Inflammatory Pseudotumor of the Skull Base Involving Fissura Petrooccipitalis: A Rare Case with Challenging Diagnosis

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ABSTRACT

Inflammatory pseudotumor (IPT) is a benign entity that may present as a solid mass mimicking a malignant neoplasm. Histologically, they are composed of varying proportions of myofibroblastic spindle cells, lymphocytes, and plasma cells. Skull base IPT is rare and usually occurs in adults with no sex predilection. The skull base IPT typically presents with headache, and/or cranial nerve palsy. There is no consensus regarding treatment of skull base IPT due to its rarity. Surgical resection and corticosteroid therapy have generally been used. The preoperative diagnosis of skull base IPT is usually difficult due to its nonspecific clinical and radiologic features. We report a case of a 42-year-old woman with IPT originating from the skull base. To our knowledge, this is the first case of IPT invading fissura petrooccipitalis. When a mass in the skull base appears hypointense on T2-weighted imaging with aggressive growth and bony destruction, IPT should be considered in the differential diagnosis.

KEYWORDS: Inflammatory pseudotumor, skull base, magnetic resonance imaging, diagnosis

Inflammatory pseudotumor (IPT) is a benign entity that can mimic a malignant neoplasm. It has been described in both genders, at all ages, and in nearly every anatomic site. In the head and neck region, it is uncommon but most often affects the orbit. Skull base IPT is rare and usually pursues an aggressive course indistinguishable from malignant tumor. The lesion may involve adjacent tracts or cranial nerves. Most reports of skull base IPT have included only a single case or a small case series. Therefore, little is known concerning the natural history of this lesion. We present a rare case of IPT originating from the skull base, extending intracranially via the fissura petrooccipitalis. To our knowledge, this is the first case of IPT invading fissura petrooccipitalis. The radiographic presentations and clinical features are discussed. The literatures regarding pathologic mechanism, preoperative diagnosis, and treatment of skull base IPT are reviewed.

CASE REPORT

A 42-year-old woman with a history of left-sided headaches presented with new-onset left facial palsy and diplopia. For nearly 2 years before admission, the patient had complained of an idiopathic left occipital headache
which could be relieved with Carbamazepine. She denied any history of associated fever, nausea, vomiting, or weight loss. A physical examination demonstrated left binocular horizontal diplopia as well as loss of sensation to her left face to light touch. Her cognitive function and tendon reflexes were normal. Epstein-Barr virus (EBV) capsid antigen IgG titers were 1:160, however, other laboratory investigations were within normal limits.

A CT scan revealed a soft-tissue density mass in the left skull base with enlargement of left fissura petrooccipitalis (Fig. 1). The lesion had also invaded the left clivus and left petrous apex. Magnetic resonance imaging (MRI) of her brain and nasopharynx was performed using a 1.5 Tesla scanner. MRI disclosed an irregular nodular mass in the same region. The mass measured $59 \times 26 \times 31$ mm in size. It was hypointense compared with cerebral gray matter on T2-weighted images (Fig. 2A) and isointense on T1-weighted images (Fig. 2B). Marrow replacement of the left clivus was noted on the T1-weighted images. The tumor exhibited moderately uniform enhancement (Fig. 2C). On postcontrast T1-weighted imaging, the tumor extended intracranially superiorly via an enlarged left fissura petrooccipitalis. The adjacent dura were thickened and enhanced (Fig. 2D). The bilateral cavernous sinuses were not involved by the lesion. The nasopharyngeal mucosa was not thickened.

The patient underwent partial resection of the lesion via the nasopharyngeal cavity. The lesion was firm with limited vascularity. On routine HE-stained sections, the lesion was composed of spindle cells in a collagenous background of abundant lymphocytes, plasma cells with varying admixtures of collagen bundles (Fig. 3). Mitoses were very rare. The final pathologic diagnosis was inflammatory pseudotumor. The patient had no complications and was discharged on oral corticosteroids. Her symptoms of facial palsy and diplopia resolved completely 2 weeks after operation, and the mild residual pain disappeared after 1 month on corticosteroid treatment. The low-dose steroid maintenance therapy with prednisolone 10 mg daily was continued for 10 weeks. Over 4 months after the operation, the patient was symptom-free and the follow-up MRI showed no sign of recurrence. Dural thickening and contrast enhancement was decreased.

**DISCUSSION**

IPT has been reported to occur most often in the lung, liver, orbit, mesentery, retroperitoneum, genitourinary tract, and upper respiratory tract. In the head and neck, IPT most commonly involves the orbit. Skull base involvement is rare.2,3 Skull base IPT usually occurs in adults with no sex predilection. Systemic symptoms such as fever or weight loss are uncommon in skull base IPT, but may occur in IPTs affecting other sites. The skull base IPT typically presents with headache, and/or cranial nerve palsy.4 Our patient presented with left-sided headaches and facial nerve palsies as the lesion was located in the left middle cranial fossa and had invaded the petrous bone and clivus. Cranial nerve palsies are most often due to the aggressive, invasive nature of skull base IPT.

