are also a frequent difficulty in general practice ; we should often advise *x*-ray treatment if we knew more of its probable utility.

Carcinoma of the Breast.—This is a condition which has been only too familiar to the general practitioner from the days when the early use of the knife offered the only prospect of cure to the more efficient stage of post-operative *x*-ray treatment. The good results of this addition to our resources are widely appreciated, but, from the patient's point of view, the number of treatments needed, the cost, and loss of time involved, as well as the strain of a procedure that must ever remind the afflicted of the possibility of recurrence, are conditions which perhaps we are apt to appraise too lightly. Personally, the results that I have at present seen from the treatment of this condition by radium encourages me to hope that the knife will in time be displaced by radium and the need for subsequent *x*-ray exposure greatly lessened.

A CONTRIBUTION TO THE COMPARATIVE STUDY OF THE TUBERCULIN TESTS IN INFANTS AND CHILDREN

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A positive tuberculin test is now universally regarded as indicating tuberculous infection. The importance of the test in infancy and childhood is therefore threefold: (a) *in the diagnosis of tuberculous disease*, for the younger the child the more likely is a positive tuberculin test to be associated with an active tuberculous lesion; (b) *in dealing with home contacts*, for the test will indicate those already infected, a point of great importance when considering separation of a child from a tuberculous parent; and (c) *in connexion with B.C.G. vaccination*, as it is claimed that both the injection and the ingestion of this vaccine is followed after a varying interval, in a large proportion of cases, by a state of tuberculin hypersensitivity, even if all contact with tuberculous individuals is avoided—so that a positive tuberculin test will indicate that the period of isolation advisable after vaccination can be terminated, and it will also form a contraindication to revaccination.

It therefore seems essential that the various known tuberculin tests be compared not only as regards their relative sensitivity, but as regards the ease with which they can be employed in infants and children in practice; and, moreover, that there should be universal agreement as to what constitutes the minimum positive reaction for each test. Not only is the latter factor found to vary according to author, but one finds important and careful investigations reported in which no statement at all is made as to what the writers have considered a positive reaction.

Material of Investigation

The 166 infants and children tested were under the care of one of us (B. W.-H.) either at the Hôpital des Enfants-Malades, Paris, or the Fondation Zola, Médan, or in the wards of Professor Ombredanne, surgeon to the Hôpital des Enfants-Malades. Their ages were as follows: under 1 year, seventy-two; 1 year, thirty-two; 2 to 4 years, sixteen; and 5 to 16 years, forty-six. As the chief importance of the tuberculin test is in children under the age of 2 years, it was considered preferable for the purpose of this investigation to divide the

Conclusion

Though I am only too conscious of the disconnected sequence of my remarks, and of the many gaps in the subject, I hope that I have raised a sufficient number of points from the angle of view of the general practitioner to stimulate discussion in a useful direction. May I summarize my chief points as follows?

1. The lack of close co-operation between general practitioner and radiologist.
2. The difficulty the general practitioner experiences in keeping abreast with the advances in the development of your specialty.
3. The need for a closer co-operation within your ranks in order to harvest the experiences and the results at which you arrive.
4. The need for a more systematic presentation of these results to the general practitioner who seeks them, more particularly in post-graduate study.

children into two groups: Group I (under 2 years), 104; and Group II (over 2 years), sixty-two. Ten children were diagnosed as suffering from, or suspected of, clinical tuberculosis. The classification of the two groups was as follows:

Group I: Cervical adenitis.
Arthritis of knee.

Group II: Pulmonary tuberculosis (T.B. found).
Pulmonary tuberculosis (no T.B. found).
Tuberculous meningitis (no T.B. found).
Tracheobronchial adenitis (no T.B. found).
Cold abscess of rib.
Pleurisy (T.B. found).
Pleurisy (no T.B. found).
Anal fistula.

