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Case report

Supratentorial extraventricular ependymoma presenting calvarial erosion: A report of 3 cases ☆,☆☆,★,★★

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ABSTRACT

Calvarial erosion is an infrequent manifestation associated with oligodendrogliomas, astrocytomas, dysembryoplastic neuroepithelial tumors, astroblastomas, glioblastomas, and meningiomas. Anaplastic ependymoma (AE), a rare malignant form of ependymoma, commonly results in poor prognosis. During the last 12 years, six patients were diagnosed with supratentorial ependymomas. All of them were AEs with extraventricular location identified in the right parietal, left parietal, and left frontal lobes, respectively. Three of them, 7-, 15, and 17-year-old male patients, presented focal calvarial erosion with smooth contour. Calvarial erosion may be a diagnostic hallmark of supratentorial AEs.

Introduction

Calvarial erosion is an infrequent manifestation of primary brain tumors that has been documented in association with oligodendrogliomas, astrocytomas, dysembryoplastic neuroepithelial tumors, astroblastomas, glioblastomas, and meningiomas [1-6]. Ependymomas are a distinct entity of glial tumor. They typically arise in the posterior fossa, while infrequently found in the cerebral hemisphere as large, cystic, and calcified masses that are extraventricular in location [7,8]. Anaplastic ependymoma (AE) is a malignant form of ependymoma with poor prognosis [9]. To our knowledge, no study has documented anaplastic ependymoma-associated calvarial erosion [7-9]. During the last 12 years, six patients were diagnosed with supratentorial ependymomas. All of them were anaplastic ependymomos (AEs) extraventricular in location. Three of the six patients presented focal calvarial erosions. Here we present these three AE cases with calvarial erosion.

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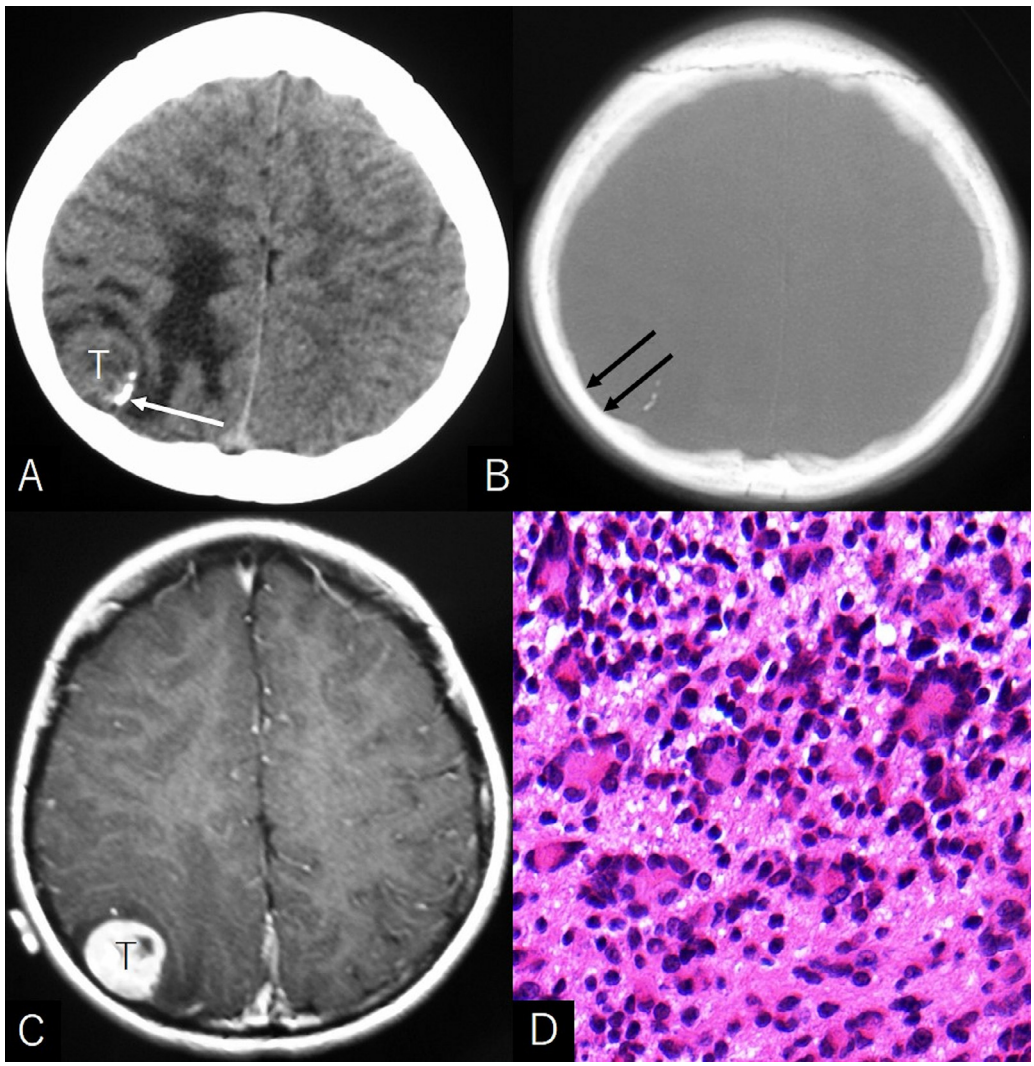

