



CONTRIBUTION TO THE PROBLEM OF CHALLENGE VACCINATION
Observations on vaccination of cured smallpox cases in India
in 1971, 1972 and in 1973



by

Dr V. Zikmund¹, Dr N. Das², Dr R. Krishnayengar³ and Dr B. Kameswara Rao⁴

Summary

Challenge vaccination of 143 recovered smallpox cases has been conducted. The dates of onset of rash ranged from 21 days to 12 months before challenge vaccination.

No major reaction occurred in 21 smallpox cases in whom challenge vaccination was performed within 6 months after onset of rash. Most of these patients had not been vaccinated before onset of smallpox. However, of 122 smallpox cases, in whom challenge vaccination was performed between 6 and 12 months after onset of rash, 16 exhibited major reactions. Of the 16 major reactions, 4 occurred among 60 persons vaccinated before the smallpox attack and 12 (19 per cent) were observed among 62 persons with no previous vaccination scar.

Introduction

In 1971, some in India, most notably Dr M.C. Apparao, ADHS-NSEP of Andhra Pradesh, questioned the usefulness of challenge vaccination in arriving at a correct diagnosis of smallpox cases. In order to try to clarify the question, we organized and conducted challenge vaccination studies on three occasions:

in Srikakulam District of Andhra Pradesh State in 1971,
in Bijapur District of Karnataka State in 1972 and
at Rourkela N.A.C. area of Orissa State in 1973

Description of studies

In Srikakulam District, smallpox cases, which had occurred two to eleven months before, were selected. The clinical diagnosis and the presence of vaccination scars was verified by the senior author and Dr Apparao. Challenge vaccination and verification of the results was performed by two qualified and reliable Paramedical Assistants of the District Headquarters, personally instructed by the senior author.

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- ¹ WHO Medical Officer, India.
 - ² N.A.C. Health Officer, Rourkela, Orissa, India.
 - ³ District H & FPO, Bijapur, Karnataka, India.
 - ⁴ District M & HO, Srikakulam, Andhra Pradesh, India.

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In Bijapur District, smallpox cases, which had occurred five to twelve months before, were vaccinated. All cases selected were seen before vaccination by the senior author, who selected for evaluation only clinically typical cases with clearly visible pockmarks. The majority of vaccinations were performed by him as well as the majority of verifications one week after vaccination.

In Rourkela, recently recovered smallpox cases were vaccinated. All had experienced the onset of rash between 21 and 69 days previously. The clinical diagnosis was confirmed by the senior author. The study was conducted by the Health Officer, who verified reactions personally.

Tables 1, 2 and 3 summarize the results. Persons which were not seen for verification on the 6th or 7th day after vaccination are not included.

Results

Major reactions were observed on the 6th or 7th day after vaccination, both in previously vaccinated and unvaccinated persons, but only if challenge vaccination was performed at least 6 months after the onset of rash.

There is some difference between the results in Bijapur and in Srikakulam Districts, in the percentage of major reactions. This may reflect the fact that the selection of cases for evaluation (typical cases only) was more careful in the group of cases from Bijapur District or possibly that the PMA's who verified the reactions in Srikakulam District, were more conservative in accepting a response as a major reaction.

Challenge vaccination less than 21 days after onset of rash

On occasions, we have asked the staff working in smallpox foci, to vaccinate all fresh smallpox cases immediately, in order to prevent smallpox infection in misdiagnosed cases (of chickenpox for example). Data were not systematically collected but in discussions with the staff concerned, we have always been informed later, that in typical smallpox cases, no major reactions were observed.

TABLE 1
 MAJOR REACTIONS AFTER CHALLENGE VACCINATION
 OF SMALLPOX CASES IN INDIA 1971-1973

District	Year of Study	No. months after onset rash	No. of persons examined	Vaccination Scar						No. major reactions found in previously		
				Not seen (unprotected)			Seen (protected)					
				No.	Clinical Form		No.	Clinical Form		Unprotected	Protected	Total
					Discrete	Confluent		Discrete	Confluent			
Srikakulam	1971	2 to 11	89	33	23	10	56	51	5	2	1	3
Bijapur	1972	5 to 12	41	35	17	18	6	4	2	10	3	13
Rourkela	1973	0 to 2	13	not recorded						0	0	0

