

## CASE REPORTS

# Lipomatous meningioma: Case report and review of the literature

Walid Radwan<sup>1</sup>, Brandon Lucke-Wold\*<sup>1</sup>, Cletus Cheyuo<sup>1</sup>, Janice Ahn<sup>2</sup>, Kymberly Gyure<sup>2</sup>, Sanjay Bhatia<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, West Virginia University, Morgantown, West Virginia, United States

<sup>2</sup>Department of Pathology, Ruby Memorial Hospital, West Virginia University, Morgantown, West Virginia, United States

**Received:** September 25, 2016

**Accepted:** October 7, 2016

**Online Published:** October 20, 2016

**DOI:** 10.5430/css.v2n4p58

**URL:** <http://dx.doi.org/10.5430/css.v2n4p58>

## ABSTRACT

Lipomatous meningiomas are a very rare form of brain meningiomas consisting of fat accumulation within the tumor. Magnetic resonance imaging (MRI) or computerized tomographic (CT) imaging can be utilized to visualize the fat accumulations, but histopathologic staining is necessary in order to make a definitive diagnosis. The key histopathologic feature is the identification of adipocyte-like cells within the tumor, but other markers have also been identified. In this case report and review of the literature, we discuss how to recognize the symptoms associated with lipomatous meningiomas and the definitive treatment approach for these rare tumors.

**Key Words:** Lipomatous meningiomas, Migraine headaches, Adipocyte-like cells, Behavioral disturbance

## 1. INTRODUCTION

Lipomatous meningiomas are a very rare variety of meningioma where adipocytes and lipoblasts contribute to fat accumulation within the tumor (see Table 1).<sup>[1]</sup> The mean age for lipomatous meningioma presentation is 50 years of age with a range from 22 to 74 years reported in the literature.<sup>[2]</sup> These tumors are a subgroup of a broader class termed “metaplastic meningiomas” that has been proposed by the World Health Organization.<sup>[3]</sup> It is a variant, which contains mesenchymal components including osseous, cartilaginous, lipomatous, myxoid and xanthomatous tissue.<sup>[1,3]</sup> Characteristic of lipomatous meningiomas are intratumoral fat accumulations,

which are best appreciated on computerized tomographic (CT) as hypodense and on T1-weighted magnetic resonance imaging (MRI) as hyperintense lesions.<sup>[4]</sup> Definitive diagnosis requires histopathologic evaluation and cannot be based on imaging findings alone.<sup>[5]</sup> In the case of intracranial lesions; the standard of care is craniotomy with tumor excision followed by histopathologic evaluation of the resected tissue.<sup>[6]</sup> We present a case of a 58-year-old woman with a history of migraines that was found to have a right parietal lipomatous meningioma, and a Simpson grade I resection was performed. We provide a detailed review of the literature and provide relevant discussion of key clinical considerations for managing patients with lipomatous meningiomas.

\*Correspondence: Brandon Lucke-Wold; Email: [bwold@mix.wvu.edu](mailto:bwold@mix.wvu.edu); Address: Department of Neurosurgery, West Virginia University, Morgantown, West Virginia, United States.

**Table 1.** Overview of lipomatous meningioma cases reported in the literature

Study	# of Cases	Key Finding
Roncaroli et al., 2001 <sup>[1]</sup>	18 cases	16 cases were supratentorial and 2 involved spinal meninges
Tang et al., 2013 <sup>[2]</sup>	15 cases	Presenting symptoms were headache, dizziness, and seizure
Yamada et al., 1999 <sup>[4]</sup>	1 case	Lipomatous meningioma with hyaline inclusion bodies
Krisht et al., 2012 <sup>[5]</sup>	1 case	Presented with intratumoral hemorrhage
Withers et al., 2003 <sup>[6]</sup>	1 case	Hyperintensity on T1 sequence MRI
Mariniello et al., 2000 <sup>[7]</sup>	1 case	Tumor in the falx cerebri with interesting histopathologic features
Colnat-Coulbois et al., 2008 <sup>[8]</sup>	2 cases	Tumors had a mix of meningothelial cells and lipid laden cells
Ishida et al., 2013 <sup>[9]</sup>	1 case	Tumors with lipid filled vacuolated cytoplasm
Savardekar et al., 2016 <sup>[10]</sup>	1 case	Lipomatous meningiomas are a subsection of metaplastic meningiomas
Jaiswal et al., 2011 <sup>[11]</sup>	5 cases	Common locations are parietal, frontal, or frontal temporal
Kim et al., 2015 <sup>[12]</sup>	1 case	Craniectomy and resection is standard of care
Gasparinho et al., 2015 <sup>[13]</sup>	1 case	Adipocyte-like cells have low proliferative activity

