CASE REPORT

Terence B. Allen,[1] *M.D.*

Sudden Infant Death with Periventricular Leukomalacia

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ABSTRACT: Periventricular leukomalacia (PVL) is a form of cerebral infarction occurring in neonates, particularly in low-weight and premature infants. PVL is well-known to neonatologists, but generally considered nonfatal. Many infants with PVL die in the hospital with multiple medical problems. Those infants with PVL who survive because of intensive care will have serious motor and sensory deficits, but these problems are rarely recognized before one year of age. When infants with PVL die at home, death seems sudden and unexpected. However, it is important to distinguish death caused by PVL from the Sudden Infant Death Syndrome because the implications for the family are quite different. This case report emphasizes that PVL may be fatal.

KEYWORDS: pathology and biology, sudden death infant syndrome, periventricular leukomalacia, sudden death in infancy, hypoxic/ischemic brain damage

This paper reports a case of sudden infant death caused by periventricular leukomalacia (PVL), a form of perinatal hypoxic/ischemic encephalopathy which has been considered nonfatal.

Report of a Case

A previously well ten-week-old infant was found dead in a crib. The child had been fed 2 h earlier and seemed content. The child was the product of a full-term pregnancy but required three weeks hospitalization following birth, because of respiratory disease. The mother was 38 years old, with diabetes milletus requiring insulin and a history of three previous miscarriages. After leaving the hospital the infant fed well, gained weight, and was considered healthy by the attending pediatrician.

At autopsy the head circumference, body weight, and body length were normal. Abnormal findings were confined to the brain and there was no bronchopneumonia. The brain weighed 480 g (normal) and contained multiple cystic spaces in the centrum ovale. The abnormal spaces were up to 1.5 cm in diameter and affected about 30% of the cerebral white matter. No evidence of cerebral hemorrhage was detected grossly. Microscopically the cystic spaces had

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[1]Deputy medical examiner, Los Angeles Medical Examiner-Coroner's Office, Los Angeles, CA.

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no lining epithelium and were surrounded by gliotic white matter containing rare hemosiderin-laden macrophages. The cystic spaces were separated from the ventricles by only a millimetre or two in areas, yet the ependymal lining was smooth and intact (Fig. 1).

Discussion

Periventricular leukomalacia (PVL) is a form of cerebral infarction peculiar to neonates [*1-3*]. The periventricular white matter in neonates is a watershed zone between vessels penetrating from the brain surface and vessels rising from the ventricular system. PVL is caused by a variety of insults during or shortly after birth which have in common cerebral hypoxia or ischemia or both. PVL is a distinctive form of perinatal hypoxic/ischemic encephalopathy that is easily recognized at autopsy. The infarcts in PVL characteristically occur around the ventricles, particularly near the foramen of Monroe, showing a histologic progression of changes typical of ischemic necrosis in the brain. PVL is not easily confused with the postmortem spaces caused by gas bacilli, which are widely distributed throughout the brain and show no histologic reaction.

PVL is common in neonates born prematurely or with low-birth weight. This type of brain damage has been found in 7 to 17% of autopsies of infants dying in intensive care nurseries [*3*]. Although PVL is invariably associated with severe motor and sensory deficits, these abnormalities are almost never recognized before one year of age. As more premature infants survive because of intensive care the incidence of PVL in the community will increase. A review of 100 cases of sudden infant death at the Los Angeles Medical Examiner-Coroner's Office revealed two infants with previously unsuspected perinatal hypoxic/ischemic encephalopathy.

When infants with PVL die suddenly at home death may incorrectly be attributed to Sudden Infant Death Syndrome (SIDS). However, there are good reasons for separating death associated with PVL from other causes of death in infancy, and especially from SIDS. PVL is a dis-

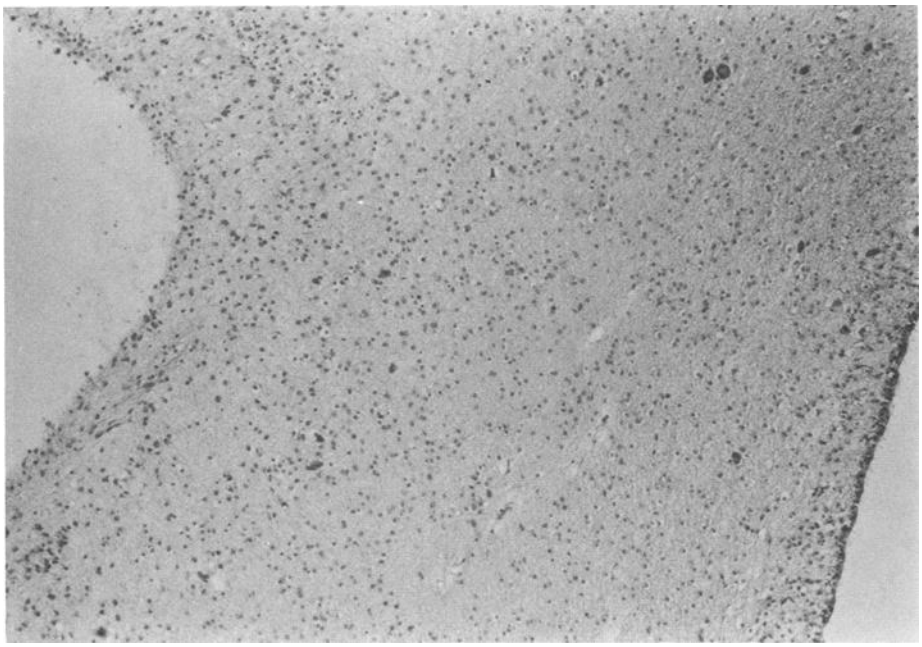

FIG. 1—*Periventricular leukomalacia (PVL). The cystic space shows no epithelial lining. The surrounding brain is gliotic. The ventricle, lined by ependyma, is present on the right.*

tinctive pathologic lesion of known etiology and prognosis. For a 38-year-old diabetic mother with three previous miscarriages, a diagnosis of PVL clearly suggests a poor outcome for future pregnancies. A diagnosis of SIDS, in contrast, might be viewed as a sporadic event with little tendency to recur in subsequent offspring [*4*].

PVL does not currently appear in lists of the differential diagnosis of sudden death in infancy [*5*], and in fact PVL has been cited in the literature as a nonfatal disease. Children with PVL have survived, rarely to adolescence, but death after one year of age is not unexpected because of the obvious neurologic disease. Several children with PVL reported in the literature have died at home of undetermined causes [*2*]. Takashima et al [*6*] found PVL in 4 of 84 cases of SIDS and in none of 45 infants dying of known acute disease or trauma. Ambler et al [*7*] have also reported a case of sudden death in infancy caused by PVL. It seems likely that the mechanism of death is seizure, which is common in children with PVL.

SIDS is a diagnosis of exclusion which should not be used when major pathologic lesions are present. The existence of perinatal hypoxic/ischemic encephalopathy, and particularly in the distinctive form of PVL, should preclude a diagnosis of SIDS.

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Address requests for reprints or additional information to
Terence B. Allen, M.D.
Los Angeles Medical Examiner-Coroner's Office
1104 N. Mission Rd.
Los Angeles, CA 90033