

signal on T2-weighted images, and are enhanced with contrast medium at MRI.⁶ However, MRI revealed the mass to be isointense on T1 and T2 in our case. Although imaging scan can help diagnose neurofibromas, the definite diagnosis can be obtained with a pathologic examination.³ Our case showed that parts of the tumor cells were positive for CD99, Ki-67, anti-smooth muscle antibody, B-cell lymphoma-2, and CD34. On the other hand, a small osteoma was detected, located below the lesion during the operation in our patient. It may be caused by the lesion eroding the frontal sinus wall.

Generally speaking, the management of neurofibromas is dependent on symptoms and signs. For the small ones, symptoms and signs may not require any intervention. Surgical excision is considered when there is pain, progressive neurologic deterioration, compression of adjacent tissues with loss of functions, and suspected malignant degeneration. Complete resection is considered to be the mainstay of treatment of neurofibromas because they are usually not encapsulated and might have an extensive infiltration.⁷ For the NF-1 associated with malignant transformation, the primary treatment is surgical removal, and radiotherapy can improve local disease control and delay recurrence.⁸ In addition, it is moderately sensitive to chemotherapy.⁹

In summary, we report a rare case of solitary neurofibroma arising from the frontal sinus in a woman. Therefore, when a mass had arisen from the frontal sinus, solitary neurofibroma should be considered. Surgical resection of the lesion was performed with excellent prognosis. Postoperative recurrence is usually rare.

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Papillary Meningioma With Vital Abnormal Vessels

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Abstract: Papillary meningioma is an uncommon meningioma subtype of World Health Organization grade III. It could show some

radiologic profiles pointing to malignant behavior, such as a cystic change, a heterogeneous enhancement, and an ill-defined border. However, to date, the radiologic profile described in this article has not been reported in previous literatures, and it is just the characteristic being considered as the major cause for patients' death. A 16-year-old adolescent boy with a 6-month history of headache was admitted to our department on June 28, 2012. Magnetic resonance imaging showed a giant well-defined mass in the left temporal region, with a severe flow void on T2-weighted image and an abundant stripelike enhancement on T1-weighted contrast-enhanced scan. In view of its middle cranial fossa location (one predilection site for meningioma), meningioma was suspected preoperatively. A regular left frontotemporal craniotomy was performed. Unexpectedly, extreme hemorrhage happened intraoperatively, and it was difficult to stop the bleeding. After identification of no hemorrhage in the operative cavity through intraoperative magnetic resonance imaging, the operation was finished, with an overall blood loss of 15,000 mL. The patient died of brain stem dysfunction the second day after the operation.

Key Words: Papillary meningioma, flow void

Papillary meningioma (PM) is one rare subtype that is included in the World Health Organization grade III meningioma. To date, fewer than 200 cases of PM have been published in the English-language literatures. Many factors (including the extent of resection, the presence of some positive histopathologic index, and adjuvant therapy, etc) had been reported to be significantly related to postoperative outcome,^{1,2} but no literature demonstrated the influence of vessel voids on survival. Hereby, we present a rare case of PM with hazardous abnormal vessels manifesting marked signal voids on magnetic resonance imaging (MRI) observation. Meanwhile, we discussed some key points from this case.

CLINICAL REPORT

A 16-year-old adolescent boy who had a 6-month history of headache was referred to our department on June 28, 2012. No special neurologic dysfunction was found on physical examination. Computed tomographic scan showed a high-density mass of the left temporal region with some ductlike shadow inside (Fig. 1A). Magnetic resonance images revealed marked signal voids intratumorally and 2 conspicuous serpentine signal voids located adjacent to the brain stem on T2-weighted sequence (Fig. 1B) as well as markedly stripelike enhancement on contrast-enhancing sequence (Fig. 1C). Extra-axial neoplasm, with the most possibility of meningioma, was considered preoperatively because of the same enhancement level of tentorium cerebelli margin nearby the tumor base. After the preoperative

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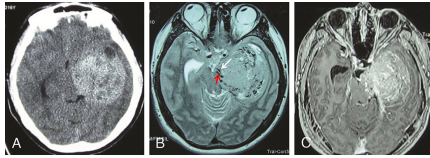


FIGURE 1. Preoperative radiologic profiles: A, Computed tomographic scan showing a high-density mass of the left temporal region with some ductlike shadow inside. B, The axial T2-weighted image reveals a well-defined lesion, with marked serpentine flow void inside and in the vicinity of the brain stem (red and white arrows). C, The axial T1-weighted contrast image revealed an abundant stripelike enhancement inside and the same level of enhancement of the tentorium cerebelli margin nearby the tumor base.

