review of literature. J Pediatr Ophthalmol Strabismus 1979, 16: 10-15.

3. Bertoni JM, Von Loh S, Allen RJ. The Aicardi syndrome: Report of 4 cases and review of literature. Ann Neurol 1979, 5: 475-482.
4. Fariello RG, Chun RWM, Doro JM, Buncic JR, Prichard JS. EEG recognition of Aicardi's syndrome. Arch Neurol 1977, 34: 563-566.
5. Wadia RS, Joshi A, Vaidya SD, Manavi AB, Kelkar SR. The Aicardi syndrome. Neurol India 1985, 33: 149-154.
6. Parrish MI, Roessmann U, Levinsohn MW. Agenesis of the corpus callosum. A study of the frequency of associated malformations. Ann Neurol 1979, 5: 475-482.
7. De Jong JGY, Deiieman JW, Houben M, *et al*. Agenesis of the corpus callosum, infantile spasms, ocular anomalies (Aicardi's syndrome). Neurology 1976, 26: 1152-1158.
8. Curatolo P, Libutti G, Dallapiccola B. Aicardi syndrome in a male infant. J Pediatr 1980, 96: 286-287.
9. Willis J, Rosman NP. The Aicardi syndrome versus congenital infections: Diagnostic considerations. J Pediatr 1980: 96: 235-239.

BCG Test in Diagnosis of Childhood Tuberculosis

G.D. Velhal
B.L. Chandan
G.A. Kothari

Tuberculosis is a serious health problem in India with tuberculization occurring to the extent of 80% by the age of 15 years(1). The tuberculin test (TT) is an accepted intradermal test for international epidemiological surveys but has its own limitations. The observation of the accelerated BCG reaction in children already infected with tuberculosis or tuberculin reactors lead to the development of the BCG test. Inspite of the superiority of the BCG test over the tuberculin test being confirmed by many workers, its use in routine clinical practice is still controversial. Thus this study was undertaken (*i*) to determine the role of the BCG test in the diagnosis of childhood tuberculosis; (*ii*) to compare its reliability with TT in the diagnosis of tuberculosis in malnourished children; and (*iii*) to compare results of TT with BCG test.

Material and Methods

The study was carried out in the Pediatric OPD of Smt. MT Agarwal Municipal General Hospital, Bombay, over a period of 5 months. One hundred and fifty one children upto the age of 12 years having no previous BCG scar and suspected of having active tuberculosis were subjected simultaneously to BCG test and TT and investigated completely to look for active tubercular lesions. BCG test and TT results were compared in all proved cases of tuberculosis.

From the Department of Pediatrics, Smt. M.T. Agarwal Municipal General Hospital, Bombay 400 008 and Department of Preventive and Social Medicine, Topiwala National Medical College, Bombay 400 008.

Reprint requests: Dr. Gajanan D. Velhal, Lecturer, Preventive and Social Medicine, Topiwala National Medical College, Dr. A.L. Nair Road, Bombay Central, Bombay 400 008.

Received for publication August 11, 1986; Accepted May 7, 1991

Material used for TT 10TU/0.1 ml of PPD RT-23 with Tween 80. BCG test was carried out by injecting 0.1 ml of BCG vaccine containing 0.1 mg of dried material, intradermally on the left shoulder.

TT results were read between 48 hours and 72 hours and were graded as follows: Negative–below 6 mm induration, Doubtful positive–6 mm to 9 mm induration, Positive (1+)–10 mm to 14 mm induration, Positive (2+)–15 mm to 19 mm induration, Positive (3+)–20 mm to 30 mm induration, Positive (4+)–more than 30 mm induration and/or necrosis.

BCG test results were also noted between 48 and 72 hours and again after the sixth day. Induration more than 5 mm in diameter was taken as positive, results being graded as: Mildly positive (1+)–induration between 5 mm to 10 mm, Moderately positive (2+)–induration between 10 mm to 20 mm, Strongly positive (3+)–induration more than 20 mm.

Statistical analysis was done by the χ^2 test.

Results

Of 151 patients, BCG test was positive in 123 children and negative in 28 whereas TT was positive in 79 and negative in 72. All doubtful positive TT reactions were taken as positive reactions because of other evidences which go in favour of active tuberculosis. Results of BCG test and TT in cases of active tuberculosis are shown in *Table I.*

Eighty two of 93 children having active tuberculosis showed various grades of malnutrition. Fifty three (64.6%) of them gave TT positive reaction, whereas 29 were negative. BCG test was positive in all 82 ($p < 0.001$).

BCG induration was significantly greater in size as compared to TT induration in proved cases of tuberculosis ($p < 0.05$) (*Table II*).

