Introduction

Meningiomas are one of the most common primary brain tumors accounting for 33.8% of all central nervous system (CNS) tumors. Malignant meningiomas are, however, uncommon and constitute a small proportion (5% or less) of all cases. Recurrence rates of around 3% for benign meningiomas and 38% for atypical meningiomas have been reported. These atypical (WHO Grade II) or anaplastic (WHO Grade III) meningiomas are likely to be locally aggressive and may very rarely present with distant extracranial metastases. Metastatic lesions have been described most frequently in the lung, bones, intraspinally, and in the liver. Metastases to the pleura have been reported as early as 1944 but are infrequent.

Case Report

A 40-year-old female presented with complaints of cough with scanty sputum, breathlessness at rest which improved on lying on the right side, and low-grade fever of 2 weeks' duration. She also reported significant loss of weight and appetite over the past 2 months. The patient had undergone craniotomies twice during the past 18 months for excision of recurrent meningiomas. In May 2015, she had presented with headache and left-sided hemiparesis. Magnetic resonance imaging (MRI) had shown a right frontal parasagittal meningioma, for which a craniotomy was performed with gross total excision of the tumor, following which she improved symptomatically. Histopathology of the tumor was reported as atypical meningioma (WHO Grade II) [Figure 1a-e]. In December 2015, 7 months following the first surgery, she developed headache and vomiting with worsening of her left hemiparesis. MRI revealed recurrence of the tumor, and she underwent another craniotomy. Intraoperatively, the tumor was found to be locally invasive and was only partially removed to minimize morbidity. Histopathological examination (HPE) of the second surgical specimens also demonstrated atypical meningioma – WHO Grade II with clear cell change. In view of incomplete resection during the second craniotomy, the patient had received adjuvant radiation therapy (30 fractions, total dose of 56 Gy) elsewhere. After being relatively symptom free for a year, she presented with respiratory symptoms in March 2017. She is a known diabetic for 3 years with fairly controlled blood sugars. There was no significant family history of malignancy.

On examination, the patient was conscious, dyspneic, and pale. She was afebrile, tachycardic, and normotensive. Her oxygen saturation was 92% while she was breathing room air. Examination of the respiratory...
system showed features consistent with a right-sided pleural effusion. CNS examination demonstrated mild residual hemiparesis on the left side.

Blood investigations revealed anemia (Hb 8.6 g/dL), albumin/globulin reversal (2.4/3.8 g/dL), and mildly elevated erythrocyte sedimentation rate (42 mm in 1st h). Chest radiograph was suggestive of a massive loculated right pleural effusion. Diagnostic thoracocentesis was done which yielded hemorrhagic pleural fluid. Biochemical analysis showed an exudative pleural effusion (glucose 74 mg/dL, protein 5.1 g/dL, albumin 2.7 g/dL, lactate dehydrogenase 2709 U/L, adenosine deaminase of 14.96 IU/L) and cytology was negative for malignant cells. Ultrasound of the abdomen showed normal study of visualized organs. Skeletal survey was unremarkable. A contrast-enhanced computed tomography (CT) scan of the thorax was performed [Figure 1f] which revealed multiple bilateral large heterogeneous enhancing lesions which were pleural based and lobulated, with associated pleural effusion. There was no involvement of the lung parenchyma. Differential diagnoses considered were metastatic atypical meningioma, mesothelioma, or neuroendocrine tumors. The patient underwent a CT-guided biopsy of the pleural mass lesion.

HPE of the tissue revealed infiltration of the pleura by cells having indistinct cytoplasm, arranged in the form of nests, cords, and trabeculae. Some of these cells had abundant clear cytoplasm, vesicular nuclei, and 1–3 prominent nucleoli; some others had fibroblastic morphology with dark condensed nuclei and inconspicuous nucleoli. A focus of necrosis, hemorrhage, and many areas of fibrosis was seen. The tumor cells were positive for epithelial membrane antigen (UltraVision LP, Clone: E29) and vimentin (UltraVision LP, Clone: V9) but negative for mesothelin (UltraVision LP, Clone: HBME1), CK 5/6 (UltraVision LP, Clone: D5/16 B4), chromogranin (UltraVision LP, Clone: SP12), and CD 34 (UltraVision LP, Clone: QBEnd/10) [Figure 2a-f]. Review of the HPE slides from the prior two surgeries showed that they closely matched the histopathology of the pleural mass. Thus, the patient was diagnosed to have recurrent atypical meningioma WHO Grade II, with pleural metastases. In view of advanced disease, the patient and her relatives opted for palliative care.

