Ectopic Neural Tissue of Occipital Bone*

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ROENTGENOLOGICAL films of the skull exhibiting multiple lytic lesions of the suboccipital bone called this
entity to our attention. The anomaly had no bearing on the condition for which the patient was admitted—a subdural hematoma
overlying the left cerebral hemisphere.

Case Report

A 57-year-old laborer was admitted to the Washington University Neuromedical Service on Dec. 20, 1961.† For many years he experienced
intermittent frontal headaches which were attributed to sinusitis. Approximately 2 weeks before admission headache of a different quality
developed, the pain being more generalized and constant in nature. On the day of admission he became drowsy, slept a great deal, and talked
incoherently.

Examination. Significant physical findings were lethargy, confusion, mild left hemiparesis, a dilated left pupil which reacted poorly to light,
bilateral extensor toe signs and a pulse rate of 56. The optic fundi were normal.

Laboratory findings, including hemogram, urinalysis, urea nitrogen, blood sodium, potassium, chloride and CO₂, were normal. Films of the skull
(Fig. 1) were interpreted by the neuroradiologist as follows: “In general the osseous and soft tissues are normal with evidence of bilateral tri-
gonal choroidal calcification and no calcification of the pineal body. There are multiple fairly discrete lytic defects in the occipital bone beneath
the groove of the transverse sinus having a soap-bubble appearance and thought to represent some benign process, not specifically understood. How-
ever, it is not possible on the basis of the appearance alone to differentiate the cause of these lesions from such diseases as multiple myeloma and
metastatic carcinoma. The remainder of the carotid artery is normal.”

The patient was considered to have an expanding intracranial lesion and therefore was trans-
ferred to the Neurosurgical Service. A left common carotid angiogram exhibited dislocation of vessels characteristic of a left subdural hematoma.

Operation. Angiography was followed immediately by left temporal craniectomy (Dec. 20, 1961) and evacuation of a large subdural hema-
toma. Examination of the right subdural space showed it to be normal.

Course. The patient made an excellent recovery. Upon reaction from anesthesia he was alert, rational and no longer hemiparetic. There was still
pupillary inequality, and he complained of intermittent headache. Within 4 days he was asymptomatic and neurological findings were entirely
normal.

To evaluate the nature of the lesions of the suboccipital bone, determinations of blood cal-
cium and phosphorus, serum protein, alkaline and acid phosphatase, and electrophoresis of serum proteins were made and found to be within normal
limits. The urine did not show abnormal Bence-Jones proteins.

2nd and 3rd Operations. On Dec. 29, 1961, two of the lesions of the left suboccipital bone were biopsied under local anesthesia. Upon exposing
the bone the involved areas could be identified by oval-shaped areas which had a bluish discoloration, each measuring 1½ by 2 cm. The involved
bone was very thin, being only a fraction of a mm. in thickness. A No. 20 needle was introduced easily through it and 1 cc. of faint blood-tinged
fluid which had the appearance of cerebrospinal fluid was aspirated. Following this the thinned bone was removed exposing grayish tissue of fiber-
granular consistency. Upon removal of this tissue a pinpoint perforation was noted in the center of the inner table of bone. Through this tiny opening
clear cerebrospinal fluid flowed and continued to well up in the bony cavity. The inner table of bone, which was thinned also, was removed ex-
posing a normal-appearing dura mater. Cerebrospinal fluid continued to flood the dura mater, but the opening through which it gained access to the
extradural space could not be identified. On Feb. 1, 1962, another lesion from the right suboccipital bone was biopsied and processed for electron
microscopy as well as light microscopy. Grossly and histologically it was identical to the ones found on the left side.

Pathology. Sections for light microscopy were stained with hematoxylin and eosin, phospho-
tungstic acid hematoxylin, and by the Nissl

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Fig. 1. Lateral (A) and anterior-posterior (B) roentgenograms of skull showing multiple lytic lesions of suboccipital bone.

technique. They were composed of brain tissue within a bony cyst. The tissue consisted principally of astrocytic glial cells and their processes, although occasional oligodendrocytes, gitter cells and even scattered neurons were present (Fig. 2). The neurons were reminiscent of Purkinje cells in their shape and single stout dendritic process.

Electron micrographs confirmed the fact that the lining of the cysts was neural tissue. The scattered neurons were large cells with a single robust process (Figs. 3 and 4). The main constituent of the tissue lining the bony cysts was formed of processes of fibrous astrocytes (Fig. 5). Dense bundles of fibrils filled the astrocytic processes. Residua of myelinated axons (Figs. 6 and 7) also were present. A basement membrane outlined the neuroglial tissue and separated it from connective-tissue elements. This membrane (Fig. 8) was equated with the pia-glial basement membrane enclosing the normal cerebellum.

Fig. 2. Photomicrograph of ectopic neural tissue obtained from one of the lytic lesions of the skull shown in Fig. 1. Hematoxylin and eosin, X 300.
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FIG. 3. Electron micrograph of neuron in lining of one of the bony cysts. Considerable accumulation of lipofuscin pigment is present within the cytoplasm. \( \times 6,000 \).

FIG. 4. Another neuron in lining membrane of one of the lytic lesions. Its abundant cytoplasm extends out into a single stout dendrite. Part of a gitter cell filled with phagocytosed lipid is at upper left. \( \times 8,000 \).
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This electron micrograph is from a region near the neurons shown in Figs. 3 and 4. It demonstrates the dense astrocytic gliosis that formed most of the lining of the lytic bony cysts. Processes are packed with fibrils. At bottom center is an infolded zone of basement membrane that represents an indentation of the pia-glial membrane. \( \times 12,000 \).

**Discussion**

Since encountering this case, we have uncovered 2 others in which radiological films of the skull exhibited features identical to the ones reported above. In neither patient could the lytic lesions be attributed to malignancy or other systemic disease. Another patient with a glomus tumor invading the posterior fossa and neck was found to have several small lytic lesions of the suboccipital bone opposite the side of the tumor. A biopsy of one of these was taken at the time of craniotomy. Histologically the lesion proved to be neural tissue, similar in appearance to the tissue of the case reported above.

An extensive, although possibly incomplete, review of the literature has not revealed a case similar to the one we report.*

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Lee and McLaurin\textsuperscript{2} have reported a small lesion of the scalp in the suboccipital region of a 2-year-old infant which proved to be glial tissue. There was no associated defect of the skull. This is the only case which bears a resemblance to the one we report.

The fact that 2 probable cases and 1 additional proven case of ectopic neural tissue of suboccipital bone has come to our attention within a short time after recognition of this entity suggests that this condition is not too rare. In all probability such lesions have been interpreted as vascular lakes or metastatic lytic lesions. A review of our own material, which is in progress, suggests that such is the case.

The anomaly described above is reminiscent of the nasal gliomas,\textsuperscript{1-4} Both are probably variants of the encephalocele.

Summary

A case in which ectopic neural tissue of suboccipital bone produced areas having the radiological appearance of multiple lytic lesions of the bone is reported. A review of films of the skull taken for a variety of reasons suggests that the condition is not too rare. Previously such lesions have been interpreted as vascular lakes or metastatic carcinoma.
References


