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Tuberculin testing in hospital personnel

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SUMMARY

Tuberculin testing of 176 personnel in a Liverpool hospital showed a total incidence of 68% negative reactors. This remarkably high percentage was similar for each of the various groups of workers tested. We did not find the Tine test to be a satisfactory method of screening for tuberculin sensitivity because 30% were doubtful reactors. In these, further tuberculin testing by the Mantoux reagent was always positive.

INTRODUCTION

Over a period of 3 months at this General Teaching Hospital we had 70 requests for examination and culture for myçobacteria from the inpatients. Of these, two were positive and both were from cases of open respiratory tuberculosis. This caused some concern among members of the staff and it was thought advisable to check on immunity to tuberculosis of hospital employees.

At first we intended to screen for tuberculin sensitivity by Mantoux testing, but because of a temporary production problem we were unable to obtain a supply of commercial tuberculin for the Mantoux Test. We therefore used the Tine Test and it was offered to any member of the hospital staff. Our policy was to arrange for chest X-rays on the positive reactors and to offer B.C.G. vaccination to those who were negative. Subsequently the Mantoux reagent became available and tests were performed in some of the volunteers who were investigated.

MATERIALS AND METHODS

A total of 185 members of the hospital staff were screened with the Tine Test. They included cardiographers, clerical staff, domestic staff, drivers, nurses (mainly auxiliary), orderlies, physiotherapists, porters, radiographers and technical staff. All except one were Caucasian, their age range was 18–64 years and 95% were female.

Each Tine Test unit consists of a stainless steel disk with 4 tines, 2 mm long, attached to a plastic handle. The tines have been dipped in a solution of old tuberculin and then dried. The reactivity of tuberculin Tine Test is similar to the intermediate strength Mantoux (5 T.U. or 0·0001 P.P.D.). The Tine Test (Lederle, batch no. 369–281/2679) was performed on the volar surface of the upper third of

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Table 1. *Intermediate strengths of P.P.D. equated with O.T.*

Tuberculin Units (T.U.)	Strength	Purified Protein Derivative (P.P.D.) (mg per dose (0·1 ml))	Old Tuberculin (O.T.) (mg per dose (0·1 ml))
5	Intermediate	0·0001	0·05
10	Intermediate	0·0002	0·10

the forearm. The skin was cleaned thoroughly with acetone and allowed to dry before the application of the disk. The test was read at 48–72 h. Extent of induration was the sole criterion; erythema without induration was considered of no significance. The size of the induration was assessed by inspection, with the forearm slightly flexed and measured by palpation with a gentle finger stroking. Recently the interpretation of tuberculin test reactions has been revised; the recommendations of the National (American) Tuberculosis and Respiratory Disease Association for the reading of the Tine Test (1969) are as follows:

5 mm or more of induration = positive reaction;
2–4 mm of induration = doubtful reaction;
less than 2 mm of induration = negative reaction.

Those who showed a doubtful Tine Test reaction were later offered a Mantoux Test.

Two intermediate strengths of P.P.D. are currently available (Table 1). For the purpose of this study the stronger intermediate strength was used. After preliminary cleaning of the skin with acetone the P.P.D. Mantoux (Evans Medical, batch no. 3N85D6) was injected intradermally on the volar surface of the upper third of the opposite forearm to the one used for the Tine Test. Injections were performed using disposable Mantoux syringes and 10 mm, 45/100 needles. The reading was made within 48–96 h. As recommended by the manufacturers, a positive reaction was defined as a central round, raised, reddened macule, 5 mm or more in diameter, surrounded by an area of erythema.

In addition, a group of 6 positive and 12 negative Tine Test reactors was also tested with the Mantoux reagent.

The Mantoux Test only was performed on a further group of 20 members of the staff.

All the Tine and Mantoux Tests were performed and read by one of us (C.A.B.) and the readings were checked by an independent observer.

RESULTS

Of the 185 tested by the Tine method, 10 did not return for reading of the test. Of the remaining 175, 15 (8·6%) gave a positive reaction, 108 (61·7%) a negative reaction and 52 (29·7%) were considered doubtful reactors (Table 2). A few positive reactors complained of pain, pruritus and discomfort at the test site but no local treatment was recommended.

Of the 52 doubtful Tine Test reactors offered the Mantoux Test, only 33 came for re-testing. All gave a positive reaction 48–72 h after the injection of P.P.D. Vesiculation and ulceration occurred in 4 cases.

