Title	STUDIES ON THE CHANGE OF TUBERCULIN REACTION REPEATEDLY TESTED AT THE SAME SITE OF THE SKIN OF A BCG VACCINATED GROUP OF SCHOOL CHILDREN : 3. RESULTS OBTAINED 18,24 AND 30 MONTHS AFTER BCG VACCINATION
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STUDIES ON THE CHANGE OF TUBERCULIN REACTION REPEATEDLY TESTED AT THE SAME SITE OF THE SKIN OF A BCG VACCINATED GROUP OF SCHOOL CHILDREN

3. RESULTS OBTAINED 18, 24 AND 30 MONTHS AFTER BCG VACCINATION

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Introduction

In previous reports[1)2)] it was mentioned that accelerated and augmented reaction resulted from the first repetition of the tuberculin test on the same site of the skin in which the degree of acceleration and augmentation became stronger at the second repetition.

The present investigation was undertaken to answer the question as to whether or not accelerated and augmented reactions might appear similarly on additional tuberculin tests.

Materials and Methods

BCG vaccinated children in the previous report[1)] were tuberculin tested in two sites of their skin 18, 24 and 30 months after vaccination. One of the injection sites was the repeated site, that is, the tuberculin test was done at the same site (7 cm distal part of the left forearm from the elbow) as in the previous reports[1)2)]. The other site was the new site: the tuberculin test was done 3 cm distal part of the left forearm from the elbow in 18 months, 8 cm proximal part of the left upper arm from the elbow in 24 months and 11 cm distal part of the left forearm from the elbow in 30 months (see Fig. 1).

Since the tuberculin tests done at the repeated site 3, 6 and 12 months after BCG vaccination were designated as the first, the second and the third repetition,

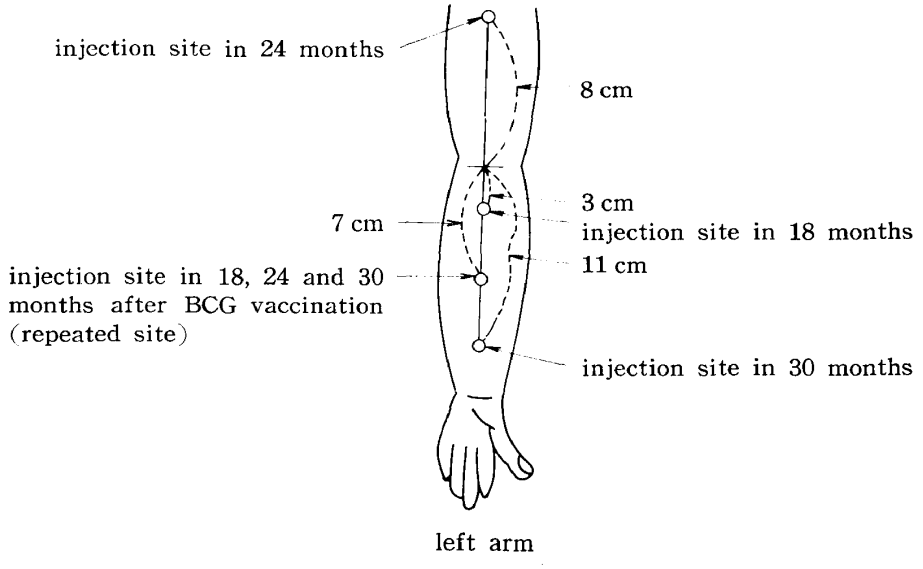

Fig. 1. Injection site of tuberculin.

respectively, in the previous reports[1)2)], the tests done at the same site 18, 24 and 30 months after vaccination in this report are designated as the fourth, the fifth and the sixth repetition, respectively.

Old tuberculin used and its dilution method and the reading index are the same as reported in the previous report[1)].

Results

Table 1 shows the results of 18 months after BCG vaccination. Table 1 (a) and (b) show the difference between 24 and 48 hour values of the new (a) and the repeated (b) sites. The table 1 (a) shows that at the new site 28 cases were stronger at 48 hour value than at 24 hour and 34 cases were the reverse. This result is different from that of the new sites in the previous reports[1)2)], that is, 18 months after vaccination the accelerated reactors increased to some extent. But the number of accelerated reactions was considerably fewer in the new site than the repeated site (Table 1 (b)). When the reactions were compared between the new and repeated sites at 24 hour (Table 1 (c)), they were remarkably stronger at the repeated site than the new site (71 to 9). But at 48 hour the difference became obscure (51 to 49) as seen in Table 1 (d).