The remaining 156 children may be considered as clinically non-tuberculous. In most of the children of Group II information as to whether they had been vaccinated with B.C.G. was not available. This was, however, known in ninety-six of the 104 children under 2 years, amongst whom twenty-nine had been vaccinated—seven less than six weeks, six between six weeks and three months, and sixteen over three months before the tests were performed.

Technique of Investigation

The tests were carried out over a period of two months on five consecutive series of children. All the tests (with the exception of the Pirquet tests in the first series of thirty-eight children, which were performed by B. W.-H.) were carried out, and all the reactions read and noted, by one of us (G. G. K.). The first series of thirty-eight children did not have a Moro test, otherwise the routine was the same.

The Pirquet, the Mantoux (1 in 1,000), and the Moro tests were performed at the same time. Two days later the test areas were inspected, and if all were found negative (or doubtful) the Mantoux test (1 in 100) was carried out. Two days later the test areas were again examined, and, if still negative, the Mantoux test (1 in 10) was performed, a control with broth being done at the same time. The tests were again read two and four days later, whatever the result.

The site of all the tests (even if positive) was thus inspected on alternate days for eight days (unless the patient had left the hospital), and (except in the case of the Moro test, where the type of response does not lend itself to these measurements) the reactions, *however slight*, were measured and palpated. Erythema was noted as "faint or marked," swelling as "slight, medium, or marked." Discoloration (blue, green, yellow) indicating bruising was also noted, as well as staining following erythema.

Technique of Individual Tests

Pirquet Test.—A drop of pure tuberculin (Pasteur Institute) was placed on the skin of the upper part of the right arm with the blunt end of a vaccinostyle.* A scarification about

* This is a metal instrument closely resembling a pen nib, commonly used for performing this test in France.

TABLE I.—*Moro Test. Positive and False Reactions*

A, area rubbed with ether only. B, area rubbed with ether and ointment. C, area rubbed with ointment only. First readings those taken two days after test.

GROUP I

Positive Reactions

1. Three macules at A, one papule at B; two days later, papule at B only present; six days later, papule desquamating.
2. Confluent papules over whole of both areas B and C, more marked at C; six days later, still present, but fainter.

False Reactions

1. Confluent papules over A and B, more marked at A; a few faint papules at C; two days later, papules at B more marked; four days later, all still present, but fainter.
2. Patchy erythema at A; two days later, erythema over whole chest, most marked at A; four days later, nil to be seen.
3. Faint, blotchy erythema at A; two days later, nil to be seen.
4. A few papules on A and B.
5. A few small macules and faint erythema at A.

GROUP II

(No false reactions, but see No. 18 below)

Positive Reactions

1. One papule at B; still visible on sixth day.
2. Confluent papules over area 10 by 15 mm. at B; still visible on eighth day.
3. Bright erythema 3 by 4 mm. and a few small vesicles at B, 2 by 3 mm. bright erythema at C; lesion at B desquamating on eighth day.
4. Papules (nearly confluent) over whole of B, fewer and smaller papules at C; no definite change on eighth day.
5. Four papules at B; nil to be seen on fourth day.
6. A few faint macules at B; nil to be seen on fourth day.

7. Many small vesicles at B, four papules at C; no change on eighth day.

8. Three large vesicular papules at B, a few very small papules at C; no change on eighth day.

9. A few vesicular papules at B; no change on sixth day.

10. Several small papules at B and C, more marked at B; no change on sixth day.

11. Very small numerous papules at B and C, more marked at B; in addition, a few vesicles at B; no change on sixth day.

12. Four vesicular papules at B, three vesicular papules at C; no change on fourth day.

13. Many confluent papules at B, many papules at C; all fainter on eighth day.

14. One small papule at B, three small papules at C; no change on eighth day.

15. Many small papules (almost confluent) over whole of B and C; fainter on eighth day.

16. A few faint papules at B and C, more at B; fainter on sixth day.

17. A few small papules at B; patient not seen later.

18. A few very faint papules on one side of A; almost confluent papules over whole of B and C; much fainter on eighth day.

