

Experience With Rapid Latex Agglutination Testing For Group A Streptococcal Pharyngitis In A Pediatric Group Office Laboratory

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Abstract: We evaluated 2401 patients with suspected streptococcal pharyngitis with the Culturette™ 10-minute Group A Strep ID test during a 6-month period in order to determine its suitability for rapid diagnosis in a busy private office practice. Duplicate throat swabs were obtained for each child, and latex agglutination was performed within 15 minutes. In children with negative latex agglutination results, the second swab was cultured. All latex agglutination results were available within 20 minutes of collection, while the patients waited in the office. Seven hundred thirty-eight specimens were positive by latex agglutination. Seventy-eight of the 1663 latex negative specimens contained group A streptococci on culture (sensitivity 90 percent). Approximately 60 percent of these latex-negative, culture-positive specimens demonstrated 3+–4+ growth in culture, unlike previous studies ascribing false-negative latex results to low colony count specimens. Fifty percent of bacitracin-susceptible streptococci tested were not group A, indicating a relatively high occurrence of nongroup A beta-hemolytic streptococcal carriage in this patient population.

The use of latex agglutination for detection of group A streptococcal pharyngitis was well-suited to our office practice, even during an extremely busy winter season. Although this assay appears to have a relatively high sensitivity, it is still prudent to culture latex-negative swabs to exclude group A streptococcal infection. The significance of nongroup A beta-hemolytic streptococci in our patient population was unclear. Further refinements are necessary. (*J Am Board Fam Pract* 1991; 4:79-82.)

Because reliable clinical criteria for differentiation of pharyngitis due to group A streptococcus (GAS) from illness caused by other infections are not precise, definitive diagnosis is dependent on throat culture results that require 24–48-hour incubation. In recent years, however, rapid diagnostic techniques allow for prompt detection of GAS antigen in pharyngeal swab specimens. The reported sensitivity and specificity of rapid GAS antigen techniques vary widely depending upon throat swabbing technique, the specific rapid test used, training and experience of personnel performing the tests, use of positive and negative control reagents, and culture techniques

for GAS. Each of these variables confound interpretation of data, and it is important that particular studies of GAS detection be interpreted within their context.

In the pediatric group office practice chosen for this study, prior data showed that the Culturette™ 10-minute Group A Strep ID test had a sensitivity of 90 percent and specificity of 93 percent, compared with culture, for diagnosis of GAS pharyngitis.¹ Based on this experience, we elected to institute routine use of this rapid method in the practice, retaining cultures for testing specimens that were negative by the Culturette™ test. This study was undertaken to evaluate that plan. Specifically, we sought to determine whether clinically useful results could be obtained “rapidly” in an office practice during a 6-month period, which included the busy winter season.

Materials and Methods

The pediatric practice consisted of five pediatricians working in an office in suburban Washington, D.C., serving a predominantly middle- to

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upper middle-class population. The full-time laboratory was staffed by registered laboratory technologists, one person per morning or afternoon shift. Each physician was well versed in proper techniques for throat specimen collection, and the laboratory technologists were instructed to perform the tests immediately and report results to the physician.

Children with acute pharyngitis up to 18 years of age were eligible for the study; they were enrolled from late August 1987 to mid-March 1988. Pharyngeal swabs (Culturette Two™) were used by physicians to collect secretions from both tonsillar surfaces and the posterior pharyngeal wall. These were taken immediately to the laboratory. Within 5 minutes of receipt of the specimen, one swab was processed for latex agglutination (LA) with the Culturette™ 10-minute test according to the manufacturer's directions. If the LA result was negative, the second swab was inoculated within 2 hours semiquantitatively onto 5 percent sheep blood agar (BBL Laboratories, Columbia, MD) and incubated anaerobically for 48 hours or until growth of beta hemolytic organisms was seen.