TABLE I –*Test Results in Children with Active Tuberculosis*

Results	n	%
Tuberculin Test		
Negative	31	33.3
Positive: doubtful	6	6.5
Positive (1+)	13	14.0
Positive (2+)	24	25.8
Positive (3+)	13	14.0
Positive (4+)	6	6.5
Total	93	100.0
BCG Test		
Negative	0	0.0
Positive mildly	19	20.4
Positive moderately	46	49.5
Positive strongly	28	30.1
Total	93	100.0

Discussion

Overall in the 151 children BCG test was positive in 123 (81.5%) children while TT was positive in 79 (52.3%). Among the proved cases of tuberculosis, TT was positive in 66.7% of cases whereas BCG test was positive in all. This difference is highly significant ($p < 0.001$). These results suggest the greater sensitivity of the BCG test. In 30 of 58 patients with no evidence of active tuberculosis as judged by other investigations and clinical findings, BCG reaction was positive. This false positivity can be attributed to previous sensitization

TABLE II—*Comparison Between BCG and TT Results*

BCG test results	TT Results						
	Neg	Doubtful +ve	+	++	+++	++++	Total
Mild positivity	12	4	2	1	0	0	19
Moderate positivity	18	2	8	13	3	2	46
Strong positivity	1	0	3	10	10	4	28
Total	31	6	13	24	13	6	93

with tubercle bacilli without active illness or with a healed infection. Twenty eight patients showed negative BCG and TT reactions and no evidence of active tuberculosis.

Results vary in other Indian studies. TT was positive in the range of 19 to 70% in proved cases of tuberculosis, whereas BCG test was positive in 45 to 100%(2-5).

Nutritional status of a patient is known to affect the outcome of TT reactions. In cases of active infection with various grades of malnutrition, TT was positive in 10 to 50% whereas BCG was positive in 72 to 100%(2,6,7). In the present study, TT was positive in 65% cases of tuberculosis with malnutrition whereas BCG test was positive in all 82 cases ($p < 0.001$). Srinivasan *et al.* also recommended the use of BCG as a diagnostic test in malnourished children(8).

Collas *et al.*(9) compared the induration caused by BCG on the third day with 10 TU OT on the second day. The BCG induration in tuberculosis patients was 13 mm while OT induration was 10 mm. They observed that for a average reaction of 10 mm of TT reaction to BCG was 13 mm with a standard deviation of 3.5 mm on the third day. Gothi *et al.*(10) comparing the induration caused by BCG and 1 TU PPD with RT-23 Tween found the former greater than TT induration. In the present study also comparison between BCG and TT reactions showed that induration with BCG was significantly greater in proved cases of tuberculosis. No untoward reactions to BCG were noted. TT was negative in 29 (37%) *X*-ray positive cases whereas BCG test was positive in all of them.

The total size of the sample in the present study is small but suggests that the BCG test is more sensitive than TT though the later is more specific. In addition it is not much affected by nutritional status, and if negative offers prophylactic protection. We, therefore, feel that the BCG test is preferable in routine day to day practice.

REFERENCES

1. Udani PM, Pamra SP, 'Tuberculosis in children. *In:* Text Book of Tuberculosis, 2nd edn Ed. Rao KN New Delhi, Vikash Publication, 1981, pp 359-362.
2. Udani PM, Parekh UC, Shah PM, Naik PA. BCG Test in tuberculosis. Indian Pediatr 1971, 8: 143-150.
3. Shrivastava DK, Shingwekar AG, Thawrani YP, Chaudhari AK. Evaluation of BCG test in childhood tuberculosis. Indian Pediatr 1977, 14: 993-998.
4. Datta T. BCG in childhood tuberculosis. Indian Pediatr 1982, 19: 793-797.

5. Bhandari NR, Bhambal SS, Beohar V. Diagnostic value of BCG test in childhood tuberculosis. Indian Pediatr 1984, 21: 555-559.
6. Aiyer R, Shekhari RR, Diagnostic value of BCG vaccination. Pediatr Clin India 1973, 8: 17-20.
7. Jaiswal S, Bhandari NR. Evaluation of diagnostic value of BCG test in childhood tuberculosis. Indian Pediatr 1976, 8: 689-695.
8. Srinivasan S, Mahadevan S. Tubercular meningitis after BCG vaccination. Indian Pediatr 1989, 26: 845.
9. Collas R, Wright J, Jardel JP. Comparison between tuberculin allergy and the relation to BCG vaccination. Amer Rev Resp Dis 1968, 97: 1017-1031.
10. Gothi GD, Tuberclin testing in clinical medicine. Indian Pediatr 1982, 19: 1013-1020.

NOTES AND NEWS

COMMONWEALTH CONFERENCE ON DIARRHEA & MALNUTRITION

Hotel Ashoka, New Delhi

29th November to 1st December 1991

Scientific Programme includes talks by Prof. A.S. McNeish, J.A. Walker Smith, A. Philips, S. Knutton and A.M. Tomkins (U.K.), G.P. Davidson, Michael Gracey & Ross Shepherd (Australia), R.K. Chandra (Canada), D. Mahalanabis, B.A. Hoque & S.K. Roy (ICDDR-B, Bangladesh), A.M. Molla (Pakistan), D. Rolston & M.K. Bhan (India) and over 100 presentations in free paper and poster sessions. Sufficient time for audience participation.

Registration fee

Till 31st Oct., 1991	Rs. 1250 only
After 31st Oct., 1991	Rs. 1500 only

Contact:

Dr. S.K. Mittal,
Organising Secretary,
Deptt. of Pediatrics,
M.A.M. College,
New Delhi-110 002.