19. Many large papules (some vesicular) at B, a few papules at C; no change on fourth day.

20. Five papules (two of which large) at B; no change on sixth day.

21. Many papules (some large) at B, a few very small faint papules at C; no change on eighth day.

22. A few papules at B; no change on eighth day.

23. A large papule at B, a small papule at C; still visible on fourth day; nil to be seen on sixth day.

24. Several papules at B, a few faint small papules at C; no change on eighth day.

1 cm. in length was then made with the sharp end, first on the skin about 5 cm. above the tuberculin, and then through the drop of tuberculin. Bleeding was not always avoided. The arm was left exposed to the air as long as possible. A reaction was assumed to be positive when there was redness (or redness and swelling) at the sides of the lower scarification in the absence of these signs in the control. In one infant (not vaccinated with B.C.G. and from a non-tuberculous household) the lower scarification showed a linear erythema only, and this reaction was not considered positive, as the intradermal test up to 1 in 10 remained negative.

Moro Test.—Tuberculin ointment, consisting of two parts of tuberculin and one part of lanoline, freshly prepared, was employed. The lanoline was heated in a mortar on a water-bath to 50° C., and when it had liquefied the warmed tuberculin was added drop by drop. To obtain a uniform paste the mixture must be thoroughly stirred till cool. In about fifty children three similar squares, one below the other, and separated from each other by about 2 cm., were sketched out with a skin pencil on the middle of the chest—4 sq. cm. for the younger and 5 sq. cm. for the older children. Owing to the smallness of some of the chests the lowest square was often situated partly or wholly on the epigastrium. In the remaining children these squares were not mapped out, as it was found possible to gauge by eye the areas required. The skin in the upper two areas was rubbed across twelve times with a swab dipped in ether. The lowest of these two areas and the remaining "non-etherized" one were then rubbed for thirty seconds with a bead of the ointment. A separate finger was used for each of the two areas, and the time estimated by counting an equal number. In this way it was hoped to obtain at least some measure of uniformity between the test and the control, and the tests in the other children. The chest was left exposed to the air as long as possible.

A positive reaction was considered to be the presence of one or more definite macules, papules, or vesicles in the middle, lower, or the middle and lower areas, in the absence of any reaction on the upper area, or when the reaction in the lower areas was considerably greater than in the upper area. In Table I are summarized the Moro tests which showed any reaction at all at any of the areas. Particular care was taken not to mistake papules and rashes commonly found on the chest for reactions due to the rubbing of the ether or ointment.

Mantoux Test.—Each dilution was freshly prepared for the day of the test from pure tuberculin (Pasteur Institute) with sterile distilled water and 0.5 per cent. phenol: 0.1 c.cm. was injected each time, a glass hypodermic syringe and intradermal needles being used for the first series of thirty-

eight children, the former being replaced by a Pictet intradermal syringe later. With the latter syringe 0.1 c.cm. of the solution is ejected as the result of performing a complete turn of, instead of pushing, the piston, and this considerably facilitates the injection. [See description of syringe (G. G. K., *Lancet*: In the press).] The test with the 1 in 1,000 dilution was performed on the right, with the 1 in 100 dilution on the left, forearm, and with 1 in 10 dilution lower down on the right forearm, when 0.1 c.cm. of the control was injected at the same time on the lower part of the left forearm. For the latter the same glycerin-veal broth employed for the preparation of the tuberculin was obtained from the Pasteur Institute. In the first thirty-eight children it was used unaltered, but for the others the broth was evaporated down and then diluted ten times with distilled water with 0.5 per cent. phenol. In the first thirty-eight children an ordinary hypodermic syringe was employed for the tuberculin 1 in 10 and the control; in the next fifty the Pictet syringe for the 1 in 10 tuberculin and an ordinary syringe for the control. In the remainder a Pictet syringe was used for both. In order to discount any difference in reaction as a result of the different type of syringe the 1 in 1,000 and the 1 in 100 tests in twenty-two children were carried out with each syringe at the same time. No appreciable difference in traumatic or minimal reactions (see below) were noted. Moreover (see Table IV), the percentage of total traumatic reactions with both syringes is the same.