The pathologic mechanism of IPT is still controversial. It is frequently associated with fever, sweats, fatigue, and lymphadenopathy, which suggests an infectious cause. Regardless of location, all IPTs share similar histological features. They are composed of varying proportions of myofibroblastic spindle cells, lymphocytes, and plasma cells.5,6 There is an absence of neoplastic cells. The isolation of EBV DNA from some cases of IPT suggests that EBV may play a role in at least a subset of IPT. The microorganisms are rarely detected in the IPTs, however. Acute immune and vascular causes of IPT have also been hypothesized. Our patient had an elevated EBV antigen IgG titer supporting a postinfectious cause. However, the term “inflammatory myofibroblastic tumor” has recently been suggested as a more descriptive name for inflammatory pseudotumor. Some authors believe this tumor is a low-grade fibrosarcoma with inflammatory cells. In 2002, the World Health Organization classified inflammatory myofibroblastic tumor as a soft-tissue tumor composed of differentiated myofibroblastic spindle cells, usually accompanied by numerous plasma cells and/or lymphocytes.5 Some studies have revealed cytogenetic clonal abnormalities and anaplastic lymphoma kinase expression suggesting a neoplastic etiology.9,10

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**Figure 1** Noncontrast axial CT scan with bone windows reveals marked expansion of the left fissura petrooccipitalis (asterisk) and destruction of the left clivus (arrow) and left petrous apex.
The preoperative diagnosis of skull base IPT is usually difficult due to its nonspecific clinical and radiologic features. Although they are histologically benign, IPTs often show aggressive clinical behavior, with locally destructive features that mimic a neoplastic process. In our case, for example, there were no signs or symptoms of infection (such as fever) and the tumor was originally thought to be a nasopharyngeal carcinoma (NPC). On CT scan, IPT frequently reveals a soft-tissue density mass with moderate enhancement. In contrast to orbital disease, skull base IPT presents with more aggressive growth and bony destruction, often accompanied by bony sclerosis. The bone sclerosis is suggestive of slow growth such as that seen in inflammatory conditions. MRI

Figure 2 (A) Axial fast spin-echo T2-weighted MR image shows an expansile heterogeneous hypointense lesion (arrow) in the left fissura petrooccipitalis involving the left clivus. (B) Axial T1-weighted MR image as the same level as (A) shows the marrow replacement in the left clivus (arrow). The normal high signal intensity of bone marrow is seen on the right side (asterisk). (C) Axial postgadolinium T1-weighted MR image at the same level as (A) demonstrates moderately enhancement of the lesion (arrow). (D) Coronal postgadolinium T1-weighted MR image with fat suppression reveals the superior extension of the mass (arrow) with cerebral dural enhancement (arrowhead).
features of skull base IPT are variable and are usually iso-
to hypointense relative to cerebral gray matter on both
T1- and T2-weighted images. The presence of marked
T2 hypointensity, as in our case, serves as an important
diagnostic clue in differentiating IPT from aggressive malignancies,
such as infiltrative NPC, metastatic carcinoma, primary
skull base lymphoma, or plasmacytoma, which are usually iso-
to hyperintense on T2-weighted images. Lu et al reported seven patients with nasopharyngeal IPT and
compared them with seven patients with NPC. All IPT
lesions were hypointense to brainstem on T2-weighted images, and six of the NPC lesions showed mild hyper-
intensity on T2-weighted images. The remaining NPC
lesion was isointense on T2-weighted images. Lee et al described a case of IPT originating from the clivus which
also showed marked heterogeneous hypointensity on T2-
weighted imaging. The hypointensity seen on T2-
weighted images likely reflects a combination of fibrosis
and attenuated cellularity. Intracranial extension with
dural thickening and enhancement were observed in our
case, which may be another feature of skull base IPT.
Strasnick et al reported on two patients with temporal
bone IPT and noted thickening and enhancement of
adjacent intracranial dural structures in both cases.

There is no consensus regarding treatment of
skull base IPT due to the rarity of the lesion. Complete
surgical removal is usually attempted. If complete sur-
gegical resection of the lesion is impossible, administration
of high-dose corticosteroid therapy is advocated. The
response of IPT to corticosteroids is dependent on its
histological features, as lesions with abundant lympho-
cytes and plasma cells are considered more sensitive to
steroids compared with those that are predominantly
fibrotic. In contrast to pseudotumors of the orbit, skull
base IPT is less responsive to corticosteroid treatment.

Recurrences during the 2 years follow-up were as high as
15% in studies of extrapolummary IPT. Long-term
administration of low-dose prednisolone is recom-
mended to prevent relapse. But the efficacy and safety
of the low-dose steroid maintenance therapy in IPT still
remains questionable. Radiation therapy has been used
in patients with orbital IPT who cannot tolerate or fail
corticosteroid treatment, but similar success has not
been demonstrated in the limited number of reported
cases of skull base IPT. In our case, the patient had
significant clinical and radiologic improvement follow-
ing surgical resection and responded well to subsequent
corticosteroid therapy.

IPT rarely involves the skull base. When it does, it
frequently presents with headache, and/or cranial nerve
palsy due to its aggressive growth and bony destruction
and can mimic a malignant tumor, radiologically. When
a mass in the skull base appears hypointense on T2-
weighted imaging with associated thickening and en-
hancement of adjacent intracranial dural structures, IPT
should be considered in the differential diagnosis. Com-
plete surgical removal appears the first choice for therapy
and subsequent steroid therapy may help to prevent
recurrence.

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