CASE REPORT

GENERALIZED CUTANEOUS VACCINIA

BY

P. R. EVANS, B.Sc., M.B., CH.B., M.R.C.P.

(From the Children's Department, King's College Hospital.)

Generalized cutaneous vaccinia is a rare disease: Chalke⁶ and Ellis¹² quote figures showing an incidence of from 1 case in 10,000 to 1 in 100,000 vaccinations. It may follow auto-inoculation, the integrity of the skin in these patients being usually impaired by some other skin disease, for example, eczema^{20, 31} or seborrhoeic dermatitis²¹: in others the virus is inoculated by scratching³⁷. When there is no pre-existing skin disease and lesions appear without scratching, implantation must be secondary to generalization in the blood. The notes which follow refer to this type.

Clinical record

The baby was a boy, aged 11 weeks, the first child of healthy parents. The father was vaccinated for the first time in 1929 when a severe reaction ensued. Vaccination of the mother was attempted in infancy but did not 'take.' She suffered from pyelitis for many months during pregnancy and labour was induced three weeks before term. Progress was uneventful, and on November 11, 1936, the boy was eleven weeks old and weighed 12½ lb. He appeared to be in perfect health. On this date he was vaccinated, two scratches 3 mm. long and 15 mm. apart being made over the left deltoid; one scratch just drew blood, the other did not. A gauze pad was placed over the scratches and fixed with strapping. This remained fixed and was not wetted in the bath at any time. The baby seemed very well for a week. On November 23 the pad was removed, two vesicles about 1 cm. in diameter were seen. They were powdered and a fresh dressing was applied. In the afternoon the child was fretful and seemed ill—the temperature was 100·8° F. This caused no anxiety as similar pyrexia occurs at this stage of normal vaccination (Ministry of Health Report²⁶). Next morning the temperature was 100° F.; in the evening it had dropped to 99°. In the afternoon a small pimple was noticed in the adductor region of each thigh, one not opposite the other, and in the evening a greyish vesicle had appeared on the summit of each spot. The child was fretful, but seemed well. On November 25 the temperature was normal. Fresh spots were noticed from time to time during the day. They appeared as small red papules with greyish opalescent vesicles in their centres, the vesicle being about 1 mm. in diameter and the papule 3 mm. As the day went on the earlier-formed vesicles became yellow and opaque, and acquired areolae. Two became umbilicated, maturing in a few hours instead of the five or six days which are necessary for the full development of the lesion of primary vaccination.

The distribution of the pocks was: abdomen, one; right buttock, one; right thigh, two; left thigh, one; left calf, one; left foot, four; right hand, one; left hand, four. The primary pocks were scabbed and drying, but

FIG. 1.—Umbilicated pocks on legs and left foot.

FIG. 2.—Pocks in the left hand.

FIG. 3.—Primary vaccination surrounded by 'satellites.'

were surrounded by about twenty newly-developed vesicles, some grey and some yellow. The group was surrounded by a band of erythema 1 cm. in width, but the whole did not extend beyond the edge of the dressing.

On November 27 three fresh spots appeared on the left hand, and one or two more on the legs. The temperature was normal. On November 28 a sudaminous rash appeared on the back and on the neck. The infant was constitutionally well, he had taken his feeds readily throughout the illness and gained over 1 lb. in weight. On December 8 one spot on the finger was septic, but the rest had disappeared, leaving no sign except small pink areas of epithelium. The original vaccination was marked by a scab 1 cm. in diameter which fell on December 19th. Six months later two small scars could be seen at the site of the original vaccination, while the secondary lesions were barely visible as small areas of macular atrophy.

Discussion

The diagnosis is clear. There was no contact with variola, the symptoms were not severe, there was no rash on the face, and the infection was not transmitted to others. The umbilicated pustules and their peripheral distribution rule out varicella. Urticaria may occur after vaccination³³, but pustules do not develop. Pemphigus has been recorded as a sequel^{4, 17, 28, 35}, but the appearance and course of the disease is different. It is difficult to assert dogmatically that auto-inoculation did not play some part, but the care exercised by the mother, the facts that the dressing was not accidentally detached or immersed in the bath, the previous healthiness of the skin, the short time during which pocks appeared, and the fact that the child was too young to scratch, are strong evidence.

Generalized vaccinia may occur at any age. Lynch²² has recorded a foetal case. Of twenty examples in the literature, twelve were in the first year of life, fifteen in the first decade, one in the second, two in the third, one in the fourth and one in the fifth. Probably the distribution may be explained by the frequency of vaccination in infancy. Primary vaccination is the usual antecedent, but Freeman's case¹⁵ followed secondary, and Stewart's³⁶ tertiary vaccination. Many more cases have occurred in the first six months of the year than in the second in the northern hemisphere.

The prognosis is good except in infancy. Four deaths occurred in these twenty cases, all in the first year of life. Encephalitis does not usually accompany generalization, though it may possibly have been present in the patients described by Weichsel³⁹ and by Paiseau and Scherrer³⁰. Secondary infection of the pocks may cause severe symptoms in a baby; vaccinal infection of the conjunctiva is to be feared because it may lead to corneal ulceration (Bedell³). Cutaneous scarring is negligible, probably because, as Dible and Gleave¹⁰ have shown, the lesions are almost limited to the epidermis. (This is surprising in a blood-borne infection, but their patient also had visceral lesions.) In primary vaccination the dermis is infected, through a scratch or puncture, and the histological picture is different.