A positive reaction for any of the intradermal tests was constituted by an erythema of at least 10 mm. in diameter, showing slight swelling or a definite erythema over 10 mm. in diameter.* Erythema 5 mm. in diameter to the above limit were considered as doubtful reactions and the test repeated with the next stronger dilution. Doubtful reactions with the dilution of 1 in 10 gave rise to difficulty in interpretation (see Table II and footnote 11).

Results

(A) RELATIVE SENSITIVITY

Table II indicates the results obtained with these tests.

Comparison of the Moro test with the other two tests in the younger group is difficult owing to: (1) the fact that thirty-eight children were not tested, (2) the relatively small number of positive tuberculin tests, and (3) the occurrence of false reactions (see above). The Pirquet

* Evidence for the need of assuming this as the minimum positive reaction has already been brought forward by one of us (G. G. K., *Lancet*: In the press).

and Mantoux (1 in 1,000) tests appear equally sensitive, the Mantoux (1 in 100) more so, and no further positive reactions were obtained with the dilution 1 in 10. Roughly, the number of positive reactions per 100 children under 2 years with the Pirquet test and Mantoux test, in the three increasingly strong dilutions, are 4, 4, 6, 6. In the older group comparison of the three tests is possible, as there were no reactions with the ether, and the number of positive tests is much greater. The number of positive reactions per 100 children, aged 2 to 16 years, for the three tests were therefore: Moro, 42 to 39 (see footnotes ⁴ and ⁵ in Table II); Pirquet, 48, and Mantoux (in the three increasingly strong dilutions), 50 (see footnote ⁶), 55 (see footnotes ⁸, ⁹, and ¹⁰), 61 to 55 (see footnotes ¹¹, ¹², and ¹³).

To summarize, it may be stated that the Moro test is the least sensitive of the three tuberculin tests, the Pirquet and the Mantoux (1 in 1,000) about equally sensitive (in favour of the latter), the Mantoux (1 in 100 and 1 in 10) increasingly more sensitive than the last two. It is interesting to note that while in children under 2 years the Mantoux (1 in 100) increases the number of positive reactions by 50 per cent. on the Pirquet, it is only two more children in a 100 that are found positive. In the older group the number of positive reactions is increased by 13 per cent. only, but six to seven more children per 100 tested are found positive. Thus in testing infants the chances of finding a positive reaction with the Mantoux test when the Pirquet is negative are very much smaller.

Finally, it should be noted that all the diagnosed or suspected cases of clinical tuberculosis were found to be Pirquet-positive and Mantoux-positive (1 in 1,000), but that two of these patients were negative to the Moro test: (a) pulmonary tuberculosis (T.B. found), and (b) tracheo-bronchial adenitis (no T.B. found).

(B) TECHNICAL ADVANTAGES AND DISADVANTAGES IN PRACTICE

The Pirquet test is undoubtedly the simplest to perform: the material is always at hand, the vaccinostyle looks like a nib and does not frighten the child, and the test can be carried out most rapidly. Certain precautions must, however, be taken. Thus: (1) so far as possible bleeding

should be avoided, as this may prevent contact of the tuberculin with the dermis; (2) the control scarification should be made above and not below the tuberculin, as otherwise the latter may run down on to the control area; (3) the lower scarification should be done *through* the tuberculin and the tuberculin not be deposited on it afterwards; (4) the tuberculin should be left exposed to the air for at least a few minutes, after which it may be gently wiped off (a dressing should not be applied, as the latter magnifies the importance of the operation in the eyes of the parents); (5) it is suggested that whenever possible the test be carried out by the medical man himself.