TABLE 2. MAJOR REACTIONS AFTER CHALLENGE VACCINATION OF SMALLPOX CASES IN INDIA IN 1971-1973

Distribution of major reactions according to time elapsed after onset of rash

Number of smallpox cases	Number of months between onset of rash and challenge vaccination													Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	
Srikakulam UP P			2 1	1		1 1	3(2) 2	1 10	8 8	9 9	6 22(1)	2 3		33(2) 56(1)
Bijapur UP P						2	5(1) 1	9(1) 2(1)	2	6(4) 1(1)	5(1) 1(1)	2(2)	4(1) 1	35(10) 6(3)
Rourkela ?	4	8	1											13
Total UP P				1		3 1	8(3) 3	10(1) 12(1)	10 8	15(4) 10(1)	11(1) 23(2)	4(2) 3	4(1) 1	
Total	4	8	4	1		4	11(3)	22(2)	18	25(5)	34(3)	7(2)	5(1)	143(16)

Symbols used: UP = Unprotected (vaccination scar not seen prior to challenge vaccination).

P = Protected (vaccination scar seen).

8(3) denotes 3 major reactions among 8 given challenge vaccination.

TABLE 3. MAJOR REACTIONS AFTER CHALLENGE VACCINATION OF CURED SMALLPOX CASES IN INDIA IN 1971 AND 1972

Se No.	District	Onset rash	Clinical form	Vaccination scar seen	Challenge vaccination		Result verified							
							after 3 to 4 days				after 6 to 7 days			
					by	date	by	induration diameter in mm	central lesion		by	induration diameter in mm	central lesion	
									kind	diameter in mm			kind	diameter in mm
1	Srikakulam	14.4.71	discrete	no	PMA	26.11.71	PMA	5	pustule	3	PMA	8	pustule	5
2	Srikakulam	14.4.71	discrete	no	PMA	26.11.71	PMA	5	pustule	8	PMA	8	pustule	5
3	Srikakulam	1.1.71	confluent	yes	PMA	28.11.71	PMA	6	-	-	PMA	8	pustule	5
4	Bijapur	19.7.71	confluent	no	WHO M.O.	21.1.72	PMA	19	vesicle	6	WHO M.O.	7	scab	5
5	Bijapur	19.6.71	confluent	no	PMA	23.1.72	PMA	8	vesicle	6	WHO M.O.	10	ulcer	6
6	Bijapur	17.4.71	discrete	no	WHO M.O.	21.1.72	PMA	24	vesicle	6	WHO M.O.	6	scab	4
7	Bijapur	9.4.71	discrete	no	PMA	22.1.72	PMA	5	vesicle	2	WHO M.O.	5	vesicle	7
8	Bijapur	3.4.71	discrete	no	PMA	22.1.72	PMA	7	vesicle	3	WHO M.O.	8	scab	4
9	Bijapur	1.4.71	discrete	no	PMA	22.1.72	PMA	5	vesicle	2	WHO M.O.	9	vesicle	7
10	Bijapur	9.3.71	discrete	no	PMA	22.1.72	PMA	8	vesicle	6	WHO M.O.	12	pustule	10
11	Bijapur	17.12.70	confluent	no	WHO M.O.	19.1.72	PMA	3	vesicle	2	PMA	10	scab	4
12	Bijapur	28.1.71	discrete	no	PMA	22.1.72	PMA	8	vesicle	3	WHO M.O.	11	scab	6
13	Bijapur	9.1.71	confluent	no	WHO M.O.	19.1.72	PMA	3	vesicle	2	PMA	10	scab	5
14	Bijapur	12.6.71	confluent	yes	WHO M.O.	21.1.72	PMA	25	vesicle	6	WHO M.O.	10	scab	6
15	Bijapur	3.4.71	discrete	yes	PMA	22.1.72		not verified			WHO M.O.	15	vesicle	7
16	Bijapur	23.12.70	confluent	yes	WHO M.O.	19.1.72	PMA	4	vesicle	2	PMA	10	scab	5

NOTE: Definition of a MAJOR REACTION was one which on the 6th or 7th day after vaccination showed a central lesion (vesicle, pustule, ulcer or scab) with one diameter of at least 4 mm and induration at least 2 mm greater was the central lesion.