Table 2 shows the results of 24 months after BCG vaccination, indicating similar tendency as seen in 18 months, except the stronger reaction at 48 hours than 24 hours in the new site (Table 2 (a)). This coincides with the results of the new sites in the previous investigations (1, 3, 6 and 12 months)[1)2)].

Table 3 shows the results of 30 months after BCG vaccination, indicating the similar tendency as seen in Table 1.

Table 1. Tuberculin reaction, 18 months after BCG vaccination (191 cases).

(a) Comparison of 24 and 48 hour values in new site.

24 hr. \ 48 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	23	7	0	0	0	28
±	4	13	4	2	0	
+	4	7	40	15	0	
++	0	3	15	53	0	
+++	0	0	0	1	0	
No. of 24 hr. > 48 hr.	34					

(b) Comparison of 24 and 48 hour values in repeated site.

24 hr. \ 48 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	4	3	3	0	0	14
±	3	1	2	0	0	
+	7	6	44	6	0	
++	3	6	70	33	0	
+++	0	0	0	0	0	
No. of 24 hr. > 48 hr.	95					

(c) Comparison of injection sites at 24 hour value.

repeated \ new	—	±	+	++	+++	No. of new > repeated
—	7	3	0	0	0	9
±	4	0	1	1	0	
+	12	11	37	3	0	
++	7	9	28	67	1	
+++	0	0	0	0	0	
No. of repeated > new	71					

(d) Comparison of injection sites at 48 hour value.

repeated \ new	—	±	+	++	+++	No. of new > repeated
—	11	1	5	0	0	49
±	9	3	1	3	0	
+	11	21	48	39	0	
++	0	5	5	29	0	
+++	0	0	0	0	0	
No. of repeated > new	51					

Table 2. Tuberculin reaction, 24 months after BCG vaccination (151 cases).

(a) Comparison of 24 and 48 hour values in new site.

24 hr. \ 48 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	14	6	1	2	0	25
±	4	19	8	3	0	
+	0	0	3	3	0	
++	0	1	3	76	2	
+++	0	0	0	4	2	
No. of 24 hr. > 48 hr.	12					

(b) Comparison of 24 and 48 hour values in repeated site.

24 hr. \ 48 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	0	0	0	0	0	2
±	1	3	2	0	0	
+	1	3	11	0	0	
++	0	1	80	29	0	
+++	0	0	8	12	0	
No. of 24 hr. > 48 hr.	106					

(c) Comparison of injection sites at 24 hour value.

new / re-peated	—	±	+	++	+++	No. of new > repeated
—	0	0	0	0	0	2
±	5	1	0	0	0	
+	4	6	4	1	0	
++	13	27	2	67	1	
+++	1	0	0	14	5	
No. of repeated > new	72					

(d) Comparison of injection sites at 48 hour value.

new / re-peated	—	±	+	++	+++	No. of new > repeated
—	1	0	1	0	0	60
±	3	3	0	1	0	
+	12	21	14	54	0	
++	2	2	0	33	4	
+++	0	0	0	0	0	
No. of repeated > new	40					

Table 3. Tuberculin reaction, 30 months after BCG vaccination (151 cases).

(a) Comparison of 24 and 48 hour values in new site.

48 hr. / 24 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	18	2	0	0	0	16
±	5	11	5	0	0	
+	12	11	60	8	0	
++	1	1	4	12	1	
+++	0	0	0	0	0	
No. of 24 hr. > 48 hr.	34					

(b) Comparison of 24 and 48 hour values in repeated site.

48 hr. / 24 hr.	—	±	+	++	+++	No. of 48 hr. > 24 hr.
—	5	1	0	0	0	2
±	6	3	0	0	0	
+	9	8	96	0	0	
++	0	2	18	2	1	
+++	0	0	0	0	0	
No. of 24 hr. > 48 hr.	43					

(c) Comparison of injection sites at 24 hour value.

new / re-peated	—	±	+	++	+++	No. of new > repeated
—	6	0	0	0	0	4
±	3	6	0	0	0	
+	10	13	86	4	0	
++	1	2	5	15	0	
+++	0	0	0	0	0	
No. of repeated > new	34					

(d) Comparison of injection sites at 48 hour value.

new / re-peated	—	±	+	++	+++	No. of new > repeated
—	19	0	1	0	0	20
±	5	8	1	0	0	
+	12	17	67	18	0	
++	0	0	0	2	0	
+++	0	0	0	0	1	
No. of repeated > new	34					

The diameters of redness were measured as done in the previous reports[1)2)]. Twenty four months after vaccination 48 hour values were usually larger than 24 hour at the new site (Fig. 3) as in the previous reports[1)2)], while, 18 and 30 months after vaccination 24 hour values were usually larger than 48 hour at the new site (Fig. 2 and 4). Other results were similar as in the previous reports[1)2)]: 24 hour values were remarkably larger than 48 hour at the repeated site, at 24 hour the values of the repeated site were remarkably larger than those of the new site, at 48 hour this difference became obscure and, when the larger diameter at either 24 or 48 hour in each site was adopted, the values of the repeated site were remarkably larger than those of the new site.