The reputed claim of the simplicity of the Moro test cannot be maintained. Thus: (1) if Table I is referred to it will be seen that out of the twenty-six positive tests in nine the area rubbed with tuberculin only gave no reaction, and in thirteen more the reaction was less marked in the area which had previously not been rubbed with ether, the preliminary cleansing of the skin with ether thus appearing to be essential; (2) the rubbing of the skin with ether gives rise in the young children (for whom the simplification of a tuberculin test is particularly desirable) to false reactions (see Table I), presumably due to their more tender skin: hence, it is essential that a control area rubbed with ether only should form part of the test; (3) the older children in this investigation strongly objected to the smell of the ether, the rubbing with ether proving, in fact, to be the most trying part of all the procedures, and, presumably, is very disagreeable to infants who cannot voice their protests; (4) rubbing two areas with ether and then one with ointment renders the operation a more prolonged one than either the Pirquet or the Mantoux test; (5) the test is messier than either of the other two, as the grease does not dry; (6) a positive reaction often results in a group of papules covering an area as much as 7 cm. in diameter, and this is more objectionable to the parents than the single erythematous patch of a positive Pirquet or even Mantoux test; and (7) it is advisable to have the ointment freshly prepared.

The Mantoux test has the following disadvantages. (1) The dilutions must be fairly freshly prepared (not more than two weeks old); (2) the test is more of an operation in the eyes of children and parents, as something is injected and the apparatus is more complicated; (3) it is more painful. Even if the needle is small and sharp, pain is

TABLE II.—Relative Sensitivity of the Three Tuberculin Reactions.

Age	Pirquet			Moro			Mantoux															
	No. Tested	Positive		No. Tested	Positive		% Positive of Whole Series	1 in 1,000			1 in 100			1 in 10								
		No.	%		No.	%		% Positive of Whole Series	No. Tested	Positive		% Positive of Whole Series	No. Tested	Positive		% Positive of Whole Series	No. Tested	Positive		% Positive of Whole Series		
										No.	%			No.	%			No.	%		No.	%
Under 2 years	104 ¹ 66 ²	4 3	3.8 4.5	66 2 ³	3.0 4.0	41.9 ⁴ —38.7 ⁵	104 61	4 30	3.8 49.1	3.8 50.0 ⁶ —48.2 ⁷	95 22	2 3 ⁸	2.1 13.0 ⁸	5.8 54.8 ⁹ —53.2 ¹⁰	87 19	0 4-1 ¹¹	0 21.0—5.2	5.8 61.1 ¹² —54.8 ¹³				

¹ In one child the test gave a linear erythema; this was not considered positive, as the Mantoux test up to a dilution of 1 in 10 remained negative.

² Excluding thirty-eight cases in which the Moro test was not performed.

³ One of these reactions was very feeble (see Table I).

⁴ Assuming that the two patients not tested (one was in a plaster jacket and the other had a rash on the chest) would both have reacted positively.

⁵ Assuming that these two patients would both have reacted negatively.

⁶ Assuming that the patient not tested (supply of tuberculin ran out) would have reacted positively; almost certainly so as the Pirquet reaction was positive.

⁷ Assuming that this patient would have reacted negatively.

⁸ Adjusted on the assumption that the nine patients not tested (left hospital) would have reacted in the same proportion as those who did.

⁹ ¹⁰ Dependent on ⁶ and ⁷.

¹¹ In only one of these was the test definitely positive by the criteria adopted; in the others it was doubtful; thus the reactions were: (a) 15 by 22 mm. ill-defined erythema (control negative), patient not seen on fourth day; (b) 12 by 15 mm. ill-defined erythema (control negative), negative on fourth day; (c) 6 by 6 mm. faint erythema and slight swelling (control negative), patient not seen on fourth day.

¹² Assuming all four reactions with 1 in 10 dilution and the one not tested with 1 in 1,000 were positive.

