Evaluation of RPR Card Test for Syphilis Screening in Field Investigations

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THE rapid plasma reagin (RPR) card test for syphilis was described by Portnoy and associates (*1*) as having the necessary components for an effective field test: (*a*) a rapid, simple method for obtaining plasma from finger-stick blood, requiring neither water bath nor centrifuge; (*b*) a stable antigen suspension; (*c*) rapid performance; and (*d*) adequate sensitivity and specificity. Preliminary evaluations of the test were conducted at the venereal disease clinic of the Fulton County (Ga.) Health Department and the social hygiene clinic of the Houston (Tex.) City Health Department where the RPR card tests were performed by technologists from the Venereal Disease Research Laboratory.

To evaluate the practicability of the RPR card test for use as a screening procedure in field investigations, 28 nontechnical venereal disease investigators from various sections of the country received a 2-day training course at the Venereal Disease Research Laboratory in the performance of the RPR card test. Each investigator was given an RPR card-testing kit with the following instructions: All named contacts to early infectious syphilis will be tested by both the RPR card test and by the VDRL quantitative slide test. In addition, all named contacts will have physical examinations in the clinic. For all others tested (suspects, associates, high-prevalence groups, and so on) the VDRL slide test is required only if the RPR card test is reactive. In this event, the venous specimen should be obtained at the time the reactive card test is noted and the patient brought to the clinic for examination.

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Results

Between April 1962 and March 1963, 3,920 persons were tested by the RPR card test, and on 2,788 of these the VDRL quantitative slide test was also performed. Results of these tests are shown in table 1 for named contacts of infectious syphilis and for all others tested. Ninety-seven percent of all contacts and 97 percent of all others who were reactive to the card test were tested by the VDRL slide test. Although instructions were not strictly followed, in most instances where only the RPR card test was performed, contacts were exposed to early latent rather than primary or secondary syphilis, venous puncture was impossible, or it was felt that a positive darkfield obviated the necessity for a VDRL slide test. In the group other than contacts who were nonreactive to the card test, 54 percent were tested with the VDRL slide test even though the second test was optional.

Among the 295 contacts who were reactive to the card test, 21 percent were nonreactive to the VDRL; in all others than contacts, 25 percent of 369 who were reactive to the card test were nonreactive to the VDRL slide test. Among contacts who were nonreactive to the RPR card test, 97.8 percent were also nonreactive to the VDRL test, and for all others tested this rate was 98.5 percent. Where discrepancies oc-

curred, the VDRL was usually in the low range of reactivity, 1 dil or less, and in only one instance was the VDRL greater than 2 dils.

Combining reactive and weakly reactive results, there was 92.9 percent agreement between the RPR card test and the VDRL slide test in contacts, and 93.2 percent agreement in all others tested. These agreement rates may be calculated from the data in table 1. For contacts, agreement between tests=207+26+832÷1,146=92.9 percent. For all others, agreement between tests=224+53+1,254÷1,642=93.2 percent. The percentage of agreement ranged from 73 to 100 percent by the 28 nontechnical personnel performing the card tests. However, relatively uniform results within areas suggest a possible difference in level of sensitivity of the VDRL slide test rather than a difference in interpretation of card test results. For example, for the four investigators participating in Chicago, agreement between the two tests ranged from 73 to 86 percent; for the three investigators in Atlanta, agreement ranged from 97 to 100 percent.

