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Case Report

Giant cell reparative granuloma of temporal bone: a case report and literature review

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Abstract: Giant cell reparative granuloma (GCRG) is a benign non-neoplastic lesion of bone that occurs mainly in the mandible and maxilla, but is also seen in the short tubular bones of feet and hands. The occurrence of GCRG in the cranium is rare. The cause of this disease remains unclear. The current study mentioned a case that a GCRG located in temporal bone in a 52-year-old male patient, who had exhibited progressive right temporal pain and hypacusia for 4 years. Non-contrast computed tomography imaging of the head revealed a soft tissue lesion with unclear margins located in the right temporal bone, as well as a wide bony defect. Magnetic resonance imaging showed a heterogeneously contrast-enhanced mass in the right temporal bone, which eroded into the temporal fossa. The lesion was completely excised and diagnosed as GCRG following the histological examination.

Keywords: Giant cell reparative granuloma, temporal bone, magnetic resonance imaging

Introduction

Giant cell reparative granuloma is a rare disease with variable behaviors and clinical presentations, ranging from large lesions with aggressive behaviors to small isolated lesions [1]. The pathogenesis was considered to be secondary to the inflammatory responding to injury. Previous findings showed that tissue destruction caused by the disease is not followed by repair; thus, it has been suggested that it should be regarded as giant cell granuloma. GCRG is classified by the location as central (occurring in bone) or peripheral (occurring in gingival soft tissues) and the incidence of benign lesions is 1-7%.

Patients with GCRG usually have localized disease that has an insidious natural clinical course, with solitary lesions identified incidentally. Symptoms may involve pain and local swelling lasting for several weeks. If sphenoid sinus is affected, the patient may suffer a frontal headache and diplopia. Temporal bone location may lead to hearing loss, vertigo and tinnitus. Microscopic examination reveals extravasated erythrocytes, an extensive amount of hemosiderin, and clusters of multinucleated giant cells within a scaffold for spindle cells [2]. Positive histological staining includes iron, CD68, and CD163.

The present study referred to the case of a 52-year-old male patient, whose right temporal bone had a GCRG lesion, and aimed to provide a clinical experience for the diagnosis and treatment of intracranial GCRG.

Case report

A 52-year-old male patient presented to the Department of Neurosurgery of the China-Japan Union Hospital of Jilin University (Jilin, China) in February 2014 with a 4-year history of aggressive swelling in the right temporal, and with a history of an injury to the right temporal owing to a car accident occurring in May 2010. The study was approved by the ethics committee of the China-Japan Union Hospital. The neurological examination found no deficits except for a painful lesion (6×5 cm) in the right temporal. Laboratory examinations found no abnor-

