Growing fracture of the skull and the role of computerized tomography

Case report

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Growing fracture of the skull is a rare complication following head injury. The case history of a child with such a fracture, who developed a leptomeningeal cyst, is presented. The unusual features of this case are discussed in the light of previous reports. The usefulness of computerized tomography in obviating the need for more invasive preoperative investigations is demonstrated.

KEY WORDS • skull fracture • growing fracture • traumatic leptomeningeal cyst • computerized tomography • childhood

Development of a growing fracture is a rare complication of head injury. A tear in the dura at a fracture site results in the formation of an arachnoid cyst. The cyst erodes the overlying bone at the fracture margins to produce a defect through which the cyst and its contents may herniate. Most cases occur in children, usually under 3 years of age, and present with hemiplegia, epilepsy, or a fluctuant scalp swelling. Radiology is necessary to establish the diagnosis.

Treatment involves the excision of the cyst and its contents, followed by cranioplasty. The surgeon should know before operating whether brain tissue is contained within the cyst and be aware of the position of important structures, such as the sagittal sinus in relation to the lesion. In the past, angiography or pneumoencephalography has been considered advisable prior to surgery.

We present a case of growing fracture where the use of the computerized tomography (CT) scan obviated the need for more hazardous procedures while still providing the necessary preoperative information.

Case Report

This 3-year-old boy fell from a window and sustained a head injury. He was admitted in coma to the referring hospital where a superficial vertex scalp laceration was sutured. A skull x-ray film revealed a linear midline occipital fracture, 5 mm wide, running from a depressed fracture at the vertex into the occipital region (Fig. 1 left). Initially, he improved but failed to continue to do so and he was referred to our unit 2 weeks after his injury.

Examination. He was irritable, would open his eyes spontaneously, and localize to pain. He had a squint, present since birth, but there was no evidence of a visual field defect. A CT scan was normal and after a few days’ observation, he was returned to the referring hospital. He was discharged from that hospital 3 weeks later, but soon developed a fluctuant occipital swelling. This enlarged and he was referred back to our unit, 8 weeks after the initial injury.

On examination, the swelling was large, transilluminated, and pulsated (Fig. 2). He had a right homonymous hemianopsia but was otherwise well. A skull x-ray film (Fig. 1 right) revealed a 15-mm wide defect in the midline of the site of the original depressed fracture, corresponding in extent to the original linear fracture. The bone margins were undermined. A diagnosis of growing fracture and traumatic leptomeningeal cyst was made. To determine whether brain tissue was contained in the cyst, a CT scan was
Growing fracture of the skull

FIG. 1. Skull x-ray films, anteroposterior view. Left: The fracture in the parieto-occipital region at the time of the injury was 4 mm wide. Right: Eight weeks later, the width of the fracture had dramatically increased to 15 mm.

FIG. 2. Clinical appearance of the enlarged occipital swelling immediately prior to operation.

Fig. 3. Preoperative computerized tomography scans. Left: Scan showing the bone defect and the overlying soft-tissue swelling containing both brain tissue and subarachnoid cyst. Right: Scan at the level of the torcula after administration of contrast material showing enhancement of the venous sinuses. These structures are in their normal position and have not herniated through the bone defect.

Operation. The dural defect was much larger than the bone defect, and the cyst contained gliotic tissue. The sagittal sinus and torcular herophili bounded the dural defect on its right, as expected from the CT scan. Excision of gliotic brain tissue was followed by dural repair and acrylic cranioplasty. Although the dural repair was judged satisfactory, the child developed a cerebrospinal fluid (CSF) leak which only stopped when a ventriculoperitoneal shunt was inserted via a frontal burr hole. There was no change in his neurological condition, but the cyst had not reaccumulated when he was reviewed 3 months later.

Discussion

The incidence of growing fractures of the skull varies with different series from less than 1% to 16%, but a review of the literature suggests it is rare.
The pathogenesis is uncertain. The dura in children is very adherent to the bone, and skull fractures tend to produce extensive dural tears which are larger than the bone defects. The dural tear allows formation of an arachnoid cyst, probably because localized subarachnoid bleeding causes adhesions. In turn, this may prevent fibroblasts from the pericranium from reconstituting the dural defect. Systolic pulsations in the brain may then cause erosion of the fracture margins and eventually result in atrophy of the brain in the region of the skull defect.

The case we present has certain unusual features. In retrospect, the age of the patient and the width of the fracture (greater than 4 mm) facilitated the development of a growing fracture. However, growing fractures usually occur in the parietal region, although occipital sites have occasionally been noted. The presence of a depressed fracture in this case might have alerted the referring hospital to seek neurosurgical advice earlier, but a closed depressed fracture with no focal neurological deficit near the sagittal sinus in a child may best be managed conservatively.

We noted the rapid development of the growing fracture over a matter of weeks, as described by Twerdy and Lugger. Other observers have stated that the skull defect may take months or years to enlarge noticeably. We found the dural defect larger than the bone defect, as did Gruber. Pneumoencephalography, isotope cisternography, and angiography have been considered advisable in order to confirm the diagnosis or warn the surgeon of the proximity of major vessels prior to surgery. However, as this case illustrates, the CT scan can demonstrate both CSF and soft tissue within the cystic swelling. The ventricular detail obtained enables hydrocephalus to be excluded without resorting to pneumoencephalography. Large vascular structures such as venous sinuses can be enhanced by intravenous administration of contrast medium, thus making cerebral angiography no longer necessary.

References


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