The combination of results of the RPR card test and VDRL slide test by diagnostic classification is shown in table 2. Among the 2,788 persons tested by both serologic techniques, 2,086 (74.8 percent) were nonreactive to both tests and 510 (18.3 percent) were reactive to both tests. Discrepancies between the two tests occurred in 6.9 percent: 38 were nonreactive to the RPR card test but reactive or weakly reactive to the VDRL slide test, and in 154 the results were reversed. In the group nonreactive to the RPR test but reactive to the VDRL, only 10.5 percent were considered nonsyphilitic, compared with 79.2 percent of those reactive to the card test but nonreactive to the VDRL. The percentage brought to treatment for primary syphilis was approximately the same for both groups, 8 and 12 percent, respectively. When

Table 1. Comparison of results of RPR card test and VDRL slide test on contacts to infectious syphilis and others

RPR card test			Quantitative VDRL slide test											
Results	Tested		Total tested by VDRL slide		Reactive						Weakly reactive		Nonreactive	
					VDRL (dils)				Total reactive					
	Number	Percent	Number	Percent	8+	4	2	1	Number	Percent	Number	Percent	Number	Percent
Contacts														
Reactive	295	25.0	295	100.0	149	18	21	[1]19	207	70.2	26	8.8	62	21.0
Nonreactive	884	75.0	851	96.3	0	0	5	[2]5	10	1.2	9	1.1	832	97.8
Total	1,179	100.0	1,146	97.2	149	18	26	24	217	18.9	35	3.1	894	78.0
All others														
Reactive	382	13.9	369	96.6	99	24	47	[3]54	224	60.7	53	14.4	92	24.9
Nonreactive	2,359	86.1	1,273	54.0	0	1	0	5	6	.5	13	1.0	1,254	98.5
Total	2,741	100.0	1,642	59.9	99	25	47	59	230	14.0	66	4.0	1,346	82.0
Total														
Reactive	677	17.3	664	98.1	248	42	68	73	431	64.9	79	11.9	154	23.2
Nonreactive	3,243	82.7	2,124	65.5	0	1	5	10	16	.8	22	1.0	2,086	98.2
Total	3,920	100.0	2,788	71.1	248	43	73	83	447	16.0	101	3.6	2,240	80.3

[1] Includes 2 reported only as reactive.
[2] Includes 1 reported only as reactive.
[3] Includes 6 reported only as reactive.

limited to patients in whom syphilis was diagnosed, primary syphilis accounted for 9 percent (3÷32) of those with a reactive VDRL and nonreactive RPR test and for 61 percent (19 ÷3) of those with a reactive RPR test but nonreactive VDRL. Furthermore, in the total group with a reactive RPR card test but nonreactive VDRL, a primary lesion was observed in approximately 1 of every 5 males, but in only one of every 16 females examined. This suggests the possibility that a number of females with recently acquired syphilis were erroneously classified as not infected.

New blood tests for syphilis are usually evaluated in terms of sensitivity and specificity, determined by the results of testing specimens from well-documented syphilitic and nonsyphilitic persons. In this series, except for patients with clinical manifestations or a history of syphilis, the category was determined by the results of the testing. Among patients diagnosed as syphilitic, the RPR card test and VDRL slide test were nonreactive in 10 percent; and among persons classified as nonsyphilitic the RPR card test was nonreactive in 94.1 percent and the VDRL slide test nonreactive in 99.5 percent (table 3). It appears, then, that both tests were equal in sensitivity, but that the VDRL slide test was more specific than the RPR card test. However, in untreated primary syphilis, the stage in which serologic tests are subordinate to the darkfield in establishing a diagnosis, the RPR card test showed greater sensitivity than the VDRL slide test (84.3 percent compared with 71.1 percent reactive). Both were 100 percent reactive in the secondary stage. In all other syphilis categories, the VDRL slide test was more reactive than the RPR card test, reflecting a greater confidence in the VDRL in establishing a diagnosis. For example, the diagnosis of untreated latency was not made in the absence of a reactive VDRL slide test, but 9.5 percent with this diagnosis were nonreactive to the RPR card test.

These data certainly suggest the possibility that the "nonsyphilitic" category includes patients with syphilis, a possibility that is strengthened by the fact that 44 percent of the 128 persons who were reactive to the RPR card test were named contacts of patients with infectious syphilis. In addition, this group includes four persons, reactive to both tests, who were diagnosed as biologic false positive reactors on the basis of a nonreactive Reiter protein test. The fallacy of this determination is brought out in a recently published paper (*2*), which includes a comparison of tests performed at the Venereal Disease Research Laboratory. In untreated primary syphilis 1 in every 3 patients and in untreated secondary syphilis 1 in every 15 patients reactive to the VDRL slide test was nonreactive to the Kolmer Reiter protein (KRP) test.

