Extradural ossification following an extradural hematoma

Case report

TSUTOMU IWAKUMA, M.D., AND CARL V. BRUNNGRABER, M.D.
Department of Neurosurgery, Nordstadt Hospital, Hannover, West Germany

The authors report a case in which the surgical removal of an extradural hematoma was followed by extradural ossification.

KEY WORDS
• extradural ossification
• extradural hematoma

REPORTS of ossification are rare since most extradural hematomas are removed surgically before ossification can occur. We are reporting such a case with extradural bone formation demonstrable in skull films.

Case Report

This 33-year-old man was admitted on January 2, 1973, for treatment of a calcified mass in the left frontal region and progressive disorientation since he suffered a fracture in the same region on November 2, 1972. Since October, 1971, he had had three generalized epileptic seizures with unconsciousness, urinary incontinence, and biting of the tongue. In the second attack on August 26, 1972, he fell hard on his face. On November 2, 1972, in the third seizure, he struck the left side of his forehead. He was immediately admitted to a local hospital where he was found to be confused but showed no lateralizing signs. Skull films showed a linear fracture of the left frontal bone. After 12 days of hospitalization, although he was still confused, he was discharged. He was rehospitalized on December 6, 1972, because of the onset of such mental disorders as irritability, lack of concentration, disturbed memory, and disorientation. Skull films taken on December 7 showed a curving line of calcification in the left frontal region (Fig. 1 left).

Examination. On January 2, 1973, the patient was transferred to our clinic with a diagnosis of calcified brain abscess or calcified intracranial hematoma. Neurological examination was normal except for mild mental disorder and left hyposmia. The electroencephalogram (EEG) revealed discrete theta waves in the left frontal region without a paroxysmal discharge. Brain scan indicated increased radioactivity in the left frontal region (Fig. 1 right). Left carotid angiograms demonstrated displacement of the anterior cerebral artery to the right and an avascular area in the left frontal region.

Operation. A left frontotemporal craniotomy performed on January 15, 1973, disclosed the linear fracture and an underly-
Extradural ossification following an extradural hematoma

FIG. 1. Left: Posteroanterior roentgenogram, January 4, 1973, showing a calcified mass in the left frontal region along the basal border of hematoma (arrow). Right: Lateral brain scan showing abnormal technetium retention in the frontopolar region.

ing encapsulated frontal extradural hematoma measuring $7 \times 6 \times 2$ cm, and containing bloody fluid. Between the dura and hematoma there was a spongy calcified mass, about 0.5 cm thick, which was adherent to both the dura and capsule of the hematoma. Along the outer margin of the calcified plate, which was in contact with the inner table of the skull, there were fine bony spicules (Fig. 2 left). The capsule of the hematoma with its attached bony plate was freed from the dura by blunt dissection. The capsule was 5 mm thick and histologically consisted of fibroblasts and collagen fibers. Microscopic section of the bony mass, made after decalcification, revealed a typical bone structure (Fig. 2 right). The postoperative course was satisfactory.

Reexamination of the skull films taken on December 7, 1972, identified calcification in the left frontal region which could not be seen on films taken November 2.

Discussion

Extradural ossification may occur within a few weeks after extradural bleeding, and is most conspicuous in young people. Recently, the authors have observed that micro-

FIG. 2. Left: Photograph of the operative field showing encapsulated hematoma (H), calcified mass or rim (arrow), dura mater (D), and bony spicules (small forceps). Right: Photomicrograph of calcified mass, made after decalcification, showing the bony trabeculae. H & E, × 80.
scopic signs of ossification following extradural hematoma were already present on the 9th day after head injury in a 9-month-old baby. We have occasionally treated cases in which extradural bone formation occurred after removal of the bone flap for the purpose of decompression or secondary to wound infection. Extradural ossification is an active rather than regressive process. The site of bone formation is not within the hematoma, but at the junction of the dura and the hematoma. Thus, the term “ossified extradural hematoma” is not appropriate. It should be called “extradural ossification following extradural hematoma.”

Subdural hematomas of very long standing may organize, and calcium may deposit in the degenerating connective tissue with ossification as its terminal phase. The calcified shadows of the subdural hematoma are seen directly under the inner table in plain skull films because calcification in subdural hematoma may occur in both the inner and outer membranes as well as in the matrix of the hematoma. However, calcification near an extradural mass is seen only along the base of the hematoma. The intracranial dura is composed of inner and outer layers; the outer layer forms the peristeum of the inner surface of the cranial bone. The phenomenon of active extradural ossification may be explained by the nature of the outer layer of the dura.

References


Address reprint requests to: Tsutomu Iwakuma, M.D., Noshio 4-28, Kiyose-shi, Tokyo, Japan.