Case Report

Retroperitoneal Extrarenal Angiomyolipomas: An Evidence-Based Approach to a Rare Clinical Entity

Emmanuel J. Minja, Megan Pellerin, Nicole Saviano, and Ronald S. Chamberlain

1 Department of Surgery, Saint Barnabas Medical Center, Livingston, NJ 07039, USA
2 School of Medicine, St. George’s University, Grenada
3 Department of Pathology, Saint Barnabas Medical Center, Livingston, NJ 07039, USA
4 Department of Surgery, University of Medicine and Dentistry of New Jersey, Newark, NJ, USA

Correspondence should be addressed to Ronald S. Chamberlain, rchamberlain@barnabashealth.org

Received 19 May 2012; Accepted 21 June 2012

1. Introduction

Extrarenal angiomyolipomas (ERAMLs) represent a very rare subset of tumors that often present as incidentalomas upon imaging for other conditions. Lesions located in the retroperitoneum present a unique challenge from a diagnostic and treatment standpoint as they can mimic other benign and malignant retroperitoneal tumors. We present a case of a 39-year-old female with a 19.3 cm × 13.5 cm × 10.7 cm left extrarenal retroperitoneal mass. Histopathologic examination and HMB-45 staining revealed the mass to be an extrarenal angiomyolipoma. A comprehensive literature review of ERAMLs as well as evidence-based care algorithm is provided.

2. Case Report

A 39-year-old female with a past medical and surgical history significant for hypertension, gastroesophageal reflux disease, and a cesarean section presented with dysfunctional uterine bleeding (DUB) in November, 2010. Transvaginal sonographic evaluation was performed and failed to reveal any gynecologic pathology. A dilatation and curettage were performed and she was started on oral contraceptives without resolution of her DUB. Two months later, she...
developed a protracted upper respiratory infection for which she was treated with a long course of antibiotics. Given the unexpected duration of her symptoms, a computerized tomography (CT) of the chest was obtained which was unremarkable; however, the lower CT images of the chest revealed a large retroperitoneal mass abutting the left kidney. A contrast-enhanced abdominal CT was subsequently obtained, which revealed an encapsulated mass measuring 19.3 cm × 13.5 cm × 10.7 cm with prominent vascular dependence on the left renal vein and artery as well as a 2 cm posterior mid-pole homogeneous fatty density (yellow arrow). Left colon is laterally displaced (orange arrow).

The mass was homogeneously yellow without stigmata of necrosis or hemorrhage. A second well-circumscribed, intrarenal mass, measuring 2 cm × 1.8 cm × 1 cm, was also identified within the inferior midportion of the renal cortex.

Both lesions had similar gross and microscopic features, with predominant adipose tissue and smaller areas of smooth muscle with epithelioid features and characteristic abnormal vessels. The larger lesion was distinct and separate from the renal parenchyma. HMB-45 staining performed on the larger lesion was positive, which is characteristic for an angiomyolipoma (Figure 4). Of note, the uterus and cervix had no microscopic abnormalities.

4. Discussion

Angiomyolipomas (AMLs) are rare complex mesenchymal neoplasms typically arising within the kidney and are composed of mature adipose tissue, smooth muscle cells, and thick-walled blood vessels [22]. Renal AMLs account for 1% of renal lesions, occurring more commonly in women [2] with an overall incidence in the general population of 0.07–0.3% [25]. Renal AMLs are sometimes referred to as hamartomas (a benign tumor-like growth composed of typical cells and tissues found in the area of the body where it occurs, but growing in a nonorganized fashion) or choristomas (a mass of normal tissue found in an ectopic location). Renal AMLs are generally felt to be more like a choristomas than hamartomas since kidneys do not normally contain smooth muscle or adipose cells [27, 28]. The presence of perivascular epithelioid cells (PEC) is often used to characterize angiomyolipomas since these cells show immunoreactivity for muscle markers (epithelial membrane antigen, keratin, vimentin, desmin, and actin) and HMB-45 [29]. Positive immunoreactivity for HMB-45, a monoclonal antibody raised against a melanoma-associated antigen, is characteristic of AMLs and can be used to differentiate AMLs from other similar appearing lesions such as liposarcomas, lipomas, leiomyosarcomas or, leiomyomas [20, 25].

