Automobile accidents caused by unsuspected neurological disease

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Two patients admitted as cerebral trauma cases following single-car automobile accidents were found to have previously-unsuspected, surgically-treatable neurological diseases that undoubtedly caused the accidents. A left posterior communicating artery aneurysm was clipped in one patient and a right frontal lobe abscess aspirated in the other, with excellent results in both patients.

KEY WORDS: automobile accidents · driver collapse · cerebral abscess · intracranial aneurysm

The number of "fell asleep at the wheel" accidents attributable to unsuspected neurological illness cannot be precisely determined. Each of the following patients was first seen because of head injury in an automobile accident; however, pre-existing neurological lesions that undoubtedly caused the single-car accidents were found in both cases.

Case Reports

Case 1

A 25-year-old man was the sole occupant in a one-car roll-over accident at 2 A.M. On admission he was oriented, mildly confused, and exhibited retrograde amnesia of several minutes' duration. A "75%" right sixth nerve palsy was present, and there was infraorbital hypesthesia in the distribution of the second division of the right trigeminal nerve. Symmetrically increased deep-tendon reflexes with extensor plantar responses were the only other positive neurological findings. Tomograms demonstrated multiple fractures of the greater wing of the right sphenoid, the sphenoid sinus, and both petrous temporal bones. The cerebrospinal fluid (CSF) was grossly bloody. The patient rapidly became alert, and the sixth nerve palsy cleared.

One week after discharge he noticed a mild intermittent left ptosis with some blurring of vision in that eye while reading. When readmitted 6 weeks after the accident he showed moderate left ptosis, a 6 mm reactive left pupil (right, 4 mm), and minimal weakness of the extraocular muscles supplied by the left third nerve. A left carotid arteriogram revealed a saccular aneurysm arising from the left internal carotid artery near the origin of the posterior communicating artery with moderate associated vasospasm. Following uneventful clipping of the aneurysm there was prompt improvement of the ptosis and elimination of the pupillary inequality.

In this case, the remote possibility that
trauma had produced the aneurysm or "growth" of a pre-existing aneurysm could not be eliminated in the absence of pre-trauma or immediate post-trauma angiography. Rarely, head trauma can cause intracavernous carotid aneurysms and cerebral cortical aneurysms but the evidence that berry aneurysms about the circle of Willis can result from trauma is more limited.

Case 2

A 25-year-old man was found confused after his car struck a telephone pole. There was no history of previous neurological problems, but 3 weeks earlier he had undergone a right upper dental extraction. While awaiting admission he experienced two major motor seizures. Admission examination was normal aside from moderate confusion and somnolence and several minutes of retrograde amnesia. Laboratory studies including an electroencephalogram (EEG) were normal aside from the finding of 6 lymphocytes/mm³ in the lumbar spinal fluid. His initial confusion cleared somewhat, but he remained withdrawn and apathetic and experienced occasional urinary incontinence while awake.

On the third hospital day, repeat lumbar puncture revealed a pressure of 210 mm H₂O, 15 neutrophils and 2 lymphocytes/mm³, a protein content of 54 mg% and a glucose content of 66 mg%. A right carotid angiogram with cross compression was performed but was interpreted as normal. The patient continued to be ambulatory but withdrawn, with no abnormal neurological signs. The temperature and peripheral white blood cell count remained normal. A repeat EEG was abnormal with a slow and sharp wave dysfunction greater on the right than the left. A third lumbar puncture on the fifth hospital day revealed a pressure of 130 mm H₂O, 170 white cells/mm³ with 16% neutrophils, 2 red blood cells, a protein content of 73 mg%, and a glucose content of 67 mg%. Cultures were negative on all punctures. A brain scan demonstrated a right frontal uptake, and a repeat right carotid angiogram showed a large right frontal mass. Emergency aspiration confirmed the diagnosis of brain abscess (culture: microaerophilic streptococcus).

Following repeated aspirations the patient's mental state improved, the incontinence and gait difficulty ceased, and he had no further seizures.

Discussion

There is general agreement that sudden medical illness is a rare cause of automobile accidents, with perhaps two of every thousand accidents resulting from driver collapse. Myocardial infarction, seizures, and diabetic hypoglycemia lead the causes of sudden collapse at the wheel, with cerebral masses and intracranial hemorrhage comprising less than 10% of the reported cases.

In a study from Sweden, Herner, et al., determined that 41 of 44,255 traffic accidents were caused by sudden driver illness, usually seizures or myocardial infarction. They estimated that prior medical screening would have been revealing in only 19 cases, at best. Two of their subjects had brain tumors with a seizure, two had unexplained subarachnoid hemorrhage, and two were listed as cerebral hemorrhage.

Norman's study of London bus drivers is of particular interest because of the accuracy in determining the incidence of sudden loss of consciousness in this group. He reported only 72 instances of collapse at the wheel (one in 100,000,000 vehicle miles) resulting in 44 accidents over a 13-year period. The drivers are selected professionals, however, who have undergone rigorous medical screening and periodic re-examination. There were two cases of "cerebral hemorrhage," one of cerebral astrocytoma, and one of metastases from lung carcinoma. One collapse was caused by cerebral embolism associated with atrial fibrillation and one by transient cerebral ischemia.

Grattan and Jeffcoate found two cases of primary loss of consciousness in 593 drivers and motorcyclists admitted to hospital following road accidents. One was an 18-year-old man who fainted following an attack of influenza and the other was an 81-year-old woman with a cerebral hemorrhage. In a second study of 9390 police accident records, they found 15 cases of accidents probably caused by sudden driver...
illness including one case of cerebral hemorrhage.

In a 4-year Baltimore study limited to driver fatalities in apparently driver-caused accidents, Peterson and Petty\textsuperscript{9} collected 81 instances of sudden driver collapse producing 36 accidents. Six of the collapses resulted from ruptured cerebral berry aneurysms and two from intracerebral hemorrhages.

In another study of driver deaths, West, \textit{et al.},\textsuperscript{13} determined that 155 of 1026 California drivers dying within 15 minutes of a single-car accident died of natural causes; 94\% were males with a mean age of 60. There were two with intracranial hemorrhage, including a 46-year-old man with a rupture of an aneurysm of the left posterior communicating artery.

A recent 5-year survey of traffic deaths in Brisbane, Australia, ascribed driver illness as the cause of 16 of 256 accidents associated with fatalities.\textsuperscript{12} All drivers had warning of impending collapse, and all but four escaped without serious personal injury. Only one driver-caused accident could be related to primary neurological disease (cerebral thrombosis).

Single case discussions include Fisher's case\textsuperscript{2} of intracerebral hemorrhage with rupture into the ventricles in a bus driver who experienced sudden dizziness and vomiting, and drove his bus into a tree. Fisher and Lindenberg\textsuperscript{3} reported a case of luetic meningoencephalitis in a 43-year-old truck driver dying in status epilepticus whose seizures at the wheel resulted in collision damage to three other cars.

A high index of suspicion of pre-existing neurological disease is indicated in every single-car accident in which the driver is alone or unobserved and where alcohol or drug levels are low or nonexistent. Meticulous neuropathological study of driver fatalities, especially in single-car accidents or suspected automobile suicides, will clarify the incidence and nature of masked neurological disease.

\textbf{References}

8. Norman LG: \textit{Professional Drivers and Road Safety. Proceedings of the Second Congress of the International Association for Accident and Traffic Medicine, Stockholm, August 9-12, 1966}, pp 139-149

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