Isolates showing beta hemolysis on blood agar were tested for bacitracin sensitivity with a 0.04 µg bacitracin disk, and sensitive organisms were confirmed as group A with specific antisera (Streptex™, Wellcome Diagnostics, Research Triangle Park, NC). A subset of 48 bacitracin-sensitive isolates was tested for streptococcal groups C, F, and G antigens if there was no agglutination with group A antisera.

Results

Overall, the use of LA testing for GAS was well incorporated into the office routine. Even during the busy winter season, there were no instances when results were not available within 20 minutes of specimen receipt in the laboratory. Physicians and laboratory personnel were satisfied with the easy performance of the test.

During the 7-month study period, 2401 patients were enrolled. Of these, 738 (31 percent) were positive by LA, and no further testing was done. Of the 1663 negative specimens that were then cultured, 78 yielded GAS (sensitivity 90 percent). The distribution of semiquantitative culture results is shown in Figure 1 and reflects a relatively equal distribution of amount of bacte-

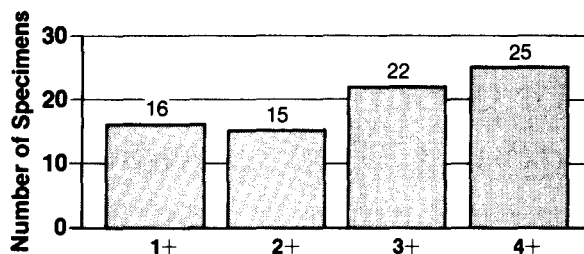


Figure 1. Distribution of semiquantitative culture results.

rial growth among the LA-negative samples. In fact, 47 of the 78 cultures (60 percent) had 3+ or 4+ growth of GAS.

Testing a small sample of the bacitracin-sensitive streptococci for other streptococcal serogroups showed a high rate of groups C, F, and G organisms in this patient population. This sample, which was taken in fall 1987, showed that 18/48 (37.5 percent) of these consecutively collected strains belonged to one of these three serogroups (Figure 2). Only 50 percent of these 48 isolates were group A. No attempt was made to collect selectively clinical information on these children, although all of them had some signs and symptoms of acute pharyngitis.

Discussion

The Culturette™ 10-minute Group A Strep ID test was easily incorporated into the group practice office laboratory, with personnel assigned to laboratory testing on site. This test was useful for rapid detection of GAS pharyngitis and for providing results while the patient remained at the office. In our setting, it allowed for same-day prescription of antibiotic therapy in 90 percent of our patients presenting with GAS pharyngitis.

Because not all office practices employ personnel specifically trained in laboratory techniques and some laboratory personnel perform other office duties that could interfere with the rapid turnaround time needed for this test, it should not

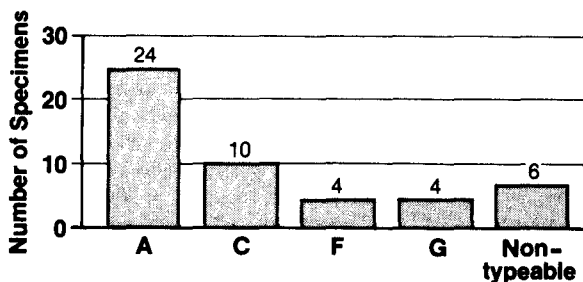


Figure 2. Other streptococcal serogroups.

be expected that rapid GAS testing is suitable to all private practices. A reasonable alternative to immediate testing would be to perform these tests in batches at the end of each morning and afternoon, when same-day telephone follow-up with the patient is still possible.

