OBSERVATIONS ON EARLY TYPE OF BRAIN ABSCESS FOLLOWING PENETRATING WOUNDS OF THE BRAIN

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In the course of the postoperative care, at the 36th General Hospital, of 206 penetrating wounds of the brain, due to shell fragment or bullet injuries, brain abscess occurred in 33 cases (16 per cent). Brief observations concerning the diagnosis, surgical treatment and chemotherapy are made in view of the commonness of this complication and, in many instances, the difficult problem of management.

MATERIAL

In this report the term "brain abscess" is used to signify a purulent collection or collections within the brain substance, characteristic of all the lesions. An expression such as "purulent encephalitis" might be used. In all cases, the cerebral substance had undergone a sufficient degree of necrosis to form frank pus in a cavity or in cavities. Since the collections were deep seated, Steinthal's term, "cortical ulcer," does not apply. The abscesses occurred early; they were associated with wound infection and frequently with a hernia or fungus. With but few exceptions they were not grossly encapsulated but were localized. Denser inflammatory tissue frequently bordered the collections. There were multiple loculated areas of pus in some instances in contrast to a single collection in others. Meningitis was also associated with the localized infection in some of the patients. The abscesses were located at the sites of the original debridements and usually also in the tracts produced by the metallic or bone fragments.

Primary debridements had been performed at American evacuation hospitals upon all patients except two. Of the group of 33 cases presented, 10 abscesses occurred among German patients and eight of these were treated at a Prisoner of War Hospital under difficult conditions. Three of the latter group were operated upon by Captain W. Klemperer and one by Captain T. Weaver. Two of the American patients had drainages of the abscesses performed while in the evacuation hospitals by Major W. Pitts and Captain E. Shearburn.

DIAGNOSIS

Two considerations appear to be important in the diagnosis of a complicating brain abscess. First, the presence of an infected wound; second, the presence of retained bone fragments in the brain following primary debride-
ment. Only three patients presented healed wounds with an underlying purulent abscess. All others had infected wounds, which failed to heal with or without herniae or fungi. Four cases of superficial cortical necrosis ("cortical ulcer") associated with purulent wound infections have not been included in this series.

The presence of bone fragments in a subcortical tract after primary debridement of a penetrating wound is presumptive evidence for a brain abscess. In only one instance following secondary debridement for the removal of bone fragments were these found to be sterile. Bone, hair, helmet-liner material or other debris provided the locus for an inflammatory collection. In our experience, ragged metal fragments were usually laden with organic material. The size of a metallic fragment was of significance in terms of the tract of damage produced; its irregularity was also of importance because of its ability to carry contaminating material.

Retained bone fragments were present in 19 of the patients with abscess; metallic foreign bodies were present in 12. Delineation of bone fragments was dependent upon satisfactory roentgenograms. In several cases, in which the diagnosis was in doubt, encephalograms were performed.

**Surgical Management**

Several methods were used in the surgical treatment of brain abscess following complete debridement of the wound and the underlying abscess.