

Cystic Meningiomas

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Cystic Meningiomas are rare tumor. There is a clear prevalence in infants, according for 10~19% of all intracranial meningiomas in this age group, compared with only 2~4% in adults. But, reports of cystic meningioma have been increased in frequency since the introduction of computed tomography(CT) and magnetic resonance image(MRI). Authors report two cases of cystic meningioma in adults. Radiological finding showed extraaxial mass with cystic component. Authors performed total surgical resection of the tumor mass and of the entire cystic component with cystic wall in both patients. Postoperative histopathological diagnosis of the tumor mass was a transitional meningioma in both patients. Both patients showed favorable prognosis and no recurrence findings in follow up MRI.

KEY WORDS : Cystic meningioma · Total surgical resection.

Introduction

The meningioma is by far the most common extra-axial intracranial tumor, and it is also the most common primary intracranial tumor except for glial origin tumors. The meningioma is mostly solid tumor, and their characteristic appearance in CT or MRI usually lead to correct preoperative diagnosis¹⁾. The diagnosis of meningioma can nearly always be established before operation.

Cystic meningiomas are not commonly encountered and these account for only 2~4% of all intracranial meningioma^{2,4,6)}. The most frequent location is the cerebral convexity followed by the parasagittal region and the most common histopathological type is the meningotheliomatous type^{3,6)}. Mean age in adult is the 55-years old and malignancy rate is rare¹⁾. In radiological appearance, cystic meningiomas are easily confused with metastatic or glial malignancy with cystic or necrotic change and may lead to incorrect presumptive diagnosis.

Authors report cases of two adult patients with cystic meningioma with radiological characteristics.

Case Report

Case 1

A 53-year old woman was admitted with a severe headache, nausea, vomiting for a month. No neurological deficit was noticed in neurological examination. A CT scan revealed highly enhanced mass lesion with peripheral low density area in left frontal lobe and midline shifting to the right by the tumor. A brain MRI also depicted typical meningioma findings in left frontal lobe with parenchymal cystic component and peripheral edematous change (Fig. 1A, B). A transfemoral carotid angiography(TFCA) showed that the tumor was mainly fed by the

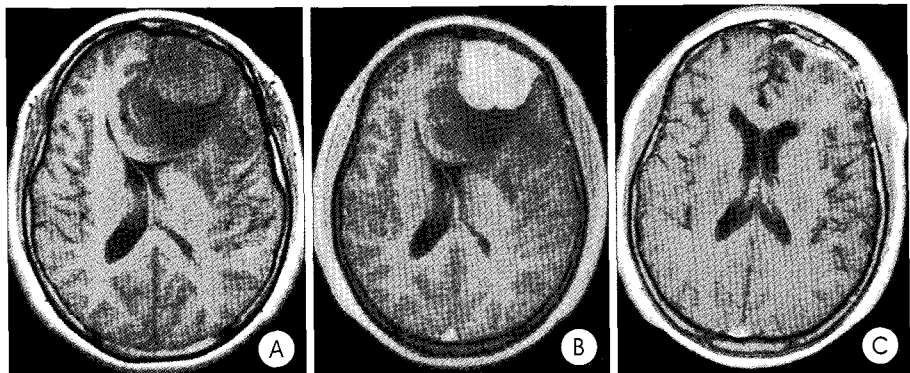


Fig. 1. Axial T1-weighted pre-enhanced (A) and enhanced magnetic resonance image(MRI) (B) in case 1 shows tumor mass with homogenous enhancement in associated with cystic portion and peritumoral edema in the left frontal region. Follow-up MRI (C) in one month after surgery demonstrates no remarkable mass or enhancing lesion.