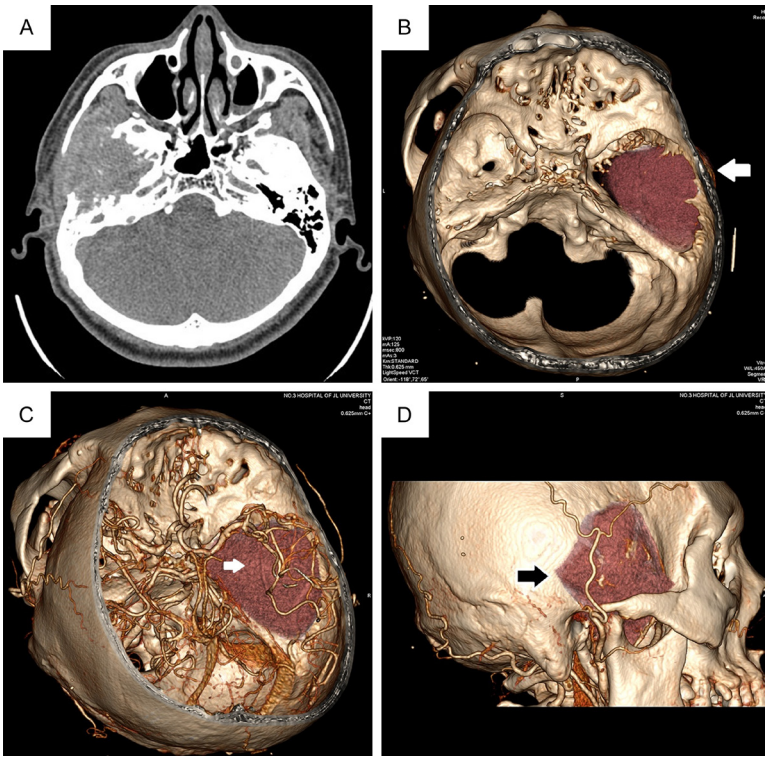

Figure 1. (A) Non-contrast computed tomography and (B) 3D-CT image revealing a soft tissue mass with unclear margins located in the right temporal bone, and a wide bony defect including part of the right sphenoid bone. (C and D) The 3D-CTA image of the head shows the lesion was associated with the right middle cerebral artery and superficial temporal.

malities. A soft tissue mass with unclear margins was identified in the right temporal bone using non-contrast computed tomography imaging. Scattered calcifications were detected in the tumor lesion. The mass invaded into the sphenoid bone. Bone window CT imaging revealed a wide bony defect, including part of the higher wing of the right sphenoid bone (**Figure 1A** and **1B**). The 3D-CTA imaging of the head showed the lesion was hypervascularized and associated with the right middle cerebral artery and superficial temporal (**Figure 1C** and **1D**). Magnetic resonance imaging revealed a heterogeneously contrast-enhancing mass close to the patient's right temporal lobe, with mixed high and low intensity on the proton density-weighted images, and extremely high intensity on the T2-weighted images (**Figure 2**).

The tumor of the temporal bone was resected from the patient, followed by right temporal craniotomy and total gross removal of the tumor. Following removal of the lesion, the lesion was founded to be entirely extradural but attached firmly to the dura. The lesion was utterly resected from the normal anatomical structures by using a surgical microscope.

Histological section of the tumor tissue stained with hematoxylin and eosin revealed the presence of multinucleated giant cells with 5-20 nuclei in the highly vascularized fibrous stromal background, along with abundant collagen bundles, hemosiderin deposits, lymphocytic infiltrates, and trabeculae of reactive bone. Immunohistochemistry of the tumor tissue revealed positivity for CD68, CD34, iron, and negativity for S-100, EMA, PR, GFAP, CK, P63, RCC, PAX-2, and the Ki-67 index was 5%. The tumor was pathologically diagnosed as GCRG (**Figure 3**).

The patient's postoperative course was uneventful. And during the 2-year follow-up period, no evidence of clinical or radiologic recurrence was found. We obtained written consent from the family of the patient for the publication of this case.

Discussion

In 1953, Jaffer HL first introduced the term 'giant cell reparative granuloma' (GCRG), which is derived from an inflammatory response due to intraosseous hemorrhage following trauma [3]. Facial and cranial skull bone involvement is rare, and in 1974 Hirschl and Katz presented the first case of GCRG originating in the temporal bone [4]. GCRG is a benign lesion presenting as a tumor with cortical thinning and local aggressiveness. When localized in the temporal region, symptoms including tinnitus, hearing loss, vertigo, and facial palsy occur [3]. Histologically, GCRG comprises a large number of multinucleated giant cells that cluster in a patchy distribution within a stroma of oval or spindle-shaped fibroblastic cells [5, 6]. GCRG also frequently contains foci of osteoid substance, hemosiderin deposits and hemorrhage [4].

