

Review Article

# Unique presentation of occipital condyle giant cell tumor as occipital condyle syndrome – A review

Gowtham Matham<sup>1</sup>, Ganesh Divakar<sup>1</sup>, A. N. Deepti<sup>2</sup>, Bejoy Thomas<sup>3</sup>, H. V. Easwer<sup>1</sup>, Krishna Kumar<sup>1</sup>

Departments of <sup>1</sup>Neurosurgery, <sup>2</sup>Pathology and <sup>3</sup>Radiology, Sree Chitra Tirunal Institute of Medical Sciences and Technology, Thiruvananthapuram, Kerala, India.

## ABSTRACT

Giant cell tumors (GCTs) of the skull are rare and only a few case series with limited number of cases have been reported till date. In the cranium, GCT usually occurs in the sphenoid and temporal bone, occipital condyle GCTs are very rare. We report a rare presentation of GCT of the occipital condyle manifested as occipital condyle syndrome. Despite gross total resection, they can recur aggressively; the presence of cortical breach might be an indicator of aggressiveness prompting early post-operative imaging and adjuvant therapy.

**Keywords:** Occipital condyle, Giant cell tumor, Occipital condyle syndrome

## INTRODUCTION

Giant cell tumors (GCTs) are locally aggressive, destructive bony lesions, usually found in the epiphysis of long bones.<sup>[1]</sup> GCTs of the skull are rare, with a predilection for sphenoid and temporal bone;<sup>[2]</sup> occipital condyle GCTs are extremely rare. Occipital condyle syndrome (OCS) is characterized by continuous unilateral occipital headache, associated with ipsilateral hypoglossal nerve paralysis. Although there are very few reported cases of GCTs involving the occipital condyle, its presentation solely as OCS has never been reported.

## CASE SUMMARY

A 22-year-old girl presented to us with 3 months duration of insidious onset gradually progressive throbbing type of the right suboccipital headache radiating to the neck and aggravated with neck movements. After a few days, she noticed slurring of speech and deviation of tongue to the right side. Clinical examination was unremarkable except for the right lower motor neuron (LMN) hypoglossal palsy. Computed tomography of the skull showed an expansile lytic lesion involving the right occipital condyle with thinning and breach of the cortex. Magnetic resonance imaging (MRI) showed 2 × 2.4 × 1.6 cm intensely enhancing homogeneous mass in the right occipital condyle, with restricted diffusion, encroaching onto the right hypoglossal canal and jugular foramen, and suggesting an aggressive primary bony lesion. There was

no soft-tissue enhancement surrounding the lesion. She underwent far lateral approach and gross total decompression of the tumor, along with occipitoaxial instrumented stabilization in view of potential instability caused by the tumor involving the articular surface of the occipital condyle. Histopathology revealed a tumor composed of mononuclear round cells displaying moderate pleomorphism and few typical mitotic figures with several uniformly distributed osteoclast-like giant cells with reactive bone formation rendering a diagnosis of giant cell tumor [Figure 1a-h].

Postoperatively, the patient had good relief of headache with static neurological deficit as preoperatively.

At 3 months follow-up, the patient remained headache free, but a routine follow-up MRI showed evidence of large recurrent lesion extending to the clivus. The patient underwent adjuvant therapy with denosumab followed [Figure 1i-l] by radiation therapy. Follow-up imaging at 1 year showed stable residual lesion, the patient remained asymptomatic except for residual right hypoglossal palsy.

## DISCUSSION

GCTs are primary bone tumors that develop through endochondral ossification. Hence, they are frequently seen in the long bone epiphysis, constituting 5% of the primary bone tumors.<sup>[3]</sup> GCT in cranium and spine constitutes only <1%,<sup>[4]</sup> sphenoid being the most common, followed by petrous temporal,

\*Corresponding author: Ganesh Divakar, Department of Neurosurgery, Sree Chitra Tirunal Institute of Medical Sciences and Technology, Thiruvananthapuram, Kerala, India. [drganeshdivakar@gmail.com](mailto:drganeshdivakar@gmail.com)

Received: 18 December 2021 Accepted: 22 September 2022 Epub Ahead of Print: 29 December 2022 Published: 27 January 2023 DOI: 10.25259/JNRP-2021-8-27 (1975)