We found in a previous study that the Culturette™ 10-minute Group A Strep ID test had a relatively high specificity (93 percent) and sensitivity (90 percent) for detection of GAS pharyngitis.¹ The high sensitivity was confirmed in the present study, which did not calculate specificity rates. These figures are generally higher than those observed in other studies performed principally at tertiary care centers.²⁻⁵ However, subtle differences in patient population and culture techniques may account for these differences. First, the physicians in this group practice are skilled in throat culture techniques. Studies done in large institutions may rely on multiple personnel for specimen collection, which could decrease the yield of GAS in culture if swabs are not collected carefully. Second, laboratory personnel in this practice are probably on par with those in hospital or research laboratories, making for more reliable interpretation of LA and culture results compared with studies using less experienced personnel. Finally, types of culture media and incubation conditions differ among studies. For our study, 5 percent sheep blood agar was used as culture medium, and specimens were incubated under anaerobic conditions. The most sensitive method for culture of GAS uses 5 percent sheep blood agar containing antibiotics, such as trimethoprim 1.25 µg/mL and sulfamethoxazole 23.75 µg/mL to inhibit growth of other pharyngeal flora.⁶ Anaerobic conditions also enhance growth of GAS in comparison with other pharyngeal flora.⁷ A less sensitive culture system will result in higher sensitivity of the rapid diagnostic system being tested. All of these factors could have resulted in high sensitivity of rapid GAS detection in the current study compared with those at large institutions.

Most prior reports about false-negative LA tests have shown a relation to low colony count specimens (1+ on semiquantitative culture).⁸⁻¹¹ We did not examine the overall distribution of colony counts in our GAS patients because we did not culture patients with positive LA tests. However, the distribution of colony counts in our LA-

negative patients did not support the notion that low colony count specimens are more likely to result in negative LA tests. Part of this finding could be explained by the timing of testing in our laboratory. LA tests were performed immediately, but cultures were often done on a batch basis, hours after the specimens were obtained. Streptococci survive better than other pharyngeal flora in a relatively dry environment,¹² and it is possible that our delayed culture practice facilitated recognition of greater numbers of GAS colonies. Therefore, we do not believe that our results necessarily conflict with the notion of a relation between false-negative LA and lower numbers of GAS in swab specimens.

We were surprised by the large numbers of groups C, F, and G streptococci isolated from pharyngitis patients in the fall months of our study, although similar rates of nongroup A beta streptococcal carriage rates have been reported elsewhere.^{13,14} There is still controversy regarding the role of these organisms in producing disease, although there are increasing well-documented reports of pharyngitis caused by nongroup A streptococci.¹⁵ It is unclear whether these patients would benefit from antimicrobial therapy, and therefore detection of groups C, F, and G streptococci in pharyngeal swabs is not clinically useful. Still, our experience serves to reinforce the point that not all bacitracin-susceptible beta hemolytic streptococci belong to group A, and, therefore, specific serogrouping should be performed on such isolates before deciding on treatment.

Our choice of Culturette™ brand of rapid GAS testing should not be taken as an endorsement of that particular product over others. Currently, there are at least 11 different products available in the United States for rapid GAS detection.¹⁶ Also, choices of culture techniques are varied and are often dictated by economic considerations in conjunction with clinical needs. Selection of an individual test system cannot be made on the basis of our study, although we conclude that the methods used in this office practice are efficient and clinically useful.

Rapid diagnosis of GAS pharyngitis is convenient for both clinicians and patients, and early institution of appropriate therapy can shorten the duration of illness and prevent sequelae such as rheumatic fever. However, Pichichero and co-

workers have also shown that early treatment of GAS pharyngitis can increase the rate of symptomatic relapse.¹⁷ Although we do not agree with their conclusion that treatment of GAS pharyngitis should be purposely delayed, the clinical implications of their study are important and deserve further investigation.

Summary

Rapid methods for detection of GAS antigen in throat swabs can be used in a private practice setting with acceptable sample processing times. The intent of such testing is to allow for earlier diagnosis of GAS pharyngitis, which was possible in 90 percent of our patients harboring GAS. It is still necessary to use standard culture techniques to detect the other 10 percent of these patients, and, therefore, laboratories using rapid techniques should have culture capabilities as well. Bacitracin susceptibility is a nonspecific test that should not be interpreted as highly predictive of GAS positivity. Further refinements in GAS antigen detection may eventually eliminate the need for back-up culture studies to diagnose GAS pharyngitis.

