Intracranial Suppuration

A Review of 139 Consecutive Cases with Electron-Microscopic Observations on Three

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Since 1750 when Morand drained the first recorded otogenic abscess, intracranial suppuration has continued to be a therapeutic problem. The dramatic early history of the treatment of brain abscess is traced in the review of Webster and Gurdjian.15 Even today, it has a mortality of almost one-third.1,6,12 In the light of the continuing importance of this disease, this paper reviews the cases that have occurred over the last 20 years at the Barnes Hospital. In addition, we have had the opportunity to examine 3 brain abscesses by electron microscopy. Many ultrastructural aspects of inflammation already have been investigated,4,5 but few reports of the response of the central nervous system to inflammation are yet available. Nelson et al.11 recently described experimental bacterial meningitis, but no observations on brain abscess have yet been published.

Material and Method

The cases of intraparenchymatous abscess of the brain and of epidural and subdural empyema seen at Barnes Hospital from 1942 to 1961, inclusive, have been reviewed. If the lesion had been demonstrated at either operation or autopsy, the case history and autopsy records were reviewed. However, several cases of terminal sepsis in which miliary abscesses were found throughout the body have been excluded from this review.

Brain abscesses from 3 patients with symp-
toms for 12, 8 and 2 weeks were studied by electron microscopy.

Tissue was obtained at the time of operation and placed in Dalton’s buffered osmium tetroxide. After fixation for 1 to 3 hours, the tissue was dehydrated and embedded in Epon 812. Phase and thin sections were cut on a Porter-Blum microtome. Thin sections were examined in an RCA EMU 3-B electron microscope. To enhance contrast, some of the grids were stained with a 25 per cent saturated solution of lead acetate.

Survey of Clinical Cases

This group of 139 cases includes the 47 cases of abscess of the brain reviewed by Kerr et al.,7 as well as 17 cases included previously in Sachs’13 review. In addition, the epidural and subdural lesions for those years have been included. Of 139 cases, 121 were intraparenchymatous; 7 were epidural; 6 were subdural (1 bilateral); and 5 patients had both a subdural empyema and a parenchymatous abscess. This is an average of 7.0 cases per year. At Barnes Hospital the average number of cases of brain abscess admitted per year has remained nearly constant over the last 20 years while the total number of admissions per year has doubled, demonstrating a relative decrease in the incidence of brain abscess seen in this institution.

Twice as many patients were male as female: 95 as compared to 44. Their age distribution is shown in Table 1. The majority (55 per cent) of the patients in this series were under 30 years of age.

Signs and Symptoms. The presenting symptoms and signs of the patients in this series were predominantly those characteristic of a mass lesion and less often those indicative of infection. Symptoms were generally of rapid onset, being of less than 2 months in
duration in over 95 per cent of the cases, although 1 patient had a draining sinus in the frontal bone for 4 1/2 years prior to admission. Headache was present consistently. Excluding infants and those either disoriented or comatose, 109 of 115 gave a history of headache at some time in their illness. Figures henceforth refer to the entire 139 cases. A history of nausea or vomiting was elicited in 90. Thirty-seven had seizures. Twenty-six persons (19 per cent) had a pulse rate of 60 or below when hospitalized. Papilledema was observed in 58 patients. Sixty-six entered with findings attributable to meningeal irritation although tonsillar herniation also may have contributed to these symptoms. Many had a temperature of 38°C or over, but after eliminating the 50 patients in whom other areas of bacterial invasion existed, there were only 18 in whom the fever could be ascribed primarily to the intracranial infection—either meningitis or abscess. Conversely, more than half (71/139) failed to show fever at the time of admission. The numerical occurrence of all physical findings will not be listed. Hemiparesis, aphasia, sensory deficits and impairment of visual fields were associated with supratentorial involvement. One patient exhibited the first evidence of a lesion of the central nervous system when he stopped breathing immediately following mastoidectomy.

Films of the skull were made almost routinely and showed variable evidence of increased intracranial pressure, pineal shift, osteomyelitis, sinus or mastoid disease. Electroencephalograms were obtained in 39 cases. Localization to a site later confirmed at either operation or autopsy—usually a slow-wave focus—was present in 21; 14 were indeterminate; and in 4 the suspected locus was incorrect. Lumbar puncture was not always performed as it was not done in many who had elevated intracranial pressure. Table 2 presents data relevant to the cerebrospinal fluid. The tendency of abscesses to elevate spinal-fluid pressure, protein, and number of cells as well as the rarity of a lowered glucose is shown. In only 4 of 74 cases was the spinal fluid considered normal in all respects. Definitive diagnosis in the majority was realized with contrast studies: ventriculography (occasionally the cannula entered an abscess during the procedure), pneumoencephalography, and carotid angiography. At times more than one of these procedures was employed and in a few cases the true nature of the mass was not evident until or after operation.

**Location and Source of Infection.** The loca-