MANTOUX AND HEAF TUBERCULIN TESTS
A COMPARATIVE TRIAL CARRIED OUT IN THE DEPOT AND TRAINING ESTABLISHMENT, R.A.M.C., JULY-SEPTEMBER, 1954

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The object of this trial was to determine the advantages, if any, of the Heaf tuberculin test over the Mantoux tuberculin test when performed on a large scale. In this Depot every recruit is tuberculin-tested to decide his suitability for nursing duties in contact with possibly tuberculous patients, and in the case of certain groups—regular soldiers, radiographers, laboratory technicians and operating theatre technicians—as an indication for B.C.G. vaccination. The average age group dealt with was 18-21 years. Each man had recently had a routine chest radiograph.

Heaf Tuberculin Test (Heaf, F., 1951)

Technique.—Standardized Old Tuberculin (undiluted) is “adrenalized” by adding 0.1 ml. of a 1:100 solution of adrenaline to 1 ml. of undiluted Old Tuberculin. A small drop of the Old Tuberculin is placed on the sterilized flexor surface of the forearm clear of superficial veins, by means of a platinum loop sterilized by flaming.

The Multiple Puncture Apparatus, which enables six punctures to be made of equal depth (2 mm. for adults, 1 mm. for children, depending on which of the detachable endpieces is used), is sterilized by dipping the endpiece in a Petri dish containing a small quantity of spirit and passing it through a flame. When the apparatus has cooled down (about 20-30 seconds), the endpiece is pressed firmly on to the skin where the Old Tuberculin has been placed, and the six needles released by the spring action. This is a painless process.

1 ml. of “adrenalized” Old Tuberculin is sufficient for approximately 200 men.

Readings.—Negative: Six faint marks on the skin with no induration.
Positive: Grade I: four or more indurated papules which can be felt, each
Mantoux and Heaf Tuberculin Tests

measuring at least 1 mm. in diameter. Grade II: the papules have coalesced to form a ring, with normal skin in the middle. Grade III: a plateau of simple induration of any diameter. Grade IV: an area of induration on which blistering or ulceration is superadded.

Erythema is present on the third day in all cases of II, III and IV and most cases of I, but by the seventh day only induration may be present.

Mantoux Tuberculin Test

0.1 ml. of 1 : 1,000 Old Tuberculin is injected intradermally into the sterilized skin of the flexor surface of the forearm so as to raise a wheal of at least 5 mm. diameter. A positive result gives an area of induration of not less than 6 mm. diameter when read on the third day. Simple erythema is not regarded as a positive reaction.

Purified Protein Derivative (P.P.D.) may be substituted for Old Tuberculin in either test, in which case the P.P.D. need not be "adrenalized" in the Heaf test.

Heaf—Mantoux Comparative Trial

Method

Each subject received a Heaf test in the left arm and a Mantoux test using 1 : 10,000 Old Tuberculin in the right arm. Three days later the Heaf results were read with the right arm concealed. Then the Mantoux results were read with the left arm concealed. Those subjects who gave a reaction of 0-2 mm. induration with the Mantoux test were retested with 1 : 100 Old Tuberculin, and those who gave a reaction of 3-5 mm. induration with 1 : 1,000 Old Tuberculin. The Heaf results were read again four days later (the seventh day after Heaf testing), as were the results of the 1 : 100 and 1 : 1,000 Mantoux tests.

Results

Total number of men tested (Mantoux and Heaf): 640.

<table>
<thead>
<tr>
<th>Mantoux Positive</th>
<th>Mantoux Positive, third day</th>
<th>Mantoux Positive, seventh day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 10,000</td>
<td>129 (99.23%)</td>
<td>128 (98.46%)</td>
</tr>
<tr>
<td>1 : 1,000</td>
<td>59 (100%)</td>
<td>59 (100%)</td>
</tr>
<tr>
<td>1 : 100</td>
<td>157 (88.20%)</td>
<td>169 (94.94%)</td>
</tr>
<tr>
<td>Totals</td>
<td>367</td>
<td>356</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mantoux Negative</th>
<th>Mantoux Negative, third day</th>
<th>Mantoux Negative, seventh day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 1,000</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1 : 100</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Totals</td>
<td>273</td>
<td>370</td>
</tr>
</tbody>
</table>

(a) Heaf-positive on third day, Heaf-negative on seventh day ... 7 (1.86%)
(b) Heaf-negative on third day, Heaf-positive on seventh day ... 22 (5.83%)
Total Heaf-positive (on one or both days) ... 377 (58.9%)
DISCUSSION

Before attempting to draw conclusions from the above results, it is necessary to point out two possible sources of error. First, measurements of the diameter of induration in the Mantoux tests were made with a ruler as calipers were not available. Secondly, there were 22 (5.83 per cent.) instances where the Heaf readings were negative on the third day but had become positive by the seventh day. All these had received 1:100 Tuberculin on the third day, and it has been suggested that this injection had "potentiated" the Heaf test to make it positive by the seventh day.

