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Case Report

The Outcome of Surgical and Radiotherapy in Central Neurocytoma: A Case Report

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Abstract

Background : Central neurocytoma (CN) is an infrequent and non-malignant neuro-epithelial tumor. CN is mostly found in lateral ventricle and may generate obstructive hydrocephalus. Surgical-radiation can increase patient survival and prognosis. This case report presented a rare case about 30-year-old female with CN.
Case presentation : 30-year-old female came to the hospital with severe headache and vomiting. Brain MRI showed a heterogeneous mass in right lateral ventricle causing obstructive hydrocephalus. The patient undergone partial resection. CN confirmed from histopathological analysis. Afterward, patient received 54 Gy conventional radiotherapy. 3 months after radiation, patient remain asymptomatic and no neurological deficit. Brain MRI evaluation showed slightly reduction of tumor mass (from 4.09 x 3.01 x 4.13 cm before radiation to 4.00 x 3.86 x 3.63 cm after radiation).
Discussion : This case report was consistent clinically, radiologically, and histopathologically with intraventricular CN. Headache and vomiting in patient due to the raised intracranial pressure from tumor mass and obstructive hydrocephalus. Headache is a significant and most frequent symptom in intraventricular tumors, may be caused by traction or compression of the pain-sensitive structures such as meningen and intracranial vasculature. Optimal management of CN still remains controversial due to their rarity. However, surgical management with gross total resection is the gold standard of treatment modality, associated with good prognosis and longer progression-free survival.
Conclusion : Based on clinical characteristic, radiographic finding and histopathological features; this case was consistent with CN of the lateral ventricle. Surgical as the treatment option followed by radiation has led to good clinical outcome in this patient.

Keywords : central neurocytoma, hydrocephalus, neuro-epethelial tumor, radiotherapy

INTRODUCTION

Central neurocytoma (CN) is an infrequent central nervous system tumor from neuro-epithelial origin, first introduced by Hassoun et al in 1982. Most CN are categorized as a grade II tumor by World Health Organization. This tumor is mostly found in the lateral ventricles and may cause obstructive hydrocephalus.[1–3] The incidence is relatively rare, which comprise only 0.1 – 0.5% of all primary central nervous system tumors and 1.6% of neuronal and neuronal-glial tumors. Most tumors present between third and four decades, nearly 25% of cases found in third decades. No gender differences in the incidence of CN. Previous studies indicated higher incidence in Asian country such as Japan, Korea, and India.[1,4,5] Central neurocytoma are typically located within the anterior part of the lateral ventricles, although also reported found in the third and fourth ventricles. The tumors usually attach to the septum pellucidum near the foramen of Monroe.[6] Clinically, CN may increase intracranial pressure due to obstructive hydrocephalus. Patients often experience headache, nausea, vomiting, seizures, visual disturbance, cognitive problems or decreased consciousness. Hormonal dysfunction has been reported as well.[1,7] Gold standard treatment of CN is surgical management with gross total resection (GTR) that associated with good prognosis and longer survival. Adjuvant radiotherapy after incomplete resection may improve the benefits. When GTR is performed, radiation is not always indicated, particularly for typical neurocytoma.[1,8] Chemotherapy, as part of multimodal treatment of CN, has been used as an adjuvant or salvage therapy for recurrent CN or inoperable patients, although the responses have not been well-understood. Chemotherapy options include carmustine, prednisone, vincristine, and cisplatin.[4,8,9] Overall, the long term prognosis with multimodal treatment was excellent, especially with adjuvant radiation following incomplete resection.[10] The case report that reported the surgical-radiation in CN is rare so this case report that discussed about CN with surgical-radiation is important to reported. This article reported 30-year-old woman with CN.