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms. ©2023 Published by Scientific Scholar on behalf of Journal of Neurosciences in Rural Practice

parietal, and frontal bones. This variation is due to the fact that sphenoid and temporal bone develops through endochondral ossification. Occipital GCTs are extremely rare, with only 11 case reports available in the literature [Table 1].<sup>[19-21]</sup> Most authors have reported cases presenting with occipital headache and no physical findings.<sup>[1,5-7]</sup> Opitz *et al.* have reported an occipital GCT in a case of von Recklinghausen's disease.<sup>[5]</sup> Kajiwara *et al.* presented a case of occipital GCT with neck pain, dysphoria, and dysphagia, who was treated with denosumab. Motomochi<sup>[2]</sup> reported a case involving the occipital condyle, with multiple cranial nerve palsies. Clinical data were not available in four cases. Our case of occipital condyle GCT has presented solely with OCS.

OCS, first described by Greenberg and Deck,<sup>[8]</sup> is characterized by continuous occipital headache, with radiating neck pain aggravated by neck movements away from the side of pain and relieved by rotation toward the side of pain.<sup>[9]</sup> Some patients may also have occipital tenderness. Usually, hypoglossal palsy manifests after the patient gets a headache. Metastases and primary skull base tumors are commonly associated with OCS in up to half of the patients. Metastases usually originate from the breast, lung, thyroid, gastrointestinal tract, pharyngeal tumors, lymphomas, and prostate.<sup>[10]</sup>

MRI and CT are the imaging modalities of choice. However, radiological features alone are not sufficient to diagnose GCT. It is challenging to differentiate skull base GCTs from other benign lesions such as brown tumors of hyperparathyroidism, giant cell reparative granuloma, cherubism, and aneurysmal bone cyst. Therefore, to avoid confusion, clinical, radiological, and pathological findings are to be correlated for the definite diagnosis of skull base GCT.<sup>[11]</sup>

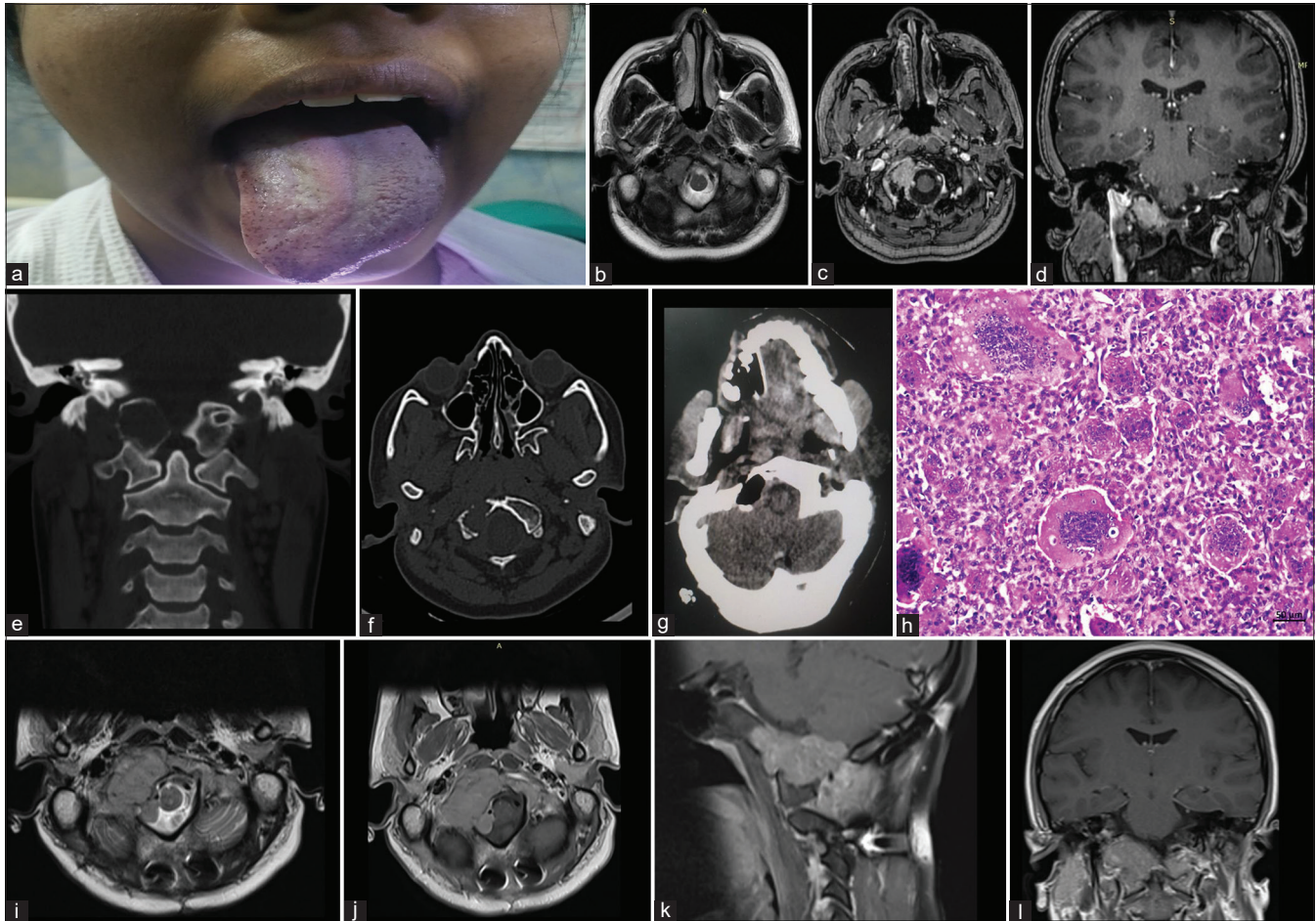
Campanacci and Baldini had designed a staging system for GCT, with Stage I tumors limited to bone but without cortical involvement; Stage II tumors involving the cortex but without cortical breach; and Stage III tumors that breach the cortex and extend into soft tissues.<sup>[12]</sup>

