THE USE OF VACCINIA HYPERIMMUNE GAMMA-GLOBULIN IN THE PROPHYLAXIS OF SMALLPOX

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Vaccinia immune gamma-globulin has been used extensively in the prevention and treatment of serious complication with smallpox vaccination,\(^1\) as well as in the prevention of post-vaccinia encephalitis.\(^2\)

The use of vaccinia hyperimmune gamma-globulin in the prophylaxis of smallpox was first attempted in 1953 in a field trial in Madras by Kempe and associates.\(^3\) In this study, intimate room contacts of 29 proved smallpox cases which had been admitted to the Madras Infectious Disease Hospital during the epidemic of 1953 were either given vaccinia immune gamma-globulin or treated as controls. All members of a single family unit were treated in a uniform manner. Among 75 control contacts there were 8 secondary cases of smallpox; 5 of these 8 cases occurred in children under 5 years of age and 3 of them in infants admitted to the Smallpox Hospital as nurseries of their infected mothers. All 3 of these infants died. In the group of 56 similarly exposed contacts, who had been given high titre gamma-globulin, one fatal and one modified case occurred. Among these 56 contacts were included 5 infants not previously vaccinated against smallpox.

A number of smaller studies carried out in Britain suggested that these were indeed valid findings, but it remained for a second trial in 1960 to prove that vaccinia hyperimmune gamma-globulin reduces the incidence of smallpox after exposure, by at least 70 per cent. Among 320 contacts receiving vaccinia immune gamma-globulin there were 5 cases of smallpox, while among 379 controls, there were 21
cases of smallpox. Combined figures of the two studies showed 29 cases of smallpox among control contacts as compared to 8 in the vaccinia hyperimmune gamma-globulin group. The groups were sufficiently similar in sex, age, vaccination history, and numbers for the results to be regarded as significant, in the sense that reduction in the incidence of smallpox with the older of 70 per cent. can be expected in contacts given immune gamma-globulin. The vaccinia immune gamma-globulin used for these studies was obtained from recently vaccinated young adults. The neutralizing titre of plasma obtained at the time of such donation was in the order of 1:25, using the standard egg neutralization test. However, the neutralizing titre of smallpox convalescence serum is 10-20 times greater than that obtained after successful primary vaccination or successful revaccination. For this reason, we would predict that an even better protection could be obtained from an immune gamma-globulin made from the plasma from convalescent smallpox patients. As long as smallpox continues to be endemic in certain parts of the world, it would be possible to make such a product. Because of the limited supply of immune gamma-globulin, it is likely that its prophylactic use will be restricted to those especially at risk, for example, close unvaccinated family contacts, new-born infants, and pregnant women, and this material might in time have a place in the prevention or treatment of haemorrhagic smallpox.
REFERENCES

1. Kempe, C. H. (1960) Studies on smallpox and complications of smallpox, complications of smallpox vaccination (E. Mead Johnson Award Address), Paediatrics, 26