The disease is not communicated except by direct contact. The child's mother developed a vaccinal lesion on the breast in the case described by Oldham²⁹ and in that by Acland and Fisher¹. In Milian's²⁵ case, the mother's cheek was infected, and the infection transmitted to a rabbit from this. Dible and Gleave¹⁰ inoculated a rabbit with material from a secondary

pock, Hill and Ross¹⁶ similarly transmitted the infection to a calf. Martin²⁴ did the same, and successfully vaccinated four human beings with the calf lymph. Huddleston¹⁸ failed to vaccinate a child with lymph taken on the seventh day.

The lymph used does not seem to be at fault in these cases: it may be human or bovine, and lymph from the same source, used at the same time, produces normal vaccination in other patients. The defect probably lies in the individual whose cutaneous immunity is imperfect. Mere dissemination of the virus by the blood is not sufficient to cause cutaneous lesions, for Eckstein, Herzberg-Kremmer, and Herzberg¹¹ have been able to demonstrate vaccinia virus in the blood three to ten days after vaccination. This accords with the finding of the Ministry of Health Committee²⁶ that the spleen was palpable in two-thirds of a group of healthy adults one to ten days after vaccination. The spleen may be felt in patients with generalized vaccinia (e.g. Korach¹⁹) but not in every case.

Although the age incidence and prognosis in relation to age of generalized vaccinia differ from those of post vaccinal encephalitis, their incubation periods are similar. (For post-vaccinal encephalitis, see the Ministry of Health Committee's Second Report²⁷; for generalized vaccinia see table 1.)

TABLE 1.
DAY OF APPEARANCE OF SECONDARY POCKS IN FORTY-THREE CASES
OF GENERALIZED VACCINIA.

DAYS AFTER VACCINATION.	NO. OF CASES.	DAYS AFTER VACCINATION.	NO. OF CASES.	DAYS AFTER VACCINATION.	NO. OF CASES.
1	1	11	6	21	0
2	2	12	0	22	1
3	1	13	3	23	1
4	2	14	1	24	0
5	3	15	0	25	0
6	3	16	3	26	0
7	6	17	1	27	0
8	3	18	1	28	0
9	1	19	0	29	0
10	3	20	0	30	1

The lesion produced by vaccination matures on the eighth or ninth day, and normally the subject is thereafter immune for a long time. Further inoculation before the ninth day does, however, produce a true vaccinal lesion. This second lesion, as Bryce⁵ recorded in 1809, is smaller than the first but proceeds through the same stages and arrives at maturity on the same day as the first pock. Trousseau³⁷ was familiar with this, but Cory⁸ examined the phenomenon more thoroughly by performing daily vaccination on the same child: nine lesions were formed, but all matured on the ninth day, after which vaccination was unsuccessful. This was confirmed by von Pirquet³². Cory also vaccinated supernumerary digits, which were subsequently amputated; on revaccination a month later the second pock was found to mature in nine days, less the number of days the vaccinated

supernumerary digit had been allowed to remain on the body. He concluded that the body produced immunity to vaccination, and that the rapidity of maturation of a pock was a measure of the immunity when this was sub-total.

In generalized vaccinia the primary vaccination develops nomally, but immunity is defective, for in half the cases the incubation period was over nine days, and in over half of those with an earlier eruption spots continued to appear until after the ninth day. Accelerated maturation is seen in the secondary pocks. Six patients have been reported in sufficient detail to allow estimation of the time of maturation (table 2).

TABLE 2.

AUTHOR.	SECONDARY LESIONS.		
	INCUBATION PERIOD.		TOTAL.
	DAYS.	DAYS.	
HUDDLESTON ¹⁸	...	3	8
TYSON ³⁸	...	5	5½
FREEMAN ¹⁵	...	6	8
KORACH ¹⁹	...	7	8
AUTHOR'S CASE	...	8	9
STEWART ³⁶	...	18	19

All matured rapidly, and in four the time taken was what would be expected if a second vaccination had been made a few days after the first, suggesting that the generalized virus reached the skin some days after primary vaccination. In one of the other cases the incubation period was eighteen days and the lesions matured in one day; in the other, rapid maturation in half a day was seen although the incubation period was only five days. Several unsuccessful attempts at vaccinating this child had been previously made, and Cory⁸ observed that after such attempts an accelerated reaction was seen. He interpreted this as the result of inoculation with some soluble immunizing body from ‘dead’ lymph. Craigie and Wishart⁹ have shown that a soluble antigen does exist.

It may be concluded that generalized vaccinia is due to an inability of the patient to develop cutaneous immunity in the normal way, although accelerated maturation, the concomitant of developing immunity, is produced.

Treatment is directed at preventing abrasion and infection of the pocks—the same means should be used for secondary as for primary lesions. The question of whether or not to inject serum from a recently vaccinated person into the patient must also be considered. Lesions may continue to appear for as long as eighteen days, immune serum might prevent further generalization in the blood and so reduce this period, though it would probably have no effect on the established lesions. The disease is serious in the first year of life, and it would seem wise to treat infants in this way. Weichsel³⁹ has used maternal blood for this purpose.

Summary

An account of generalized cutaneous vaccinia in an infant is given. The disease is uncommon, it may occur at any age, and after primary, secondary, or tertiary vaccination. It is commoner in the first half of the year than the second. It may cause death in infancy, and may be transmitted by direct contact or animal inoculation. Its incubation period is similar to that of post-vaccinial encephalitis. It probably arises through a failure of the individual to develop cutaneous immunity. The treatment of infants with serum from a recently vaccinated person is advisable.

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