sufficiently so to keep her awake. On Sept. 27 she had been radiographed at the request of her own doctor, but no lesion was found. Clinically the only positive finding was slight thickening and pitting at the site of pain, and marked osteo-arthritis grating of both knees. X-ray examination at this stage showed the early stages of what later proved to be a typical stress fracture. Films taken at intervals revealed all the features of stress fracture, both in its incipient stage and in its progress. The nick in the cortex followed by a clear infraction, with later the typical transverse zone almost right across the shaft, was clearly demonstrated.

The second case is most interesting from the point of view of differential diagnosis, for at one stage the x-ray films were so suggestive of sarcoma that a biopsy was performed.

Case II

Pte. T., aged 18. After a strenuous infantry exercise the patient complained of pain in the left knee. There was no history of injury. The pain had been present for some weeks before he was sent to hospital. When seen there it was referred to the knee-joint generally, but more especially to the medial side of the lower end of the femur, where a tender bony-hard swelling could be felt. Full range of knee movement was present. Radiologically (Fig. 1)

FIG. 1.—Case II. The broad-based pyramid is clearly seen and layering of the periosteum can be made out.

FIG. 2.—Case II. The layering is more clearly seen.

the swelling was seen to be due to a heaping up of poorly calcified bone in a low broad-based pyramid, and extending along the femoral shaft in both directions from its base was a thin layer of similar new bone. This layer was seen on the medial, anterior, and posterior surfaces, extending practically to mid-shaft. Underlying the pyramid was a region of endosteal new bone extending nearly halfway across the shaft. A cortical nick could be clearly seen in the negative. A tentative diagnosis of stress fracture was made at this stage. The onion-skin layering of the new bone extending along the shaft, however, gave rise to some anxiety. Control films of the opposite femur failed to show any similar changes. The Wassermann reaction was negative, and at no time was there any sign of local inflammation. Ewing's tumour and osteogenic sarcoma were considered, but it was decided to watch the progress of the swelling and take frequent control radiographs.

With rest in bed the tenderness and pain diminished, and at the end of three weeks the swelling had not increased in size. Films at this stage showed that the new bone was more densely calcified and better defined. At the end of another three weeks the clinical condition was unchanged, and a radiograph (Fig. 2) showed a further increase in density of the new bone mass, and its outline was smoother.

We now felt that the diminution of pain and tenderness, taken in conjunction with the radiological findings, indicated a healing lesion and almost confirmed our earlier diagnosis of stress fracture; but we were still uneasy about the earlier periosteal changes, and so a biopsy was performed. When the swelling was exposed (D. A. R.)—and this was done easily, there being no infiltration of the surrounding tissues—the pyramid was found to be hard, smooth, and rounded, and it easily scaled off the underlying bone, leaving a smooth normal-looking cortex. A portion of the cortex and

underlying cancellous bone was removed. Macroscopically this could not be distinguished from normal bone.

The specimens were examined microscopically by Dr. J. Carr Brundret, who reported the presence of subacute and chronic osteitis compatible with the clinical diagnosis of stress fracture. There was no evidence of Ewing's tumour or sarcoma.

Still later films showed a more calcified new bone which was gradually merging into the normal cortex, and four months after the onset of symptoms the man was discharged to his unit.

Comment

Of these two cases the second is the more unusual, and both clinically and radiologically the more important. The first presents four unusual features—the relatively advanced age of the patient, the nocturnal pain, the absence of a history of strenuous exertion, and the presence of well-established osteo-arthritis; but, apart from that, the behaviour of the case was that of a typical stress fracture, and the diagnosis was never in doubt. Diagnosis was much more difficult in the second case, for while the changes seen radiologically to be taking place within the cortex were those usually associated with stress fractures, the much more widespread subperiosteal changes were very suggestive of sarcoma.

We wish to thank Dr. R. Fawcitt and Dr. J. Blair Hartley for their criticism and help with the films.

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TUBERCULIN TESTING IN CHILDREN

A COMPARISON OF METHODS

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The investigation here reported has been carried out with a view to comparing the sensitivity of children to three forms of the tuberculin skin test: first, the Mantoux intradermal test; second, the Vollmer patch test; third, the diagnostic tuberculin jelly test.