Table 2. *Results of Tine and Mantoux tests in hospital personnel*

Test	Number tested	Positive reaction	Negative reaction	Doubtful reaction
Tine	185*	15 (8·6%)	108 (61·7%)	52 (29·7%)
Mantoux	20	8 (40%)	12 (60%)	None

* Ten Tine tested did not return for reading.

Table 3. *Results of Mantoux, following Tine testing in hospital personnel*

Number tested	Tine Test reading	Mantoux Test positive	Mantoux Test negative
33	Doubtful	33	None
6	Positive	6	None
12	Negative	1	11

Table 4. *Tuberculin sensitivity (Tine and/or Mantoux tested) in various groups of hospital personnel*

Group	Number tested*	Negative reactors	Positive reactors
Clerical staff	20	12 (60·0%)	8 (40·0%)
Domestic staff	82	58 (70·7%)	24 (29·3%)
Nursing staff	49	33 (67·3%)	16 (32·7%)
Technical staff	10	7 (70·0%)	3 (30·0%)
Miscellaneous	15	10 (66·6%)	5 (33·3%)
Total	176	120 (68·1%)	56 (31·8%)

* Ten Tine tested did not present for the reading and 19 doubtful Tine reactors did not present for further testing with Mantoux.

Six Tine Test positive reactors were all found to be positive with the Mantoux Test. Of 12 Tine Test negative reactors given the Mantoux reagent, 11 gave a negative reaction and one a positive reaction (Table 3).

Of 20 staff members in which the Mantoux Test only was performed, 8 (40%) reacted positively and 12 (60%) negatively.

The distribution of the tuberculin status amongst the various types of hospital workers is shown in Table 4.

DISCUSSION

The present study has shown an alarming incidence of negative tuberculin reactors (68%) for a group of 176 hospital personnel, including nursing and technical staff. Moreover the lack of reactivity to tuberculin was evenly distributed amongst the various groups of hospital workers investigated. The only recent figures for incidence of tuberculin positivity in this country are in infant school children; 16·5% positive to mammalian tuberculin by the Heaf Test (Gordon, 1975). Our results demonstrate a high incidence of negative reactors also in the adult community. However, an even lower positivity rate to tuberculin has been found in American adult hospital employees (Atuk & Hunt, 1971). These findings

raise important considerations that concern the welfare of hospital personnel who are clearly at risk (Ehrenkranz & Kicklighter, 1972). It would therefore seem important to determine the incidence of negative tuberculin sensitivity in other hospital regions in the United Kingdom, and to ensure that staff are offered B.C.G. vaccination when they are taken into employment.

We found the Tine Test to be a convenient method of screening for sensitivity to tuberculin as it is simple to use and relatively painless. It has been widely used and several authors have reported favourably on the results obtained by it (Rochester & Shee, 1966; Rosenthal, 1966; Rosenthal, Nikurs, Yordy & Williams, 1967; Rosenthal, McEnery, Nika & Thorne, 1969; Shee & Rochester, 1966). However, others found it to be less sensitive than the Heaf Test (Arthur & White, 1965; Emerson & Shaw, 1964; Griffith & Kingsley, 1965). Furthermore, some reports have shown a substantial lack of correlation between the results obtained by the Tine Test and the Mantoux Test (Noble & Behnke, 1965; Young, 1967). Following the recommendations of the National Tuberculosis and Respiratory Disease Association (Diagnostic Standards and Classification of Tuberculosis, 1969), Fine *et al.* (1972) found that the expression of results of the Tine Test into the three categories – positive, negative and doubtful – resulted in a substantial decrease in the incidence of false positive reactions by this test. Although it was not our intention in this study to compare the Tine with the Mantoux Test, several points have emerged that require some consideration. Thus, we have found an incidence of 30% doubtful Tine reactors and this has necessitated much further testing by the Mantoux Test. In our opinion this detracts from the usefulness of the Tine Test as a screening method. Contrary to other reports, all the doubtful Tine reactors were found to be positive on re-testing with Mantoux reagent (Noble & Behnke, 1965, Fine *et al.* 1972). This was unlikely to have been conversion resulting from the Tine testing itself, because the Mantoux testing was performed soon afterwards (within 2–3 weeks). All the Tine Tests in this study were taken from one batch and it could be argued that this had lost potency as has been reported elsewhere (Arthur & White, 1965). (This possibility was drawn to the attention of the manufacturers.)

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