In an effort to resolve this latter problem, 304 men were Heaf tested and received no Mantoux test. This survey gave the following results:

<table>
<thead>
<tr>
<th>Total number of men tested</th>
<th>...</th>
<th>...</th>
<th>...</th>
<th>304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heaf-positive on one or both days</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>161 (52.96%)</td>
</tr>
<tr>
<td>Heaf-positive on third day</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>151 (49.67%)</td>
</tr>
<tr>
<td>Heaf-positive on seventh day</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>158 (51.97%)</td>
</tr>
<tr>
<td>Heaf-negative on third day, Heaf-positive on seventh day</td>
<td>...</td>
<td>...</td>
<td>10 (6.21%)</td>
<td></td>
</tr>
<tr>
<td>Heaf-positive on third day, Heaf-negative on seventh day</td>
<td>...</td>
<td>...</td>
<td>3 (1.86%)</td>
<td></td>
</tr>
</tbody>
</table>

These figures follow closely those obtained in the main trial, and despite the small number investigated they do suggest that there is in fact no potentiation of the Heaf test when a second Mantoux test is performed on the third day. It is inferred from these facts that the third day is too early to read the Heaf test and that the fifth or sixth day would be better.

It is to be expected that those men who are Mantoux-positive to the higher dilutions of tuberculin (1:10,000 and 1:1,000) will give a high percentage of Heaf-positive readings on both third and seventh days, since their tuberculin sensitivity is high. This is borne out by the results.

The percentage of Heaf-positives amongst those who required 1:100 tuberculin to reveal sensitivity was appreciably lower, being 88.2 per cent. on the third day and 94.94 per cent. on the seventh. The higher percentage of Heaf-positives on the seventh day has already been discussed.

The percentages of total Mantoux- and Heaf-positives (57.34 per cent. and 58.9 per cent.) are very similar, but both figures are much lower than the 85 per cent. usually quoted for the population as a whole. This is no doubt due to the age group involved, chiefly 18 to 21 years.

ADVANTAGES OF THE HEAF TEST

1. **Speed.**—If two instruments are available and used alternately, one being allowed to cool after sterilization while the other is in use, 200 tests can be performed in an hour by one operator. The same number of Heaf readings can be done in a much shorter time, depending on the supply of clerks to write down the results.

2. **Simplicity.**—If the quantity of tuberculin is sufficient, and if the apparatus is placed firmly and squarely on the forearm, the performance of the test is uniform and foolproof. No skill is required.

3. **Painlessness.**—The Heaf test is painless.
Mantoux and Heaf Tuberculin Tests

4. Accurate and Easy Readings.—As soon as one is familiar with the Heaf-positive Grade I results, the readings are more easily and speedily performed than Mantoux readings. The reading of Grades II, III and IV is especially simple.

5. Lack of Severe Reactions.—A small number of men with Grade IV readings complained of slight discomfort which cleared up quickly with Anthisan cream. It must be stated, however, that painful arms following Mantoux testing has been equally uncommon in this unit.

SUMMARY

1. The Mantoux and Heaf tuberculin tests have been compared in 640 men.
2. The results of the Heaf tests closely follow those of the Mantoux tests, and therefore the Heaf test may be substituted for the Mantoux.
3. It is suggested that the fifth or sixth day would be more suitable for reading the Heaf test than the third day.
4. The Heaf test is simple and the results are easily read.
5. The Heaf test is painless and reactions are negligible.

We are indebted to Dr. K. Neville Irvine, M.A., D.M., B.Ch. (Oxon.), Adviser on B.C.G. Vaccination to the Oxford Regional Hospital Board, for advice and guidance in this trial.

REFERENCE

R. L. Townsend and R. MacDonald

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