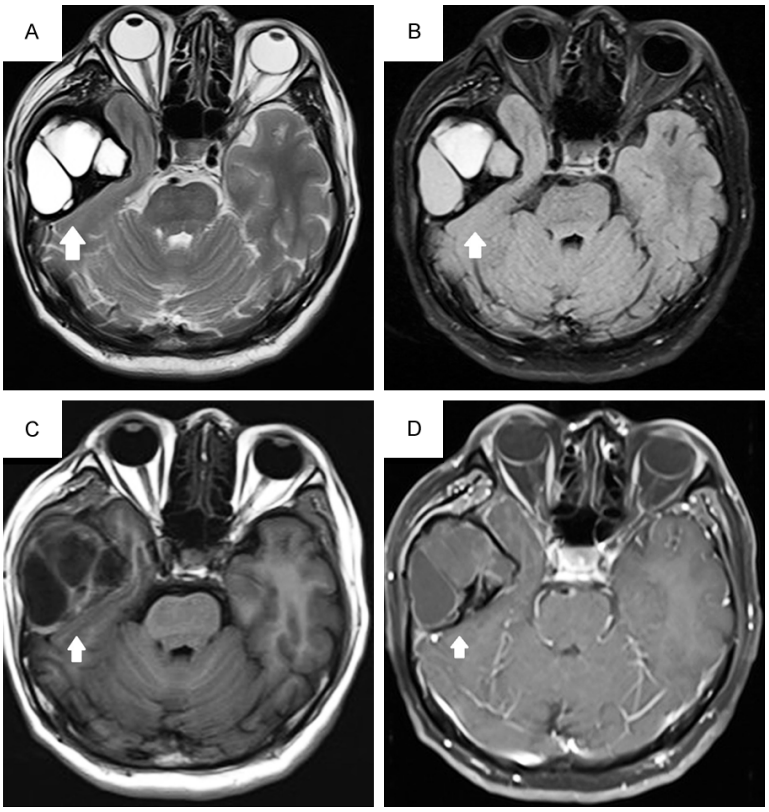

Figure 2. Magnetic resonance images showing the tumor as (A) high intensity in T2WI, (B) mixed high and low intensity on the proton-density-weighted image, (C) low intensity on the T1WI, (D) with heterogeneous enhancement by gadolinium on the T1WI.

The etiology of GCRG is controversial, and Jaffer first proposed that GCRG is a local reparative process due to a trauma-induced intraosseous hemorrhage. Based on this theory, when the bone has a trauma that causes bone tissue bleeding, macrophages migrate into the area to repair the damaged region. A GCRG is generated by the presence of excessive responsiveness. However, there are many patients with GCRG who deny any history of trauma. Infectious and developmental etiologies have also been reported [4]. Using immunohistochemistry, Maruno et al. found that no proliferative activity in the stroma was identified in GCRG. [7], suggesting stromal proliferation is a potential mechanism by which GCRG occurs. The patient, in this case, had a clear history of trauma, supporting the trauma theory of GCRG.

The preoperative diagnosis of GCRG without surgery is challenging. However, some investigators suggest that characteristic MRI findings involve a thick low T1- and T2-weighted signal rim with variable central signal [8]. Other lesions appearing on the radiograph also have similar imaging characteristics, including giant cell tumor (GCT), brown tumor of hyperparathyroidism, and aneurysmal bone cyst.

It is crucial that GCT is excluded because GCRG is similar with GCT in clinical manifestations and histological appearance. In comparison to GCRG, GCTs frequently occur in the long bones, and only 1% of cases were associated with skull, mainly located in the sphenoid and temporal bones [9]. GCTs present as single tumors and are more evident in the elderly (aged 60-80 years) [9]. Histology examination results show GCTs as multinuclear, ovoid or round, distributed in a more uniform manner, and no new bone formed. Compared to the GCRG, the GCTs have fewer foci of hemorrhage, and little hemosiderin deposition [10]. Mitotic cells and focal necrosis are present in GCTs, but not in GCRGs. Immunohistochemical analysis revealed that the p63 protein is strongly positive, which produces no critical findings in GCRGs [11]. Most importantly, GCTs recurs or has malignant transformation; thus, adjuvant radiation therapy is indicated, and where surgery and radiation therapy are not effective, chemotherapy becomes the mainstay of treatment [12].

