Radiology Case Reports 17 (2022) 3830–3834

Available online at www.sciencedirect.com

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journal homepage: www.elsevier.com/locate/radcr

Case Report

A rare case of sphenoid giant cell tumor: Case report & review of imaging features post short-term denosumab treatment ☆

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ARTICLE INFO

Article history:
Received 1 July 2022
Revised 6 July 2022
Accepted 8 July 2022

Keywords:
Giant cell tumor
Sphenoid
Denosumab

ABSTRACT

Background: Giant cell tumors (GCTs) are locally aggressive but rarely malignant bone neoplasms that uncommonly involve the skull. In this report, we describe a tumor of the sphenoid sinus. *Case presentation:* A 51-year-old female was presented with headache, and bilateral decreased visual acuity, CT scan, and brain MRI revealed an infra-sellar enhancing tumor expanding to the sellar and supra-sellar region which proved to be a GCT. the patient had received 03 months of preoperative denosumab-based treatment and imaging follow-up showed regression in size and morphology modifications of tumor tissue. *Conclusion:* This is one of few reports to describe the appearance of sphenoid bone GCT, and the first report to highlight the effects of short-term denosumab treatment in GCTb in such a location.

Abbreviations: GCTb, Giant cell tumor of bone; PR, Pulse rate; RR, Respiratory rate; CBC, Complete blood count; MRI, Magnetic resonance imaging; T1-WI, T1 Weighted images; T2-WI, T2 Weighted images; MDT, Multidisciplinary team; RECIST, Response Evaluation Criteria in Solid Tumours.

☆ Competing Interests: The authors declare that there is no conflict of interest.

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https://doi.org/10.1016/j.radcr.2022.07.040

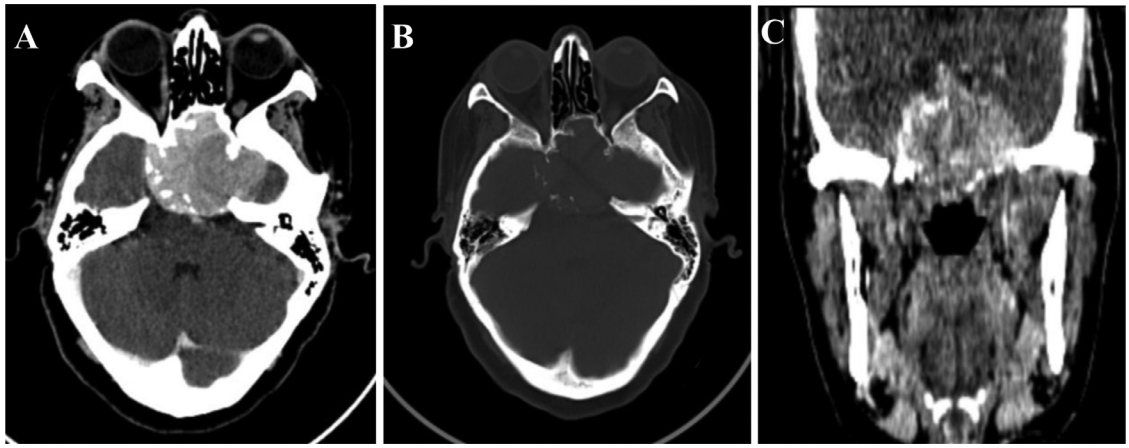

Fig. 1 – Axial enhanced Brain CT scan (A: Brain window, B: Bone window), (C) Cornal reformation revealing a large expansile and lytic lesion filing the sphenoid sinus with invasion to the adjacent sellar and suprasellar region.

Introduction

Giant cell tumors of bone (GCTb) are mostly benign and locally aggressive neoplasms that arise in the epiphyses of long bones [1]. GCTb account for 3%–5% of primary bone tumors.

Of these, less than 1% occurs in the head and neck, especially the sphenoid and petrous temporal bones [1]. This type of tumor frequently occurs in the second and third decades of life and is predominantly female [2]. Symptoms vary depending on the size and location of the tumor and may include headache, cranial nerve palsy, and diplopia [3].