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left middle meningeal artery. Devascularization with embolic material was successfully performed. Gross total surgical removal of the tumor mass and of the entire cystic component with cystic wall was performed via a frontal transcortical approach. The tumor was purple-yellowish, encapsulated, and highly vascularized mass with well defined margin and was measured by 5 × 4 × 3cm. Large cystic portion was present in marginal area between tumor and frontal cortex. Cystic fluid was xanthochromic and acellular. Fluid showed similar glucose level to CSF. However, protein level was elevated and lactic dehydrogenase(LDH) was decreased. The capsule and dura suspected tumor invasion was resected and duroplasty was performed by Lyodura®. Histopathological findings was consisted of transitional meningioma and no malignant features (Fig. 3). After operation, symptom was improved and no neurological deficit was noticed. Recurrence was not observed in brain MRI at the follow up period of 27 months (Fig. 1C).

Case 2

A 43-year old female was admitted with headache, right side numbness and weakness and speech disturbance for 2 years. Symptoms and signs had been aggravated progressively. In neurological examination, motor weakness (right hemiparesis Grade IV) was detected. Brain MRI revealed typical menin-

gioma findings in the left parietal lobe with peritumoral subarachnoid space dilatation, peripheral edematous change, and midline shifting to the right (Fig. 2A, B). A TFCA showed that the tumor was mainly fed by the left middle meningeal artery, and devascularization with embolic material was successfully performed. Gross total surgical removal of the tumor mass and of the entire cystic component with cystic wall was performed via a parietal transcortical approach. The tumor was purple-yellowish, friable-hard and highly vascularized mass with well defined margin and was measured by 5 × 5 × 4cm. Small cystic portion was present in subarachnoid space of tumor periphery. Cystic fluid was clear and acellular. Fluid showed the same chemistry as CSF. The dura suspected tumor invasion was removed and duroplasty was performed by Lyodura®. Histopathological diagnosis was a transitional meningioma without malignant features (Fig. 3). After operation, symptoms and signs was improved. Recurrence was not noticed in brain MRI at the follow up period of 37 months (Fig. 2C).

Discussion

The presence of a cyst in associated with a meningioma was first described by Bouchut et al. in 1928 and was addressed by Penfield in 1932^{2,3,5,7}.

Meningioma cyst may line inside or around the tumor. Nauta, et al., proposed four relationships between a meningioma, the associated cyst, and the surrounding brain¹⁻⁸. Type I, centrally-located intratumoral cyst : the cyst is contained wholly within the tumor and is totally surrounded by macroscopic tumor; Type II, peripherally-located intratumoral cyst : the cyst is at the periphery, but still wholly within the margins of the tumor; Type III, peritumoral cyst with walls consist-

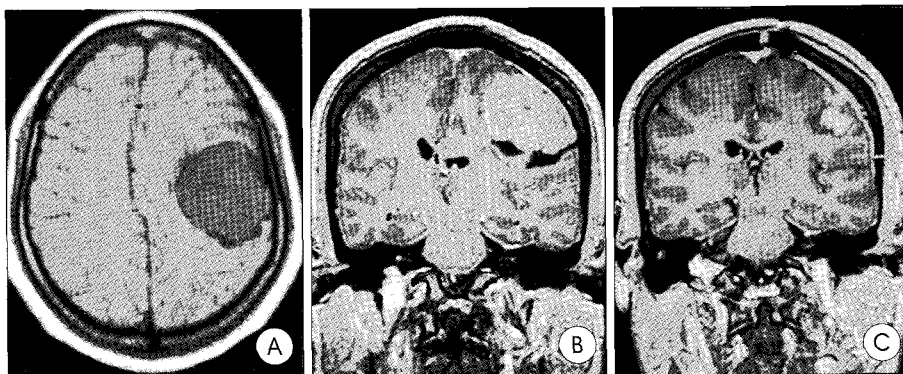


Fig. 2. Axial T1-weighted pre-enhanced (A) and coronal enhanced magnetic resonance image (MRI) (B) in case 2 shows tumor mass with homogenous enhancement in associated with cystic portion and peritumoral edema in left parietal area. Follow-up MRI (C) in one month after surgery demonstrates no remarkable mass or enhancing lesion.

