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CASE REPORT

Glioblastoma multiforme with metastasis to lung, bone, and chest wall: a case report

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Abstract

Glioblastoma multiforme (GBM) is a common brain tumor that rarely metastasizes extra-cranially. We present the case of a 40-year-old male with left temporal GBM who underwent craniotomy followed by radiotherapy and chemotherapy. Postoperative MRI scans at different time intervals demonstrated a good response. Eleven months after the initial diagnosis, there were no clinical or radiological signs suggesting recurrence. However, the tumor showed metastasis simultaneously to the chest wall, lungs, and bone, despite 2 cycles of chemotherapy. The patient developed paraplegia 14 months after the initial diagnosis and died due to systemic failure 19 months after diagnosis. Extracranial metastasis of GBM is extremely rare. We present the unusual case of a patient with GBM who showed simultaneous metastasis to the lungs, bone, and chest wall. The prognosis of patients with extracranial metastasis of glioblastomas is very poor, regardless of chemoradiotherapy. Newer approaches, such as immunotherapy and anti-angiogenic therapy, need to be further studied.

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Glioblastoma multiforme (GBM) is an aggressive central nervous system (CNS) neoplasm associated with poor survival. Extracranial metastasis is rare, with the reported instances attributed to leptomeningeal involvement, cerebrospinal fluid (CSF) dissemination, direct seeding through craniotomy defects or shunt catheters, and very rarely, lymphatic or hematogenous spread to distant organs [1]. However, sporadic cases of GBM metastasis have been reported over the years [2]. This report details the unique case of a patient with GBM who showed post-surgical metastasis to the chest wall, lungs, and bone without local brain relapse and demonstrated an unfavorable chemotherapeutic response.

Case history

A 40-year-old male complaining of pain in the right chest wall was admitted to our hospital. Twelve months prior, he had a craniocerebral injury, and a solitary large (49 × 35 × 31 mm) left temporal lobe tumor was detected in the MRI scan (Fig. 1). He underwent a craniotomy and tumor debulking with satisfactory postoperative MRI. Histological examination confirmed a diagnosis of glioblastoma with oligodendrocytoma components. Immunohistochemical analysis demonstrated positive in situ expression of GFAP, OLig-2, EMA, Ki-67 (70%), S-100, and Vimentin. Genotyping revealed that the tumor was IDH-1 (isocitrate dehydrogenase-1) wild type. The patient underwent gross tumor resection followed by radiotherapy (60 Gy/30) with concomitant (6 cycles) and adjuvant temozolomide-based chemotherapy.

Eleven months following the initial diagnosis, he complained of progressive low back pain. CT scan revealed a mass in the right chest wall (73 mm × 54 mm), indicating multiple lung metastases (Fig. 2). MRI showed thoracic spine metastases from the primary GBM. Emission computed tomography (ECT) showed

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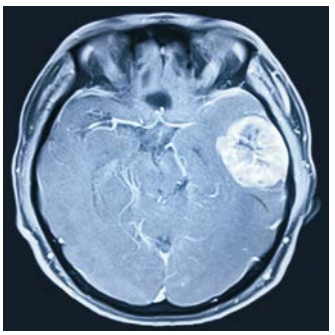

Fig. 1 Contrast-enhanced T1 brain MRI

metastasis to the right rib 4-10, T10 vertebra, right ilium, right sacroiliac joint, bilateral upper humerus, and right superior femur.

Percutaneous biopsy of the right thoracic wall mass confirmed the diagnosis of GBM metastasis. Immunohistochemical analysis indicated the following profile of the metastasized tumors: CD34+ (vascular), GFAP-, olig-2+ (individual cells), s-100+, EMA-, IDH1-, ATRX+, P53+, ki-67+ (50%), and CK-. The patient received 2 cycles of chemotherapy with paclitaxel and cisplatin.

Fourteen months after the initial diagnosis, the patient presented with physical weakness and urinary incontinence. CT revealed enlargement of chest wall mass and the progression of lung and bone metastasis (Fig. 3). Response Evaluation Criteria in Solid Tumors (RECIST) score for the patient was progressive disease (PD), despite 2 cycles of chemotherapy. The patient refused to receive radiotherapy for the thoracic spine and other anti-tumor treatment strategies. He was discharged after two weeks of best supportive care. Subsequently, he developed paraplegia and died due to systemic failure, 19 months after the initial diagnosis.