In all, 380 children were tested, of whom 200 did not react to any of the tests. It is with the remaining 180 children that we are concerned. These 180 are made up of two groups of children: first, cases in a sanatorium, diagnosed on clinical, radiological, or bacteriological grounds as cases of active tuberculosis, the lesions being pulmonary, glandular, or in the bones or joints; second, cases attending a children's hospital that were found to be suffering from unexplained cough or glandular enlargement or showed other signs or symptoms giving rise to a suspicion of tuberculosis, or children who gave a history of contact with open tuberculosis.

Technique.—The Mantoux test was performed by the injection of 0.1 c.cm. of 1/10,000 old tuberculin into the skin on the flexor aspect of the forearm, and was read 48 hours after injection. Where this reaction was negative the test was immediately repeated, using 1/1,000 old tuberculin and reading again after 48 hours. The Vollmer patch and the jelly tests were both applied on the back between the shoulder-blades after the skin had been cleaned with aether meth. The jelly was applied in the shape of the letter V, each arm of the V about 1/2 in. long. The jelly was immediately covered by a large patch of elastoplast, about 3 in. by 2 in., extending well beyond the area of skin covered by the jelly; in this way any skin reactions to the elastoplast could be distinguished from reactions to the jelly; in fact, no such reactions were encountered.

The patches used in all the cases here recorded were fresh and from one source. Both patch and jelly tests were read after 48 hours.

Interpretation of Tests.—A positive Vollmer patch test was recorded if the reaction was positive either to human or to bovine tuberculin, or to both. A positive Mantoux was recorded if, after 48 hours, there was a palpable wheal not less than 3/4 cm. in

diameter with an area of surrounding erythema. A positive jelly test was recorded where either limb of the V showed wheal formation with surrounding erythema.

Results

The results of the tests on these 180 children are set out in the tables below.

TABLE I.—*Sanatorium Series*

Mantoux Tub. 1/10,000	Vollmer Patch	Tub. Jelly	No.
+	—	—	3
++	—	—	0
+++	+	+	31
++++	+	+	24
—	+	—	0
—	+	—	0
—	+	—	0
58	31	55 (94.8%)	58

TABLE II.—*Hospital Series*

Mantoux Tub. 1/10,000	Vollmer Patch	Tub. Jelly	No.
+	—	—	54
++	—	—	0
+++	+	+	31
++++	+	+	16
—	+	—	0
—	+	—	0
—	+	—	1*
101	31	48 (47%)	102

TABLE III

Mantoux Tub. 1/1,000	Vollmer Patch	Tub. Jelly	No.
+	+	+	0
++	+	+	0
+++	—	—	1*
++++	—	—	20
—	+	+	0
—	+	+	0
—	—	+	0
21	0	1 (4.8%)	21

* The same case.

These figures show that the chance that the results shown in Table III could have been obtained by random sampling of the same population (the same, that is to say, in the degree of correspondence between positive Mantoux tests and positive jelly tests) as that from which those in Table II were drawn is so low as to be negligible. In fact, the cases in Table III were all those which, by not reacting to the Mantoux at 1/10,000, failed to qualify for inclusion in Table II. One child, who is recorded as reacting only to the jelly test in Table II, reappears as a reactor to the Mantoux at 1/1,000 in Table III.

In respect of frequency of positive jelly tests among the positive reactors to Mantoux 1/10,000, the hospital series (Table II) gives a significantly lower figure than the sanatorium series (Table I)—47% as contrasted with 94.8%.

Now, the hospital series as a whole (Tables II and III) might be considered as a mixture of subjects with *developing* tuberculin sensitivity, whereas the sanatorium subjects (Table I) were, by selection, a sample of *developed* tuberculin sensitivity. It is therefore possible that the sensitivity of the subjects recorded in Table I was, on the average, greater than that of the subjects recorded in Table II. On this view the difference in frequency of positive jelly tests in Tables I and II would be interpreted as meaning that a high degree of correspondence between the two tests could be expected only in subjects who showed a positive reaction to the Mantoux test at a considerably higher dilution than 1/10,000.

