ABSTRACT

Meningiomas are common intracranial neoplasms. Meningomas are rarely subjected to fine-needle aspiration (FNA) studies. However, intraoperative squash preparations are commonly done. FNA of meningiomas are usually performed incidentally for cases with a clinical suspicion of some other disease such as metastatic carcinoma. We are reporting two cases, which were referred to our center with a diagnosis of metastatic carcinoma on FNA from swelling of the temporal region. We are discussing the characteristic cytomorphological features, which help in diagnosing meningiomas, the common cytological differentials, and the utility of immunohistochemistry (IHC) on cell block preparations in confirming the diagnosis, especially when there is a clinical differential diagnosis.

Key words: Cell block; cytopathology; immunohistochemistry (IHC); meningioma

Introduction

Meningiomas are common intracranial neoplasms that account for approximately 18% of primary intracranial tumors and 25% of primary intraspinal tumors.[1] Increasing evidence supports the development of meningiomas from arachnoid cap cells. Arachnoid cells are thought to arise from the neural crest. They normally line the inner aspect of the arachnoid membrane and fill the cores of the arachnoid villi that project into the lumens of dural veins and venous sinuses. Meningiomas are typically slow-growing tumors that predominantly affect middle-aged females.[2] Meningiomas are neoplasms, which are subject to hormonal influence. Most meningiomas arise within the cranial cavity and are dura-based. Sometimes they permeate the skull, produce hyperostosis, and later on present as visible masses in the scalp. In such situations, they may be subject to fine-needle aspiration (FNA).

Case report

We are reporting two cases of meningiomas of the temporal region, which were referred to us with a diagnosis of metastatic carcinoma. The first case was a 78-year-old lady who presented to the local hospital with complaints of pain in the right eye and headache in the right temporal region. On examination, there was a vague swelling above the right eyebrow measuring 4 × 4 cm. FNA was performed at the local hospital and a diagnosis of metastatic carcinoma was given.

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The patient was referred to our oncology outpatient clinic. A repeat FNA was performed at our center and a diagnosis of meningioma was made. Meanwhile, a review of magnetic resonance imaging (MRI) of the brain at the outside center was also performed, which showed a well-defined round extraaxial enhancing lesion measuring 11.5 × 11 × 10 mm along the right basifrontal dura, which was suggestive of meningioma. Also seen was a lytic destructive lesion with cortical irregularity and breach of both inner and outer tables extending into the overlying subcutaneous tissue and underlying temporal dura. This lesion was radiologically thought to be osteomyelitis or metastasis. However, FNA from this area confirmed that this was also part of the meningioma. Because of the outside report of metastatic carcinoma, the patient was worked up for other malignancies. However, no other disease was detected.

The second case was a 64-year-old lady who noticed a swelling on the left temporal region of 8 months duration. She was evaluated at a local hospital following which FNA was performed, which was reported as metastasis from thyroid carcinoma. Ultrasound scan of the thyroid gland done at the same hospital showed multiple isoechoic to hyperechoic nodules. MRI of the brain showed erosion in the orbital and cerebral surfaces of the greater wing of the sphenoid bone. Associated soft tissue infiltration of the left temporalis muscle was seen. Intracranial extension with mild indentation of the left temporal bone was also noted. The possibilities considered radiologically were metastasis or primary malignant neoplasm of the bone. Meanwhile total thyroidectomy was performed, which was reported as nodular colloid goiter. The patient was referred to our center for further management. On examination, there was a vague swelling measuring 4 × 3 cm above the left eyebrow. There was also mild proptosis of the left eye. FNA was repeated at our center and a diagnosis of meningioma was made.

In both these cases, cytology smears showed the characteristic features of meningioma such as spindle-shaped tumor cells, whorls, intranuclear pseudo-inclusions, nuclear grooves, and psammoma bodies [Figure 1a and b]. The abundant cytoplasm in smears showed wispy, terminally twisted extensions on the tumor cells. The diagnosis of meningioma was made from the smears; however, since in both these cases there was clinical suspicion of metastatic carcinoma, immunohistochemistry (IHC) was performed on cell block preparation made from the aspirated material. The panel we chose was epithelial membrane antigen (EMA), vimentin, and S100. For the second case, we also added thyroglobulin. The cells were strongly positive for vimentin [Figure 1c] and showed weak patchy positivity for EMA [Figure 1d] and S100, thus confirming the diagnosis of meningioma. In the second case, atypical cells were negative for thyroglobulin, thus ruling out the possibility of metastatic thyroid carcinoma.

**Discussion**

Meningiomas of the scalp can be congenital, ectopic meningiomas or acquired due to secondary extension from an underlying intracranial meningioma.[3] Meningiomas are rarely subjected to FNA and the cases who come for FNA come with clinical suspicion of some other disease and are usually incidentally diagnosed in cytological smears. Squash preparations of intracranial meningiomas for intraoperative consultation are however, well-described.[4]

The characteristic cytopathological features of meningioma include spindle-shaped tumor cells, whorls, intranuclear pseudo-inclusions, nuclear grooves, and psammoma bodies. However, pathologists should be aware that higher grade tumors can show the predominance of epithelioid cells, small cell change, etc.[5] Depending on the location, the differential diagnosis on FNA material is broad. Whorled spindle cells of meningioma can be confused with granuloma. Keratin pearls from well-differentiated squamous cell carcinoma can come as a cytological differential for the whorled spindle cells of meningioma. The dense eosinophilic cytoplasm of squamous cells and abundant wispy cytoplasm in case of meningioma can also rarely come as cytological differential for the whorled spindle cells of meningioma.[5] The presence of nuclear grooves, intranuclear inclusions, and psammoma bodies in cytology preparations raises suspicion of metastatic thyroid carcinoma.
The abundant cytoplasm in smears showing wispy, terminally twisted extensions on the tumor cells, forming whorls is a clue to diagnose meningioma.

With IHC, most of the cases can be sorted out. Meningiomas show positivity with EMA, vimentin, and S100. Usually, a panel of EMA and vimentin is sufficient for the diagnosis of meningiomas. Focal positivity with estrogen and progesterone receptors is also described. Though meningiomas may show positivity for keratin, they do not usually show strong and diffuse staining as in case of carcinomas. Negativity for thyroglobulin and thyroid transcription factor-1 helps to differentiate from thyroid carcinoma. When a differential of solitary fibrous tumor is considered, the negativity for CD99 and B-cell lymphoma 2 (Bcl-2) will be helpful in reaching a correct diagnosis. [6]

**Conclusion**

Meningiomas have characteristic cytomorphological characteristics. A high degree of suspicion, along with a clinical, radiological correlation and IHC helps in clinching the diagnosis.

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**Conflicts of interest**

There are no conflicts of interest.

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