ASSESSMENT OF RAPID E.S.R. ESTIMATION USING AN INCLINED TUBE

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IT IS WELL-KNOWN that failure to keep an E.S.R. tube vertical will result in a falsely high reading. An inclination of as little as 5° will cause sedimentation to take place more rapidly. Inclining the tube reduces the vertical distance of fall and increases the horizontal area of cross-section by the reciprocal of that factor.

The Martin E.S.R. kit consists of a tube of the same bore as the standard Westergren tube. It is supplied with a wooden case which serves two functions:

1. To act as a carrier for the tube.
2. To act as a holder so that the tube may be held either vertically or at 30°.

The makers claim that when the tube is held in the latter position a 7 minute reading will correspond to a one-hour reading on a standard vertical tube. It should be added that the reading must be taken from the side (i.e. in profile) and not from the front (i.e. ‘en face’) because the thin red line of R.B.C.’s which collect on the dependent surface of the tube make it impossible to get a correct reading from a front view.

An accurate 7 minute E.S.R. estimation would be of tremendous value in general practice and in busy casualty departments. Unfortunately the first 15 controlled tests carried out with the sloping tube indicated that the makers’ claims of accuracy for this period were quite untenable (See table: tests 1-15). Results number 1 and 10 show that even a very elevated E.S.R. could be overlooked if a 7 minute reading were relied upon.

The search for an accurate E.S.R. estimation using an inclined tube was hence abandoned, but further tests were carried out to ascertain whether a rapid screening test which would serve an alerting function in indicating a significantly raised E.S.R. could be devised using this apparatus. A total of fifty controlled tests were carried out against the standard vertical Westergren pipette (See table test 1-50). A number of preliminary trials (not recorded here) had seemed to indicate that a 12 minute reading on the inclined tube might be the most useful for this purpose. It was arbitrarily decided to regard as ‘significantly raised’ readings of 15 mms. per hour and over with respect to the vertical tube and 30 mms. and over with respect to the 12 minute reading on the inclined tube.

RESULTS

Applying the criteria of significance given above, it was found:

1. In 36 out of 50 comparative tests (72 per cent) there was agreement between the results from the standard Westergren 1-hour readings and the sloping (30° horizontal) 12 minute Martin readings.

2. In 10 out of 50 comparative tests the screening test was too sensitive, i.e., there were 20 per cent of false positives given by the Martin apparatus (See tests numbers 3, 7, 15, 23, 25, 28, 32, 34, 41 and 42).
| Test No. | Standard Vertical 1 hr. | 30° Sloping 7 min. | 30° Sloping 12 min. | Test No. | Standard Vertical 1 hr. | 30° Sloping 12 min. | Test No. | Standard Vertical 1 hr. | 30° Sloping 12 min. | Test No. | Standard Vertical 1 hr. | 30° Sloping 12 min. |
|---------|------------------------|-------------------|-------------------|---------|------------------------|-------------------|---------|------------------------|-------------------|---------|------------------------|-------------------|
| 1       | 129                    | 8                 | 126               | 16      | 110                    | 70                | 33      | 12                     | 29                |
| 2       | 30                     | 54                | 74                | 17      | 30                     | 65                | 34      | 14                     | 31 F.P.             |
| 3       | 3                      | 7                 | 43 F.P.           | 18      | 4                      | 18                | 35      | 55                     | 80                |
| 4       | 3                      | 2                 | 11                | 19      | 15                     | 33                | 36      | 51                     | 90                |
| 5       | 19                     | 2                 | 17 F.N.           | 20      | 43                     | 41                | 37      | 19                     | 36                |
| 6       | 22                     | 18                | 48                | 21      | 8                      | 27                | 38      | 21                     | 52                |
| 7       | 13                     | 12                | 30 F.P.           | 22      | 25                     | 107               | 39      | 13                     | 26                |
| 8       | 24                     | 3                 | 20 F.N.           | 23      | 10                     | 45 F.P.           | 40      | 5                      | 25                |
| 9       | 6                      | 2                 | 6                 | 24      | 20                     | 40                | 41      | 3                      | 35 F.P.             |
| 10      | 96                     | 4                 | 85                | 25      | 13                     | 55 F.P.           | 42      | 5                      | 35 F.P.             |
| 11      | 6                      | 2                 | 10                | 26      | 18                     | 32                | 43      | 45                     | 56                |
| 12      | 8                      | 5                 | 20                | 27      | 15                     | 20 F.N.           | 44      | 17                     | 43                |
| 13      | 34                     | 11                | 26 F.N.           | 28      | 10                     | 46 F.P.           | 45      | 3                      | 12                |
| 14      | 3                      | 2                 | 10                | 29      | 19                     | 36                | 46      | 33                     | 57                |
| 15      | 10                     | 7                 | 30 F.P.           | 30      | 35                     | 80                | 47      | 3                      | 24                |
|         |                        |                   |                   | 31      | 15                     | 36                | 48      | 4                      | 11                |
|         |                        |                   |                   | 32      | 8                      | 35 F.P.           | 49      | 10                     | 26                |

F.P. = False Positive  
F.N. = False Negative
(iii) In 4 out of 50 comparative tests the screening test failed to alert the presence of a significantly raised standard E.S.R. reading.

(See tests number 5, 8, 13 and 27).

**COMMENT**

It is acceptable that a screening test should err on the side of over-sensitivity rather than the opposite. If one thinks of a burglar alarm the point is made. Ten “false alarms” in 50 is perhaps rather high, but in 4 of these (numbers 7, 15, 25 and 34) the alarm was only marginally too sensitive.

False negatives (see numbers 5, 8, 13 and 25) are of much more serious import, but in the instances where the alerting function of the sloping tube failed, the standard E.S.R. readings were 19, 24, 34 and 15 mms. respectively, so it is fair to say that no markedly raised E.S.R. was missed.

**CONCLUSION**

It is concluded that in the use of an inclined tube as a means of rapid E.S.R. estimation is not a practical proposition. The 7 minute E.S.R. suggested by the makers could be dangerously misleading. The 12 minute screening test, though much more satisfactory, is still not thought to be sufficiently reliable for use in general practice or in busy outpatient departments.

It should be stressed that the apparatus is neat and portable. When the stand is used to hold the tube vertically it behaves exactly like a standard Westegren tube. Moreover, the tube is filled from below using a syringe. This should recommend it on grounds of hygiene alone.

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