Discussion

The two principal objectives of this evaluation were to determine the practicability of the RPR card test as a screening procedure in field in-

Table 2. Combination of RPR card and VDRL slide test results by diagnostic classification

Diagnostic classification	RPR–N VDRL–N		RPR–N VDRL–R/WR		RPR–R VDRL–N		RPR–R VDRL–R/WR		Total with both tests	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Not infected	2,056	98.6	4	10.5	122	79.2	6	1.2	2,188	78.5
Infected and brought to treatment for	16	.8	14	36.8	21	13.6	307	60.2	358	12.8
Primary syphilis	16	.8	3	7.9	19	12.3	83	16.3	121	4.3
Secondary syphilis	0	------	0	------	0	------	148	29.0	148	5.3
Latent syphilis	0	------	7	18.4	0	------	67	13.1	74	2.7
Other or unspecified	0	------	4	10.5	2	1.3	9	1.8	15	.5
Previous adequate treatment	12	.6	18	47.4	10	6.5	193	37.8	233	8.4
Diagnosis deferred	2	.1	2	5.3	1	.6	4	.8	9	.3
Total cases	2,086	74.8	38	1.4	154	5.5	510	18.3	2,788	100.0

NOTE: N, negative; R, reactive; WR, weakly reactive.

Table 3. Diagnostic classification by RPR card and VDRL test results

Diagnostic classification	Total with both tests	RPR card test		VDRL slide test		
		Reactive	Non-reactive	Reactive	Weakly reactive	Non-reactive
	Number					
Nonsyphilitic	2, 188	128	2, 060	4	6	2, 178
Syphilitic	591	531	60	442	90	59
Untreated	358	328	30	292	29	37
Primary	121	102	19	73	13	35
Secondary	148	148	0	147	1	0
Latent	74	67	7	60	14	0
Other or unspecified	15	11	4	12	1	2
Treated syphilis	233	203	30	150	61	22
	Percent					
Nonsyphilitic	100. 0	5. 9	94. 1	0. 2	0. 3	99. 5
Syphilitic	100. 0	89. 8	10. 2	74. 8	15. 2	10. 0
Untreated syphilis	100. 0	91. 6	8. 4	81. 6	8. 1	10. 3
Primary	100. 0	84. 3	15. 7	60. 3	10. 7	28. 9
Secondary	100. 0	100. 0	. 0	99. 3	. 7	. 0
Latent	100. 0	90. 5	9. 5	81. 1	18. 9	. 0
Other or unspecified	100. 0	73. 3	26. 7	80. 0	6. 7	13. 3
Treated syphilis	100. 0	87. 1	12. 9	64. 4	26. 2	9. 4

vestigations and the reliability of the test when performed by nontechnical personnel. The term "field investigations" in this evaluation refers to confidential investigations of persons suspected of syphilis which are conducted outside of the clinic. The venereal disease investigator, as an epidemiologist, is primarily concerned with locating and bringing to treatment all source and spread contacts of patients with infectious syphilis, thus breaking the chain of infection. Evaluations of the RPR card test in population surveys in areas where modern laboratory facilities are unavailable have not been reported at this time.

The evaluation was conducted in States where investigators are permitted by law to draw blood specimens. It was the consensus of the 28 investigators that the card test technique was too cumbersome for confidential investigations. Under most circumstances a specimen of blood for laboratory analysis could be obtained without too much difficulty, but only in rare instances was it practical to spread out the card test equipment. Most agreed, however, that it was of considerable value in the clinic as an aid in completing the diagnosis of contacts to infectious syphilis on the initial clinic visit. Clinicians agreed that a reactive test stimulated their search for inconspicuous lesions and more thorough darkfield examinations. In areas where the card test was used in this manner there was a noticeable improvement in the epidemiologic indices. Since only three drops of blood are required, the card test is also extremely useful in testing babies.

