Hemangiomas of bone are rare lesions comprising only 0.7% of all osseous tumors and 10% of primary benign tumors of the skull. Hemangioma of the skull is commonly encountered as a solitary lesion. Although very rarely, there exists the type of lesion that is often mistaken for a hamartomatous malformation or endothelial tumor. It originates in the diploe of the skull, grows gradually, and, if undetected sooner, invades the inner as well as the outer table. It is a benign tumor, but growth persists and may destroy the inner core by invading deep into the cranium. This type of lesion is often noticed as a bony lump in the head and is detected first as a punched-out lesion on plain radiograph. Although its definitive diagnosis must be made histopathologically, a physician needs to distinguish it differentially to distinguish this particular type from other similar lesions, as a misdiagnosis may lead to malpractice. Typical findings on plain radiograph and computed tomography (CT) are usually reliable. Although this is a benign lesion, recurrence must be avoided. Once a lesion is diagnosed as this type, radical resection and immediate reconstruction are recommended. Although curettage and covering of the lesion with alloplastic material are a simple option for hemangioma of the skull, this combination is not usually sufficient to prevent recurrence. The only option to ensure the avoidance of recurrence is complete resection.

Key Words: Hemangioma of the skull, radical resection, split calvarial bone graft, calcium phosphate cement
PATIENT 1

A 34-year-old woman presented with a tumorous lesion in the right side of the forehead (Fig. 1A). The tumor, 1.5 \( \times \) 2.0 cm, grew gradually during a period of about 2 years. Plain radiograph showed a honeycomb appearance (Fig. 1B); CT showed a honeycomb shadow, suggesting an intraosseous hemangioma of the skull (Fig. 1C), and three-dimensional CT view shows a honeycomb mass (Fig. 1D). The tumor, made up of fleshy bulk in the frontal bone (Fig. 1E), was resected en bloc with an intact area of 3 mm from its margin (Fig. 1F). Histopathologic examination showed a typical hemangioma of the skull (Fig. 1G); the resection-created defect was reconstructed with the outer table of split calvarial bone harvested from the same-side frontoparietal area measuring 3 \( \times \) 3 cm and fixed by absorbable plate (Fig. 1H). The harvested outer table was applied to the bony defect at the resected site on the forehead (Fig. 1I). Two months have passed with no problems (Fig. 1J).

PATIENT 2

A 51-year-old woman presented with an asymptomatic hard tumor in the right side of the forehead. The tumor, 2.0 \( \times \) 2.5 cm, grew gradually during a period of about 1 year. Plain radiograph showed a punched-out lesion in the right side of the forehead (Fig. 2A). Computed tomography clearly showed a honeycomb shadow in an intraosseous lesion in the frontal bone (Fig. 2B), and three-dimensional CT view shows a honeycomb mass (Fig. 2C). The inner table of the skull was intact, and a hemangioma of the skull was diagnosed. The tumor was resected en bloc. The bony defect was reconstructed immediately using calcium phosphate cement (Fig. 2D). Histopathologic examination showed a typical hemangioma of the skull (Fig. 2E). The postoperative course was uneventful. Four years have passed with no problems. No features suggestive of recurrence have been noted in the meantime.

DISCUSSION

The incidence of hemangiomas is about 0.5% to 1% of all benign skeletal tumors. It is usually found in the vertebral column. However, hemangioma of the skull is seen in about 10% of bony tumors that originate in the skull. Women are generally more affected in the ratio from 2:1 to 4:1. The peak incidence in terms of age is around the third to fifth decades. The lesion is often located in the frontal, parietal, or temporal bone as a solitary lesion. It is less common in the occipital, sphenoidal, or petrous bone. It usually grows slowly and invades the outer table, showing frontal or parietal bulk in the affected site. Sometimes the lesion grows inward and destroys the inner table of the skull, exposing itself intracranially. A hemangioma is histologically cavernous and capillary. Microscopically, there are multiple engorged vascular elements interspersed within thin-walled dilated spaces in the abundant trabecular bone. Patients usually complain of a painless bulk of the skull, and headache may at times accompany the complaint. Our 2 cases had no symptoms of headache, nor were there neurological findings. Only the bulk in the affected site was noticed.

Radiographic findings are crucial in making the diagnosis. A punched-out lesion will be seen on a plain view. A honeycomb shadow is also sometimes seen in a plain view, but the sunburst appearance and honeycomb shadow are typically detected in a tangential plain view. IFC unequivocally shows the honeycomb appearance, and the inner table of the skull is invaded, then it necessitates resection.

Curettage followed by covering of the lesion with alloplastic material is perhaps an optimal mode of treatment for hemangioma of the skull. But it is not usually sufficient to prevent recurrence. The tumor is benign, and it requires en bloc radical resection to ensure no recurrence. Also, as the tumor is located in the skull, a second operation should somehow be avoided. As complete resection is feasible, intracranial surgery is acceptable. In case a bony defect is created, reconstruction is carried out with autogenous bone, including calvarial bone. Alloplastic materials such as calcium phosphate cement and methylmethacrylate are alternatives. Some surgeons are reluctant to use those materials because they are foreign to the human system and have a risk of causing infection. As our technical strategies of materials for reconstruction, we organize a split calvarial bone graft if a defect is near the frontal sinus, and other technical strategies of materials for reconstruction, we organize a split calvarial bone graft if a defect is near the frontal sinus, and calcium phosphate cement if it is somewhat far from the sinus.

In our 2 cases, the postoperative course was uneventful, and no revision in the morphologic contour was needed. No recurrence was suspected in either case with a follow-up period of 2 months in the first case and of 4 years in the second.

REFERENCES