Performance Characteristics and Utilization of Rapid Antigen Test, DNA Probe, and Culture for Detection of Group A Streptococci in an Acute Care Clinic

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Group A streptococcus (GAS) antigen testing has become a routine point-of-care (POC) test in acute care settings. Concern about performance parameters (PP) of these tests as well as inappropriate antibiotic use has resulted in various recommendations regarding diagnosis of GAS. There were two objectives in this study. The first was to evaluate the rapid GAS antigen test presently in use (Thermo BioStar, Boulder, Colo.) and the GAS Direct probe test (Gen-Probe, San Diego, Calif.) compared to culture. The second was to define the optimal use of these technologies in a large acute care pediatric clinic. A total of 520 consecutive pediatric patients presenting with symptoms of pharyngitis at any of three Lahey Clinic acute care facilities were evaluated. Pharyngeal specimens were collected using a double-swab collection device (Copan, Corona, Calif.). One swab was used for the antigen test, the second was used for the probe test, and the pledget was placed in the collection device for culture on 5% sheep blood agar, incubated for 48 h anaerobically, and subsequently placed in Todd-Hewitt broth. After discrepant analysis, sensitivity, specificity, and positive and negative predictive values were as follows: 94.8, 100, 100, and 96.9% for the probe test and 86.1, 97.1, 93.7, and 93.4% for the antigen test, respectively. Sensitivity using an enhanced culture technique was 99.4% (163 of 164). False-positive (FP) antigen results were often seen from patients previously diagnosed and/or treated for GAS. No FP results were seen with the probe test. Colony counts for the false-negative (FN) antigen tests were higher than those for the FN probe tests. Compared to culture and DNA probe, the rapid antigen test (RAT) offered a result at the time of the patient's visit, with acceptable PP when prevalence of disease is high. Follow-up testing with the RAT of GAS patients who previously tested as positive should be avoided due to increased FP results. The probe test was comparable to culture in performance. Results indicate the probe test can be used as the primary test or as a backup to negative antigen tests. The probe test offers the advantage over culture of same-day reporting of a final result but, in contrast to a POC test, necessitates follow-up communication to the patient. Preliminary data show the specificity of the probe test to be greater than that of the RAT for patients previously diagnosed with GAS.

TABLE 1. Comparison of GAS test methods[a]

Parameter[b]	GAS Direct probe test No. of specimens (total no.)	%	OIA RAT No. of specimens (total no.)	%	Culture No. of specimens (total no.)	%
Sensitivity	164 (173)	94.8	149 (173)	86.1	172 (173)	99.4
Specificity	347 (347)	100	337 (347)	97.1	347 (347)	100
PPV	164 (164)	100	149 (159)	93.7	172 (172)	100
NPV	347 (358)	96.9[c]	337 (361)	93.4[d]	347 (348)	99.7

[a] A total of 520 specimens were evaluated.
[b] PPV, positive predictive value; NPV, negative predictive value.
[c] FN probe test specimens had plate colony counts of <10 (3 specimens), 10 to 25 (5), and 25 and 50 (1).
[d] FN OIA specimens had plate colony counts of <10 (6 specimens), 10 to 25 (8), 25 to 50 (8), and >50 (2).

1) Qual è la prevalenza di streptococco A (GAS) nel campione analizzato?
2) Quanti sono i falsi positivi del test «GAS probe test»?
3) Quanti sono i falsi negativi del test «OIA RAT»?
4) Gli Autori in discussione affermano:

ness of the test for a given practice setting (8). Most importantly, the prevalence of disease in this study was very high (33%), and the predictive value of the RAT was 93.7%. For a prevalence of 10%, the predictive value of this test would be only about 75%. Physicians using only RATs for diagnosis of GAS should be aware of this critical limitation.

Che calcoli hanno effettuato gli Autori per affermare che «con una prevalenza del 10% il test RAT avrebbe una valore predittivo (positivo) di circa 75%»?

SOLUZIONI

1) Qual è la prevalenza di streptococco A (GAS) nel campione analizzato?   173 / 520 =0.3307 -> 33%
2) Quanti sono i falsi positivi del test «GAS probe test»?   0 (specificità e VPP 100%)
3) Quanti sono i falsi negativi del test «OIA RAT»?   24 (173-149 o 361-337)
4) Che calcoli hanno effettuato gli Autori per affermare che «con una prevalenza del 10% il test RAT avrebbe una valore predittivo (positivo) di circa 75%»?

La sensibilità e la specificità del test RAT sono risultate del 86.1% e 97.1% rispettivamente.
Applicandole ad una popolazione (per comodità/esempio di numerosità 1000) con prevalenza del 10% ottengo la seguente distribuzione:

	RAT+	RAT-	Tot
GAS+	100*0.861≈86		100
GAS-	900-874=26	900*0.971≈874	900
Tot	86+26=112		1000

VPP=86/112=0.767

Oppure applico il teorema di Bayes:
VPP=Sn*Prev/[Sn*Prev+(1-Sp)*(1-Prev)]=0.861*0.1/[0.861*0.1+ (1-0.971)*0.9]=0.767

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5) Quanti sono i falsi negativi (FN) del test «GAS probe test»?

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Dei 173 soggetti con GAS, 164 sono risultati positivi con il probe test: quindi i FN sono 173-164=9

Oppure

Dalla Tabella 1 risultano 358 negativi al test, di cui 347 sono detti essere Veri negativi (GAS-|test-), quindi sembrerebbero 11 (358-347=11)

Questo è chiaramente un errore nell'articolo, perché i due approcci dovrebbero portare allo stesso risultato (provate con il RAT test).
Dalla nota *c* della tabella 1 si evince che i FN sono in realtà 9 (3+5+1), coerentemente a quello che è scritto nei risultati.

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Sensitivity	164 (173)
Specificity	347 (347)
PPV	164 (164)
NPV	~~347~~ (358)

349