Discussion

GBM is the most malignant primary brain tumor with overall survival rates between 12-15 months [3]. Extracranial metastases from GBM are rare, with very few reports of lung [2, 4–5] and bone metastasis [5]. Furthermore, liver, lymph node, spleen, cardiac, orbit, meningeal, and surgical seeding/operative flap metastases have also been observed in some cases [6]. Davis [7] reported the first case of chest wall metastasis from GBM in 1928, but subsequent reports have been sparse. Our patient presented a rare case of GBM that exhibited simultaneous metastasis to the lungs, chest wall, and bone.

The overall paucity of documented extracranial GBM metastasis can be explained by the absence of cerebral lymphatics, early occlusion of veins, and short overall survival of the patients [2]. However, several cases of

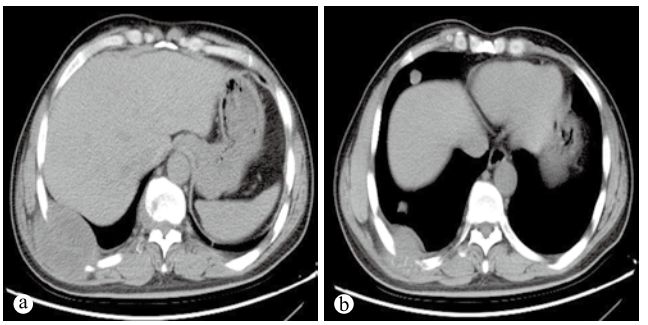

Fig. 2 Bone destruction on the right side of the 6th and 9th rib. Localized soft tissue mass and bone destruction in the 10th thoracic vertebra (a). Multiple tumor metastases in both lungs (b)

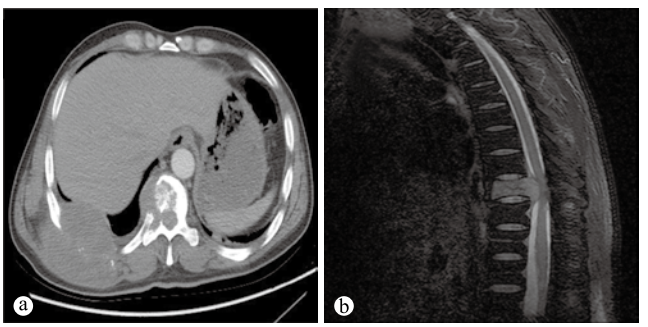

Fig. 3 CT revealed enlargement of the chest wall mass and thoracic spinal metastasis (a). MRI revealed tumor metastasis to the thoracic spine, compressing the spinal cord (b)

extracranial metastasis of GBM have been reported in recent years, which could be the likely result of the lymphatic spread of tumor cells during surgery [5] due to mechanical disturbance of the lymph nodes. The risk of post-surgery metastasis is aggravated if the tumor lies in a region with extensive venous drainage. Hematogenous spread of GBM is unusual as the thin-walled intracerebral veins would probably collapse from compression before tumor invasion [8]. However, circulating tumor cells (CTCs) have been detected in the blood of GBM patients [9],which significantly contribute to GBM metastasis [8]. As our patient showed simultaneous metastasis to the chest wall, lungs, and bone, the metastasis was considered the result of hematogenous spread.

Current recommendations for newly diagnosed glioblastomas are maximum safe resection, followed by fractionated localized radiotherapy with daily concomitant temozolomide and adjuvant temozolomide [3, 10]. However, there is no standard treatment at present for extra-neural metastasis of glioblastoma. We introduced 2 cycles of chemotherapy with paclitaxel and cisplatin on account of the extensive nature of metastasis seen in our patient, which unfortunately was ineffective. As he refused radiotherapy for the thoracic spine, it is unclear whether paraplegia could have been delayed

with radiation therapy. However, in a similar case report of a GBM patient with extensive spinal metastasis who accepted adjuvant radiotherapy for the cervical spine in addition to chemotherapy, anti-angiogenic therapy, and immunotherapy with pembrolizumab and bevacizumab, death occurred 13.8 months after the initial diagnosis[11].

Due to its highly aggressive nature, patients with glioblastomas have a poor prognosis, despite the use of radiotherapy and chemotherapy in patients who develop metastasis. The efficacy of immunotherapy and anti-vascular therapy require further study.

Conclusion

GBM metastases have become more frequent in recent years due to post-surgery lymphatic and hematogenous dissemination, in addition to the usual route of the CSF. We present a rare case of a patient with GBM who showed simultaneous post-surgery metastasis to the lungs, bone, and chest wall, and died 19 months after the initial diagnosis. Novel treatment guidelines and therapeutic strategies need to be developed for recurrent and metastatic GBM.

Conflicts of interest

The authors indicated no potential conflicts of interest.

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