Therefore, the accelerated and augmented reaction was also observed in 18, 24 and 30 months after BCG vaccination.

Table 4 shows the number of cases and its frequency of the diameter of redness having 5 mm or more larger at 24 hour than at 48 hour in each new site of 1, 3, 6, 12, 18, 24 and 30 months after BCG vaccination. There was little difference in the number of such cases, except the higher percentage 18 and 30 months after vaccination.

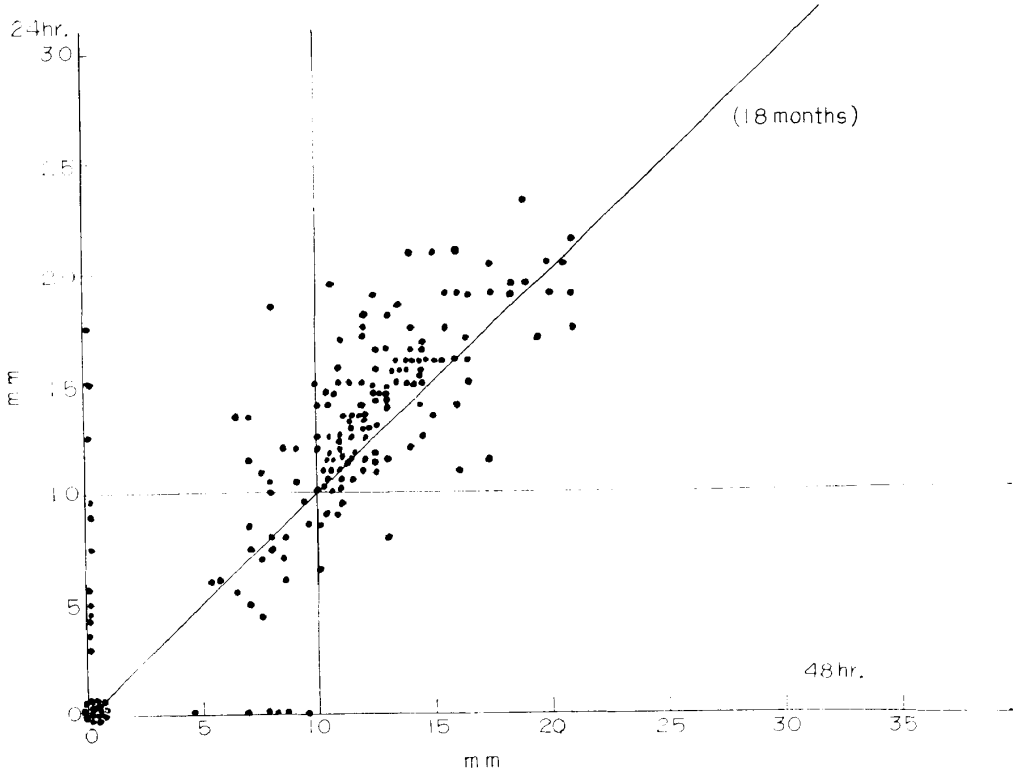

Fig. 2. Comparison of 24 and 48 hour values in redness in new site.