CASE PRESENTATION

A 30-year-old female came to the hospital with a severe headache and vomiting over the past week. Other symptoms such as limb weakness, visual disturbance, and seizure were absent. Then she was referred to hospital for further examination. Standard neurological examination revealed no abnormalities such as cranial nerve palsies, hemiparesis, or visual disturbance. In funduscopic examination there was no signs of papilledema. Cognitive function evaluated using Montreal Cognitive Assessment – Indonesian version (MoCA-Ina) resulted in score 25 points revealed a mild cognitive impairment especially in the memory domain. Patient treated with maintenance dose steroid (dexamethasone intravenous 20 mg/day tapering off) and analgetic for her headache. Brain MRI showed a large mass located in right lateral ventricle with intratumoral bleeding which caused obstructive hydrocephalus and mild cerebellar herniation, suggestive central neurocytoma, with differential diagnosis choroid plexus papilloma. Patient underwent surgery with partial tumor resection. The headache was reduced after surgery. Post-operative brain MRI still showed a mass in the right lateral ventricle which smaller than before surgery Results of histopathological examination with Hematoxylin-Eosin staining showed diffuse, hypercellular round/ oval tumor cells, with fibrillar background, and on the other side showed honeycomb-like appearance. The cells appeared relatively monomorphic, isomorphic with round / oval nuclei, speckled chromatin, mitotic structures are difficult to find. Immuno-histochemical staining showed diffusely positive staining of synaptophysin, partially positive of neuronal nuclei (NeuN) and positive GFAP in surrounding glial cells. Negative results for EMA, CD117 and CK, with conclusion of Central Neurocytoma, grade II WHO classification. After surgery, patient received conventional cranial irradiation with total dose of 54 Gy, delivery in 2 Gy daily fractionations. During treatment, toxicity in this patient was only hairloss. 3 months after radiation we evaluated the patient both clinical and radiologic. Patient had no complaint and neurological

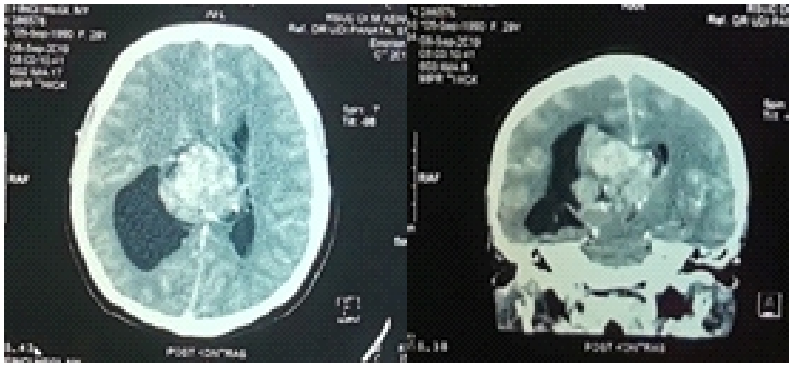

Fig 1. Pre-operative brain MRI showed inhomogenous mass located in the right lateral ventricle (size 5.63 cm x 5.36 cm x 5.16 cm) attached to septum pellucidum with minimal intratumoral hemorrhage caused obstructive hydrocephalus and midline shifting to the left side, suggested a central neurocytoma

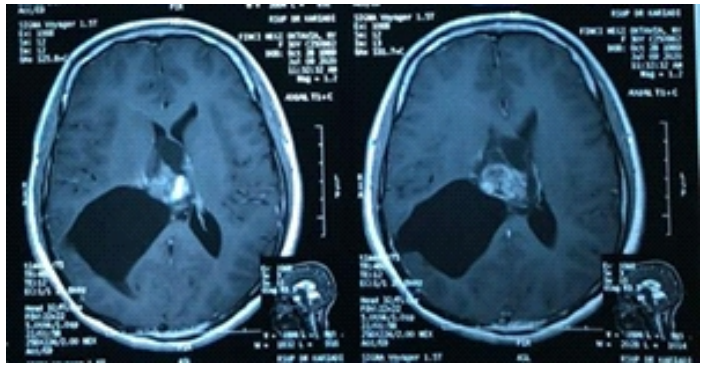

Fig 2. Post-operative brain MRI still showed a mass in the right lateral ventricle which smaller than before surgery (4.09 x 3.01 x 4.13 cm)