Due to the rarity of primary skull base GCTb, standard treatment regimens remain unclear and debatable. Even with advances in endoscopic surgical techniques, complete resection is often not achievable without compromising function [4]. The recent use of DENOSUMAB, a human monoclonal antibody that inhibits osteolysis is proving useful in reducing tumor burden and preventing tumor recurrence. Although there are many literature resources describing imaging features after long-term treatment with denosumab, this report represents the first one reporting imaging findings after short-term treatment of a GCTb that affects the skull base.

Case Presentation

A 51-year-old female without medical or surgical history suffering for about 8 months before admission from headaches of increasing intensity, refractory to medical treatment, with a bilateral decrease in visual acuity and recent diplopia. On examination the temperature was 36.5 (oral), BP: 125/70, PR: 77, and RR: 16. Ophthalmological examination showed a decrease in visual acuity and sixth nerve palsy on the right; No visual field abnormalities, corneal reflexes, or papilledema were observed. Testing of other cranial nerves, and remaining motor and sensory neurological examinations, was normal. The laboratory findings including complete blood count (CBC), biochemistry, thyroid, and pituitary function, were all within the normal range.

Contrast-enhanced computed tomography scan of the brain was performed, demonstrating an enhancing large mass occupying the sphenoid sinus and expanding into the sellar and suprasellar region measuring about 5 × 4.6 × 3.9 cm, the mass involved ethmoidal air cells anteriorly, it had eroded the clivus and extended up to prepontine cistern and displacing the basilar artery backward without compressing the brain stem, laterally it encases the cavernous sinuses and internal carotid arteries (ICA) (Fig. 1).

Given the sellar and supra-sellar location of the tumor, some diagnoses were initially suggested, especially pituitary macroadenoma, craniopharyngioma, atypical meningioma, or even a bone tumor (chordoma, chondrosarcoma), the decision was to complete the investigations with a brain MRI.

Initial gadolinium-enhanced MRI scan reconfirmed the presence of a large mass exhibiting Isosignal on T1-WI, low signal intensity on T2-WI with a cystic component, and heterogeneous enhancement (Fig. 2).

An endoscopic endonasal biopsy was performed, and the histopathological result described the presence of multinuclear components of large cells with abundant cytoplasm and multiple round nuclei, in favor of a GCTb.

The approach of the multidisciplinary team was to start denosumab treatment before surgery. Therefore, she received 120 mg given as a single subcutaneous injection once every 4 weeks, simultaneously she started taking 4000 IU oral vitamin D per day (initially her vitamin D level was 8 μg/l; normal range is 20-40 μg/l), and 1000 mg oral calcium. After 3 months, a new brain MRI was performed, to assess early therapeutic responsiveness. It showed a decrease in tumor size by 32%, which measures actually about 3.4 × 3.9 × 3.6 cm (which is sored as a partial response according to RECIST criteria) with noticeable changes in tumor tissue on both T1 and T2 WI illustrated in Fig. 3. Regarding these results, surgery was planned.

