REPORT OF A CASE OF POSTVACCINAL ENCEPHALITIS IN A FOUR-MONTH-OLD CHILD WITH RECOVERY

CAPTAIN HERBERT J. JACOBS, CAPTAIN MELVILLE G. MAGIDA, AND
CAPTAIN DAVID R. METCALF, MEDICAL CORPS
ARMY OF THE UNITED STATES

The purpose of this paper is to report a case of postvaccinal encephalitis in infancy and to review the literature. The authors feel that such a report is of interest inasmuch as this clinical entity is exceedingly rare under one year of age.

To our knowledge this is the first case of a patient under 6 months of age which has been reported in the American literature. Numerous reports of cases in children over the age of one year can be found in American, British, and Continental literature. Flexner in 1929 stated that the disease was unknown in this country in children under the age of 6 months; and our review has failed to disclose any additional American cases.

In the foreign journals, however, mention is made of this complication occurring in infants under six months of age. Sakoschansky refers to the work Hewlett did in 1933 in which that author states that young infants are almost totally immune. Further, he reports a case in a child 14 weeks of age occurring ten days after primary vaccination, mild in character, with recovery. Scott in 1932 in his review of British and Continental literature reports twenty-two cases over a five-year period occurring in infants under one year of age. These were collected from British, German, Polish, French, Dutch, and Scandinavian sources; but the data are largely incomplete and inconclusive with regard to diagnostic findings. Thompson states that in England 63 per cent of all vaccinations were done on infants under one year of age. In that age group nine cases of postvaccinal encephalitis occurred. In those vaccinated over one year of age, or 37 per cent, eighty-four cases developed. In Holland he notes that in children under 2 years of age there is an incidence of one case in 13,551 vaccinations (0.002 per cent), while in the 3- to 12-year age group there is an incidence of one case in 3,555 (0.03 per cent).

In American reports, Armstrong in 1931 and Hempelman in 1936 concurred with the low incidence in infancy.

CASE REPORT

This 4-month-old white male infant was admitted to the Station Hospital on Jan. 31, 1948, with a chief complaint of listlessness of twenty-four hours' duration.

Past History.—The child was normal and full-term, delivered spontaneously as a vertex presentation without instrumentation, after a normal pregnancy. Growth and development were normal. Previous status was unremarkable with no history of contagion. The infant was breast-fed until the age of 3 months, at which time the mother placed him on a formula consisting of evaporated milk, water, and Karo syrup, on which he did well. Immunization for diphtheria-pertussis-tetanus was started (using the alum-precipitated combined preparation of Sharpe and Dohme) at the age of 2½ months.
full course was completed on January 19 at 3½ months, when vaccination on the left deltoid by the multiple pressure method was performed. Primary reaction developed thereafter with erythema, vesiculation, crusting, and regional adenopathy.

Present Illness.—One week prior to admission (five days after vaccination) the child developed diarrhea characterized by the passage of ten to twelve greenish-yellow, watery stools unassociated with pyrexia or evidence of dehydration. Treatment was symptomatic and the diarrhea subsided after thirty-six hours.

For three days prior to admission (starting nine days after vaccination) the mother noted that the child appeared sluggish, not playful as usual, and manifested occasional vomiting. This persisted until the day before admission, at which time the child became somnolent, did not cry, and would not grasp proffered objects. Later in the course of the day involuntary movements of the left side of the face, corner of the right lip, and roving movements of the eyes were noted. This was associated with "failure to focus," inability to follow objects, and "inward turning" of the left eye. Feeding and bowel habits were normal without evidence of associated systemic reaction or pyrexia. Because of these complaints hospitalization was sought.

Physical Examination.—The child was a well-developed, well-nourished 4-month-old white male, asleep during the examination, crying only with painful stimuli. The skin was clear except for a mild ammoniacal dermatitis of the groins. The anterior fontanel admitted one finger and was under normal tension. Examination of the eyes revealed the pupils to be round, regular, and equal, reacting to light. Objective following of light was absent. Irregular gyrations of the eyes occurred, and paresis of the right lateral rectus and right inferior oblique muscles was noted as manifested by internal strabismus. The ears, nose, and throat were unremarkable. The lungs were resonant and clear to auscultation. The heart was normal in size and configuration with a normal sinus rhythm at a rate of 110 per minute. The abdomen was soft without palpable organs or masses. Neurological examination revealed the neck to be supple. There was no evidence of Kernig or Brudzinski signs. Examination of the cranial nerves revealed them to be intact with the exception of the previously mentioned findings in the right VI and III nerves. The deep tendon reflexes were physiologic, the superficial reflexes active and symmetrical, and the plantar response flexor.

