MRI Findings of Giant Plasmacytoma of the Calvarium

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ABSTRACT. We report two cases of giant plasmacytoma of the calvarium with the dural tail sign. Though the dural tail sign has been reported as a highly specific finding of meningiomas, the recent literature has described its appearance with other tumors, such as schwannomas, lymphomas, and metastatic brain tumors. Therefore,we reviewed 10 cases of plasmacytomas with a dural tail sign including our two cases and discussed the origin of dural tail signs. It was concluded that giant plasmacytoma of the calvarium is one of the entities that produces a dural tail sign.

Key words ① **dural tail sign** ② **MRI** ③ **plasmacytoma**

There are three types of plasma cell tumors : multiple myelomas, solitary bone plasmacytomas, and solitary extramedullary plasmacyotmas. The relationship of these tumors is unclear. It is well known that cases of plasmacytoma show punched-out lesions of cranium, but giant intracranial plasmacytomas are very rare. There have been few Magnetic resonance images (MRI) findings. The authors present MRI findings of a giant plasmacytoma of the calvarium and discuss those findings with regard to the published literature.

CASE REPORT

Case 1 :

A 65-year-old woman was admitted in May 1999 because of progressive mental disturbance and left hemiparesis of one month duration. X-ray films disclosed a giant right fronto-temporal osteolytic lesion. Computed tomography (CT) revealed a giant extradural mass with homogenous enhancement(Fig. 1A, B). Bone window CT showed a solitaly osteolytic mass (Fig. 1C). MRI showed the mass to be mainly isointense on both T1-weighted and T2-weighted images (Fig. 2A, B). Gadolinium-diethylenetriaminepentaacetic acid (Gd-DTPA) T1-weighted images revealed a mainly homogenously enhanced mass with linear enhancement in the dura (Fig. 2C). External carotid angiography showed tumor staining supplied by the bilateral middle meningeal arteries. The internal carotid angiography did not show tumor staining. Laboratory findings were normal. Of course, Bence Jones protein was negative and immunoelectrophoresis of serum proteins showed them to be within normal range. A preliminary diagnosis of an intraosseus meningioma was made. The patient underwent a wide right scalp incision and craniotomy. The outer layer of the fronto-parietal bone appeared partially destroyed by a tumor which was grayish and elastic. The tumor could separate easily from the dura, and it had not infiltrated the dura matter. The tumor was totally removed, and histological diagnosis

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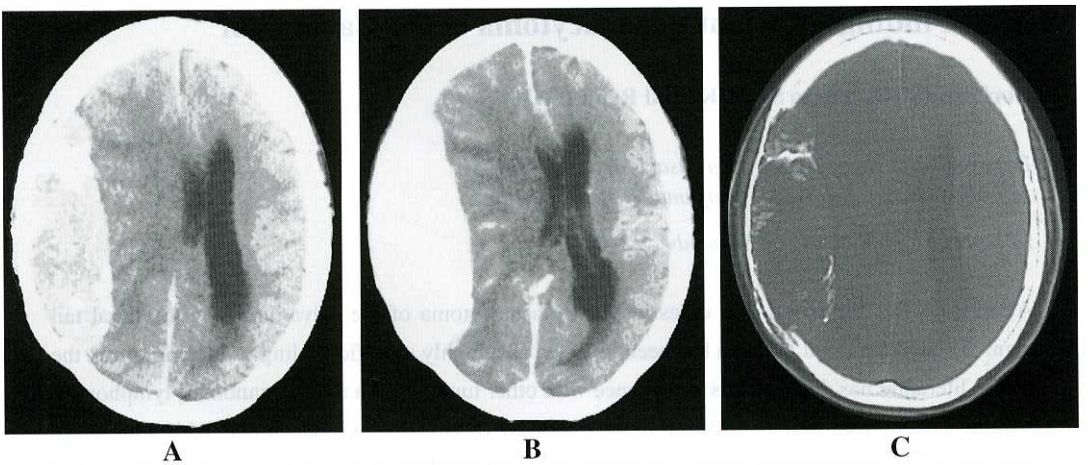

A B C

Fig. 1. CT scan. (**A**) A plain CT scan showing a giant high density mass in the right fronto-parietal region. (**B**) An enhanced CT scan showing marked homogenous enhancement. (**C**) A bone window CT scan showing an osteolytic lesion.