In Portnoy's preliminary evaluation in which the card test was performed by technologists from the Venereal Disease Research Laboratory (*1*), agreement between the RPR card test and VDRL slide test in 2,402 specimens examined was 93.5 percent. Agreement in the present evaluation, with the card test being performed by nontechnical personnel on 2,788 specimens, was 93.1 percent. Reactivity rates for the RPR card test and VDRL slide test in the preliminary evaluation were about the same, 22.6 and 22 percent, respectively. In the present evaluation, the reactivity rate was 23.8 percent

for the RPR card test and 19.7 percent for the VDRL slide test, a difference which is statistically significant at the 1 percent level.

When analyzed by the 15 areas participating in the evaluation, the difference in reactivity rates between the two tests was significant in only 2. In Chicago, the reactivity rate for the RPR card test was 38.9 percent and for the VDRL slide test, 25.6 percent, in 347 persons examined; in St. Louis, reactivity rates for the two tests among 480 persons examined were 22.3 percent and 10.8 percent, respectively. In the other 13 areas, the rates for the two tests were identical in 3, an average of 2 percentage points lower for the RPR card test in 3, and an average of 2 percentage points higher for the RPR card test in 7. Basing the comparison on agreement between the RPR card test and VDRL slide test, the results of the RPR card test performed by minimally trained venereal disease investigators in this evaluation compare favorably with the results of the RPR card test performed by experienced laboratory serologists in the preliminary evaluation, with the two exceptions noted.

Summary and Conclusions

1. After a 2-day training period, 28 nontechnical venereal disease investigators performed the RPR card test on a total of 3,920 persons; 2,788 of this number were also tested by the VDRL slide test.

2. The overall agreement between the two tests was 93.1 percent. The range in agreement between the two tests by the 28 investigators performing the card tests was 73 to 100 percent.

3. Although the card test appeared to be more sensitive than the VDRL slide test, at only 2 of the 15 areas participating in the evaluation was there a significant difference in results between the two tests.

4. In performing the test, nontechnical personnel compared favorably with experienced serologists.

5. Experienced venereal disease investigators considered the RPR card test impractical for confidential field investigations conducted outside of the clinic.

6. Clinicians considered the test a valuable tool for improving the efficiency of the busy venereal disease clinic.

REFERENCES

(1) Portnoy, J., Brewer, J. H., and Harris, A.: Rapid plasma reagin card test for syphilis and other treponematoses. Public Health Rep 77: 645–652, August 1962.

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New Chief for Division of Hospitals

Dr. Gabriel P. Ferrazzano will assume the position of chief of the Division of Hospitals in the Public Health Service on July 1, 1964. Currently head of the Division of Health Mobilization, Dr. Ferrazzano will succeed Dr. Myron D. Miller, who will become medical officer in charge of the PHS Hospital in San Francisco, Calif.

Dr. Ferrazzano has served as medical officer in charge of the PHS Hospital in Chicago and of the PHS Outpatient Clinic in New York City; assistant chief of surgery and later clinical director of the PHS Hospital in New Orleans; and chief of surgery, U.S. Penitentiary Hospital, Atlanta.

A native of Warren, R.I., he received his premedical training at Holy Cross College, Worcester, Mass., and his M.D. degree from Marquette University, Milwaukee, Wis. He received his internship training at the Waltham General Hospital, Waltham, Mass., and the PHS Hospital, Portland, Maine. His residency in surgery was obtained at the PHS Hospital in Boston.

Dr. Ferrazzano is a fellow of the American College of Surgeons, a member of the American Medical Association, the Association of Military Surgeons, the American Hospital Association, and the American College of Hospital Administrators.