Course.—Lumbar puncture was performed shortly after admission. The dura was entered between L-3 and L-4, the cerebrospinal fluid was found to be under normal pressure, and 8 c.c. of clear fluid were removed. The cell count was 19,96 per cent of which were lymphocytes and 4 per cent polymorphonuclear neutrophiles. The Pandy reaction for globulin was negative. Total protein was 20 mg. per cent, colloidal gold curve and Wassermann negative.

On admission hemoglobin was 11.6 Gm. (Sahli), red blood cells were 3.88 million, white blood cells were 11,400 with 39 per cent polymorphonuclears, 58 per cent lymphocytes and 2 per cent monocytes.

The findings as noted remained unchanged until the second hospital day (February 2) when the infant experienced the following reaction: coarse twitching of the right frontalis muscle and right upper lid, bilateral rotatory nystagmus, abduction of the right arm associated with contraction of the biceps and rhythmic "pill-rolling" movements of the fingers. The left arm was extended and pronated, and the right leg maintained in extensor spasm with dorsiflexion of the great toe. Respirations were deep and irregular at a rate of 14 to 18 per minute. The tongue was directed to the left with
coarse fibrillations over its surface. The picture changed intermittently with hyperextension of both upper extremities over the head. The total duration of this episode was forty-five minutes. Blood calcium was 9.2 mg per cent and carbon-dioxide combining power 52 volumes per cent.

The child for the remainder of the day was afebrile and took nourishment well, though remaining listless and manifesting persistent internal strabismus of the right eye.

On the third hospital day, occasional twitching of the left arm was noted. During the morning feeding, which was poorly taken, paresis of the right upper extremity developed with failure to respond to painful stimuli. The feeding was followed by a paroxysm of coughing and regurgitation. This was rapidly succeeded by drawing up of the left side of the face, and twitching of the nose and left facial muscles. Concomitantly the right lower extremity became rigid, maintained in extensor spasm, and the fingers of the right hand tightly flexed. This was followed by slow, clonic movements of the right lower extremity and rapid, clonic movements of the right hand. The head was turned to the left and rapid, irregular, ocular gyrations were again noted. This episode lasted eight minutes, after which there was no alteration in physical findings.

During the remainder of the hospital course there was no recurrence of a similar nature. By the fifth hospital day the child was alert and active. The right upper extremity was normal in function, ocular gyrations ceased, and internal strabismus of the right eye diminished, while the child regained the ability to follow light in all directions. The child was discharged on the seventh hospital day with minimal residual right internal strabismus. In all other respects the child was normal and active. Temperature never exceeded 100° F. (R) throughout the hospital course, fluctuating between 98.4 and 98.6° F. during the last three hospital days. Therapy was entirely symptomatic.

**Epidemiology**

A review of the literature reveals the following pertinent facts. Postvaccinal encephalitis is a complication of primary vaccination, rather than re-vaccination, and is rare in infancy. The type of vaccine used bears no relation to the complication. The method of vaccination, as well as the degree and character of the local reaction are also apparently unrelated. A tendency for grouping of cases as to time and place has been noted. The incidence of the disease parallels the total number of vaccinations, though is not necessarily proportional. The case rate of postvaccinal encephalitis is lower in the United States than in European countries.

**Pathology**

The pathologic entity has been noted to involve the entire central nervous system, both white and gray matter, but particularly the former. The characteristic microscopic lesion is perivascular neurone demyelinization associated with areas of extra- and intra-adventitial infiltration of leucocytes and glial cells. The spinal fluid is sterile with a moderate pleocytosis and increased protein. No inclusion bodies have been found.

In comparing this pathologic reaction with that occurring after measles and the other exanthemata, it has been noted by Greenfield that there is more perivascular infiltration and more complete demyelinization in postvaccinal encephalitis. Further, Thompson states that in encephalitis follow-
ing measles the gray matter is but little affected, while in postvaccinal encephalitis both gray and white matter are involved, though the predominant reaction occurs chiefly in the latter.

**PATHOGENESIS**

While the pathogenesis of postvaccinal encephalitis is still in doubt, four hypotheses have been postulated: (1) accidental; (2) caused by the virus itself; (3) activation of a latent neurotrophic virus already present; and (4) allergic. The weight of available experimental data indicates that the third theory is most likely.\(^2,3,5,9,11,25,26,28\) Rivers\(^2,3\) supports this view in analogy to the so-called fever blister. The most convincing evidence that the postvaccinal condition is caused by activation of some questionable virus is found in the clinically and possibly pathogenetically similar conditions occurring independently and following other exanthems.

**TREATMENT**

The results of therapy are inconclusive. An over-all review reveals a gross mortality of approximately 50 per cent with the remainder usually manifesting rapid and complete recovery.\(^2,25,26,28\) Symptomatic therapy, sulfonamides, and convalescent sera\(^9\) have not dramatically altered the course of this disease.

**SUMMARY**

1. A case of postvaccinal encephalitis with recovery in a 4-month-old child is presented.
2. The literature from 1928 to date is reviewed and discussed.

**REFERENCES**