The treatment of choice for GCTs is *en bloc* resection of the tumor whenever feasible.<sup>[13]</sup> However, skull base GCTs are often not amenable to complete resection due to the proximity to critical neurovascular structures. Good local tumor control can be achieved by gross total resection. Recurrence rates are as high as 40–60% with subtotal resections.<sup>[14]</sup> As most of these data are available from surgical series of long bone GCTs, it is doubtful whether this can be extrapolated to similar lesions of the skull base. Moreover, due to rarity

**Table 1:** Cases of GCT involving occipital bone reported till date

Study	Age/sex	Clinical features	Region	Extent of resection	Adjuvant therapy	Recurrence
Troell <sup>[21]</sup> 1930	20/M	NA	Occipital	PR	No	NA
Arseni <i>et al.</i> <sup>[19]</sup> 1975	8/F	NA	Occipital	STR	No	NA
Motomochi <i>et al.</i> <sup>[2]</sup> 1985	53/M	Headache, dysphagia and dysarthria, 9,10,11, and 12 CN palsy	Occipital bone, condyle, hypoglossal canal, and clivus	STR	Yes (RT)	No (26 months)
Bertoni <i>et al.</i> <sup>[3]</sup> 1992	58/F	NA	Occipital	STR	No	Yes (died after 1.5 years)
	24/F	NA	Occipital bone with petrous and sphenoid bone	STR	Yes (RT)	No (7 years)
Optiz <i>et al.</i> <sup>[5]</sup> 1996	NA	NA	Occipital condyle	NA	NA	NA
Lu <i>et al.</i> <sup>[22]</sup> 2011	19/F	Headache and vomiting	Left occipital bone with petromastoid and temporal bone	GTR	No	No (1 year)
Zhang <i>et al.</i> <sup>[7]</sup> 2013	19/F	Headache and vomiting	Occipital	GTR	No	No (31 months)
Harris <i>et al.</i> <sup>[6]</sup> 2004	24/F	Headache, tenderness, external swelling	Occipital bone, along with dural involvement	GTR	No	NA
Gonca hanedan uslu <sup>[1]</sup> 2014	22/F	Neck pain, headache	Occipital bone with dural sinus involvement	STR	Yes (RT)	No (20 months)
Kajiwara and Takeshi <sup>[20]</sup> 2019	56/M	Right neck pain, dysphoria, and dysphagia	Right occipital bone with condyle	Biopsy	Denosumab	No (5 years)
Our case	22/F	Right occipital headache, right hypoglossal palsy	Occipital condyle	GTR	Yes (RT and denosumab)	Yes (1 year)

CN, cranial nerves; F, female; GCT, giant cell tumor; GTR, gross total resection; M, male; NA, data not available; PR, partial resection; RT, radio therapy; STR, subtotal resection.