## 2. CASE

The patient is a 58-year-old female who presented in early June 2016 with main complaint of right-sided headache. She had been referred by an outside facility for a history of an enlarging submental mass starting in May, and a finding of a right parietal homogeneously enhancing mass. Her past medical history included basal cell carcinoma on her cheek that was excised, migraines, left arm numbness, forgetfulness. Other significant conditions include a history of depression, reflux, hypertension, inflammatory bowel disease, and diverticulosis. There was no history fever or weight loss on presentation. On physical exam her body mass index (BMI) was 38.9 kg/m<sup>2</sup> and lymphadenopathy was noted in the submental area. The remainder of her history and physical exam was non-contributory. CT brain revealed two hypodense lesions, one in the right parietal measuring 2.6 cm × 2 cm and a left galeal mass adjacent to the bone measuring 1.4 cm × 1 cm and MRI showed hyperintensity of the lesions on T1-weighted sequence, along with contrast enhancement on T1 + Gadolinium. In addition, gradient echo sequence (GRE) revealed presence of blood products (see Figure 1).

CT of the chest, abdomen, and pelvis with and without contrast was ordered. The CT scan revealed bilateral hypodense renal masses and hypodensity within the spleen that were not concerning for malignancy. Based on the imaging results, an ultrasound core biopsy of the submental lymph node was scheduled and performed. The biopsy results showed a reactive lymph node with no evidence of malignancy. After discussing the results with the patient, she underwent a right

posterior temporal craniotomy for Simpson grade 1 tumor resection. On gross pathology, the tumor was pink, rubbery, and hemorrhagic. Microscopically, the tumor demonstrated a mixture of meningothelial lobules and adipocyte-like cells consistent with lipomatous meningioma (see Figure 2). The patient recovered well post-surgery and was discharged on post-operative day 3. At her 1-month postoperative visit, her headache had resolved. The excisional site was without drainage or infection.