Fig. 1 – Axial computed tomography (*A*, *B*) and post-contrast T1-weighted magnetic resonance imaging (*C*) showing an enhancing tumor in the right parietal lobe (*A and C*, T) accompanied by granular calcifications (*A*, arrow), cyst component, extensive perifocal edema, and focal calvarial erosion with smooth contour. Abnormal findings are not found in the diploe (*B*, double arrows). (*D*) Photomicrograph of the tumor, hematoxylin and eosin stain, consistent with anaplastic ependymoma with rosette formation. Original magnification, × 200.

Case report

Case1: A 7-year-old male sustained focal seizure in the left upper and lower extremities. Cranial computed tomography (CT) scan and magnetic resonance imaging (MRI) revealed a round enhancing mass, 20 × 30 × 25 mm, in the right parietal lobe. It was accompanied by granular calcifications, cyst component, extensive perifocal edema, and focal erosion in the adjacent calvarium. Contours of the erosion were smooth, lacking abnormal findings of the diploe (Fig. 1**A-C**). Gross total tumor resection was achieved. The dura mater was intact. Histological examination of the resected specimen was consistent with AE (Fig. 1**D**). The patient has been followed-up for 9 years without recurrence.

Case2: A 15-year-old male sustained headache for 2 months. CT scan and MRI revealed a large enhancing mass, 70 × 65 × 65 mm, in the left parietal lobe. It was accompanied by massive calcifications, cyst component, extensive perifocal edema, and focal erosion in the adjacent calvarium. Contours of the erosion were smooth, lacking abnormal findings of the diploe (Fig. 2**A-C**). Gross total resection was achieved. The dura mater was intact. Histological examination was consistent with AE (Fig. 2**D**). The tumor showed local recurrence 6.5 years later, when total resection was again performed, followed by chemotherapy with temozolomide. The patient has been recurrence-free for 5 years since the second surgery.