References

1. Schwartz RH, Hayden GF, McCoy P, Sait T, Chhabra O. Rapid diagnosis of streptococcal pharyngitis in two pediatric offices using a latex agglutination kit. *Pediatr Infect Dis* 1985; 4:647-50.
2. Campos JM, Charilaou CC. Evaluation of Detect-A-Strep and the Culturette Ten-Minute Strep ID kits for detection of group A streptococcal antigen in oropharyngeal swabs from children. *J Clin Microbiol* 1985; 22:145-8.
3. Lieu TA, Fleisher GR, Schwartz JS. Clinical performance and effect on treatment rates of latex agglutination testing for streptococcal pharyngitis in an emergency department. *Pediatr Infect Dis* 1986; 5:655-9.
4. White CB, Bass JW, Yamada SM. Rapid latex agglutination compared with the throat culture for the detection of group A streptococcal infection. *Pediatr Infect Dis* 1986; 5:208-12.
5. Strandjord TP, Rich EJ, Quan L. Comparison of two antigen detection techniques for group A streptococcal pharyngitis in a pediatric emergency department. *Pediatr Infect Dis J* 1987; 6:1071-2.
6. Tolliver PR, Roe MH, Todd JK. Detection of group A streptococcus: comparison of solid and liquid culture media with and without selective antibiotics. *Pediatr Infect Dis J* 1987; 6:515-9.
7. Randolph MF, Redys JJ, Cope JB. Evaluation of aerobic and anaerobic methods for recovery of streptococci from throat cultures. *J Pediatr* 1984; 104:897-9.
8. Roddey OF, Clegg HW, Clardy LT, Martin ES, Swetenburg RL. Comparison of a latex agglutination test and four culture methods for identification of group A streptococci in a pediatric office laboratory. *J Pediatr* 1986; 108:347-51.
9. Gerber MA, Randolph MF, Chanatry J, Wright LL, DeMeo KK, Anderson LR. Antigen detection test for streptococcal pharyngitis: evaluation of sensitivity with respect to true infections. *J Pediatr* 1986; 108:654-8.
10. Gerber MA, Spadaccini LJ, Wright LL, Deutsch L. Latex agglutination tests for rapid identification of group A streptococci directly from throat swabs. *J Pediatr* 1984; 105:702-5.
11. Berkowitz CD, Anthony BF, Kaplan EL, Wolinsky E, Bisno AL. Cooperative study of latex agglutination to identify group A streptococcal antigen on throat swabs in patients with acute pharyngitis. *J Pediatr* 1985; 107:89-92.
12. Facklam RR, Carey RB. Streptococci and aerococci. In: Lennette, EH, Balows A, Hausler WJ Jr, Shadomy HJ, eds. *Manual of clinical microbiology*. 4th ed. Washington, D.C.: American Society for Microbiology. 1985:154-75.
13. Hayden GF, Murphy TF, Hendley JO. Non-group A streptococci in the pharynx: pathogens or innocent bystanders? *Am J Dis Child* 1989; 143:794-7.
14. Hofkosh D, Wald ER, Chiponis DM. Prevalence of non-group-A beta-hemolytic streptococci in childhood pharyngitis. *South Med J* 1988; 81:329-31.
15. Cimolai N, Elford RW, Bryan L, Anand C, Berger P. Do the beta-hemolytic non-group A streptococci cause pharyngitis? *Rev Infect Dis* 1988; 10:587-601.
16. Radetsky M, Solomon JA, Todd JK. Identification of streptococcal pharyngitis in the office laboratory: reassessment of new technology. *Pediatr Infect Dis J* 1987; 6:556-63.
17. Pichichero ME, Disney FA, Talpey WB, et al. Adverse and beneficial effects of immediate treatment of group A beta-hemolytic streptococcal pharyngitis with penicillin. *Pediatr Infect Dis J* 1987; 6:635-43.