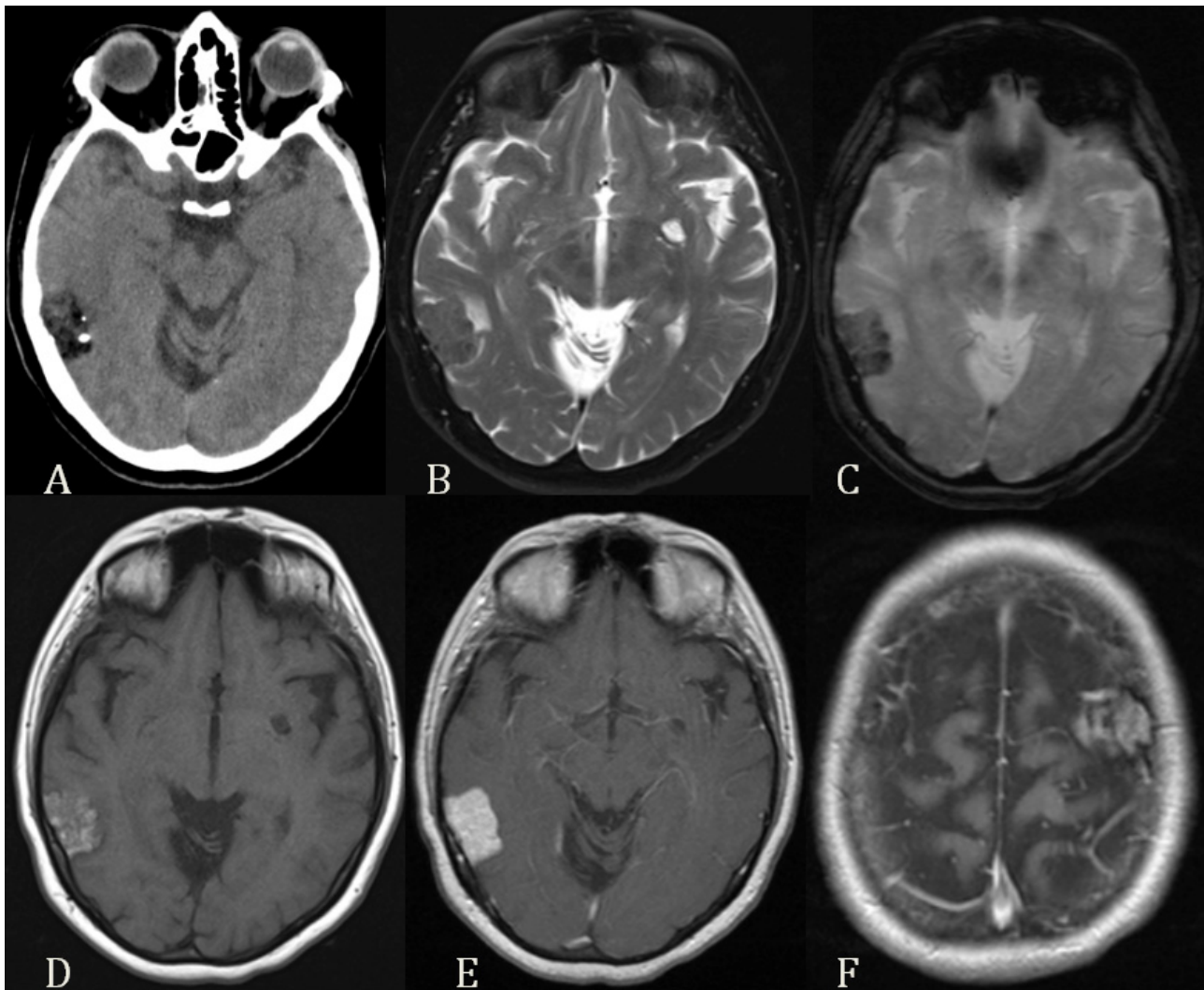
## 3. DISCUSSION

The underlying pathophysiology of lipomatous meningiomas has been debated. Though initially thought to involve the metaplasia of meningothelial cells to adipocytes,<sup>[7]</sup> several authors have attributed the alteration to fat accumulation due to disrupted metabolism within meningothelial cells.<sup>[1,8]</sup> The cells are typically positive for histologic markers including epithelial membrane antigen, vimentin and CD68. The hallmark finding however is the presence of adipocyte-like cells, which were noted in the histopathologic specimen from our patient.<sup>[9]</sup> Savardekar and colleagues found that these lipomatous areas are readily visible with standard MRI protocols.<sup>[10]</sup> In our particular case, there was no evidence of a dural tail sign on T1 + Gadolinium which is not unusual as a dural tail sign is only present in 52%-78% of meningiomas.<sup>[14]</sup> Once the lesion was identified in our patient, a CT of the chest, abdomen, and pelvis was performed to rule out metastatic disease.

Fortunately, lipomatous meningiomas are most often WHO grade I, typically slow growing, are not metastatic, and do not