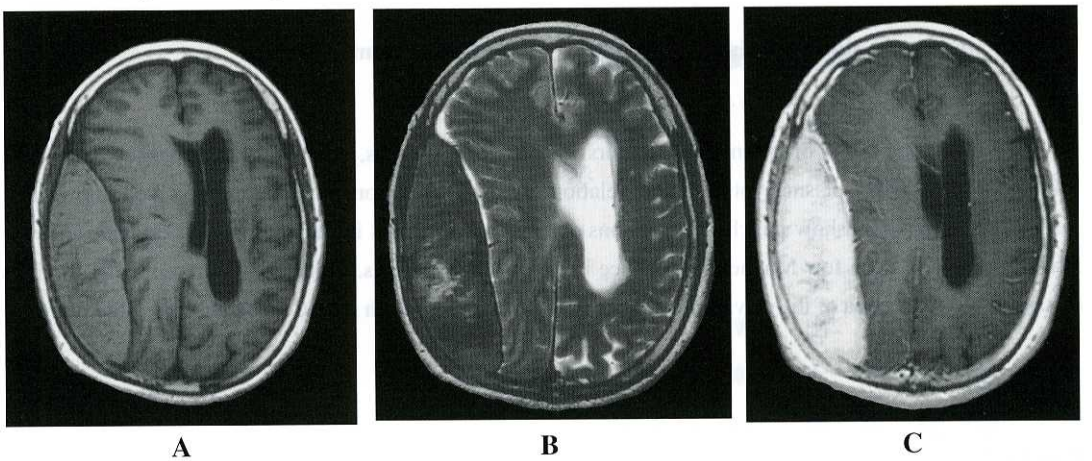

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Fig. 2. MRI on admission. (**A**) T1WI showing an isointensity mass. (**B**) T2WI showing an isointensity mass. (**C**) Gd-DTPA T1WI revealing marked enhancement and the dural tail sign.

showed it to be a plasmacytoma. Immunohistochemical staining of neoplastic plasma cells revealed diffuse IgA and kappa light chain antibodies. The patient did not undergo either postoperative radiotherapy or chemotherapy, and her symptoms were completely gone at discharge. There has been no recurrence , during the four years following her initial diagnosis.

Case 2 :

A 52-year-old man was diagnosed with multiple myeloma in April 1992, but he did not receive any treatment at that time because there were no symptoms. A bone marrow biopsy revealed neoplastic plasma cells with IgG and the kappa light chain. In October 1994, he complained of diplopia. Neurological examination on admission showed an ocular movement disturbance, exophthalmos, and impairment of visual acuity. X-ray films disclosed a giant left frontal osteolytic lesion. CT revealed a left extradural mass with strong homogenous enhancement. Bone CT revealed a solitary osteolytic mass. MRI showed the mass to be isointense on both T1-weighted and T2-weighted images. Gd-DTPA T1-weighted images disclosed a