Case3: A 17-year-old male sustained headache for 3 weeks. CT scan and MRI revealed a large enhancing mass, 80 × 50 × 45 mm, in the left frontal lobe. It was accompanied by coarse calcifications, cyst component, extensive perifocal edema, and focal erosions in the adjacent calvarium. Contours of the erosion were smooth, lacking abnormal findings of the diploe (Fig. 3**A-E**). Gross total resection was achieved. The dura mater

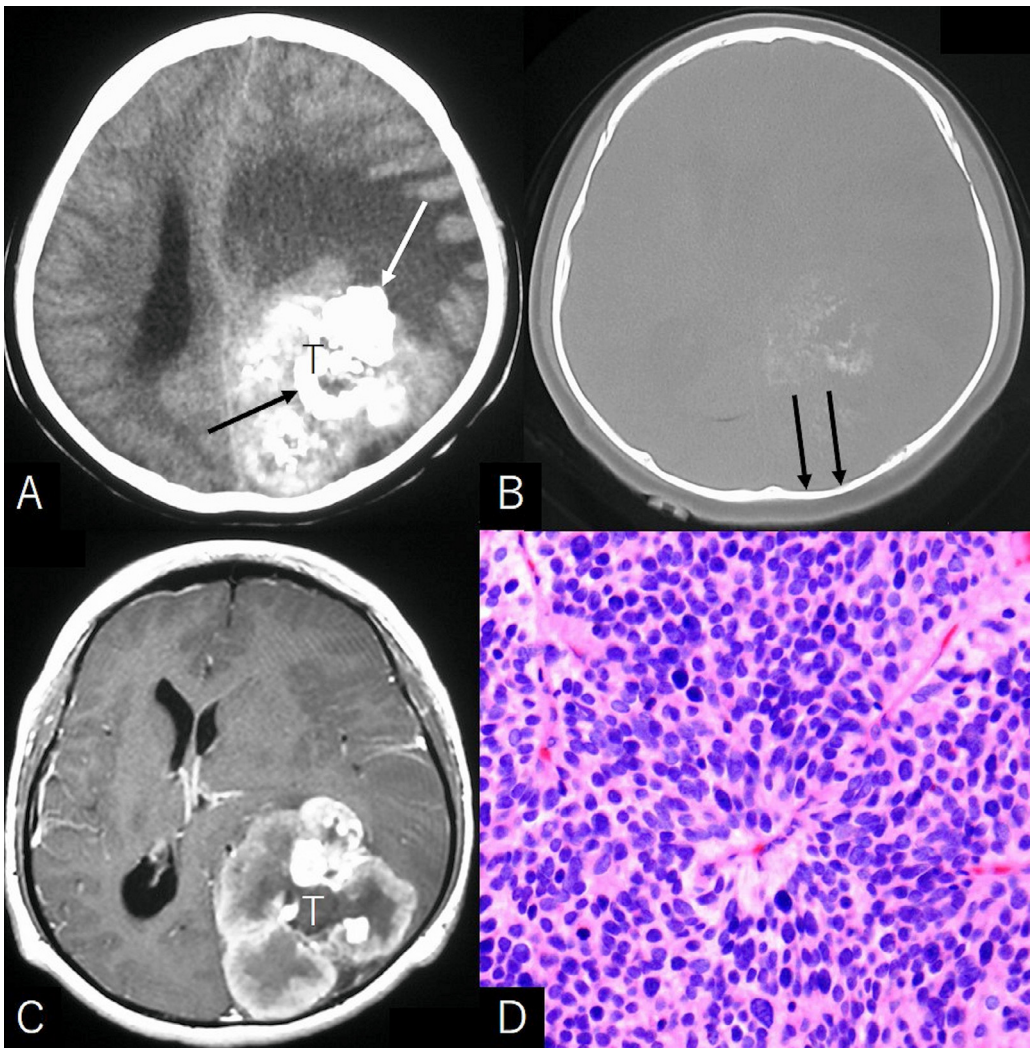

Fig. 2 – Axial computed tomography (*A, B*) and post-contrast T1-weighted magnetic resonance imaging (*C*) showing an enhancing tumor in the right parietal lobe (*A and C,* T) accompanied by massive calcifications (*A*, arrows), cyst component, perifocal edema, and focal calvarial erosion with smooth contour. Abnormal findings are not found in the diploe (*B*, double arrows). (*D*) Photomicrograph of the tumor, hematoxylin and eosin stain, consistent with anaplastic ependymoma with rosette formation. Original magnification, × 200.

was intact. Histological examination was consistent with AE (Fig. 3**F**). The patient has been followed-up for 6 months without recurrence.