¹³ Assuming only one of the four reactions with 1 in 10 was positive and the one not tested with 1 in 1,000 was negative.

TABLE III.—*Mantoux Test. Doubtful and Minimal Reactions.*

Age	1 in 1,000						1 in 100						1 in 10					
	No. Tested	No. Positive	Minimal Reactions		Doubtful Reactions		No. Tested	No. Positive	Minimal Reactions		Doubtful Reactions		No. Tested	No. Positive	Minimal Reactions		Doubtful Reactions	
			No.	%	No.	%			No.	%	No.	%			No.	%	No.	%
Under 2 years	104	4	29 (24)	27.8	3 (3)	2.8	95	2	38 (32)	40.0	7 (7)	7.1	87	0	54 (43)	62.0	4 (3)	4.5
2 to 16 years	61	30	9 ¹ (7)	14.7	2 (1)	3.2	22	2	8 ² (6)	36.3	1 (1)	4.5	19	4-1 ³	7 (6)	36.8	1-4 ³ (0)	5.2-21.0

¹ One of these became positive with dilution 1 in 100; another showed a slight stain only till eighth day, when there developed a faint erythema 10 mm. in diameter (negative with dilution 1 in 100).

² One of these became positive with dilution of 1 in 10.

³ See footnote ¹¹ in Table II.

Numbers in parentheses represent reactions visible or showing staining at least on fourth day after performance of test.

caused by the distension during the injection (in infants considerable force is often required to eject even 0.1 c.cm. from the ordinary hypodermic syringe); (4) if the test is negative with 1 in 1,000 dilution the parents are more likely to object to the repetition of an apparently exactly similar operation.

The test is considerably simplified, however, by the use of a Pictet intradermic syringe (see above).

(C) MINIMUM POSITIVE REACTIONS

Pirquet Test.—A reaction should be regarded as positive if there is at least 1 mm. of erythema on each side of the lower scarification, in the absence of such change in the upper one. A linear erythema should not be regarded as positive, and it is advisable in such cases to carry out the Mantoux test (1 in 100). It should be noted that six of the thirty-four positive Pirquet tests were more marked on the fourth day after the test.

Moro Test.—The presence of even one definite large papule on the area rubbed with the ointment, in the absence of any change on the area rubbed with ether only and of papules or a rash on the neighbouring skin, may be regarded as a positive reaction. However, owing to the frequency of the latter on many chests, it is advisable, when only one or two papules are present, or any doubt is felt, to perform a confirmatory test with the Pirquet or the Mantoux (1 in 1,000). An area of erythema only should not be regarded as a positive reaction.

Mantoux Test.—An area of erythema 10 mm. in diameter, showing some swelling to touch, or a well-defined erythema of greater diameter, should be regarded as the minimum required for a positive reaction. Erythemata 5 mm. in diameter up to the above measurement should be regarded as doubtful reactions, and the test performed with the next stronger dilution. Table III gives the number of these doubtful reactions with each dilution in each group. Only two out of a total of thirteen (1 in 1,000 and 1 in 100 dilutions only) were positive with the next stronger dilution. One of the positive reactions with 1 in 1,000 and one of the positives with 1 in 100 were doubtful two days after the test, but became positive on the fourth day.* It is therefore advisable, when a doubtful reaction is obtained, to postpone carrying out the test with the next stronger solution until the test has been reinspected on the fourth day.

Table IV gives the number of obviously traumatic reactions as shown by blue, green, or yellow colouring of bruising. It is of interest to note that the percentage is the same for both groups of children and whether an ordinary hypodermic or Pictet syringe is used.

* It should also be noted that five of the thirty-four positive reactions with 1 in 1,000, one of the four positives with 1 in 100, and the definitely positive reaction with 1 in 10 were more marked on the fourth day after the test.