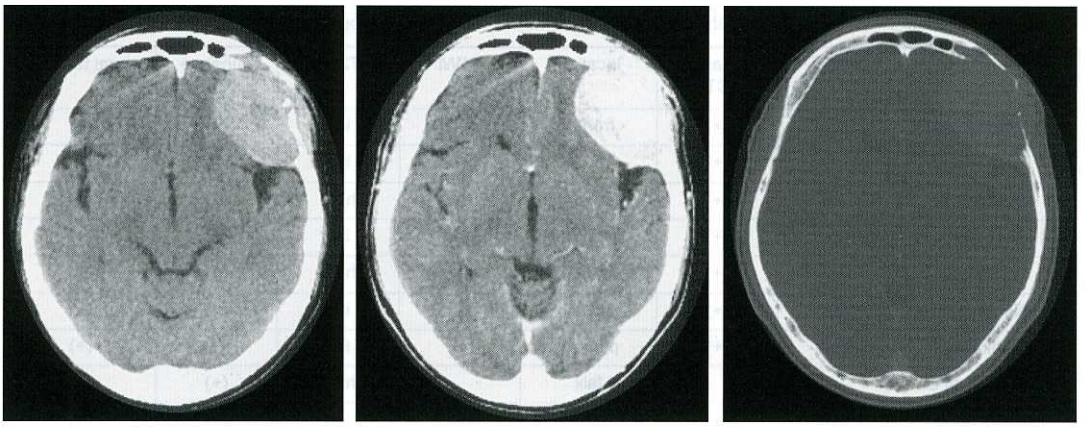

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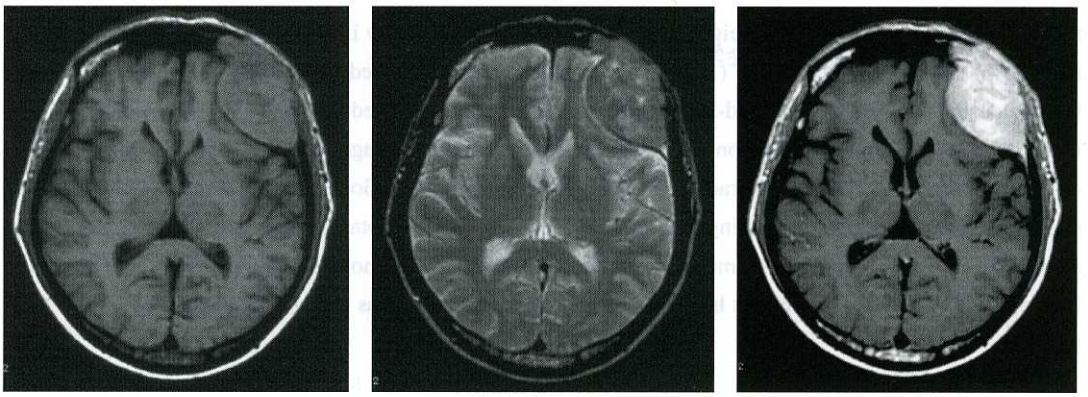
Fig. 3. CT scan. (**A**) A plain CT scan showing a slightly high density mass in the left frontal region. (**B**) An enhanced CT scan showing marked homogenous enhancement. (**C**) A bone window CT scan showing an osteolytic lesion.



A B C

Fig. 4. MRI on admission. (**A**) T1WI showing an isointensity mass in the left frontal region. (**B**) T2WI showing an isointensity mass. (**C**) Gd-DTPA T1WI revealing marked enhancement and the dural tail sign.

homogenously strongly enhanced mass and a dural tail sign. He received radiation therapy and chemotherapy. This therapy was effective and the tumor was reduced, but he died from pneumonia in February 1996.

DISCUSSION

Both immune serum examination and neuroradiological findings are important in making a diagnosis of giant plasmacytoma of the calvarium. We presented the neuroradiological findings of our two cases. CT revealed a slightly high density osteolytic mass and strongly homogenous enhancement. T1-weighted and T2-weighted images showed isointensity in most of the tumor. Gd-DTPA T1-weighted images showed homogenously strong enhancement and a dural tail sign. A summary of the neuroradiological findings of our two cases and eight other cases of giant plasmacytoma of the calvarium reported in the literature are presented here (Table 1)[2),9)~13),16),17)]. CT revealed a high density mass in three cases (43%) and an isodensity mass in four (57%). Enhanced CT showed strong enhancement in all of the cases. MRI provided more information

Table 1. Plasmacytoma of the calvarium. Summary of the neuroradiological findings of 10 cases.

	P-CT	enhance CT	location	T1WI	T2WI	enhance MRI	dural tail sign
Matsuda et al	high	(+)	frontal	iso	iso	(+)	(+)
Tanaka et al		(+)	frontal	iso	iso	(+)	(+)
Okuno et al	iso	(+)	parietal	iso	high	(+)	(+)
Sato et al	iso	(+)	temporal	high	iso	(+)	(+)
Anada et al		(+)	frontal	high	high	(+)	(+)
Nakai et al	iso	(+)	frontal	iso	iso	(+)	(+)
Yanaka et al	high	(+)	parietal	low	iso	(+)	(+)
Ceslovas et al			falx		high	(+)	(+)
Present case 1	high	(+)	frontoparietal	iso	iso	(+)	(+)
Present case 2	iso	(+)	frontal	iso	iso	(+)	(+)

than CT about such tumors. T1-weighted images revealed low intensity in six cases (67%), high intensity in two (22%) and isointensity in one (11%). T2-weighted images showed isointensity in 7 cases (70%) and high intensity in three (30%). Gd-DTPA T1-weighted images showed homogenous enhancement. It is useful to know the tumor infiltration area. Gd-DTPA T1-weighted images showed the dural tail sign in all cases. The dural tail sign is a characteristic finding of meningioma. Goldsher et al described the dural tail sign in 60% of their cases of meningioma[5]. However, Bourekas, Gupta, Lunardi and Tien reported that it also appears in schwannomas, metastatic tumors, superficial glimomas, chloromas, sarcoidosis and lympomas[4),6)~8),14),15)]. This report has shown that giant plasmacytomas are also characterized by the dural tail sign.

The origin of the dural tail sign is controversial. Goldsher et al did not detect tumor infiltration into the dural tail in their cases of meningioma[5]. In our case 1, there were no tumor cells in the dura and the dural tail disappeared after total removal of the tumor. At least in Case 1, tumor infiltration was not related to the dural tail sign. Other theories of origin include hypervascularity, vascular dilatation, and proliferation of loose connective tissue. This problem still remains unsolved.

In conclusion, T1-weighted and T2-weighted images showed isointensity in the majority of cases. Gd-DTPA T1-weighted images appeared to be especially useful in determining tumor extension. The dural tail sign is not a characteristic sign, but it is important for the diagnosis of giant intracranial plasmacytomas. We determined that the giant plasmacytoma is one of the entities which shows the dural tail sign, but could not clearly determine the origin of the dural tail sign.

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