Kuru-Plaques in a Case of Creutzfeldt-Jakob Disease*

S. M. CHOU and J. D. MARTIN

Department of Pathology and Department of Neurology,
West Virginia University, School of Medicine, Morgantown, W. Virginia U.S.A.

Received August 25, 1970

Summary. Numerous periodic-acid-Schiff positive plaques occurred in the cerebellum of a patient diagnosed as having Creutzfeldt-Jakob disease. Microscopic and submicroscopic structures of the plaques were identical with those described in Kuru. This is an additional link between these two neurological diseases in which the clinical, histopathological, and virological features are in many respects similar.


"Kuru", a subacute familial fatal degenerative disease of the human central nervous system, known to occur in a restricted area in New Guinea, was successfully transmitted to primates (Gajdusek et al., 1966, 1967, 1968). Subsequently, another subacute degenerative disease of the human central nervous system, Creutzfeldt-Jakob disease, was transmitted to chimpanzees (Gibbs et al., 1968). The characteristic histopathological pictures, the protracted clinical courses, the successful transmissions of the diseases to animals, as well as the long incubation periods, categorized these two human diseases, together with scrapie and mink encephalopathy, into the "subacute spongiform viral encephalopathies" (Gibbs et al., 1969). Although the transmissible agent has not been isolated or identified, they have been frequently cited as examples of "slow virus" infection.

The similarity of the histopathological findings in both Kuru and Creutzfeldt-Jakob disease has been repeatedly stated and emphasized (Klatzo et al., 1959a, b: Neumann et al.). The triad of microscopical findings in both diseases consists of status spongiosus, proliferation of hypertrophied astrocytes and neuronal loss. The distribution of the lesion varies widely in cases of Creutzfeldt-Jakob disease and to a lesser extent in Kuru. Cerebellar degeneration is, in general, more prominent in Kuru. Peculiar periodic-acid-Schiff (PAS) positive plaques have been observed in approximately half of all the reported cases of Kuru, especially in the cerebellum (Klatzo). These plaques stain similarly but not identically to amyloid and they differ from senile plaques, being only weakly argentophilic (Field et al.). These plaques have been considered to be the unique and the "outstanding
specific change” in Kuru (Field et al.) and, therefore, are often referred to as the Kuru plaques. Similar, but somewhat different plaques have been described in natural scrapie (Beck and Daniel). They have never been described, however, in either mink encephalopathy or in Creutzfeldt-Jakob disease. The finding of numerous plaques, identical to the Kuru plaques, in a case of Creutzfeldt-Jakob disease prompted this report.

Case Report

G. S. (WVU # 187209) a 64-year-old man presented in February 1968 with a 6 months history of progressive dementia, personality change, inappropriate behaviour, visual hallucinations, nocturnal jerking of his arms, and gait and truncal instability. He was born in Garret County, Maryland and raised in West Virginia. He worked as a coal miner until 1952 then as a truck mechanic until September 1967. He never travelled outside the United States. Past history revealed a head injury as a child with a 12 hours period of unconsciousness, typhoid fever at age 10 and recurrent tonsillitis. He ate hog brains seasonally as a young man, none for the past 43 years. Family history was negative for nervous or mental illness, except for a paternal aunt who was admitted to a state mental institution as a young woman.

On examination he was agitated, confused, disoriented and mildly aphasic. Facial grimaces, sucking and grasp reflexes were prominent. There was marked truncal and gait instability with frequent falls. Gait was also apraxic. Postural reflexes were impaired. Muscle bulk and power were normal, but tone varied from rigidity to flaccidity. Stretch reflexes were normal except for absent ankle jerks. Plantar responses were flexor. There was mild incoordination of the extremities. Sensory examination was normal. Memory and mentation were markedly impaired. Optic discs and visual fields were normal.

Laboratory investigation revealed a normal hemogram, normal serological values, blood chemistry and cerebrospinal fluid. Electroencephalography showed nonspecific generalized dysrhythmia. Skull x-rays and radioisotope brain scan were normal. Pneumoencephalographic findings were consistent with atrophy of the cerebral hemispheres. Electromyographic findings were consistent with a mild peripheral neuropathy. His family refused permission for a brain biopsy. The patient died in a state hospital in June, 1968 of pneumonia. Dr. B. K. Nanda performed the necropsy and described bilateral acute lobar pneumonia and terminal gastrointestinal bleeding.

Neuropathological Findings

The brain weighed 1350 g. There was diffuse, moderate edema; however, the sulci were widened and cortical atrophy was externally evident, especially in the temporo-frontal regions. Generalized atrophy was seen in the cerebellum. The cortical ribbon showed generalized thinning in cut surfaces of the brain. The lentiform nuclei were severely shrunken, with consequent dilatation of the lateral ventricles (Fig.1a). Histopathologically, extensive status spongiosus, associated with proliferation of hypertrophic astrocytes and neuronal loss, was observed in the lentiform nuclei (Fig.1b) and to a lesser extent in the cortex. The temporal and frontal lobes were more markedly involved than the occipital lobe. Extensive marginal gliosis was seen in the subpial zone. PAS-positive plaques were not observed in the cortical gray or subcortical white matter of the cerebrum. The cerebellum showed generalized loss of both granule cells and Purkinje cells. The axons of the Purkinje cells often showed “torpedo” swellings (Fig.1c). Numerous PAS-positive Kuru plaques, with characteristic radially-oriented fibrils at the periphery (Fig.1d), were seen in the granule cell layer, the white matter and the molecular layer, in that order of frequency. These plaques, measuring 4 to 40 µ in diameter, were faintly positive and anisotropic in Congo-Red stained sections. They were weakly argentophilic (Fig.1c), metachromatic and strongly PAS-positive (Fig.1f). They did not appear to be associated with any cellular elements and often showed a tendency to displace surrounding cellular elements. The plaques were more often observed in the vermis. Status spongiosus was noted in the tegmental gray of the mesencephalon and pons. Minimal