Computerized tomography (CT) and computerized tomographic angiography (CTA) are the most commonly used imaging modalities to investigate AMLs. Wang et al. [28] analyzed the radiologic abdominal CTs characteristics of retroperitoneal extrarenal AMLs (ERAMLs) in an effort to distinguish them from liposarcomas. These authors noted that retroperitoneal ERAMLs typically display aneurysmal dilatation of the intratumor vessels, intratumoral linear vascularity, bridging veins, beak sign, hematomas, and discrete intrarenal/extrarenal fatty tumors, yet none of these are pathognomonic. Magnetic resonance imaging (MRI), may also be used in conjunction with CT imaging and is particularly useful in delineating the anatomical relationship between ERAMLs, the kidney, and its vasculature, especially when dealing with perinephric and retroperitoneal AMLs. Brain CTs are recommended for patients with renal AMLs since 30–40% of these patients may also have features of tuberous sclerosis (TS) and similarly 80% of patients with TS will develop renal AML [30–32]. The brain CT of these patients typically demonstrates characteristic periventricular subependymal nodules with calcifications [2].

3. Pathology

The en bloc gross specimen included the left kidney and weighed 1693 gm. The kidney measured 11.5 cm × 4.5 cm × 3 cm, and the mass located near the superior renal pole measured 23 cm × 14 cm × 9 cm (Figure 3). Serial sections of the mass and the kidney revealed it to be fully circumscribed and separate from the renal parenchyma. The mass was homogeneously yellow without stigmata of heterogeneous fatty density (yellow arrow). Left colon is laterally displaced (orange arrow).

Figure 1: (a) oral contrast and (b) IV and oral contrast: abdominal computerized tomography demonstrating an encapsulated fatty vascular mass (white arrows) lateral to the left kidney measuring 19.3 cm × 13.5 cm × 10.7 cm with prominent vascular dependence on the left renal vein and artery as well as a 2 cm posterior mid-pole homogeneous fatty density (yellow arrow). Left colon is laterally displaced (orange arrow).
Figure 2: Abdominal magnetic resonance imaging demonstrating a large fatty encapsulated mass (white asterisk) measuring 19.3 cm × 13.5 cm × 10.7 cm with prominent vascularity (white arrows). The anatomic relationship between the mass and the left kidney can be well seen in Figure 2(b).

Figure 3: Gross image of the en bloc resected mass including the left kidney (black arrow), demonstrating a well-encapsulated fatty mass attached to the upper pole of the kidney (white arrow) with a smooth outer surface measuring 23 cm × 14 cm × 9 cm.

Distinct from renal AMLs, ERAMLs are extremely rare tumors with less than 60 reported cases worldwide in the literature. Friis and Hjortrup reported the first ERAML (1982) [1] involving a 22-year-old female presenting with abdominal pain and weight gain who was found on exploratory laparotomy to have an 11 kg retroperitoneal AML. Ditonno et al. [16] have reported the largest series of ERAMLs, involving 40 cases. In their report, the liver was the most common extrarenal location (N = 18), followed by the uterus (N = 7), retroperitoneum (N = 4), and head and vagina (N = 2 each) as well as one each involving the penis, nasal cavity, hard palate, abdominal wall, fallopian tube, spermatic cord, and colon. Other reported uncommon sites include the mediastinum, [33, 34] duodenum, appendix, stomach, and adrenal glands [9].

Retroperitoneal ERAMLs present a unique diagnostic challenge since they must be distinguished from other retroperitoneal masses including retroperitoneal sarcomas, atypical lipomas, adrenal adenocarcinomas, leiomyomas with fatty change, and renal cell carcinomas. Although the majority of ERAMLs are benign, 2 cases of metastatic and recurrent ERAMLs have been reported. Gupta et al. [26] described a case of a 29-year-old male with a history of tuberous sclerosis and a retroperitoneal AML which metastasized to the liver and mediastinum 19 years after initial diagnosis and resection. The second case involved an 80-year-old female who developed metastasis to liver and bone one year following surgical resection of a retroperitoneal AML. Although malignant transformation is difficult to predict, high mitotic activity within the primary tumor was a common factor in both metastatic cases. Additionally, certain ERAMLs variants, most notably the epitheloid variants, are thought to be the most aggressive, suggesting a higher likelihood of metastatic transformation and distant spread [26]. Rare cases of AML malignant transformation with
lymph node involvement have been documented in the literature [18, 29–32]; however, all cases involved patients with renal AMLs and tuberous sclerosis.