**Discussion**

Meningiomas are traditionally considered to be benign tumors; however, some are more aggressive and tend to be locally invasive. Extracranial metastases from meningiomas are extremely rare and may be found in the lungs, liver, long bones, pelvis and skull, cervical lymph nodes, pleura, vertebrae, and mediastinum. According to the WHO classification of CNS tumors (2016), meningiomas have been divided into three grades based on their histology as Grade I (meningioma), Grade II (atypical meningioma), and Grade III (anaplastic meningioma).

**Atypical meningiomas**

Atypical meningioma can be diagnosed on the basis of 3 of 5 histological features: spontaneous necrosis,
sheeting (loss of whorling or fascicular architecture), prominent nucleoli, high cellularity, and small cells (tumor clusters with high nuclear: cytoplasmic ratio). Further brain invasion has been included as a criterion for the diagnosis of atypical meningioma.[5] Atypical and anaplastic meningiomas are notable for their high recurrence rate and the occurrence of extracranial metastasis.

Metastasis in meningiomas

Distant metastases are uncommon with benign meningiomas, but up to 5% of atypical and 30% of anaplastic meningiomas can metastasize. Meningiomas may metastasize through lymphatic, hematogenous, or cerebrospinal fluid.[6] The various sites of metastases and the reported incidences are represented in Table 1.[3,4] Lung metastases seem to be the most frequently reported, and pleural involvement has been documented by a few authors.[2,5,6‑11] Isolated pleural metastasis without lung involvement is rare and has been reported in a patient with frontal atypical meningioma by Yacoub et al.[11] Due to the rarity of occurrence, prognosis of metastatic meningiomas is unknown, and no definitive therapeutic regimen has been established for such cases.

Conclusion

Atypical meningiomas are associated with high recurrence rates and a potential to metastasize. Hence, a high degree of clinical suspicion is warranted to detect metastases, especially in patients with WHO Grade II/III meningiomas, locally invasive tumors, and documented recurrences. Pleural metastasis should be considered in the differential diagnosis of patients presenting with pleural effusion or mass, in the background of previous atypical meningioma.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

8. Russell and Sachs, 1942 Right parietal meningiosarcoma
9. Dublin, 1944 Right parietooccipital meningiosarcoma
10. Cross and Cooper, 1952 Left parietal meningioma
11. Shuangshoti, 1970 Occipital angioablatic meningioma
12. Miller and Ramsden, 1972 Right frontal meningioma
13. Som, 1987 Parasagittal meningioma
14. Kros, 2000 Papillary meningioma
15. Kaminski, 2001 Frontal meningioma
16. Yacoub, 2003 Frontal meningioma
17. Emran, 2005 Frontal parasagittal meningioma
18. Nakayama, 2013 Right parietal meningiothelial meningioma

Table 1: Reported incidence of extracranial metastases from meningiomas

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Sites of metastases</th>
<th>Reported incidence (%)</th>
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</thead>
<tbody>
<tr>
<td>Karasick, 1974</td>
<td>Lung</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Abdominal viscera</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Bones (long bones, pelvis, skull, vertebrae)</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Mediastinal metastases</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Pleural involvement</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Cervical lymph nodes</td>
<td>14</td>
</tr>
<tr>
<td>Estani, 2009</td>
<td>Lung</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Abdominal viscera</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Bones (long bones, pelvis, skull, vertebrae)</td>
<td>11</td>
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<td></td>
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<td>5</td>
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<tr>
<td></td>
<td>Pleural involvement</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Cervical lymph nodes</td>
<td>18</td>
</tr>
<tr>
<td>Surov, 2013</td>
<td>Lung</td>
<td>37.2</td>
</tr>
<tr>
<td></td>
<td>Bones</td>
<td>16.5</td>
</tr>
<tr>
<td></td>
<td>Intraspinally</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
<td>9.2</td>
</tr>
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</table>

Table 2: Pleural metastases from intracranial meningiomas

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Primary tumor</th>
</tr>
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<tbody>
<tr>
<td>Russel and Sachs, 1942</td>
<td>Right parietal meningiosarcoma</td>
</tr>
<tr>
<td>Dublin, 1944</td>
<td>Right parietooccipital meningiosarcoma</td>
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<td>Cross and Cooper, 1952</td>
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<td>Kros, 2000</td>
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<tr>
<td>Kaminski, 2001</td>
<td>Frontal meningioma</td>
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<tr>
<td>Yacoub, 2003</td>
<td>Frontal meningioma</td>
</tr>
<tr>
<td>Emran, 2005</td>
<td>Frontal parasagittal meningioma</td>
</tr>
<tr>
<td>Nakayama, 2013</td>
<td>Right parietal meningiothelial meningioma</td>
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