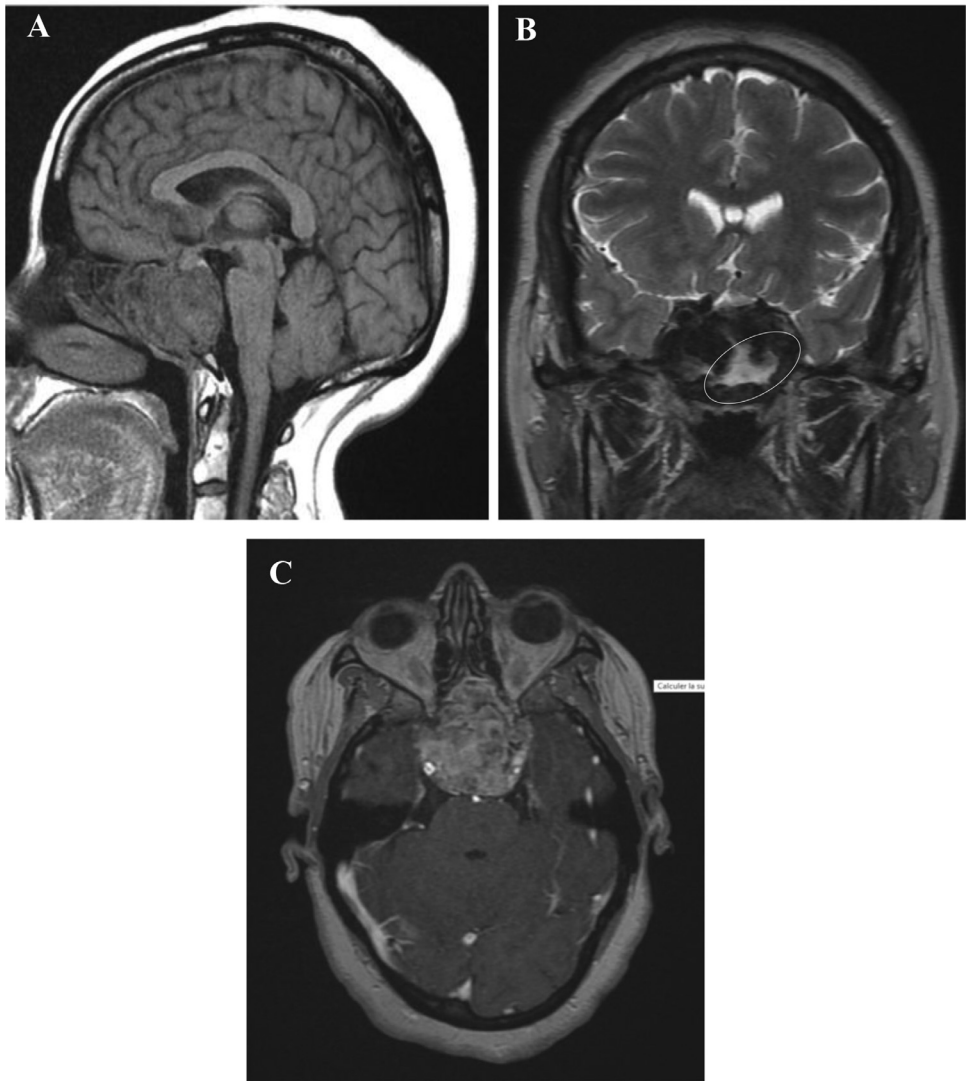

Fig. 2 – Initial MRI scan: A (Sagittal T1), B (Coronal T2), C (axial T1 C+) showing the extensions of a sphenoid mass (white arrow), with low signal T2, isosignal T1 and heterogeneous enhancement post-administration of contrast agent. Note the large cystic component on T2-WI (white circle).

Discussion

Giant cell tumors account for 3%-7% of bone tumors and 90% of them involve the epiphyses of long bones such as the distal femur and proximal tibia [5]; they are rarely found in the skull. Most reported cases of GCT of the skull involve the sphenoid and temporal bones. This can be attributed to the fact that tumorigenesis occurs in the endochondral bone instead of the intramembranous bone [6]. The most common clinical manifestations in this location are headache, visual disturbances such as diplopia, and cranial nerve palsies [7].

Radiological features on their own are insufficient to make an accurate preoperative diagnosis: enhanced CT scan shows an expansive lytic lesion with an epicenter in the infra-sellar fossa, and can detect with evidence tumor calcifications. MRI shows cystic and solid components usually iso or hypointense in T1 and T2, with heterogeneous enhancement post gadolinium administration [8]. The differential diagnosis must include a wide spectrum of pathologies including not only other bone tumors in this location (the famous "brown tumor" of hyperparathyroidism, eosinophilic granuloma, chordoma, and chondrosarcoma) but also sellar and supra-sellar lesions which may, if large, involve the sphenoid sinus [8]. In our case, as the final diagnosis depends on histopathology, the patient underwent an endonasal endoscopic biopsy which revealed GCTb.

Despite surgery being the gold standard of treatment for these tumors, Denosumab, a fully human monoclonal anti-RANK-L antibody, is a promising treatment option for advanced cases. Based on clinical trials and case studies, denosumab has been shown to control the tumor and reduce the stage of surgery in patients with GCTB [8]. Therefore, Denosumab was approved by the FDA in 2013 for the treatment of patients with GCTB considered inoperable, metastatic, or for whom surgery would result in major morbidity, [9].