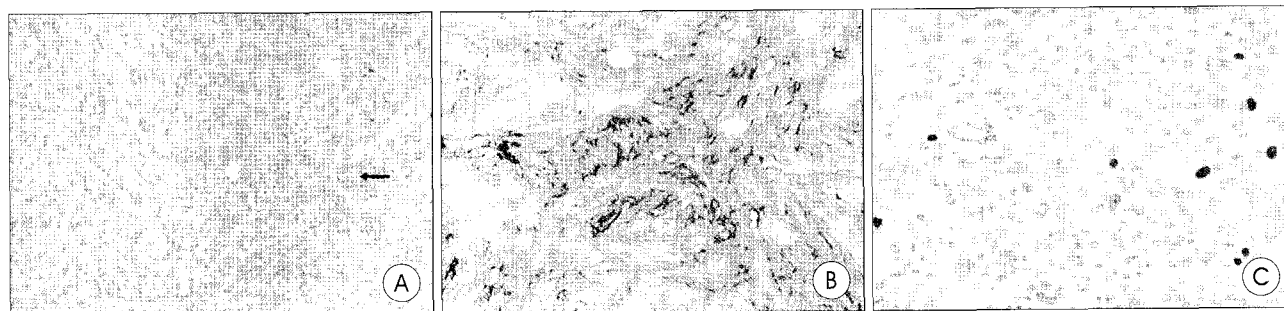


Fig. 3. Microscopical findings showing transitional (mixed) type consisted of syncytial type in the right (black arrow) and fibrous type in the left (white arrow) (H and E, x100) (A). Immunohistochemical stain in tumor cell revealed positive findings against epithelial membrane antigen (EMA) (B), Ki-67 (C).

ting of both adjacent parenchyme and tumor. It presents with signs of glial reaction; type IV : peritumoral cyst with walls formed by a arachnoid, with the cyst separated from the tumor by a distinct capsule. In our cases, first case was classified into the type III and second case was classified into the type IV cystic meningioma.

Cyst formation is more frequent in children than in adults^{4,5}. Many etiologies have been suggested for cyst formation in meningioma^{1,2,4,8}. Intratumoral cysts of Nauta Type I, II may be the outcome of : 1) microcystic degeneration; 2) ischemic necrosis or 3) hemorrhage; 4) transudation or secretory changes within the tumor tissue. Microcystic degeneration is considered to be the confluence of the cellular degenerative phenomena such as vacuolar, myxomatous, mucoid, and fatty degeneration leading to the formation first of microcavitation and then of macrocavitation within the tumor. In addition, transudation or secretory changes within the tumor tissue may produce cyst¹. The exudative nature of the cyst fluid and the absence of cells and blood breakdown products in the cystic fluid may suggest that cyst formation is the result of active secretion by tumor cell⁸. Peritumoral cysts are large, generally unilocular and contain xanthochromic fluid³. Peritumoral cyst of Nauta Type III may be the outcome of reactive gliosis or fibroblastic proliferation or the final stage of the intense peritumoral edema. Peritumoral cyst of Nauta Type IV may be secondary to a widening of the subarachnoid space or mechanical trapping of the cerebrospinal fluid spaces compressed by the tumor. In our cases, the first patient's cyst was in peritumoral location and contained xanthochromic fluid, that is considered as the outcome of reactive gliosis or intense peritumoral edema. In second patient, the cyst was located in peritumoral area and contained CSF-like fluid, that is considered as the result of subarachnoid space widening or mechanical compression of cerebrospinal space by tumor mass.

Little is known of meningioma cystic fluid. No feature distinguished fluid from gliomas or meningiomas. In both types, the protein content was elevated, but in the meningioma fluid, glutamine-oxaloacetic transaminase(GOT) and lactic dehydrogenase(LDH) levels were significantly lower than in the gliomas⁷. In our cases, protein content of cystic fluid was marked elevated in first case but, showed normal range in second case. LDH levels were decreased in both cases.