Discussion

Supratentorial ependymomas are characterized by large, cystic, calcified, and extraventricular masses found in children and young adults [7]. Additionally, in the present AEs, focal calvarial erosions were found in patients with AEs, accounting 50% of our cases. Erosions were focal and possessed smooth contours, coupled with intratumoral calcifications, may indicate an indolent growth of AEs. Such appearance was similar to oligodendroglioma-associated calvarial erosions [4]. Furthermore, such erosions were identified even in a small, cortically located AE. Therefore, calvarial erosion, an infrequent manifestation of primary brain tumor, was deemed a diagnostic clue to AEs, especially when a supratentorial tumor predominantly involves the cerebral cortex. Whilst, calvarial erosion can be a manifestation of various benign and malignant parenchymal lesions [1-6]. Radiologists need to assume it when encountered a brain tumor with concurrent calvarial erosion. Surgical resection is proposed as the optimal treatment of AEs, as efficacy of postoperative chemoradiation therapy is not determined [8,9]. Therefore, gross-total resection is recommended at a surgery for supratentorial brain tumor that is assumed to be an AE.

Focal calvarial erosion with smooth contour may be a diagnostic hallmark of supratentorial AEs.

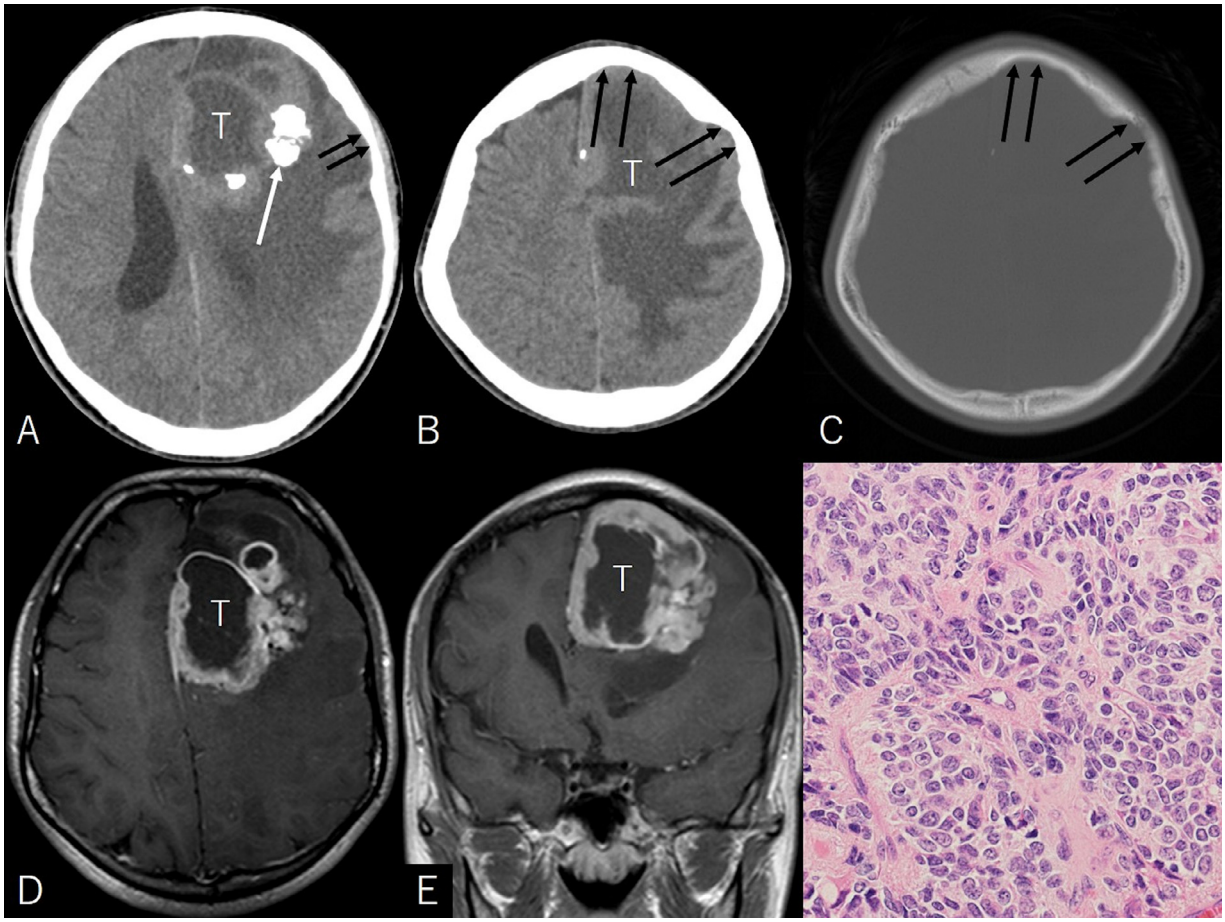

Fig. 3 – Axial computed tomography (*A-C*) and post-contrast axial and coronal T1-weighted magnetic resonance imaging (*D, E*) showing an enhancing tumor in the left frontal lobe (*A, B, D, and E,* T) accompanied by coarse calcifications (*A,* arrow), cyst component, extensive perifocal edema, and focal calvarial erosions with smooth contours. Abnormal findings are not found in the diploe (*A-C,* double arrows). (*F*) Photomicrograph of the tumor, hematoxylin and eosin stain, consistent with anaplastic ependymoma with rosette formation. Original magnification, x 200.