To date, only 16 cases of retroperitoneal ERAMLs (including our case) have been reported, making the retroperitoneum the second most common extrarenal location of AMLs (Table 2). Among patients with retroperitoneal ERAMLs, the average age was 45 years (ranging from 22 to 80 yrs) with a male: female ratio of 1 to 5.3. Sixty-nine percent of patients with retroperitoneal ERAMLs presented symptomatically with nonspecific abdominal pain, 13% presented with incidentalomas, and another 13% with abdominal fullness. The most common imaging modality used to identify the ERAMLs was a CT scan (94% of cases). Retroperitoneal ERAMLs differed widely with respect to size, ranging from 6 cm³ to 7980 cm³ and weighing between <1 kg and 11 kgs. The majority of cases (69%) were managed surgically via en bloc radical nephrectomies and in 4 cases a renal-sparing resection was performed. One case was managed with embolization without resection.

56% of patients had follow-up evaluation ranging from 2 to 60 months after surgical resection. Outside the context of tuberous sclerosis, the only reported recurrence to date happened after a radical en bloc nephrectomy with distal metastasis to liver and bone 12 months postoperatively [26]. All other patients have remained disease-free and asymptomatic at last follow-up and no recurrence has been documented after a renal sparing nephrectomy or embolization. To date, the longest documented followup duration is 5 years, with that patient being asymptomatic and without a recurrence. As the only recurrence was documented 12 months after an en bloc radical nephrectomy, these lesions should be followed closely with CT imaging during the first year after resection, with continued yearly followup for 5 years or dictated by symptoms.

5. Conclusion

Extrarenal angiomyolipomas are rare and occur most commonly in the liver; however, the retroperitoneum is the second most common location. Lesions in the retroperitoneum present a unique diagnostic challenge since they can mimic other retroperitoneal benign and malignant tumors, which must be differentiated. CT scans and MRIs are the diagnostic imaging modalities of choice and are useful in delineating the anatomical relationship of these lesions to the kidney and its vasculature. Hemodynamically stable patients should undergo surgical resection, while unstable patients may benefit from emergent tumor embolization and a subsequently staged surgical resection. Once the pathology specimen is obtained, immunoreactivity to an HMB-45 stain is a useful tool to differentiate ERAMLs from other retroperitoneal tumors. ERAMLs should be analyzed from mitotic index and the presence of epitheloid variant as

Figure 4: Extrarenal mass (Hematoxylin and Eosin). Photomicrograph of the mass demonstrate mature adipose tissue with a tortuous thick blood vessel (black arrow) ((a); ×20) and bundles of smooth muscles lacking elastic tissue lamina ((b); ×40), adipose tissue with small areas of smooth muscle with epithelioid features ((c); ×40). Focal staining with HMB45 antibody was positive (blue star) ((d); ×40), consistent with angiomyolipoma.
Table 1: All reported cases of extrarenal angiomyolipomas (1982–2011).

| Author | Location | N | Average age | Presenting symptoms |
|--------|----------|---|-------------|---------------------|
| Demopoulos et al. [3] | Uterus | 7 | 51 | Pelvic pain, menometrorrhagia |
| Gutmann et al. [4] | Hard palate | 1 | 39 | Oral swelling |
| Bures and Barnes [5] | Head | 2 | 25 | Enlarging mass |
| Chen and Bauer [6] | Abdominal wall | 1 | 42 | Stress incontinence/abdominal pressure |
| Chaitin et al. [7] | Penis | 1 | 53 | Painless mass |
| Katz et al. [8] | Fallopian tube | 1 | 40 | Pelvic pain, menometrorrhagia |
| Miyahara et al. [9] | Liver | 18 | 50 | Epigastric tenderness |
| Dawlatly et al. [10] | Nasal cavity | 1 | 52 | Nasal obstruction/epistaxis |
| Peh and Sivanesaratnam [11] and Chen [12] | Vagina | 2 | 46 | Lower abdominal swelling |
| Castillenti and Bertin [13] | Spermatic cord | 1 | 26 | Testicular pain/scrotal swelling |
| Hikasa et al. [14] | Colon | 1 | 67 | Melena |
| Current case, Minja et al. | Retroperitoneum | 16 | 46 | Abdominal pain, flank pain |
| **Total** | | 52 | 44.75 (mean) | |

Table 2: Detailed information on all published retroperitoneal extrarenal angiomyolipomas (1982–2011).

