antibiotic use in clinical practice is highly recommended. As expected, the majority of cases included in this study were young children under 5 years of age and the majority had viral infections confirmed by a negative culture. Among bacterial cases, GAS constituted 89% (71/505 positive cultures) — 14% of the whole group (71/505 children). This is slightly lower than the reported prevalence of 15—36%. and is perhaps due to the fact that cases of acute pharyngotonsillitis without catarrh were not included in the study. In practice, this group of children constitutes the majority of cases seen every day by general pediatricians and general practitioners. Unfortunately, antibiotics are frequently given, which make children with URTIs the main consumers of antibiotics.

Although the positive predictive value was reasonably high (~96%), the SAT negative predictive value was extremely high at over 99% for the whole group as well as for children under five years of age. Coupled with the very high sensitivity of 95.8%, the Diaquick Strep. A Test (SAT) was found to be extremely reliable and useful in clinical practice. It has two other major advantages: speed and no need for a follow-up throat swab culture in negative cases. In terms of antibiotic usage, it reduced the need for antibiotics to only 74 children (15%), whilst a staggering 431 (85%) required no antibiotic therapy. It is far superior to any other rapid streptococcal antigen test so far assessed and wide use in clinical practice is highly recommended.

In conclusion the Diaquick Strep. A Test (SAT) is a simple, quick, and extremely reliable test. It should be incorporated in the initial assessment of children with fever and URTI/pharyngotonsillitis. Its use will allow the practicing of a ‘no initial antibiotics’ policy safely, with a marked reduction in antibiotic use in these children.

Acknowledgements

We are very grateful to Dr Ian G. Jefferson, Consultant Pediatrician/Pediatric Endocrinologist, Sheikh Khalifa Medical City, Abu Dhabi, for reviewing the manuscript and for his constructive and helpful suggestions. We would also like to thank Ms Celeste Estera, Al-Zahra CME Coordinator, for manuscript preparation.

Conflict of interest: No conflict of interest to declare.

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