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Primary diffuse large B-cell lymphoma of the dura mater and cranial vault

Case report and review of the literature

MARCELO GALARZA, M.D., ROBERTO GAZZERI, M.D., HAMED A. ELFEKY, M.D., AND ROBERT R. JOHNSON II, M.D.

Departments of Neurosurgery and Pathology, Sinai Grace Hospital, Detroit, Michigan; and Department of Neurosurgery, Azienda Hospital San Giovanni–Addolorata, Rome, Italy

✓Primary high-grade lymphoma of the dura mater and cranial vault has rarely been reported. The authors treated a 61-year-old man who presented with a slow-growing scalp mass that involved the cranial vertex. Magnetic resonance imaging revealed an oval mass of the dural type with peripheral edema in the bilateral parietal region, with attachment to the cranial vault and extension to the subgaleal space. After subtotal resection, pathological examination yielded a diagnosis of malignant large B-cell lymphoma. Twenty-three months postoperatively, after undergoing radiation therapy and chemotherapy, the patient is neurologically intact and without systemic dissemination of the malignancy. This is a case of primary malignant B-cell lymphoma of the dura mater with extensive involvement of the skull, which is a very rare event. Imaging-based diagnosis and combined therapy consisting of surgery, radiation therapy, and chemotherapy for the disease are discussed, and the literature on extraaxial malignant lymphomas is extensively reviewed.

KEY WORDS • B-cell lymphoma • extraaxial lymphoma • meninges • cranial vault

DIFFUSE large cell, mixed and immunoblastic lymphomas of B-cell origin can be considered together as aggressive lymphomas. Approximately 30% of cases originate in extranodal sites, particularly the gastrointestinal tract and the Waldeyer ring, but also in bone, skin, sinuses, eyes, ocular adnexa, gonads, the CNS, thyroid, and lungs.[2,8,10,17,23,27,35,37,40] In unselected series of cases the incidence of primary CNS lymphomas in brain tumors varies from 0.3 to 1%, and the entity constitutes approximately 1% of all lymphomas.[2,17,27,40] Within the CNS, these lymphomas have a predilection for the midline or paraventricular structures. Primary extraaxial involvement of large cell type B lymphoma is infrequent, with the worldwide literature containing only a few cases.[9,10,12,23,35–37,41] The precise anatomical location of the neoplasm reported here, without systemic manifestation, makes this case unique in its type.

Case Report

History and Examination. This 61-year-old man was admitted with generalized headaches, which had developed over a period of 3 months. His medical history was unremarkable. The patient's physical examination demonstrated no focal neurological abnormality other than a palpable biparietal mass involving the scalp. Admission CT scanning revealed a high-density extradural mass in the superior sagittal sinus invading the vertex and subgaleal space that was homogeneously enhanced after contrast administration. In addition, CT scans with bone windows revealed involvement of both cranial tables without osteolysis. No cerebral edema was in evidence. On MR imaging, the mass measured 13 × 8 × 2 cm. It was slightly hypointense on T_1-weighted and hyperintense to gray matter on T_2-weighted images. Tumor enhancement after administration of gadolinium was homogeneous. Associated swelling of the pericranium and subcutaneous tissue involvement were observed (Fig. 1). Downward displacement of a patent superior sagittal sinus was present. Based on the location of the lesion, precontrast signal intensities, and an additional lesion outside the cranium, a metastatic tumor rather than a typical meningioma was suspected.

Operation. The large excrescent mass was resected through a right parietal craniotomy with contralateral extension. The tumor was gray, firm, relatively avascular, and densely attached to the dura mater from which it arose. The adjacent bone was severely infiltrated in both cranial tables, with continuous infiltration of the galea and subcutaneous fatty tissue. Our diagnosis (based on evaluation of frozen sections) was poorly differentiated malignant neoplasm that we strongly suspected was a lymphoma.

Postoperative Course. The patient's postoperative course was uneventful and he recovered completely. Results of a radiographic skeletal survey were negative. Follow-up CT

Abbreviations used in this paper: CHOP = cyclophosphamide, doxorubicin, vincristine, and prednisone; CNS = central nervous system; CT = computed tomography; MR = magnetic resonance.