The diagnosis of the brown tumor which is associated with hyperparathyroidism is based on clinical and laboratory findings, as this tumor is radiologically and histologically similar to GCRG and GCT. In the majority of cases, hypercalcemia and hypophosphatemia may appear incidentally on routine laboratory tests, and 85% of patients have an image of a parathyroid adenoma [12]. Treatment of brown tumor of hyperparathyroidism requires normalization of serum PTH, calcium, and phosphorus levels

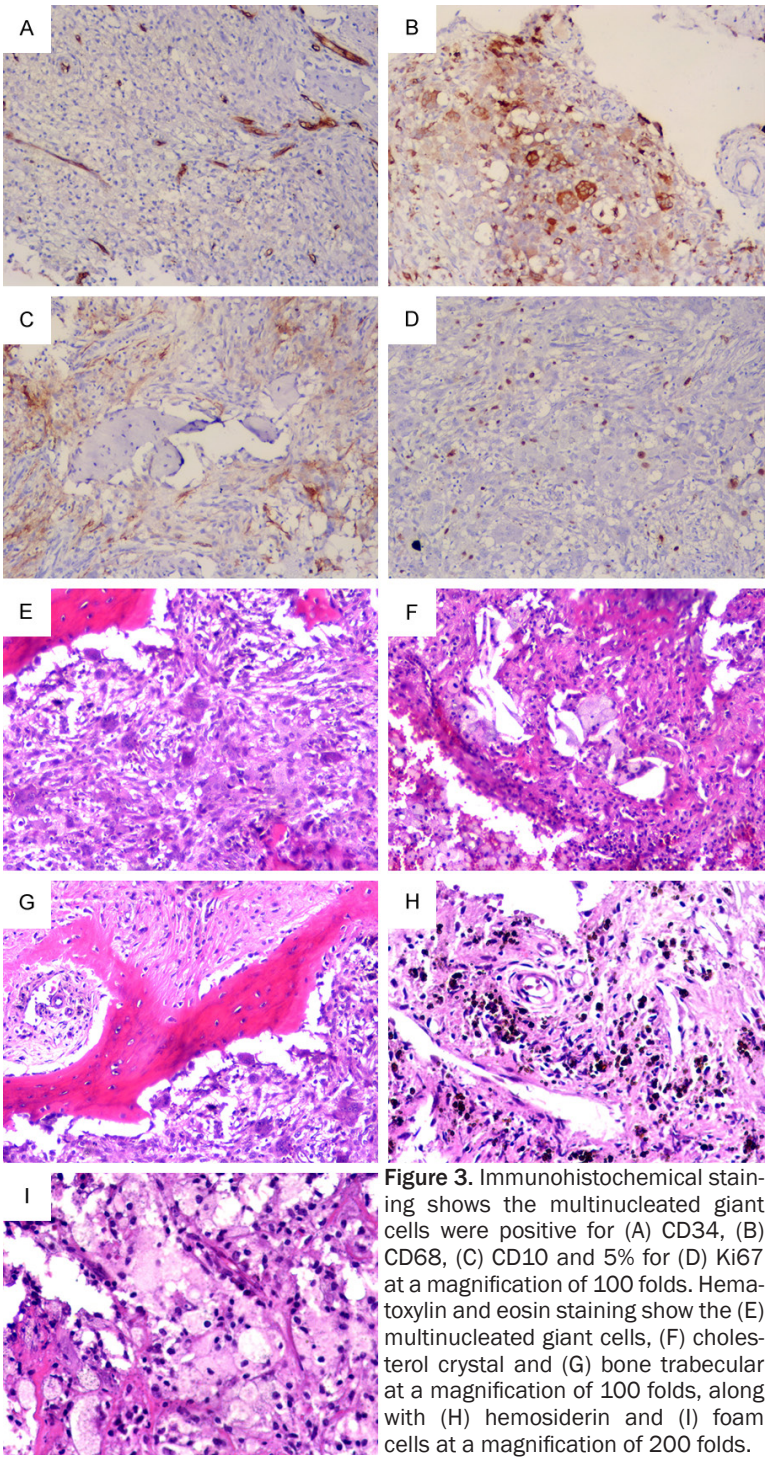

Figure 3. Immunohistochemical staining shows the multinucleated giant cells were positive for (A) CD34, (B) CD68, (C) CD10 and 5% for (D) Ki67 at a magnification of 100 folds. Hematoxylin and eosin staining show the (E) multinucleated giant cells, (F) cholesterol crystal and (G) bone trabecular at a magnification of 100 folds, along with (H) hemosiderin and (I) foam cells at a magnification of 200 folds.

prior to any surgical procedure. If the lesion continues to grow when the hyperparathyroidism has been controlled, surgical resection is imperative. The brown tumor will therefore not transform into malignant transformation [12].