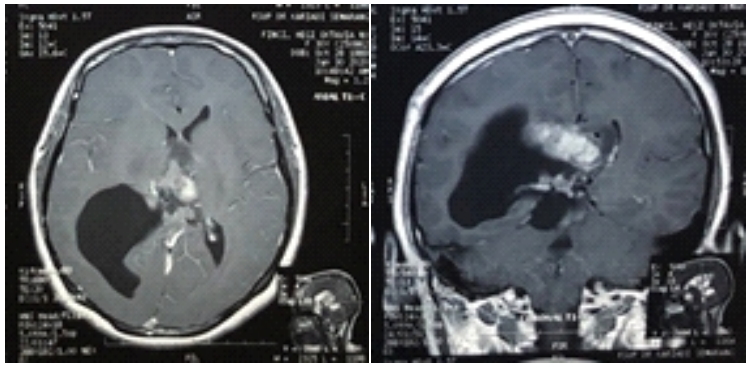

Fig 3. Brain MRI evaluation 3 months after radiotherapy showed slightly reduction in tumor mass (4.00 cm x 3.86 cm x 3.63 cm)

examination were within normal limit. Brain MRI evaluation showed minimal reduction in tumor mass than before radiation. Cognitive examination remains normal, with MoCA-Ina score was 28 points.

DISCUSSION

This case report was consistent clinically, radiologically, and histopathologically with intraventricular CN. Headache and vomiting caused by raised intracranial pressure due to tumor mass and obstructive hydrocephalus. Headache is a significant and most frequent symptom in intraventricular tumors, may be caused by traction or compression of the pain-sensitive structures such as meningen and intracranial vasculature.[1,11] According to previous study by Schild et al, reported that headache have found in more than 90% in patients with central neurocytoma, followed by visual disturbance and vomiting, with the onset of symptoms to diagnosis can occure from 3 days to 2 years, although more common less than 6 months, similar to our patient.[12,13] Pre-operative cognitive examination resulted in mild cognitive impairment, particularly in memory domain, similar to previous study reported that the prevalence of cognitive impairment in lateral ventricle tumor were estimated in 10–20% patients, which may be caused by involvement of periventricular limbic structures.[7,14]

On Brain MRI, CN is quite typical, 50–60% showed heterogenous, including solid and cystic mass with calcifications, as found in this case. T1-weighted image showed inhomogenous mild to moderate contrast enhance mass within lateral ventricle with an attachment to septum pellucidum, with the presence of intratumoral hemorrhage, causing obstructive hydrocephalus. According to previous studies, two third of intraventricular central neurocytoma located in lateral ventricel, although can be found in third and fourth ventricle. Intratumoral hemorrhage is rarely occur.[1,4,5,7]

Optimal management of CN still remains controversial due to their rarity. However, surgical management with gross total resection (GTR) is the gold standard of treatment modality, associated with good prognosis and longer progression-free survival. This patient underwent partial resection to prevent its post-surgical complication, similar to the literature more than >50% patients can not completely resected due to the risk of postoperative neurological deficits. Surgery aim to reduce tumor mass, clear CSF pathways due to hydrocephalus and establish histological diagnosis.[1,8]

Most of CN corresponds histologically to WHO grade II. Hematoxylin – Eosin staining in this patient showed uniformly round tumor cells, with small lobulated nuclei and speckled chromatin. Each case may have variations like