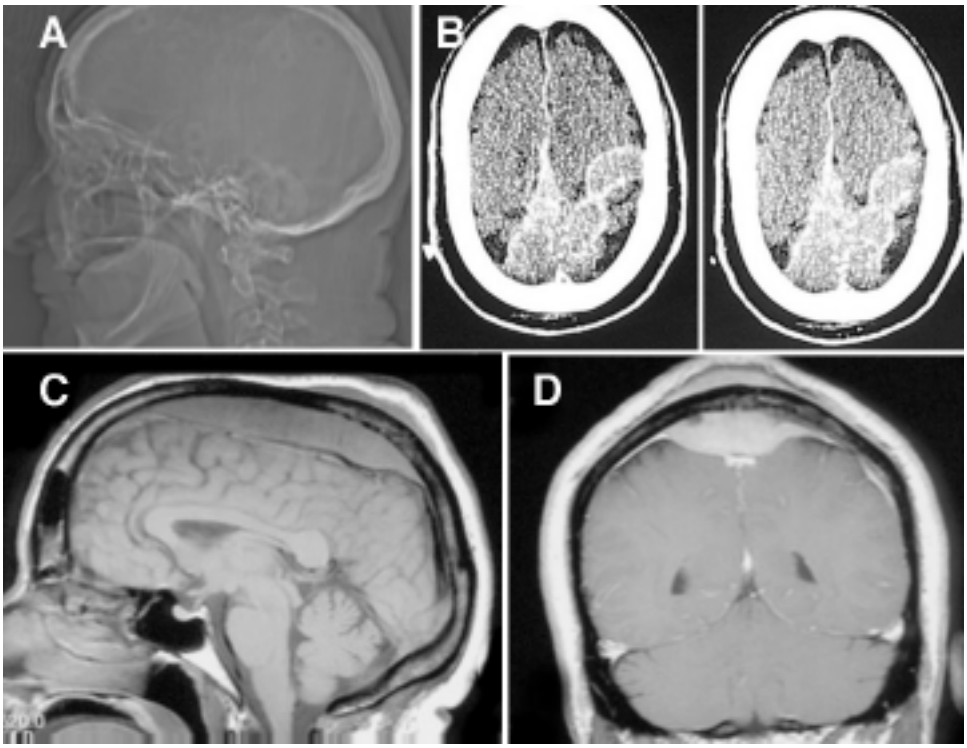

FIG. 1. Sagittal scout view (A) revealing no evidence of lytic or blastic lesions in the cranial vault. Head CT scans (B) obtained without addition of contrast material, demonstrating an extraaxial bilateral frontoparietal lesion involving the cerebral falx and meninges. Sagittal and coronal T1-weighted MR images obtained without (C) and with (D) gadolinium contrast, demonstrating a contrast-enhanced (in D), transcalvarial mass that permeates the diploic space and occupies the subgaleal space.

scanning of the chest, abdomen, and pelvis demonstrated no evidence of pathological entities. Assessment of a bone marrow aspirate yielded normal results.

Pathological Findings. On microscopic examination, the neoplasm was seen to be composed of atypical, moderately large, mitotically active, occasionally cleaved, pleomorphic lymphoid cells. The neoplastic cells were infiltrating and destroying osseous tissue. Tumor immunophenotyping was done using flow cytometric analysis (CD5, CD10, CD19, and CD20) and by histochemical evaluation of the lymphoid cells. These exhibited strong immunoreactivity both to leukocyte common antigen and to B-cell marker (L26). The nuclear staining proliferation index with Ki 67 (MIB-1 marker) exceeded 90% of tumor cells. No staining was noted for chromogranin, synaptophysin, or the epithelial markers AE1 and AE3. The final neuropathological report confirmed the diagnosis of a high-grade meningeal diffuse large B-cell lymphoma with extensive involvement of a marginal zone (Fig. 2).

Adjuvant Therapy and Outcome. After the pathological findings were reviewed, the patient was treated with CHOP chemotherapy every 3 weeks for six cycles. After that, fractionated whole-brain radiation therapy was delivered in 18 fractions of 180 cGy each. After treatment, the patient remained free of neurological symptoms. Head CT scans and MR images obtained 4 months after surgery and adjuvant therapy revealed no residual tumor. After a follow-up duration of 23 months, the patient is neurologically intact and has no systemic dissemination of the malignancy.

Discussion

The medical literature offers a wide variety of reported cases of extraaxial primary CNS lymphomas. Neverthe-

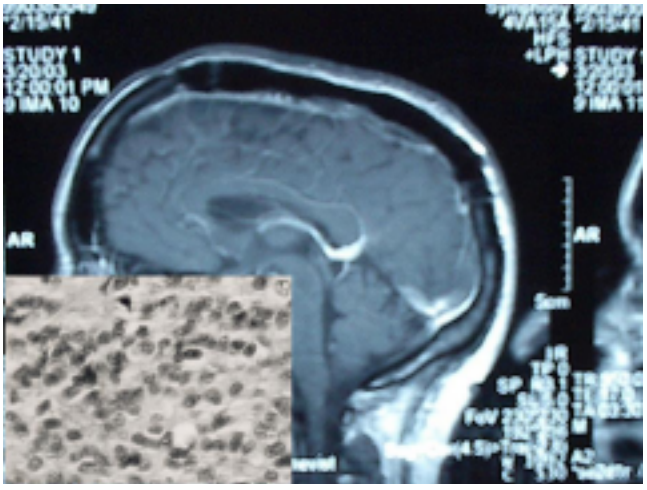

FIG. 2. Postoperative sagittal T_1–weighted MR image obtained after gadolinium administration demonstrating complete resection of the lesion. *Inset*: High-power photomicrograph showing the neuropathological features of a primary diffuse large B-cell lymphoma of the meninges and cranial vault. Large bizarre lymphoid cells can be seen in the right lower quadrant. H & E, original magnification × 40.

