Parietal giant cell glioblastoma with IDH1 mutation: A case report

Hendrikus Masang Ban Bolly1,2*, Achmad Adam1, Hasrayati Agustina3, Ahmad Faried1, Muhammad Zafrullah Arifin1

ABSTRACT

Background: Giant cell glioblastoma (GCG) is a primary glial tumor of the central nervous system. It accounts for < 1% of all glioblastoma and known as one of rare glioblastoma. It is correspondence a similar clinical feature to IDH-wildtype glioblastoma. We present a case with the diagnosis of GCG following tumor resection and histopathology examination using specific immunohistochemistry of IDH1 mutant staining.

Case presentation: A 43-year-old male with progressive headache and left extremity hemiparesis. MRI with gadolinium contrast showed a mass at the right parieto-occipital lobes with the characteristic of iso-hyperintense signal on T1W sequence, central necrosis and enhancement of the gadolinium contrast. The T2W sequence showed a hyperintense signal in the mass. Craniotomy tumor removal was performed with prone position and total removal was achieved. Histopathology finding and the immunohistochemistry staining showed results of Glioblastoma. We present a case with the diagnosis of GCG following tumor resection and histopathology examination using specific immunohistochemistry of IDH1 mutant staining.

Conclusion: The role of the present therapy or IDH1 mutation status of the patient or both of them in prolonged survival time still has to be elucidated and remained a mystery.

Keywords: giant cell glioblastoma, isocitrate dehydrogenase, mutation


INTRODUCTION

Giant cell glioblastoma (GCG) is a rare case which counts less than 1% of all glioblastoma.1,2 This kind of glioblastoma has a better prognosis than other glioblastoma although most of them have a poor prognosis. GCG sometimes has to be differentiated with metastasis lesion in neuroimaging examinations, whether computed tomography (CT) or magnetic resonance imaging (MRI). The modality of histopathology examination and even the molecular entity of IDH1 status will contribute to a better prognostic prediction of the patient. The five years survival rate is > 10% which better than another glioblastoma (3.4%).1,3,4 In this case report, we present a case with the diagnosis of GCG following tumor resection and histopathology examination using specific immunohistochemistry of IDH1 mutant staining.

CASE PRESENTATION

A 43-year-old male complained of a severe headache 4 days before admission. The complaint of progressive intermittent headache was lasting for 3 weeks and followed by the weakness of his left extremities. There was no history of previous stroke and other complain. Neurological examination showed a left central type cranial nerve VII paralysis.

The results of routine blood examinations were normal. MRI with gadolinium contrast showed a mass at the right parieto-occipital lobes with the characteristic of iso-hyperintense signal on T1W sequence, central necrosis and enhancement of the gadolinium contrast. The T2W sequence showed a hyperintense signal in the mass. There were peritumoral edema and midline were shifting to the contralateral direction of the mass. There was a global compression of the sulci and gyri (Figure 1).

The work up diagnosis was suspected of a glioma. Craniotomy tumor removal was performed with prone position and total removal was achieved. The tumor tissue shows a macroscopic characteristic of a hypervascularized mass. Some parts of the tumor were easy to aspirate by the suction cannula and some parts were yellowish tissue. The solid components were collected for further histopathology examinations. A full decompression was achieved and the bleeding was controlled.

We examined multiple sections and staining for microscopic examination. Multinucleated giant cells and small fusiform cell were specific histologic characteristic found microscopically. Some giant cells with palisading and large ischemic necrosis were observed. A specific formation of a pseudo rosette-like pattern with a typical feature of mitotic was also noted. Glioblastoma Protein (GFAP) examination showed positive results combine with a high index (> 10%) of proliferation confirmed...
with Ki-67 staining. Interestingly, our immunohistochemistry examination of IDH1 R132H mutant showed positive expression of the mutations (Figure 2). The final results of histopathology conclude as giant cell glioblastoma with IDH1 mutation-positive.

