Complete agenesis of both parietal bones was found as a single anomaly in an otherwise healthy boy. The defect in the cranial vault was restored with preformed methyl methacrylate onlay plates.

**KEY WORDS**  •  agenesis of parietal bones  •  developmental skull defect  •  cranioplasty

**Developmental** defects of the skull have been described mostly as anomalies without clinical significance or in association with intracranial pathology incompatible with life. A defect as large as that presented here in an otherwise normal child has not, to the best of our knowledge, been described in the literature. The problems involved with this defect and the treatment chosen are discussed.

**Case Report**

This child was the first born son of young, healthy, and non-consanguinous parents. Pregnancy was uneventful. On pelvic examination during the first stage of labor, a round, soft part was palpated. Breech presentation was suspected; however, an x-ray film showed the normal presentation of the head in which no parietal bones were seen. Upon delivery, the child's Apgar score was 10, the body weight 2860 gm, and the head circumference 35 cm. On palpation as well as on plain films of the skull, the bone structure of the skull was normal except for the complete absence of both parietal bones. At the age of 1 month the head circumference was 37.2 cm. In order to exclude intracranial pathology a pneumoencephalogram was performed. It showed a normal ventricular system both in size and configuration. No treatment was considered possible at that stage.

The child developed normally. At the age of 18 months he was brought to the hospital as an emergency with a left hemiplegia, the result of a minor trauma at home. The electroencephalogram showed diffuse slowing over the right hemisphere. He recovered completely within 48 hours. At that time the head circumference was 48 cm and its configuration was normal. At the age of 2 years and 3 months, the boy sustained another minor head injury. It caused severe left hemiparesis which cleared after 24 hours. At that time the head circumference was 51 cm, which was smaller than that of his father by only 2.5 cm. Their general facial features and the shape of their heads were very similar. It was felt that restoration of the cranial vault was feasible at that point.

The frontal, temporal, and occipital bones were normal (Fig. 1). The defect in the skull was trapezoid in shape on each side and symmetrical. It measured 14 cm in the sagittal line and 8 cm from the midline to the temporal bone. A computerized tomography scan showed normal brain structure and a normal ventricular system (Fig. 2). Cranioplasty by rib grafts seemed impractical. This would require the resection of a large number of ribs. Also, it was believed that the pericranium which had not produced bone would not take the bone grafts. Metal plates also seemed inappropriate because of their large size, the difficulty of fixing in place at this age, the inferior cosmetic effect, and the danger of bending of such large plates in the event of trauma. The use of preformed methyl methacrylate onlay plates was chosen.

The edge of the defect was marked on the shaven scalp (Fig. 3), and a wax cast was prepared. From this, an impression ("negative") reversible hydrocolloid
Agenesis of parietal bones

Fig. 1. Preoperative cephalometric radiogram. The lucency is the area of absent bone.

A cast was made. The methyl methacrylate was poured into the cast at the thickness determined from cephalometric x-ray films. Radio-opaque fibers were imbedded in the material. The plates were allowed to polymerize at 160°F for 24 hours. The implant was prepared as two almost symmetrical plates separated along the sagittal line to allow future expansion of the brain. Multiple holes were drilled in the plates for transgrowth of fibrous tissue. The outer borders of the plates were made thinner to overlap the adjacent bone (onlay). Holes were made in these edges for fixing the implant by sutures to the surrounding bone. The implant was sterilized with ethylene oxide.

A transverse incision was made and the whole defect area was exposed. Adjacent pericranium and muscle were elevated. Only minor adjustments of the plates were required. The plates were secured by 3-0 silk sutures to the bone through small drill holes.

Loose sutures were tied from one half to the other in the sagittal line (Fig. 4). The postoperative course was uneventful. The shape of the head was satisfactory and has remained so in the 1-year period since the operation. The presence of the synthetic implants is not recognizable even on palpation.

The child continues to develop normally. Being an active little boy he had several minor injuries. None had neurological sequelae. The head circumference at present is 51.3 cm.

Discussion

Congenital defects in the parietal bones are of three kinds: 1) Cranioschisis, large skull defects associated with brain anomalies that are incompatible with life; 2) Cranial dysostosis, small bone defects, sometimes associated with maternal use of aminopterin; and 3) Parietal foramina, which occur in 60% of normal skulls and rarely exceed 5 mm in diameter (foramina parietalia permagna). These are the result of faulty ossification of the parietal bones. Larger defects were described in the presence of scalp defects. Total agenesis of parietal bones has not been described. The present case demonstrates parietal agenesis as an isolated anomaly, accompanied by no intracranial or other pathology.

Despite the absence of a very large area of skull in this patient, the ventricular system remained normal. This seems to confirm experimental observations that only the combination of a defect in the coverings of the brain and increased intraventricular pressure enhance ventricular dilatation. It also stresses the importance of the role of the dura which is relatively greater than that of bone in the ventriculomegalic process. This also raises doubts as to the efficacy of decompressive surgical procedures that involve only bone in cases of acute intracranial hypertension.

The technique employed in this case is currently used by us, mainly in cases where relatively large

Fig. 2. Computerized tomography scan of the child. The ventricular system is normal. The bone defect is seen in the higher cuts (right pair).
FIG. 3. The edges of the bone defect as marked for the preparation of the cast.

skull defects are present and in which a satisfactory cosmetic effect is difficult to achieve otherwise. The mechanical strength of the methyl methacrylate plates exceeds that of bone.9

References

Address reprint requests to: Abraham Sahar, M.D., Department of Neurosurgery, Hadassah-University Hospital, Ein-Kerem, Jerusalem, Israel.

FIG. 4. The operative field with the methyl methacrylate plates *in situ*. The transverse lines are the imbedded radio-opaque fibers. Note the "sagittal suture" left for future expansion of the head.