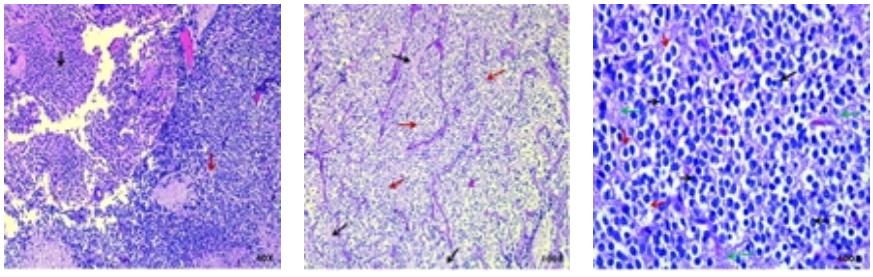

Fig 4. Upper left: uniformly diffuse hypercellular round/oval tumor cells with fibrillary background. Upper right: round/ oval cells with fibrillary background and honeycomb-like appearance. Lower: relatively monomorphic cells, isomorphic with round/ oval nuclei and speckled chromatin

honeycomb pattern and fried-egg appearance.[1,4,7,15] Immunohistochemical markers may help in differentiating CN from other tumors. IHC evaluation in this patient showed diffusely positive staining of Synaptophysin, partially positive of Neuronal nuclei (NeuN) and positive GFAP in surrounding glial cells. Synaptophysin is a transmembrane glycoprotein present in presynaptic vesicles of neurons, a strong indicator for neuronal origin, and known to be the most useful marker for CN. Soylemezoglu et al. proposed a novel antigen, neuronal nuclear antigen (NeuN); as a reliable neuronal marker in the differential diagnosis of clear cell neoplasms of the CNS.[4,7,16]

After surgery, the patient received conventional radiotherapy with total median dose of 54 Gy/ 27 fractination. During radiation, signs of radiation toxicity were only hairloss. Radiotherapy or radiosurgery performed as adjuvant treatment when GTR cannot be achieved, inoperable patient or in aggressive tumor. Radiotherapy had a statistically significant in improving local control and progression-free survival.[1,4] According to literature, there were no optimal radiation dose established for CN. The total dose prescribed has been ranging from 50.4 Gy to 55.8 Gy with a median of 54 Gy. Rades et al, whom the only one that investigates the appropriate radiation dose, reported that dose of ≥54 Gy significantly improves local control in patients with subtotally resected neurocytomas.[17,18]

There are no consensus guidelines of chemotherapy in treatment of CN. Some studies reported CN treatment with chemotherapy with different agents, both as initial treatment or in recurrence tumor. The effects of chemotherapy in CN were minimal, Kulkarni et al hypothesized that CN have a low proliferative index that did not well responded to chemotherapy regiments.[19,20]

Three months after adjuvant radiotherapy, patient had no clinical symptoms like headache or vomiting. We performed MRI evaluation which showed slightly reduction of tumor mass (from 4,09 x 3,01 x 4,13 cm before radiotherapy to 4,00 cm x 3,86 cm x 3,63 cm after radiotherapy). Previous case study reported tumor size reduction after 54 Gy/ 27 fractions of conventional radiotherapy.[21]

We also performed cognitive test, resulted in normal function, improved than before radiation. This was different to literature that reported cognitive impairment as longterm radiation complication due to the white matter injury and late neurotoxicity. Short term memory impairment was the most common toxicity.[1,22] Overall, the long-term clinical outcome of CN after multimodal treatment is excellent, a recent retrospective evaluation of CN over 30 years in a single institution showed an overall survival rate of 91% at 5 years and 88% at 10 years.[10] Five-year survival rate in patients who underwent GTR were 99% and 86% who had subtotal resection.[4] The effects of adjuvant radiation after incomplete surgery was described by Rades et al, showed that RT improved the 10-year OS. In their report, local control was 95% with complete resection, 96% with complete resection plus radiotherapy, 89% with incomplete resection plus radiotherapy, and 46% with incomplete resection alone.[17]

CONCLUSION

Based on clinical characteristic, radiographic finding, and histopathological features; this case was consistent with central neurocytoma of the lateral ventricle. Surgery as the treatment of choice followed by radiation has led to good clinical outcome in this patient.

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