Table III gives the number of minimal reactions noted—that is, all reactions showing erythema, or erythema and swelling, less than 5 mm. in diameter. It will be noted that their percentage increases with each dilution, particularly in the younger group. It must be emphasized that 118 out of 145 (80 per cent.) of even these reactions show some staining at least on the fourth day after test. The need for the use of a control test (as described) when the Mantoux test with the dilution 1 in 10 is employed is obvious, especially if the test is stopped at this dilution. The 145 control injections gave rise to eight reactions showing bruising, sixty-three (43 per cent.) minimal reactions, eight reactions corresponding to those described as "doubtful" (seven still visible on the fourth day), and four reactions (two visible on the fourth day)

TABLE IV.—*Mantoux Test. Reactions Indicating Bruising.*

Age	1 in 1,000			1 in 100			1 in 10		
	No. Tested	No. Showing Bruising	%	No. Tested	No. Showing Bruising	%	No. Tested	No. Showing Bruising	%
Under 2 years	104	8	7.6	95	10	10.5	87	6	6.6
2 to 16 years	61	3	4.9	22	3	13.6	19	3	15.7

All Dilutions

Age	No. of Tests	No. Showing Bruising	%	Group I Only	No. of Tests	No. Showing Bruising	%
Under 2 years	286	24	8.3	Ordinary syringe	107	9	8.4
2 to 16 years	102	9	8.8	Pictet syringe	179	15	8.3

measuring 10 mm. in diameter or more. Eleven of these last twelve reactions occurred in the children under 2 years. As, from what has already been stated, these minimal and doubtful reactions cannot be attributed to the trauma of the injection or to the type of syringe used, one is tempted to suggest that they are due to the irritation of some substance* in the broth in which the tuberculin is prepared, and that the infant's skin is particularly sensitive to it.

(D) THE B.C.G. VACCINATED CHILDREN†

While admitting that the smallness of the numbers renders conclusions impossible, it is nevertheless of interest

* This is left intentionally vague. Further work on this question is now being carried out by one of us (G. G. K.).

† The results under this heading appear contradictory with those obtained by one of us in papers previously published. Account should therefore be taken of the small number of vaccinated children here tested.—B. W.-H.

to point out that of the twenty-two infants who had been vaccinated with B.C.G. over six weeks before (sixteen over three months before)—all by mouth except two, four a second time since birth—only two were positive to a tuberculin test. Thus:

(a) Vaccinated subcutaneously nine weeks before test. Had been in contact with sputum-positive mother for a few days before admission. Negative Pirquet; positive to Mantoux (1 in 100).

(b) Vaccinated at birth by mouth seventeen months before test. Had been in contact for eleven months with a father who coughs, but whose examinations were stated to be negative as regards tuberculosis. Positive Pirquet and Mantoux (1 in 1,000).

Conclusions

In spite of the relatively small number of children here investigated we feel justified in drawing the following conclusions:

1. The Moro test is the least sensitive of the three tuberculin tests commonly employed. The Pirquet (pure tuberculin) and the Mantoux test (1 in 1,000) are about equally sensitive, the Mantoux (1 in 100) being definitely more sensitive.

2. For use in infants and young children the Moro test* has definite disadvantages as regards technique and interpretation of results. When employed, a control test with ether only should always be carried out.

3. The Pirquet test is, for infants and young children, the simplest and easiest test to perform, and should therefore be employed first. If found to be negative, an intradermal test with a dilution of 1 in 100 should then be carried out. In older children it is worth while to repeat the test, if still negative, with a dilution of 1 in 10.

4. The Mantoux test in a dilution of 1 in 10 should always be carried out with a control injection of the broth used for the preparation of tuberculin.

5. A Pirquet test should be regarded as positive only if there is at least 1 mm. of erythema on each side of the scarified area.