**Figure 1:** (a) Clinical picture showing right LMN hypoglossal palsy, (b) pre-operative magnetic resonance imaging (MRI) T2 axial images showing hypointense right occipital condylar lesion, (c and d) post-contrast images showing enhancing mass in the right occipital condyle (axial and coronal respectively), (e and f) coronal and axial computed tomography image showing the lesion, (g) post-operative cavity and excision of the right occipital condyle lesion, and (h) tumor comprising mononuclear stromal cells interspersed with osteoclast-like giant cells (hematoxylin and eosin, original magnification  $\times 200$  and scale bar  $50 \mu\text{m}$ ). (i) Axial T2 MRI showing large hypointense recurrence in the right occipital condylar region and (j-l) post-contrast MRI showing moderately enhancing large recurrent lesion in axial, sagittal, and coronal planes, respectively.

of these cases, an optimal treatment strategy for skull base GCTs has not been described in the literature.

Histological grading is a poor predictor of clinical outcome. The radiological staging system by Campanacci and Baldini<sup>[11]</sup> neither delivers reliable prognostic value regarding recurrence rates or functional outcomes nor helps in deciding on the management options. Although some authors have reported Campanacci and Baldini Grade II/III tumor excision and soft-tissue involvement as factors underlying increased recurrence rates, convincing evidence for the same could not be established.<sup>[15,16]</sup> We assume that, in our case, cortical destruction is the probable underlying cause for this early aggressive recurrence despite the tumor being relatively small in size.

Adjuvant therapy can reduce the chances of recurrence. Furthermore, many forms of radiation therapy and various

chemotherapeutic agents were investigated in patients with unresectable tumors. Radiation therapy as a single agent was able to achieve control rates of up to 70–80%, but in the case of recurrent tumors, it was of limited response.<sup>[1]</sup> There were concerns of malignant transformations with radiotherapy but with newer highly conformal techniques of radiation, this seems to be insignificant.

Many chemotherapeutic agents such as doxorubicin, cisplatin, methotrexate, zoledronate, and raloxifene<sup>[17]</sup> have been tried. New target-based drugs are developed as the pathophysiology of GCT has been studied well. The neoplastic component of GCT is the stromal cell which overexpresses receptor activator of nuclear factor  $\kappa\text{B}$  ligand (RANKL), while the osteoclast-like giant cells express RANK. RANKL is a member of the TNF family of molecules which bind to the RANK receptor. Denosumab is a human-derived monoclonal

antibody against RANKL, which selectively binds human RANKL and inhibits osteoclast differentiation and osteoclast-mediated bone resorption. Results of a multicentric Phase II trial<sup>[18]</sup> regarding the usage of denosumab for the primary treatment as well as an adjunct in recurrent GCTs showed favorable risk-to-benefit ratio. Almost 99% of patients had a clinical benefit in either complete/partial reduction or non-progression. Denosumab (120 mg) is usually administered subcutaneously once every 4 weeks with additional loading doses on the 8<sup>th</sup> and 15<sup>th</sup> days. Three percentage of patients developed osteonecrosis of the jaw on prolonged denosumab treatment. Further studies are required to identify the optimal duration and dosage for minimizing complications.

## CONCLUSION

OCS may be the sole manifestation of GCTs of the occipital condyle, which is an extremely rare site for these locally aggressive lesions. A high index of suspicion and early imaging is necessary to detect these lesions before they produce cortical breach and encroach adjacent critical neurovascular structures. From our own experience and available literature data, we feel that cortical breach is a predictor of early recurrence in such lesions, despite gross total removal. However, despite large lesion size, adjuvant denosumab and radiation therapy may be helpful in maintaining symptomatic quiescence, especially in regions, where *en bloc* resection is not feasible. Further, long-term follow-up data from a sizeable number of such patients are required to develop a standard of care in skull base GCTs.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- Uslu GH, Canyilmaz E, Yöney A, Aydın S, Sahbaz A, Sari A. Giant cell tumor of the occipital bone: A case report and review of the literature. *Oncol Lett* 2014;8:151-4.
- Motomochi M, Handa Y, Makita Y, Hashi K. Giant cell tumor of the skull. *Surg Neurol* 1985;23:25-30.
- Bertoni F, Unni KK, Beabout JW, Ebersold MJ. Giant cell tumor of the skull. *Cancer* 1992;70:1124-32.
- Murphey MD, Nomikos GC, Flemming DJ, Gannon FH, Temple HT, Kransdorf MJ. From the archives of AFIP. Imaging