TABLE 1

*Literature review of primary meningeal high-grade B-cell lymphomas**

Authors & Year	Patient Age (yrs), Sex	Location of Lesion	Cranial Vault Involvement	Symptoms	Postop Treatment
Holtas, et al., 1985	60, F (Case 1)	lt frontal	yes	seizures, scalp mass	RT
Parekh, et al., 1993	65, F	lt parietal	yes	scalp lump	RT
Sato, et al., 1993	65, M	rt parietal	yes	scalp mass, hemiparesis	RT & chemo
Landys, et al., 1995	62, M	frontoparietal	yes	headaches	chemo
Paige & Bernstein, 1995	51, M	bilat occipital	yes	scalp mass, headaches	chemo & RT
	71, M	lt temporal			
Curty, et al., 1997	19, M	rt parietal	yes	scalp lump, headaches	chemo
Freudenstein, et al., 2000	50, F	bilat convexity	no	headaches, seizures	RT & chemo
Pardhanani, et al., 2000	77, M	lt orbitofrontal	yes	ocular proptosis	RT

* Chemo = chemotherapy; RT = radiation therapy.

less, after meticulous analysis of the reported cases (Table 1), we found that there are only a few with characteristics similar to the one reported here. Other reported cases included the following: 1) a similar type of lymphoma but in other extraaxial locations (that is, orbit,[35] Meckel cave,[1,5] parasellar,[34,40] zygoma,[32,35] or cerebellopontine angle,[8]); 2) a different subtype of lymphoma according to the clinical classification of non-Hodgkin lymphomas[2] (that is, T-cell,[28,29] mixed type,[4,11,22] noncleaved,[11,26,39] small cell type,[3,12,21,33,38] and low-grade [including mucosa-associated lymphoid tissue lymphomas])[14,19,20,24]; 3) other extraaxial lymphoid tumors;[6,7,13,15,18,30,42] and 4) nonspecified types of lymphomas in the reported cases.[16,25,31,40]

Lymphomas involving the skull may imitate meningiomas,[3,4] metastases,[29] or, less frequently, extradural abscesses with osteomyelitis[12,35] or extradural hematomas.[39] High-grade lymphomas involving bone are characterized by a permeative growth pattern and a large soft-tissue component in the extradural and galeal compartment; nonetheless, there may be limited destruction of cortical bone, as in the present case. Periosteal reaction is occasionally seen, especially when a soft-tissue mass is present. Metastatic carcinomas in the extraaxial CNS may show osteolytic bone lesions. Patients with chronic osteomyelitis usually demonstrate lytic bone lesions and systemic signs.[12,35,37] The most likely alternative entity to rule out is noncalcified meningioma, for which angiography is usually diagnostic. Meningiomas demonstrate a distinct pattern of contrast enhancement, and may have associated hyperostosis or calcifications.[4,12,17,41] The angiographic finding typical of lymphoma is an avascular tumor. A blush or vascular encasement of the mass seems to be rare.[16] In our case, as in previous reports, malignant dural lymphomas with extensive involvement of the cranial vault revealed a nonhomogeneous hyperdensity on MR imaging, lack of calcifications on CT scanning, and dim contrast enhancement on both imaging modalities.

Therapy for intermediate- to high-grade non-Hodgkin lymphomas in localized extranodal presentations of less than 10 cm can be successfully managed by three cycles of an adriamycin-containing regimen (CHOP protocol) followed by radiation therapy in the involved field. Other approaches include a full course of aggressive chemotherapy with or without subsequent radiation therapy, and radiation therapy alone in carefully selected cases.[2] In our case, the tumor seems to be controlled with the aforementioned combination therapy.

Conclusions

Although it is extremely uncommon, primary malignant lymphoma should be considered in the differential diagnosis of scalp masses. This is especially true when a mass involves both dura mater and cranial bone, the patient has a painless clinical presentation, and the aforesaid imaging characteristics are observed. Nonetheless, the number of occurrences of this entity reported in the literature is too small to allow consideration of final conclusions.

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Address reprint requests to: Marcelo Galarza, M.D, Division of Neurosurgery, Villa Maria Cecilia Hospital, 48010, Cotignola, Rome, Italy. email: galarza.marcelo@gmail.com.