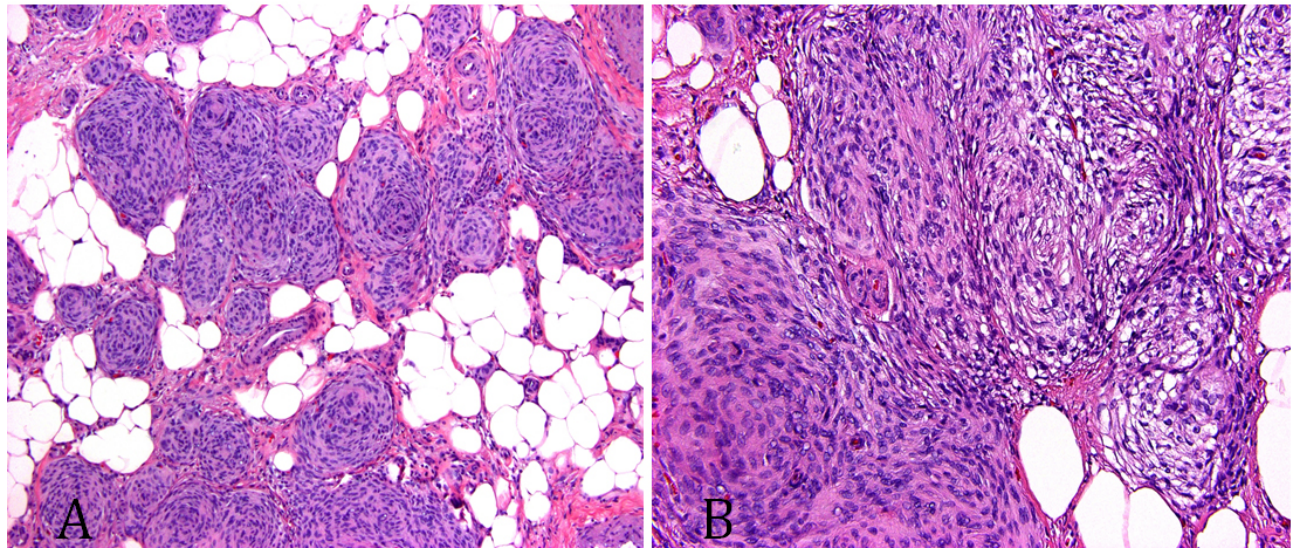
require chemotherapy or radiation following resection.<sup>[15]</sup> Following gross total resection, they exhibit low recurrence. Only 17% of lipomatous meningiomas recurred in the case series by Roncaroli and colleagues.<sup>[11]</sup> When identified with appropriate imaging, complete resection is readily obtainable in the vast majority of cases.<sup>[6]</sup> A Simpson grade I was achieved in our patient with excellent recovery post-surgery with limited residual symptoms. We chose to operate on the right side, as the patient appeared to be symptomatic from this lesion given her right-sided headaches, in addition, we would obtain tissue pathology that would guide treatment strategies for the small left parietal lesion.

Symptom manifestation for lipomatous meningiomas is variable depending on size and location of the tumor. The majority of lipomatous meningiomas reported in the literature have been frontal or fronto-temporal in origin with only a few being parietal.<sup>[11]</sup> Seizures are the most common manifestation for frontal and fronto-temporal tumors, while headaches are more common for parietal tumors.<sup>[12,13]</sup> Our patient had a history of migraine headaches, which may have been the result of her slowly growing lipomatous meningioma. Another rare finding is that lipomatous meningiomas can sometimes manifest as behavioral disturbance in patients.<sup>[8]</sup> Our patient had a history of both depression and forgetfulness.



**Figure 1.** Brain CT

(A) Non-contrast CT axial demonstrated a hypodense mass with calcifications in the right parietal lobe; (B) T2-weighted axial view demonstrated mixed intensity of the mass; (C) Gradient echo sequence (GRE) demonstrated susceptibility consistent with blood products; (D) T1-weighted axial view demonstrated hyperintense signal of the mass; (E) T1-weighted Gd-enhanced axial view demonstrated contrast enhancement of the mass; (F) T1-weighted Gd-enhanced axial view of the left parietal mass demonstrated contrast enhancement.



**Figure 2.** H&E staining

(A) H&E, 10× shows mixture of meningotheelial lobules and adipocyte-like cells; (B) H&E, 20× shows meningotheelial lobules with larger adipocyte-like cells and cells with prominent lipid accumulation (upper right).

#### 4. CONCLUSIONS

Lipomatous meningiomas are a rare variety of meningiomas that are WHO grade I. Suspicion for this type of tumor should be high for patients with seizures, headaches, or behavioral changes that have lipomatous characteristics on imaging with either CT or MRI. The identification of meningotheelial lobules and adipocyte-like tumor cells after resection confirms the diagnosis.