Discussion

In a communication by Donald Paterson (*Journal*, April 15, 1944, p. 531) an account was given of the testing by Vollmer patch, Mantoux test, and tuberculin jelly of 100 selected children, of whom 32, 35, and 35 were found to be positive reactors to these tests respectively. It was not stated whether the 35 subjects who gave positive jelly reactions were the same as the 35 who gave positive Mantoux reactions, or whether they

included the 32 giving positive patch tests, but this is to be inferred from the conclusion that "it would appear that in this series tuberculin jelly was a more accurate method of performing the skin test than the Vollmer patch." With this conclusion the results here presented are in agreement. But Paterson does not state explicitly what strength of old tuberculin was used in the Mantoux tests which he records. Writing of the reaction of the tuberculin jelly, he states that "experience has shown that . . . the reaction is equivalent to that of 0.1 c.cm. 1/100 old tuberculin (intracutaneous Mantoux test)." In the series here recorded we have not used intracutaneous old tuberculin in greater doses than 0.1 c.cm. of 1/1,000, but a comparison of the two tables showing Mantoux tests at 1/10,000 and 1/1,000 would suggest that a series of children who reacted only to 0.1 c.cm. of 1/100 would give a still lower figure of correspondence between the jelly and the Mantoux tests.

Clinical Notes.—Though it is no part of the purpose of this communication to discuss the significance of these reactions to tuberculin, certain points of interest relating to the clinical condition of these children may be noted. As has been said, the positive reactors in the sanatorium series were children who had all been diagnosed as cases of active tuberculosis. Among the children given us to test six were found who did not react to any form of tuberculin. Subsequent reference to the notes on these cases showed that on clinical and radiological grounds they had already been diagnosed as suffering from "non-tuberculous lesions." In the hospital series of 122 positive reactors 24 were diagnosed as cases of active tuberculosis. In 8 of these cases the tubercle bacillus was recovered by gastric lavage; the others showed either typical radiological appearances or pyrexia, loss of weight, chronic cough, enlarged glands of neck, inflamed joint, or gave a history of contact with open tuberculosis. In this hospital series were three cases of miliary tuberculosis with meningitis, confirmed at necropsy. It is interesting to note that all three gave a positive reaction to the Mantoux test at 1/10,000. Only one gave a positive reaction to jelly and none gave a positive patch test. It may be noted that all these 24 cases diagnosed on clinical and radiological grounds as suffering from active tuberculosis reacted to the Mantoux 1/10,000, and in this sense are comparable with the children in the sanatorium series.

Summary

As compared with the Mantoux test, the Vollmer patches used in this investigation appear to be unreliable to the point of being valueless.

The reaction to the diagnostic tuberculin jelly varies markedly in the two series; in the hospital series 47% of positive reactors to 1/10,000 Mantoux reacted to jelly, whereas in the sanatorium series 94.8% reacted. Of the 21 cases that reacted to the Mantoux test only when performed with 1/1,000, one gave a positive reaction to the jelly, and none to the Vollmer patch test. It seems clear that the jelly is a less sensitive test than the Mantoux in the dilutions used here, and is found to be positive only in those cases with a relatively high degree of allergy to tuberculin.

We wish to thank Dr. W. A. Bullough, county medical officer, school medical officer, and chief tuberculosis officer, Essex County Council, and Dr. M. C. Wilkinson, medical superintendent of Black Notley Sanatorium, for allowing us to apply these tests to their patients; and Dr. R. B. Fisher for advice on the statistical aspects of the results.

The annual report of the Professional Classes Aid Council for 1944-5 was presented by the president, Viscount Hailsham, at the annual general meeting held on July 5. The Council was founded in 1914 to meet the needs of professional men and women among whom the outbreak of the last war had caused distress. It was reconstituted in 1921 because of the need for a comprehensive and permanent system of relief for members of the professional classes and their dependants who had suffered seriously from that war and post-war conditions. It is composed of representatives of most of the benevolent funds of the professional associations, and its work is carried on in close co-operation with them. Lord Moran, P.R.C.P., succeeds Lord Dawson of Penn as Patron for the medical profession, and the British Medical Association and the Royal Medical Benevolent Fund are represented by Dr. Henry Robinson and Dr. W. P. S. Branson. The present war has put a heavy strain upon the funds of the Council, with the result that there has been a mounting deficit at the end of each year. The office is at 20, Campden Hill Square, London, W.8.