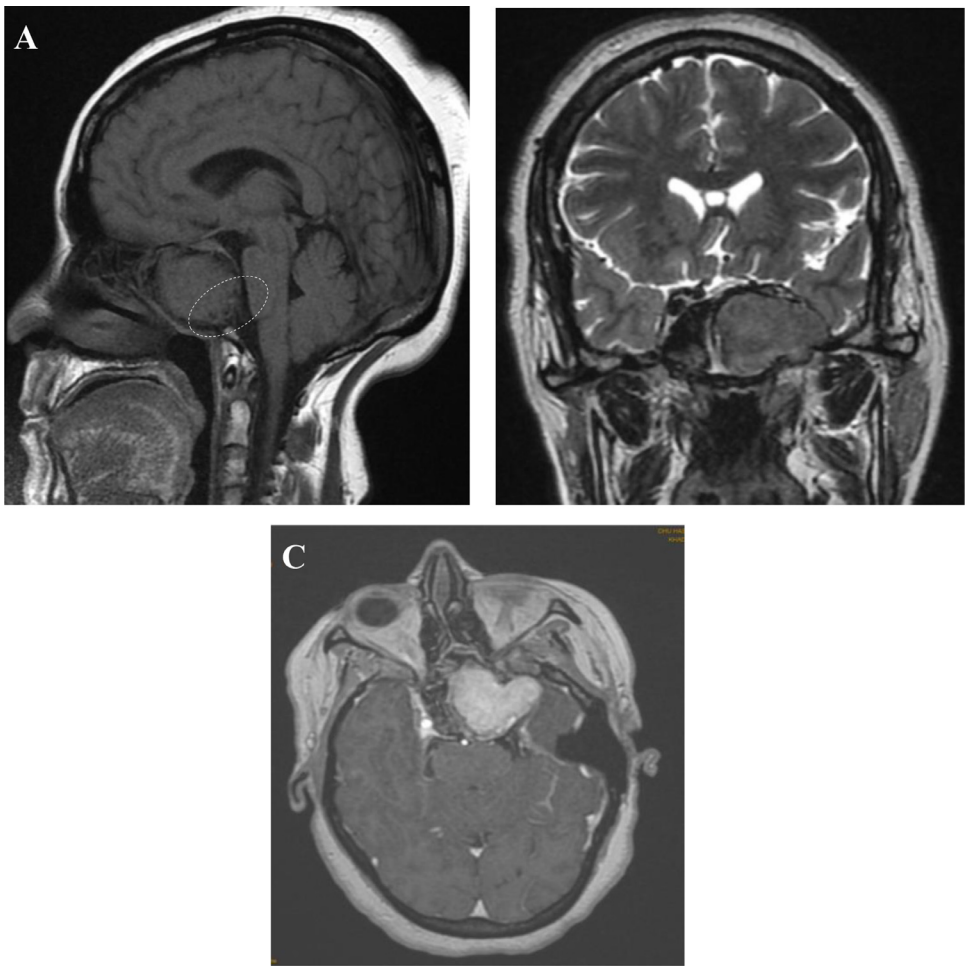

Fig. 3 – MRI scanning post 3 months denosumab treatement : A (Sagittal T1), B (Coronal T2), C (axial T1 C+) demonstrate regression in size of the sphenoid mass (white arrow), disparition of cystic component, calcified peripheral rim (circle), and increased density in both T1 and T2 WI.

To the best of our knowledge, no studies have been reported to demonstrate imaging changes after short-term treatment with denosumab in skull base GCTb. Previous studies evaluating the use of denosumab in long bones found that MRI is the imaging modality of choice to assess a decrease in size of a soft tissue component of GCTB, which may indicate a positive response to Denosumab. Oguro et al reported that the maximum tumor diameter, assessed on T2-weighted images, reduced by an average of 15% after 19 months of treatment [10]. Our patient showed a partial response according to the RECIST after only 3 months of treatment.

MR signal intensity is an important determinant in evaluating response treatment in GCTB. Previous studies have described that T1 signal intensity does not change significantly under treatment [10,11]. Our patient showed no modification on T1 WI which is also in keeping with the literature.

T2 signal intensity decreases under denosumab treatment with the formation of low-grade marginal sclerosis [12,13]. In our case there is also low-grade marginal sclerosis but the T2 signal was higher and more heterogeneous. According to an interesting study by von Borstel D and al. MRI can also show increased intralesional T2 WI heterogeneity, after short-term (6-8 weeks) denosumab treatment, and has been described and misinterpreted as disease progression [14]. These findings are not unusual and represent an adequate response to treatment.