- of giant cell tumor and giant cell reparative granuloma of bone: Radiologic-pathologic correlation. *Radiographics* 2001;21:1283-309.
- Opitz H, Petersen D, Heiss E, Duffner F, Meyermann R. Giant cell tumor of the occipital bone in a case of von Recklinghausen neurofibromatosis. *Clin Neuropathol* 1996;15:226-30.
- Harris AE, Beckner ME, Barnes L, Kassam A, Horowitz M. Giant cell tumor of the skull: A case report and review of the literature. *Surg Neurol* 2004;61:274-7.
- Zhang Z, Xu J, Yao Y, Chu S, Cheng H, Chenet D, et al. Giant cell tumors of the skull: A series of 18 cases and review of the literature. *J Neurooncol* 2013;115:437-4.
- Greenberg HS, Deck MD, Vikram B, Chu FC, Posner JB. Metastasis to the base of the skull: Clinical findings in 43 patients. *Neurology* 1981;31:530-7.
- Liu MT, Lin GY, Lin CC, Cheng CA, Chen MA, Lee JA. Occipital condyle syndrome as an initial presentation of lung cancer: A case report. *Acta Neurol Taiwan* 2015;24:11-4.
- Harisankar CN, Vijayabhaskar R, Muthukumaran S, Kumar K. Occipital condyle syndrome caused by isolated bone metastases from thyroid cancer. *Indian J Nucl Med* 2019;34:48-50.
- Lee JA, Bank WO, Gonzalez-Melendez M, Olan WJ, Tabbaraet SO. Giant cell tumor of the skull. *Radiographics* 1998;18:1295-302.
- Campanacci M, Baldini N, Boriani S, Sudanese A. Giant-cell tumor of bone. *J Bone Joint Surg Am* 1987;69:106-14.
- Thomas DM. RANKL, denosumab, and giant cell tumor of bone. *Curr Opin Oncol* 2012;24:397-403.
- Tamura R, Miwa T, Shimizu K, Mizutani K, Tomita H, Yamane N, et al. Giant cell tumor of the skull: Review of the literature. *J Neurol Surg A Cent Eur Neurosurg* 2016;77:239-46.
- Balke M, Schremper L, Gebert C, Ahrens H, Streitbueger A, Koehler G. Giant cell tumor of bone: Treatment and outcome of 214 cases. *J Cancer Res Clin Oncol* 2008;134:969-78.
- Simon KS, Rout S, Lionel KR, Joel JJ, Daniel P. Anatomical considerations of cutaneous nerves of scalp for an effective anesthetic blockade for procedures on the scalp. *J Neurosci Rural Pract* 2023;14:62-9.
- Patibandla MR, Thotakura AK, Rao MN, Addagada GC, Nukavarapu MC, Panigrahi MK, et al. Clival giant cell tumor-a rare case report and review of literature with respect to current line of management. *Asian J Neurosurg* 2017;12:78-81.
- Chawla S, Blay JY, Rutkowski P, Cesne AL, Reichardt P, Gelderblom H, et al. Denosumab in patients with giant-cell tumour of bone: A multicentre, open label, phase 2 study. *Lancet Oncol* 2019;20:1719-29.
- Arseni C, Horvath L, Maretsis M, Carp N. Giant cell tumors of the calvaria. *J Neurosurg* 1975;42:535-40.
- Kajiwara Y, Takechi A, Watanabe Y, Miyoshi H, Shiraishi T. Giant cell tumor in the skull base bone treated with anti-rankl inhibitor. *Neurooncol Adv* 2019;1:ii38.
- Troell A. Zwei fälle von riesenzellentumor in Knochen beobachtet 3.5 bezw. 18 Jahre. *Acta Chir Scand* 1930;67:906-13.
- Lu ZH, Yao ZW. Giant cell tumour of the posterior cranial fossa: A case report. *Br J Radiol* 2011;84:e208-11

**How to cite this article:** Matham G, Divakar G, Deepti AN, Thomas B, Easwer HV, Kumar K. Unique presentation of occipital condyle giant cell tumor as occipital condyle syndrome – A review. *J Neurosci Rural Pract* 2023;14:3-6.