Aneurysmal bony cyst (ABC) is a cyst with multinucleate giant cells with a similar histological appearance as GCRG. The major difference between ABC and GCRG is on the MR scan, where the former releases high signals on both T1- and T2-weighted sequences, and the GCRG gives only equal or reduced signals [8].

As long as a diagnosis of GCRG is made, surgical treatment remains the first choice. Previous literature on surgical treatment regarding GCRG is encouraging, with success of resection evidenced in 80% of cases, 10-15% of cases recurring, and no case experiencing malignant transformation. In addition to surgical resection, various pharmacological therapies for GCRGs have been reported [1]. Pharmacology agents that have been used successfully include intra-lesional corticosteroid injections and systemic treatment with calcitonin or interferon α-2 [1].

In conclusion, GCRG is a rare and non-neoplastic tumor of the bone. The diagnosis of GCRG is based on clinical presentation, history, radiation imaging, pathological findings, and the response to surgical resection. Surgical removal remains the first choice of treatment, along with pharmacological therapies such as corticosteroid injection or calcitonin, which are to be used when the tumor is considered aggressive. Prognosis is excellent with the correct treatment.

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Disclosure of conflict of interest

None.

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References

[1] de Lange J, van den Akker HP, Veldhuijzen van Zanten GO, Engelshove HA, van den Berg H and Klip H. Calcitonin therapy in central giant cell granuloma of the jaw: a randomized double-blind placebo-controlled study. Int J Oral Maxillofac Surg 2006; 35: 791-795.

[2] Triantafillidou K, Venetis G, Karakinaris G and Iordanidis F. Central giant cell granuloma of the jaws: a clinical study of 17 cases and a review of the literature. Ann Otol Rhinol Laryngol 2011; 120: 167-174.

[3] Boedeker CC, Kayser G, Ridder GJ, Maier W and Schipper J. Giant-cell reparative granuloma of the temporal bone: a case report and review of the literature. Ear Nose Throat J 2003; 82: 926-929, 933-924, 936-927.

[4] Hirschl S and Katz A. Giant cell reparative granuloma outside the jaw bone. Diagnostic criteria and review of the literature with the first case described in the temporal bone. Hum Pathol 1974; 5: 171-181.

[5] Katz A and Hirschl S. Giant cell reparative granuloma in the temporal bone. Arch Otolaryngol 1974; 100: 380-382.

[6] Ung F, Li KK, Keith DA and McKenna MJ. Giant cell reparative granuloma of the temporal bone: case report and review of the literature. Otolaryngol Head Neck Surg 1998; 118: 525-529.

[7] Maruno M, Yoshimine T, Kubo T and Hayakawa T. A case of giant cell reparative granuloma of the petrous bone: demonstration of the proliferative component. Surg Neurol 1997; 48: 64-68.

[8] Kim HJ, Lee HK, Suh DC, Choi CG, Kim JK, Lee JH and Cho KJ. Giant cell reparative granuloma of the temporal bone: MR findings with pathologic correlation. AJNR Am J Neuroradiol 2003; 24: 1136-1138.

[9] Menge M, Maier W, Feuerhake F, Kaminsky J and Pfeiffer J. Giant cell reparative granuloma of the temporal bone. Acta Neurochir (Wien) 2009; 151: 397-399.

[10] Orhan E, Erol S, Deren O, Sevin A, Ekici O and Erdogan B. Idiopathic bilateral central giant cell reparative granuloma of jaws: a case report and literature review. Int J Pediatr Otorhinolaryngol 2010; 74: 547-552.

[11] Bilodeau E, Chowdhury K and Collins B. A case of recurrent multifocal central giant cell granulomas. Head Neck Pathol 2009; 3: 174-178.

[12] Triantafillidou K, Zouloumis L, Karakinaris G, Kalimeras E and Iordanidis F. Brown tumors of the jaws associated with primary or secondary hyperparathyroidism. A clinical study and review of the literature. Am J Otolaryngol 2006; 27: 281-286.