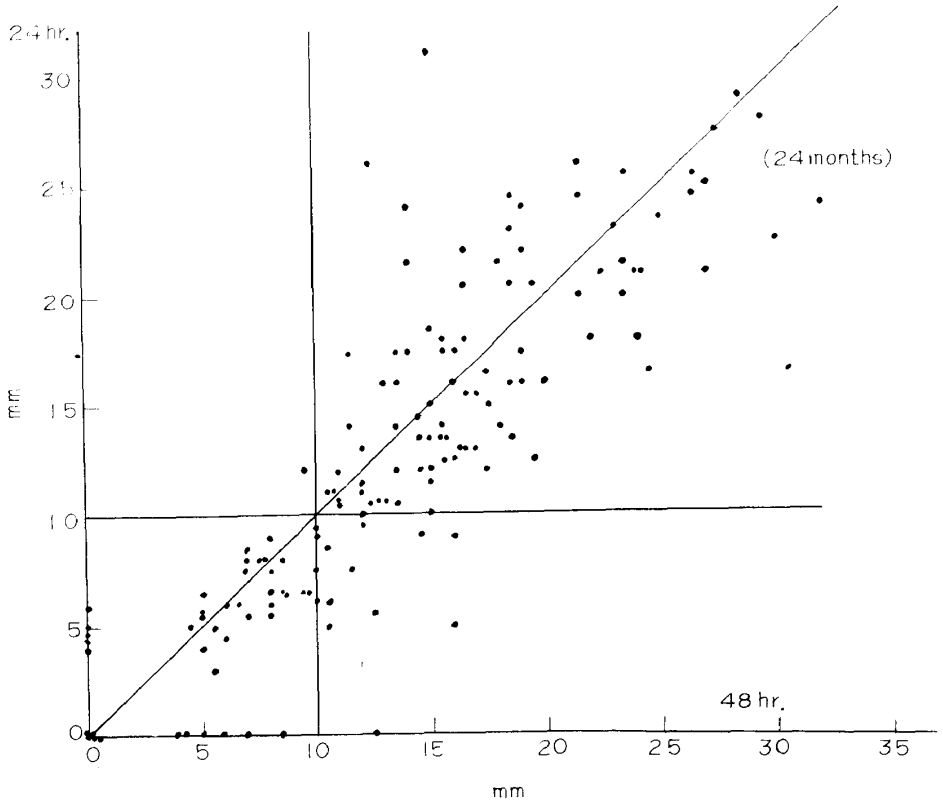

Fig. 3. Comparison of 24 and 48 hour values in redness in new site.

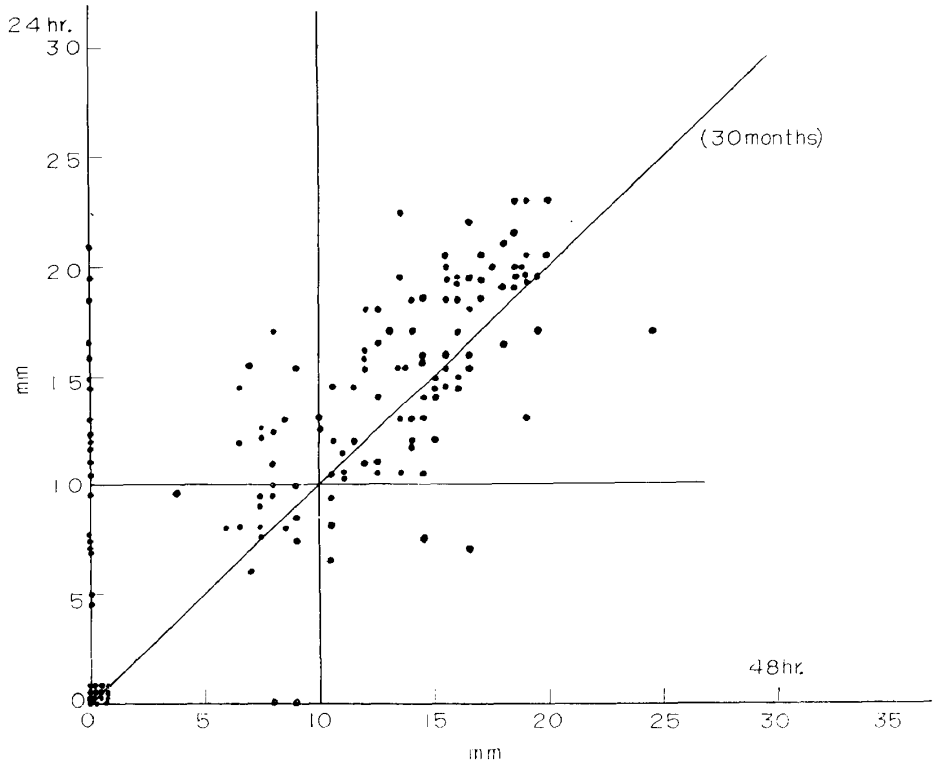

Fig. 4. Comparison of 24 and 48 hour values in redness in new site.