#### ACKNOWLEDGEMENTS

Brandon Lucke-Wold received funding support from Sigma

Xi Grants in Aid of Research, American Association of Pharmaceutical Scientists Pre-doctoral Fellowship, and the American Foundation of Pharmaceutical Education. Research reported in this publication was supported by the NIGMS of the National Institutes of Health under award number U54GM104942. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

#### CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

#### REFERENCES

- [1] Roncaroli F, Scheithauer BW, Laeng RH, et al. Lipomatous meningioma: a clinicopathologic study of 18 cases with special reference to the issue of metaplasia. *Am J Surg Pathol.* 2001; 25: 769-775. PMID: 11395554. <http://dx.doi.org/10.1097/00000478-200106000-00008>
- [2] Tang H, Sun H, Chen H, et al. Clinicopathological analysis of metaplastic meningioma: report of 15 cases in Huashan Hospital. *Chin J Cancer Res.* 2013; 25: 112-118.
- [3] Louis DN, Ohgaki H, Wiestler OD, et al. The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathol.* 2007; 114: 97-109. <http://dx.doi.org/10.1007/s00401-007-0243-4>
- [4] Yamada H, Hanada T, Okuda S, et al. Secretory meningioma with lipomatous component: case report. *Brain Tumor Pathol.* 1999; 16: 77-80. PMID: 10746964. <http://dx.doi.org/10.1007/BF02478906>
- [5] Krisht KM, Altay T, Couldwell WT. Myxoid meningioma: a rare metaplastic meningioma variant in a patient presenting with intratumoral hemorrhage. *J Neurosurg.* 2012; 116: 861-865. <http://dx.doi.org/10.3171/2011.12.JNS111020>
- [6] Withers T, Klevansky A, Weinstein SR. Lipomeningioma: case report and review of the literature. *J Clin Neurosci.* 2003; 10: 712-714. [http://dx.doi.org/10.1016/S0967-5868\(03\)00078-X](http://dx.doi.org/10.1016/S0967-5868(03)00078-X)
- [7] Mariniello G, Spaziante R, Del Basso De Caro ML, et al. An unusual case of lipoblastic meningioma of the falx cerebri. *Clin Neurol Neurosurg.* 2000; 102: 180-185. [http://dx.doi.org/10.1016/S0303-8467\(00\)00094-9](http://dx.doi.org/10.1016/S0303-8467(00)00094-9)
- [8] Colnat-Coulbois S, Kremer S, Weinbreck N, et al. Lipomatous meningioma: report of 2 cases and review of the literature. *Surg Neurol.* 2008; 69: 398-402; discussion 402. <http://dx.doi.org/10.1016/j.surneu.2006.11.072>
- [9] Ishida M, Fukami T, Nitta N, et al. Xanthomatous meningioma: a case report with review of the literature. *Int J Clin Exp Pathol.* 2013; 6: 2242-2246. PMID: 24133605.
- [10] Savardekar AR, Verma A, Narayan V, et al. Pathological correlation of Magnetic Resonance Imaging features in a classical case of lipomatous meningioma. *Surg Neurol Int.* 2016; 7: 32. <http://dx.doi.org/10.4103/2152-7806.179849>

- [11] Jaiswal AK, Mehrotra A, Kumar B, et al. Lipomatous meningioma: a study of five cases with brief review of literature. *Neurol India*. 2011; 59: 87-91. <http://dx.doi.org/10.4103/0028-3886.76876>
- [12] Kim L, Huang C, Morey AL, et al. Intraosseous lipomatous meningioma. *Case Rep Neurol Med*. 2015; 2015: 482140. <http://dx.doi.org/10.1155/2015/482140>
- [13] Gasparinho MG, Ferreira M, Lavrador JP, et al. Revisiting Lipomatous Meningioma: A Case Report and Review of an Unusual Entity. *Int J Surg Pathol*. 2015; 23: 399-403. <http://dx.doi.org/10.1177/1066896915583695>
- [14] Wen M, Jung S, Moon KS, et al. Immunohistochemical profile of the dural tail in intracranial meningiomas. *Acta Neurochir (Wien)*. 2014; 156: 2263-2273. <http://dx.doi.org/10.1007/s00701-014-2216-4>
- [15] Dulai MS, Khan AM, Edwards MS, et al. Intraventricular metaplastic meningioma in a child: case report and review of the literature. *Neuropathology*. 2009; 29: 708-712. <http://dx.doi.org/10.1111/j.1440-1789.2009.01008.x>