The expansion of the cyst rather than the tumor itself is responsible for increased mass effect and clinical deterioration⁵. In our cases, the time between onset of symptoms and diagnosis ranged between 4 weeks in first case and 2 years in second case.

Cystic meningiomas are diagnostically confusing tumor^{1-5,7,8}. Improved imaging was not eliminated the diagnostic confusion between the cystic meningiomas and other intracranial tumor³. Cystic meningiomas are usually difficult to differentiate from

gliomas, hemangioblastomas and metastatic lesions^{2,5}. CT scan appearance of such cystic meningiomas may mimic that of a glial tumor and lead to an incorrect presumptive diagnosis. This false impression may be perpetuated by the gross appearance at operation, which can mimic a malignant glioma. CT scans usually fail to show a solid tumor or dural enhancement. Gadolinium enhanced MRI scans are very helpful in detecting a small nodule attached to the dura and therefore, support the diagnosis of meningioma². Multiplanar MRI studies for cystic meningiomas have displayed a diagnostic accuracy of 80%^{2,4,8}. Cystic meningioma can be made from an angiographic study that includes an external carotid artery injection, as gliomas are rarely fed via the external carotid artery^{2,4}.

Nevertheless, cystic meningiomas are usually very similar to glial or metastatic tumors and occasionally only the final pathologic examination will define the diagnosis². The possibility of meningioma should be considered in the diagnosis of any intracranial neoplasm with large cyst, particularly if the tumor is parasagittal⁵. Biopsy of all suspected cerebral neoplasm is important because an incorrect diagnosis of glioma frequently results in palliative treatment rather than surgical removal of potentially curable neoplasm.

Accurate preoperative radiologic diagnosis (Multiplanar MR images) and intraoperative histopathologic studies are fundamental in surgical strategy and outcome². In our cases, because brain MRI revealed typical meningioma findings with peritumoral cystic portion and TFCA revealed typical meningioma findings also, cystic meningioma was highly suspected. Nevertheless total surgical resection was performed for the accurate diagnosis and favorable prognosis. In the operating room, we could make sure of cystic wall and cystic fluid with naked eye, and in histopathological findings, meningioma was confirmed. So we could diagnose the cystic meningiomas.

Traditionally, meningiomas are classified as meningotheiomatous (syncytial), fibroblastic, transitional (mixed), and angioblastic type^{2,8}. In addition, atypical malignant types are also discussed. The most common type is the meningotheiomatous type followed by the fibroblastic type^{2,6}. In our cases, all of two cases were transitional type (combination of meningotheiomatous and fibroblastic type).

Usually the walls of the large eccentric cysts associated with meningiomas have been composed of reactive glia or collagen, but, neoplastic cells have rarely been found in the distal cyst wall¹. Therefore the resection and careful pathological evaluation of the walls of any cyst are mandatory to avoid recurrence. This is supported by the fact that 8% of cystic meningiomas are malignant and 12% are recurrence¹. Peripheral enhancement of the cyst wall strongly indicates the presence of tumor infiltration. However, lack of enhancement of the cyst wall does not exclude tumor infiltration. Consequently, total surgical

removal of the entire cyst wall should be performed to prevent recurrence^{1,2,4,6}. In our cases, peripheral enhancement of cystic wall was not detected, but total surgical resection was performed to prevent recurrence. After operation, our patients showed excellent outcome and favorable prognosis and recurrence was not detected presently.

Conclusion

Authors report two cases of cystic meningiomas in adult, which were classified into Nauta type III and IV. We performed gross-total surgical resection of tumor mass and of the entire cystic component. Despite the absence of typical ring-enhancement of cystic wall in our two cases, complete extirpation was performed to prevent recurrence. Both patients showed favorable prognosis and recurrence is not observed in follow up MRI.

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