REFERENCES

[1] Cunningham DA, Lowe LH, Shao L, Acosta NR. Neuroradiologic characteristics of astroblastoma and systematic review of the literature: 2 new cases and 125 cases reported in 59 publications. Pediatr Radiol 2016;46(9):1301–8.
[2] Handzhiev DD, Kalevski SK, Handzhieva SV, Dzhenkov DL, Salieva- Badi S. Low grade astrocytoma causing dural and calvarial destruction. J Clin Neurosci 2017;40(6):84–9.
[3] Koeller KK, Dillon WP. Dysembryoplastic neuroepithelial tumors: MR appearance. AJNR Am J Neuroradiol 1992;13(5):1319–25.
[4] Lee YY, Tassel PV. Intracranial oligodendrogliomas: imaging findings in 35 untreated cases. AJR Am J Roentgenol 1989;152(2):361–9.
[5] Satyarthee GD, Mahapatra AK. Giant pediatric glioblastoma multiforme causing primary calvarial erosion and sutural diastasis presenting with enlarged head. J Pediatr Neurosci 2015;10(3):290–3.
[6] Vivier J, Bardien S, Van der Merwe L, Brusnicky J, Zaharie D, Keyser R, et al. A study of meningiomas in South Africa: investigating a correlation between clinical presentation, histopathology, and genetic markers. Br J Neurosurg 2009;23(1):63–70.
[7] Furie DM, Provenzale JM. Supratentorial ependymomas and subependymomas: CT and MR appearance. J Comput Assist Tomogr 1995;19(4):518–26.
[8] Sun S, Wang J, Zhu M, Beejadhursing R, Gao P, Zhang X, et al. Clinical, radiological, and histological features and treatment outcomes of supratentorial extraventricular ependymoma: 14 cases from a single center. J Neurosurg 2018;128(5):1396–402.
[9] Byun J, Kim JH, Kim YH, Cho YH, Hong SH, Kim CJ. Supratentorial extraventricular ependymoma: retrospective analysis of 15 patients at a single institution. World Neurosurg 2018;118:e1–9.