Table 4. The cases having the diameter of redness 5 mm or more larger at 24 hour than at 48 hour in each new site of 151 cases.

months after BCG vaccination	1		3	6	12	18	24	30
injection sites of tuberculin	7 cm distal part of the flexor side of the right forearm from the middle of the elbow	7 cm distal part of the flexor side of the left forearm from the middle of the elbow	11 cm distal part of the flexor side of the right forearm from the middle of the elbow	3 cm distal part of the flexor side of the right forearm from the middle of the elbow	8 cm proximal part of the flexor side of the right upper arm from the middle of the elbow	3 cm distal part of the flexor side of the left forearm from the middle of the elbow	8 cm proximal part of the flexor side of the left upper arm from the middle of the elbow	11 cm distal part of the flexor side of the left forearm from the middle of the elbow
No. of cases	4	8	4	2	3	17	6	25
per cent	2.6	5.2	2.6	1.3	2.0	11.3	4.0	16.6

Discussion

The accelerated and augmented reaction at the repeated site was observed in 18 (the fourth repetition), 24 (the fifth repetition) and 30 months (the sixth repetition) after BCG vaccination as was in 3, 6 and 12 months[1)2)].

It has been reported that the weak reactions difficult to assess at 48 hour increased in number by the frequently repeated tuberculin tests[3)4)]. The number of reactions with induration was less in the repeated site than in the new site at 48 hour values, but the diameter of redness was not always smaller in the repeated site than the new site even at 48 hour values. Therefore, it can not always be concluded that the reactions of the repeated site at 48 hour are weaker than those of the new site. Matsushima[5)] reported that the reactions of the repeated site were weaker than those of the new site in positive reactors caused by the infection of the virulent tubercle bacilli, while the reactions of the repeated site were stronger than the new site in positive reactors caused by BCG vaccination. The discrepancy between our results and other workers[3)4)] may be due to the difference of the subjects to whom the tuberculin test was done: our examination was done on BCG vaccinated group only, while other workers examined on positive reactors caused by the infection of virulent tubercle bacilli and BCG vaccination as well.

Eighteen and thirty months after BCG vaccination it was observed that the stronger and larger reactors at 24 hour than 48 hour in the new site were more in number than the reverse cases. These results were different from those of the new site in the previous reports[1)2)]. Two explanations may be possible for these results. The first possible explanation is that the accelerated reaction may appear also at the new site due to the repetition of the tuberculin injection, and

the other is that even though the tuberculin tests were done at the supposedly new sites 18 and 30 months after vaccination, it is possible that the site was not always exactly new.

Concerning the first explanation, Horai et al.[6] reported that the accelerated reaction appeared at the new site due to the repetition of the tuberculin injection, especially in positive reactors caused by the infection of the virulent tubercle bacilli. If such a phenomenon exists even in the BCG vaccinated group and if our result is due to such a phenomenon, similar result must have been obtained also 24 months after BCG vaccination. But in 24 months only a few showed the accelerated reaction in the new site (Table 2 (a) and Fig. 3) and the number of cases having the diameter of redness 5 mm or more larger at 24 hour than at 48 hour did not increase with the repetition of tuberculin injection in each new site (Table 4). Therefore, the first explanation seems not to be adequate.

Concerning the second explanation, the tuberculin tests in 18 and 30 months after vaccination were done at 3 cm and 11 cm distal parts of the left forearm from the elbow, respectively, and these injection sites were both 4 cm apart from the repeated site as seen in Fig. 1. The distance of 4 cm was not insufficient in order to avoid the influence of the previous test[1]. But in the repeated site (7 cm distal part of the left forearm from the elbow) the tuberculin test was done repeatedly 4 or 6 times untill 18 or 30 months' test and, as the length of the forearm of the children has extended by the growth during this study, it was difficult to test exactly at the same site and the distance of 4 cm might not be enough to avoid the influence of the former test. Therefore, it may be possible that the appearance of the accelerated reaction be due to the mixture of some persons who were tested as the new site at the positively reacted site in the former examination.

These results show the difficulty of changing the exact site of injection in each time during a long period of investigation in children.

Summary

Continuing previous investigations the tuberculin reaction was examined 18, 24 and 30 months after BCG vaccination (the fourth, the fifth and the sixth repetition at the same site, respectively).

1) Accelerated and augmented reaction was marked on the fourth, the fifth and the sixth repetition.

2) In the BCG vaccinated group the accelerated reaction was not observed at the new site even when the tuberculin injection was repeated.

REFERENCES

1) Kobayashi, Y. et al.: Acta Tuberc. Jap., **10**; 84, 1960.
2) Kobayashi, Y. et al.: ibid., **11**; 40, 1961.
3) Maeda, K.: Rec. Adv. in Res. Tuberc., **7**; 221, 1954.
4) Shigematsu, I. et al.: Koshu Eisei, **14**; 78, 1953.
5) Matsushima, M.: Comment at the 37th General Meeting of the Japan Tuberculosis Association, 1962.
6) Horai, Z. et al.: Kekkaku, **36**; 589, 1961.
Note: Except for No. (1) and (2) all references are in Japanese.