preparation was finished, a left frontotemporal craniotomy was performed. Because of severe compression by the tumor, it was difficult to open the Sylvian fissure for cerebrospinal fluid release; thus, partial temporal tissue was resected for tumor exposure. In the gross observation, the tumor presented with meatlike appearance, containing a lot of sinusoidal structures, a few large supply arteries, and venous drainages inside (Fig. 2). It was hard to stop the bleeding using both electric coagulation and gelatin sponge hemostatic gauze. Initial frozen-section analysis was presumed to be a high-grade glioma. The first intraoperative MRI (iMRI) scan showed resection of 80% of the tumor and the amount of hemothecle in the operative cavity (Fig. 3A). In view of the frozen-section analysis and the close location of the remnant to the brain stem, the intended extent of resection was achieved and the priority of our task lied in stopping the persistent angiostaxis. Intraoperative observation found that the blood supply originated from breaches of the cerebral middle/posterior artery, middle meningeal artery, and anterior choroidal artery. Although a laborious operation, the volume of blood loss still reached to the level of approximately 1500 mL/h, so the left cerebral middle artery and several pieces of large venous drainages lateral to the midbrain were cut off at last (Fig. 3C), with a total blood loss of 15,000 mL. Then, mechanical ventilation and pressor agent were constantly used to maintain respiration and blood pressure postoperatively. Unfortunately, the patient died of brain stem dysfunction on the second day after the operation.

Subsequent histopathologic examination (Figs. 4A, B) revealed sheets of cells arranged in a perivascular pseudopapillary pattern with a central fibrovascular core, and the tumor cells in the papillary area displayed abundant eosinophilic cytoplasm and vesicular nuclei. Occasionally, psammoma bodies were mixed with such papillary structure in some places. Immunohistochemical staining of tumor cells were diffuse positive for epithelial membrane antigen and vimentin but negative for progesterone receptor and glial fibrillary acidic protein. Histopathologic examination, in addition to immunohistochemical staining, established the diagnosis of PM.

DISCUSSION

Papillary meningioma is a special meningioma subtype with a predilection for male patients and younger group. It shows an aggressive growth pattern, a more likelihood of recurrence, and an extracranial metastasis compared with its benign and even malignant counterparts.

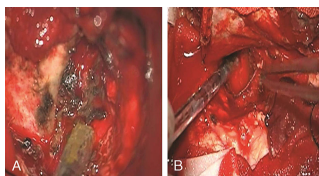


FIGURE 2. Intraoperative microscopic view: A, A lot of draining veins were seen in the operative field. B, A few arteries have come across intraoperatively.

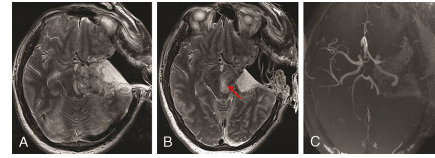


FIGURE 3. A, The first iMRI scanning verified a mixture of blood and cerebrospinal fluid. B, No bleeding was verified on the last iMRI scanning, but brain stem edema was present on T2-weighted image as high signal (red arrow). C, Intraoperative magnetic resonance angiography demonstrated resection of the left cerebral middle artery.

As a high-grade meningioma, they were found to have abundant blood supplies during operations in our other cases of PM, but all of them achieved a favorable surgical outcome. However, this case is different from our previous cases and the ones mentioned in the literature, and its certain characteristics could give us some enlightenment.

Flow void represents rapid blood flow through either dilated arteries or dilated veins,³ and it appears most often among high-flow vascular lesions (such as aneurysm and arteriovenous malformation), some vascular tumors (such as hemangiopericytoma,⁴ hemangioblastoma⁵), malignant neoplasms (such as glioblastoma⁶), and even benign neoplasms (such as pituitary adenoma and Schwannoma^{7,8}).

Intratumoral flow void can be occasionally seen among meningioma entity with the predilection for angiomatous subtype.⁹ Patients with voids of vessels tend to have more blood loss intraoperatively, posing a great surgical challenge to operators. We respectively analyzed the radiologic and intraoperational profiles of such case and found that there were 2 large draining veins straddling the tumor and brain stem, which was undervalued before the operation and only considered as the same general vessels with those that came across in our previous cases; it is just this detail being the origin of following events. Resection of draining veins led to brain stem edema (Fig. 3B) and subsequent dysfunction. It is the major cause of death. During the resection of convex lesions, the awareness of central sulcus vein protection has been well established. However, draining veins of skull base location are frequently underestimated and the appearance that occurred in our case presenting crosstalk between brain stem and tumor is also seldom.