GCTb lesions may exhibit central cystic areas, which decrease during treatment, Oguro et al. found that the size of cystic component decreased markedly in 80% of patients after treatment, related to the blocking effect of denosumab on RANKL and the resulting suppression of osteoclasts [15,16]. This finding was also observed in our case.

Conclusion

We conclude that the imaging criteria for reporting a therapeutic response in long bone GCT are the same as in our case involving a skull base bone. However, the decrease in tumor size was greater than that reported in the literature which may suggest a better therapeutic response to denosumab in this location. As our study is the first to address this issue, further studies are required to confirm this hypothesis.

Author's contribution

Aassouani farid is the corresponding author, he participated in the organization and writing of the article and studied the cases with GS. ***Badreeddine Alami*** supervised working and validated the figures. **Samia Arifi** followed up the patient in the oncology department. All authors read and approved the final manuscript

Patient consent

Written informed consent was obtained from the patient's legal guardian for publication of this case report.

Availability of data and materials

The data sets are generated on the data system of the CHU Hassan II of Fes.

REFERENCES

[1] Larsson SE, LoRENTZON RONNY, Boquist LENNART. Giant-cell tumor of bone. A demographic, clinical, and histopathological study of all cases recorded in the Swedish Cancer Registry for the years 1958 through 1968. J Bone Joint Surg Am 1975;57(2):167–73.

[2] Wolfe James T, Scheithauer Bernd W, Dahlin David C. Giant-cell tumor of the sphenoid bone: a review of 10 cases. J Neurosurg 1983;59(2):322–7.

[3] Bonet Hilda Bibas, Fauza RA, Lavado MG, Paez RO, Nieman j, et al.,↑ Garcin syndrome resulting from a giant cell tumor of the skull base in a child. Pediatr Neurol 2003;28(5):392–5.

[4] Balke Maurice, et al. Giant cell tumors of the axial skeleton. Sarcoma 2012;2012:411–14.

[5] Leonard Jeffrey, Gokden M, Kyriakos M, Derdeyn CP, Rich KM, et al. Malignant giant-cell tumor of the parietal bone: case report and review of the literature. Neurosurgery 2001;48(2):424–9.

[6] Isaacson Brandon, Berryhill Wayne, Arts HAlexander. Giant-cell tumors of the temporal bone: management strategies. Skull Base 2009;19(04):291–301.

[7] Murphey Mark D, Nomikos GC, Flemming DJ, Gannon FH, Temple HT, Krasndorf MJ, et al.,↑ Imaging of giant cell tumor and giant cell reparative granuloma of bone: radiologic-pathologic correlation. Radiographics 2001;21(5):1283–309.

[8] van der Heijden Lizz, et al. Giant cell tumour of bone in the denosumab era. Eur J Cancer 2017;77:75–83.

[9] Luengo-Alonso Gonzalo, et al. Denosumab treatment for giant-cell tumor of bone: a systematic review of the literature. Arch Orthop Trauma Surg 2019;139(10):1339–49.

[10] McCarthy Catherine L, et al. Giant celtumorur of the distal radius/ulna: response to pre-operative treatment with short-term denosumab. Clin Sarcoma Res 2017;7(1):1–11.

[11] Hakozaki Michiyuki, et al. Radiological and pathological characteristics of giant cell tumor of bone treated with denosumab. Diagn Pathol 2014;9(1):1–6.

[12] Oguro Sota, et al. Giant cell tumors of the bone: changes in image features after denosumab administration. Magn Reson Med Sci 2018;17(4):325.

[13] Von Borstel Donald, et al. Giant cell tumor of the bone: aggressive case initially treated with denosumab and intralesional surgery. Skelet Radiol 2017;46(4):571–8.

[14] Klenke Frank M, et al. Giant cell tumor of bone: risk factors for recurrence. Clin Orthop Relat Res 2011;469(2):591–9.

[15] Xu SF, et al. Denosumab and giant cell tumour of bone—a review and future management considerations. Curr Oncol 2013;20(5):442–7.

[16] Girolami I, Mancini I, Simoni A, Baldi GG, Simi L, Campanacci D, et al. Denosumab treated giant cell tumour of bone: a morphological, immunohistochemical and molecular analysis of a series. J Clin Pathol 2016;69:240–7. doi:10.1136/jclinpath-2015-203248.