6. The minimum required for a positive Mantoux test with any dilution is an area of erythema 10 mm. in diameter, associated with some swelling to touch, or a well-defined erythema greater in area than this. Reactions showing an erythema 5 mm. in diameter or more should be regarded as doubtful, re-inspected on the fourth day, and, if still doubtful or negative, the test should be repeated with a stronger dilution. If a reaction obtained with a dilution of 1 in 10 is on the fourth day definitely more marked than the control test, but still under the limit of a positive reaction as indicated above, it is advisable to regard the test as doubtful, and repeat it either within ten days or in three months' time.¹

7. It is suggested that instead of maintaining the controversy as to the relative value of the Pirquet and Mantoux tests, the test indicated here (Pirquet followed by Mantoux 1 in 100), combining both, should be adopted as a routine under a different name—for example, "the combined tuberculin test," or "the cutaneous intradermal test."

We should like to express our thanks to Professor Ombrédanne for allowing us to test the patients under his care, to Dr. Guérin, of the Pasteur Institute, for supplying the broth used for the control test, and to the ward sisters for their help during the course of the investigation.

REFERENCE

¹ Hart, P. D'A.: Medical Research Council Special Report No. 164, 1932.

* The tuberculin ointment now prepared by Löwenstein and sold in small tin tubes as "dermotubin" contains only 40 per cent. tuberculin and is recommended to be used on the arm, back, chest, abdomen, or front of leg, after preliminary cleansing with benzene, ether, alcohol, or soap and water.

CHLOROFORM-HYOSCINE AMNESIA IN LABOUR

BY

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In the *British Medical Journal* of May 26th, 1934, there is an admirable article on hyoscine amnesia in labour by Mr. Trevor Barnett. It stresses the value of hyoscine alone in producing an amnesia which is preferable to hyoscine-morphine narcosis. Mr. Barnett has verified that the use of hyoscine without the initial injection of morphine eliminates the oligopnoea of the newborn infant. In his conclusions he stresses three conditions which make it impossible for the general practitioner to employ the method he advocates. These are:

1. The need for constant supervision during labour.
2. Occasional necessity for two nurses to control the patient.
3. That the method cannot be employed unless one is assured of the presence of the possibly necessary skilled attendants. (These, perhaps, meaning a qualified medical assistant and two nurses.)

This valuable method, then, can only be utilized in a nursing home where such skilled staff is provided.

It is my intention to try to show that a modification of the hyoscine method has proved to be of great value as a domiciliary measure. During the last ten years in general practice I have conducted eighty-four confinements on the lines about to be described. The usual antenatal examination and care are observed, and the cases selected are those which one, as a general practitioner, would select for home treatment.

Details of Procedure

Treatment is commenced when the patient complains of pains which are regular and of moderate strength. The strength and duration of pains are best gauged by abdominal palpation. I have not found that any arbitrary division between first and second stages of labour assists one's judgement. The nervous constitution of the patient and the consequent degree of fear and sensitiveness to pain are more important. As the practitioner's efforts are directed towards saving the patient from any avoidable suffering, it is better to institute the treatment too early rather than let the pains assume too severe a character. Erring on the early side does not seem to protract the labour. After all, one is dealing with a psychosomatic process and not with a stereotyped mechanism which must conform to an average standard set by textbooks.

The patient is put to bed. One nurse is in attendance. An initial light anaesthesia is induced by chloroform until the patient is quiet and sleeping between pains. (It is the experience of most general practitioners that women in labour take chloroform very well.) A hypodermic injection of hyoscine (1/100 grain) is given immediately. The patient is lightly under. The hyoscine is repeated in doses of half this amount at intervals varying from half an hour to an hour. The ideal to be aimed at is that the patient should be definitely drowsy and quiet between pains. During pains discomfort is evidenced merely by subdued groans and slight restlessness. Any indication of returning awareness can be controlled by immediate inhalations of chloroform and a subsequent injection of hyoscine. This use of chloroform as an intermediary often makes all the difference between a perfect amnesia and one in which a severe pain is recalled with extraordinary intensity.

One also finds that chloroform controls any restlessness which hyoscine may produce. This, however, is rarely