Magnetic Resonance Imaging of Calvarial Eosinophilic Granuloma with Pericranial Soft Tissue Reaction

—Case Report—

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Abstract

A 4-year-old girl presented with an eosinophilic granuloma in the cranial vault. Magnetic resonance (MR) imaging showed the mass as slightly low intensity on T₁- and high intensity on T₂-weighted images. The pericranial soft tissue was densely enhanced after gadolinium-diethylenetriaminepenta-acetic acid infusion. The mass was soft and successfully removed. Histological examination disclosed Langerhans' cell histiocytosis. MR imaging is useful for the diagnosis of calvarial eosinophilic granuloma with soft tissue involvement.

Key words: Langerhans' cell granuloma, eosinophilic granuloma, magnetic resonance imaging, bone tumor

Introduction

Eosinophilic granuloma of the bone is the localized and most benign form of Langerhans' cell histiocytosis, previously known as histiocytosis X. Magnetic resonance (MR) imaging is the accepted technique for preoperative evaluation of bone and soft tissue tumor, but MR imaging of skull lesion in eosinophilic granuloma is rare.^{2,8,9} Here we present a case of solitary eosinophilic granuloma involving the cranial bone with marked pericranial soft tissue reaction on MR imaging.

Case Report

A 4-year-old girl had a painless scalp mass in the right parietal bone which grew rapidly. Radiography revealed the mass as a round osteolytic lesion without sclerotic margins. MR imaging of the lesion showed the mass involving right parietal bone as low intensity on the T₁-weighted image, and high intensity with periosteal soft tissue reaction on the T₂-weighted image (Fig. 1). After intravenous injection of gadolinium-diethylenetriaminepenta-acetic

Fig. 1 left: Axial T₁-weighted magnetic resonance (MR) image showing a low intensity mass in right parietal bone. right: Sagittal T₂-weighted MR image showing a hyperintense mass (arrowheads) with pericranial reaction (arrows).

acid (Gd-DTPA), the mass was enhanced intensely together with the pericranial soft tissue and dura mater (Fig. 2).

The patient underwent surgery for total removal of the lesion. A dark red, soft mass without capsule was found occupying the defect of the bone. The

Fig. 2 Axial (left) and sagittal (right) T₁-weighted magnetic resonance images after intravenous injection of gadolinium-diethylenetriaminepenta-acetic acid showing the mass which is intensely enhanced with pericranial tissue (arrows), and dural surface (arrowheads).

boundary between the mass and the pericranium was indistinct, but the dura mater beneath the lesion was not involved. Histological examination disclosed the early phase of Langerhans' cell histiocytosis characterized by the proliferation of histiocytes intermingled with multinuclear giant cells.

Discussion

Eosinophilic granuloma most commonly presents as a solitary lesion in the cranium, most often in the calvarium of children and young adults who present with an enlarging painless scalp tumor. The diagnosis has been based on the radiographical osteolytic "punched-out" defect. Computed tomography more clearly defines the lytic lesion and also demonstrates the associated soft tissue component. MR imaging of eosinophilic granuloma shows relatively consistent characteristics: intermediate to high intensity on T₁, high intensity on T₂, and marked enhancement after Gd-DTPA infusion.^{2,3,6,7} Permeative areas in the bone with associated periosteal reaction are common radiographic manifestations of long bone involvement, but MR imaging of the skull lesion is rare.^{1-4,6}

There are three phases in the evolution of eosinophilic granuloma: incipient, mid, and late phases.⁵ In the early (incipient to mid) phase, the lesions tend to have aggressive patterns with periosteal lamination and poorly margined osteolytic lesions. Numerous inflammatory cells are usually present and periosteal soft tissue involvement is

seen. In the late phase, the lesion become more circumscribed and the cellular inflammatory infiltrate clears. Therefore, focal lesions surrounded by ill-defined bone marrow and soft tissue reaction as in our case are considered to represent periosteal inflammation in the early phase of eosinophilic granuloma. MR imaging is suitable for the demonstration of accompanying soft tissue mass or inflammation, and dural involvement in calvarial lesions. Monroc et al.⁶ reported that the size of soft tissue mass correlated well with the activity of the bony lesion.

Langerhans' cell histiocytosis should be considered when a scalp mass lesion exhibits rapid growth in children, and MR imaging should be performed to detect such cases of eosinophilic granuloma with soft tissue extension.

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