**DISCUSSION**

GCG was described for the first time in 1909 by Schminck. It was still not fully understood and incompletely characterized because of its rarity. This tumor included in World Health Organization (WHO) classification as a grade IV from astrocytic origins. Histology appearance shows a highly cellular of the specific size of the tumor cells (500 μm). There is pseudo palisading necrosis or a large ischemic form. The giant cells also show lipid accumulation and microcalcifications.

The manifestation of GCG was similar to classic glioblastoma, which depends on the tumor location. GCG predominantly developed in subcortical white matter in the temporal and parietal lobes. The other location also found in the cerebellum, lateral ventricles, optic chiasm, and spinal cord. Turner et al. concluded that the radiologic appearance of the GCG is not well documented. Otherwise, the characteristic consideration could be the same as a classic radiologic feature of glioblastoma.

The main characteristic of the symptoms develops as focal neurological deficit and increase of the intracranial pressure due to peritumoral edema. Our patient has the symptoms of progressive headache and paresis of the cranial nerve VII followed by left hemiparesis. The neuroimaging of glioblastoma shows an irregular shape with ring enhancement and central necrosis. MRI shows hypointense signal on T1W and hyperintense on T2W that surrounded by edema. The specific mural nodule surrounds the cystic parts has been signed in the MRI.

Interestingly, in this case, there was IDH1 mutation (Fig. 2D). Theoretically, GCG do not express IDH mutations and consider as the variant of IDH-wildtype glioblastoma. However, the literature showed that there was 5% of the GCG with IDH1/2 mutations. The IDH1/2 mutations occurred 100% in secondary glioblastoma (IDH mutant) and 0% reported in both of primary glioblastoma and gliosarcoma. The peak ages of the GCG diagnosis vary from 42 to 44 years old. The average ages were 54.5 years old and predominant in males (the male-to-female ratio is 1.6). It was similar to our patients as a male and 43 years old. GCG could be associated with neurofibromatosis type 1 and tuberous sclerosis.

The molecular characteristics of the GCG are PTEN mutation (33%), ATRX expression loss.

**Figure 1.** MRI of the patient. A. T1W axial (above) and sagittal (below) showing a hypointense signal in central of the tumor. B. T1W with gadolinium contrast axial (above) and coronal (below) showing a hypointense signal in the central of the tumor and ring enhancement in the tumor. C. T2W coronal (above) and axial (below) showing a hyperintense signal.

**Figure 2.** A. HE staining showed a bizarre appearing giant cells, multinucleated eosinophilic dominant, extensive necrosis (*) and smaller fusiform cells (H&E, 100x). B. IHC staining of glial fibrillary acidic protein (GFAP) [100x]: indicate the origin of the tumor was a glial cell. C. IHC staining of Ki-67 [200x]: showed a high index (>10%) proliferation indicate a high-grade glioma characteristic. D. IHC staining of mutant IDH1 R132H [200x]; showed an immunoreactive results, indicate a specific mutation of isocitrate dehydrogenase I gene at codon 132 of amino acid, changing of Arginine (R) to Histidine (H).
The D-2-hydroxyglutarate was an oncometabolite that has a dominant role in tumorigenesis. Epidemiological studies showed that the mutations make the survival time become longer. Therefore, mutations of IDH1 contribute to the prolonged survival time of the GCG patients.

CONCLUSION
The diagnosis of rare GCG was presented with post tumor resection, histopathology examination and molecular examination of IDH1 mutant status. The patient received additional chemo-radiotherapy and showed a prolonged survival time than the average. The role of the present therapy or IDH1 mutation status of the patient or both of them in prolonged survival time still has to be elucidated and remained a mystery.

CONFLICT OF INTEREST
Author declares no conflict of interest regarding this study.

AUTHOR CONTRIBUTION
Author contribute equally in this study.

FUNDING
Author declare no sponsorship regarding this study.

REFERENCES: