Metastasis to the base of the skull can result in a variety of clinical presentations. In 1981, Greenberg et al. evaluated 43 patients with skull base metastases, and described five distinct clinical syndromes: the orbital, parasellar, middle fossa, jugular foramen, and occipital condyle syndromes. Of these, the occipital condyle syndrome (OCS) was associated with the most clearly stereotyped clinical presentation. Patients with OCS presented with a severe, continuous, unilateral occipital headache, often exacerbated by head-turning. Physical findings were usually limited to a unilateral hypoglossal paresis and mastoid tenderness.

We present two cases of typical OCS, both of which were the first sign of disseminated malignancy. The challenges in establishing the diagnosis of disseminated malignancy will be discussed.

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We present two cases of typical OCS, both of which were the first sign of disseminated malignancy. The challenges in establishing the diagnosis of disseminated malignancy will be discussed.
Patient 1

A 58-year-old woman presented to the emergency department with a six-week history of severe, constant, left-sided headache. The pain originated in the left occipital region and radiated over the top of her head. Three weeks after the onset of her headache, she experienced sudden onset dysarthria and tongue weakness. She had no other symptoms, and was feeling otherwise well.

She had a past history of small cell lung cancer, which had been diagnosed a year previously. She had been treated with radiotherapy and etoposide/carboplatin chemotherapy. Her last cycle of chemotherapy was approximately six months prior to the onset of her headache, and she had no symptoms of recurrence. She also had a past history of migraine without aura.

Her general medical examination was normal, with the exception of tenderness over her left mastoid region. The sole abnormality on neurological examination was left tongue deviation and significant left-sided tongue atrophy (Figure 1).

A standard computed tomography (CT) scan of her head was normal. Cerebrospinal fluid studies, including cytological examination, were normal. Magnetic resonance imaging (MRI) of her brain showed no enhancing lesions and no stroke. Magnetic resonance angiography (MRA) was normal. Note was made of a minor hypointensity in the marrow of the left occipital condyle (Figure 2A and 2B). Subsequent bone scan did not demonstrate any abnormality in the skull base.

After a week, she began to develop severe low back pain and bony tenderness in the sacro-iliac area bilaterally. Magnetic resonance imaging of her spine demonstrated an epidural mass and marrow infiltration of the vertebral bodies at several levels. She was re-admitted to hospital and a diagnosis of metastases from lung cancer was made. She was treated with palliative radiotherapy. A few weeks later, she developed diplopia, and physical examination demonstrated a partial left sixth nerve palsy. Repeat MRI of her head demonstrated a large skull base mass that extended from the left occipital condyle into the clivus and left sphenoid sinus (Figure 2C and 2D). There were also two new enhancing lesions in the right frontal lobe.

As she had not responded to radiotherapy, her care was transferred to the palliative care service. She was treated with oral dexamethasone and analgesics, and died at home five months after the onset of her tongue weakness.

Patient 2

This 36-year-old man presented to the emergency department with a ten-day history of severe, sharp headache in the left
occipital region. The pain originated in the left side of his neck and radiated through the mastoid region to the top of his head. It was so intense that it interfered with his sleep. Two days after the onset of his headache, he noticed mild dysarthria and difficulty chewing certain foods. Six weeks prior to the onset of his headache, he had right facial numbness and paresthesias that had resolved spontaneously after two weeks. He was otherwise well and had no relevant past medical history.

There were no abnormalities on general medical examination. The only abnormality on neurological examination was leftward deviation of his tongue and left-sided tongue weakness. There was no tongue atrophy.

Computed tomography of his head demonstrated a subtle hyperdensity in the region of the right cavernous sinus. However, subsequent magnetic resonance imaging did not reveal any abnormality in this region. There were no soft tissue masses or posterior fossa lesions on MRI, and magnetic resonance angiography was normal.

Although this patient received no treatment, the headache and tongue weakness gradually resolved over the next few weeks. However, two months later, he developed severe nausea and vomiting and a diffuse headache. He also started to experience intermittent chills and severe drenching night sweats. Laboratory investigations showed pancytopenia, with a white blood cell count of $2,600 \times 10^6 /L$, hemoglobin of $131 \text{ g/L}$ and a platelet count of $139,000 \times 10^9 /L$. His serum calcium level was elevated at 3.35 mmol/L. Chest radiograph showed a paravertebral mass at the T10 level.

He was admitted to hospital for medical management and further investigations. Computed tomography of his chest, abdomen and pelvis confirmed the presence of a paravertebral mass at the T10 level. In addition, there was mild splenomegaly, multiple enlarged para-aortic and retroperitoneal lymph nodes and two pulmonary nodules in the left lower lobe. Bone marrow biopsy showed hypercellular marrow with many Reed-Sternberg cells and an immunohistochemical pattern consistent with Hodgkin's lymphoma. A CT-guided biopsy of a retroperitoneal lymph node confirmed the diagnosis of Hodgkin's lymphoma.

Because of the bone marrow involvement and constitutional symptoms, it was determined that he had Stage IVB disease. He was treated with six cycles of ABVD (doxorubicin, bleomycin, vinblastine and dacarbazine) chemotherapy, and initially showed signs of remission. However, he has since returned with recurrent disease, is being treated with salvage chemotherapy. He is being evaluated for bone marrow or peripheral blood stem cell transplantation.

**DISCUSSION**

Both of these cases demonstrate several key features of occipital condyle syndrome. In our patients, and in almost all of the 25 previously-reported cases of OCS, a stereotyped pattern of severe, continuous, unilateral headache and associated mastoid tenderness (Table). Almost all patients had isolated unilateral tongue paresis with no other abnormalities on neurological examination. In most of these cases, headache preceded the tongue paresis, often by days or weeks.

As with our patients, diagnosing the underlying cause of occipital condyle syndrome can be challenging. It is difficult to establish the utility of cytological examination of the cerebrospinal fluid, as it is reported in only three cases. However, in all three cases, it was negative. Imaging techniques such as computed tomography (CT) of the skull base and radionuclide bone scan often do not demonstrate abnormalities in the occipital condyle. As seen in the Table, magnetic resonance imaging (MRI) is more sensitive in detecting abnormalities in the occipital condyle. However, this test is also imperfect. In one of our patients, and in one study.

### Table: Summary of the clinical characteristics of all reported cases of occipital condyle syndrome

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of patients</th>
<th>Age (yrs)</th>
<th>Severe, continuous unilateral headache</th>
<th>Mastoid tenderness</th>
<th>Isolated CN XII palsy on exam</th>
<th>Headache preceded tongue paresis</th>
<th>Time to diagnosis (from symptom onset)</th>
<th>CSF cytology positive</th>
<th>Bone scan positive</th>
<th>Initial CT abnormal</th>
<th>Initial MRI abnormal</th>
<th>No Prior history of cancer (i.e. first presentation)</th>
<th>Presumed primary malignancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenberg et al. 1981 [1]</td>
<td>9</td>
<td>NR</td>
<td>7/9</td>
<td>9/9</td>
<td>6/9*</td>
<td>NR</td>
<td>2-6 weeks</td>
<td>NR</td>
<td>NR</td>
<td>2/3*</td>
<td>NR</td>
<td>1/9</td>
<td>Breast (4), Lung (1), Prostate (1), Lymphoma (1), Other (2)</td>
</tr>
<tr>
<td>Salamanca et al., 2006 [4]</td>
<td>1</td>
<td>66</td>
<td>1/1</td>
<td>1/1</td>
<td>1/1</td>
<td>3 weeks</td>
<td>1/1</td>
<td>NR</td>
<td>0/1</td>
<td>1/1</td>
<td>1/1</td>
<td>1/1</td>
<td>Prostate</td>
</tr>
<tr>
<td>Our cases</td>
<td>2</td>
<td>36-58</td>
<td>2/2</td>
<td>2/2</td>
<td>2/2</td>
<td>1-3 months</td>
<td>0/1</td>
<td>0/1</td>
<td>0/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>Lung (1), Hodgkin's lymphoma (1)</td>
</tr>
</tbody>
</table>

*aInformation was not available for all cases, therefore, only reported information is shown.*

458

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previously-reported case,\textsuperscript{2} there was no abnormality of the skull base on MRI. Presumably, a very small space-occupying lesion (too small to be detected by conventional imaging) can be sufficient to cause headache and hypoglossal palsy. Importantly, evaluation of the occipital condyles (on imaging) by a radiologist can be hampered by insufficient clinical data.\textsuperscript{5}

There is no obvious explanation as to why Patient 2 improved spontaneously before returning with constitutional symptoms and lymphadenopathy. There are case reports of spontaneous remission of Hodgkin’s lymphoma,\textsuperscript{6} which is presumed to be on the basis of an immune response, though other factors have been implicated. It is conceivable that a small occipital condyle tumour could remit spontaneously, even as the lymphoma continued to proliferate elsewhere.

Occipital condyle syndrome was the first manifestation of malignancy in Patient 2, and in 8 of 25 previously-reported cases. The diagnosis of malignancy is frequently delayed by several months. A wide variety of malignancies can cause OCS, including metastases from solid tumours of the breast, lung, prostate and gastrointestinal tract, primary pharyngeal tumours and lymphoma. Only a small fraction of patients with OCS have a benign explanation for their symptoms. In a series of 100 patients with twelfth nerve palsy, over half of patients with non-traumatic tongue paresis had a malignancy.\textsuperscript{7}

In summary, occipital condyle syndrome is a rare but easily recognizable and clearly stereotyped clinical syndrome that is usually associated with skull-base metastasis. The diagnosis can be elusive, and diagnostic imaging of the skull base may be normal on initial presentation. Patients who present with this syndrome should be evaluated carefully to rule out malignancy.

\textbf{REFERENCES}