Another factors also contributed to such deterioration. Extensive blood supply from breaches of the cerebral middle/posterior artery, middle meningeal artery, and anterior choroidal artery made it difficult to stop the bleeding. The left cerebral middle artery was forced to be resected, which led to postoperative temporal lobe swelling. Moreover, because of the blood supply from the cerebral posterior artery, frequent operation adjacent to the brain stem for hemostasis could damage blood supply to the brain stem. Combined function of

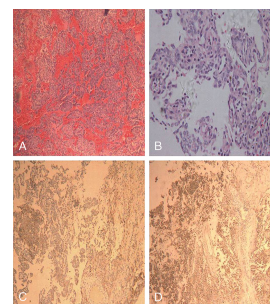


FIGURE 4. Pathologic examination: A, Histologic examination of the tumor (hematoxylin-eosin, original magnification, $\times 40$) displays extreme bleeding. B, High-power field ($\times 400$) demonstrates sheets of cells arranged in a perivascular pseudopapillary pattern with a central fibrovascular core, and the tumor cells in the papillary area displays abundant eosinophilic cytoplasm and vesicular nuclei. C and D, Immunohistochemical staining was positive for epithelial membrane antigen and vimentin ($\times 40$).

an external cause (compression from swelling temporal lobe) and an internal cause (brain stem edema, ischemia) resulted in the brain stem dysfunction and respiration/circulation failure.

Meningioma cell can secrete many proangiogenic factors, such as vascular endothelial growth factor.¹⁰ Histologic characteristics (perivascular location of tumor cell) contribute to a higher concentration of proangiogenic factors around the blood vessels than do other meningioma subtypes, therefore, more vessel proliferation. Such theory is also seemingly applicable to hemangiopericytoma, which has the similar histologic characteristic and the propensity for flow void.

In conclusion, flow voids of the skull base tumor, especially those in the vicinity of the brain stem, should be kept in mind carefully because of their possibility of crosstalk with brain stem circulation.

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Titanium Screw Entered Into Maxillary Sinus: A Rare Incident During Rigid Fixation of the Porous Polyethylene Implant in Enophthalmos Correction

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Abstract: Screw fixation is used for accurate augmentation by porous polyethylene implant in traumatic enophthalmos correction to avoid complications such as migration and protrusion. We report an incident of titanium screw entered into the maxillary sinus during enophthalmos correction with porous polyethylene implant. Such

incident could be avoided by standard manipulation. We here present the rare case and offer proposals for the screw fixation of porous polyethylene implant during traumatic enophthalmos correction.

Key Words: Traumatic enophthalmos, porous polyethylene implant, titanium screw

Orbital zygomatic fracture without treatment or with inappropriate immediate reduction often results in enophthalmos, dystopia, and malar deformity. Enophthalmos correction is always considered as important and difficult in the treatment of postorbital zygomatic fracture deformity. Orbital wall reconstruction and(or) orbital zygomatic fracture reduction are used to correct traumatic enophthalmos in our department. We use porous polyethylene implant in most cases. In severe enophthalmos, which needs multiple layers of porous polyethylene implantation, we use screw fixation for accurate augmentation and to avoid complication such as migration and protrusion. Screw fixation is a basic manipulation for craniofacial surgeons. However, we need to further standardize the manipulation to minimize the complication. Here, we report an incident of titanium screw entered into the maxillary sinus during enophthalmos correction with porous polyethylene implant and offer proposals for the rigid fixation of porous polyethylene implant.

CLINICAL REPORT

A 38-year-old man who underwent orbital zygomatic fracture 2 years ago with inappropriate immediate reduction was arranged for enophthalmos correction by porous polyethylene implantation and orbital zygomatic fracture reduction. Individually customized multiple layers of porous polyethylene implant were designed according to the preoperative three-dimensional computerized tomography and intraoperative adjustment. During the fixation of the porous polyethylene implant, the screw accidentally entered the maxillary sinus through the orbital inferior wall. Luckily, the screw was found by thorough and meticulous search. The patient was satisfied with the outcome (Fig. 1).

DISCUSSION

Orbital zygomatic fracture without treatment or with inappropriate immediate reduction is frequently seen in the clinic. Enophthalmos is common in postorbital zygomatic fracture deformity. It is caused by enlarged orbital volume, intraorbital tissue displacement and atrophy, and scar formation.^{1–3} Orbital reconstruction aimed to correct enophthalmos can be performed by autogenous bone or alloplastic material. Because of the long-term absorption of the autogenous bone onlay implantation, we use porous polyethylene implant designed according to the preoperative three-dimensional computerized tomography and intraoperative adjustment in most

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