| Case | Author | Presenting symptoms | Age/sex | Size | Imaging | Location | Treatment | Followup/outcome |
|------|--------|---------------------|---------|------|---------|----------|-----------|-----------------|
| 1    | Friis and Hjortrup (1982) [1] | Pain, weight gain | 22F 11 kg | IVU | PPS | RN | 36 MO/asymptomatic |
| 2    | Randazzo et al. (1987) [15] | Pain, bleeding | 64F 6 cm³ | IVU, CT | Right PNS | RSR | 2 MO/asymptomatic |
| 3    | Ditonno et al. (1992) [16] | Pain, bleeding Weight loss/abdominal mass | 37M 3.7 kg (7980 cm³) | US, CT | Left PNS | RN | 8 MO/asymptomatic |
| 4    | Peh et al. (1994) [17] | Abdominal pain, flank pain | 53F 336 cm² | US, CT, A | Left PNS | RN | N/A* |
| 5    | Angulo et al. (1994) [18] | Abdominal pain | 42M 220 cm³ | US, CT, A | Right AS | RSR | N/A* |
| 6    | Gupta and Guleria (2011) [19] | Abdominal pain | 42F 1.1 kg (216 cm³) | CT | Right PNS | RN | 18 MO/asymptomatic |
| 7    | Liwnicz et al. (1994) [20] | Abdominal pain | 39F 22.5 cm³ | CT | Right PNS | RN | N/A* |
| 8    | Law et al. (1994) [21] | Incidental finding | 41F 648 cm³ | IVU, CT, US, FNA | Left PNS | RN | 8 MO/asymptomatic |
| 9    | Law et al. (1994) [21] | Pain | 41F 3.5 kg (4840 cm³) | CT, MRI | Right PNS/PHS | RSR | N/A* |
| 10   | Mogi et al. (1998) [22] | Abdominal pain + fullness | 51F ND | CT, A | Left PNS | AE | 12 MO/asymptomatic |
| 11   | Murphy et al. (2000) [23] | Abdominal pain, bleeding | 60F 3.3 kg (4840 cm³) | CT, A | Right PNS | RN | 60 MO/asymptomatic |
| 12   | Tsutsumi et al. (2001) [2] | Fatigue, abdominal pain | 35F 2.8 kg (3726 cm³) | US, CT, A | Right PNS | RSR | N/A* |
| 13   | Tseng et al. (2004) [24] | Abdominal fullness Macrosticoscopic hematuria | 31M ND | CT, A | Right PNS | RN | N/A* |
| 14   | Obara et al. (2005) [25] | Abdominal pain | 80F 16 cm | CT, MRI | Left PNS | RN | 1 year/distal metastases |
| 15   | Gupta et al. (2007) [26] | Asymptomatic | 39F 1.7 kg (2898 cm³) | US, CT | Left PNS | RN | 16 MO/asymptomatic |

ND: not documented; A: angiography; CT: computerized tomography; MRI: magnetic resonance imaging; US: ultrasound; IVU: intravenous urography; FNA: fine needle aspiration; PNS: perinephric space; PHS: perihypertatic space; PPS: peripancreatic space; AS: adrenal space; RN: radical nephrectomy; RSR: renal sparing resection; AE: angio embolization; MO: months; N/A*: follow-up information not available.
these characteristics may be associated with distal metastasis and disease recurrence. To date, only one case of disease recurrence and distal metastasis has been documented in a patient with tuberous sclerosis. This occurred in an 80-year-old female one year after a radical en bloc nephrectomy. Since the longest documented follow-up duration for an EAML is 5 years, it is recommended that patients undergo serial CT imaging for the first year and be followed for 5 years based on symptoms. The ERAML reported in this paper measured 23 cm × 14 cm × 9 cm (2898 cm³), weighed 1.7 kgs (Table 1), and did not have increased mitotic index or epithelial variance. Follow-up CT scans every 4 months revealed no recurrence and patient has remained disease-free 16 months postoperatively.

**Conflict of Interests**

All authors listed declare that there are no conflict of interests, and the authors have not accepted financial sponsorship in producing and presenting this work. The paper has been seen and approved by all the authors and the material is previously unpublished.

**References**

[1] J. Friis and A. Hjortrup, “Extrarenal angiomylipoma: diagnosis and management,” *Journal of Urology*, vol. 127, no. 3, pp. 528–529, 1982.

[2] M. Tsutsumi, A. Yamauchi, S. Tsukamoto, and S. Ishikawa, “A case of angiomylipoma presenting as a huge retroperitoneal mass,” *International Journal of Urology*, vol. 8, no. 8, pp. 470-471, 2001.

[3] R. I. Demopoulos, F. Denarvaez, and V. Kaji, “Benign mixed mesodermal tumors of the uterus: a histogenetic study,” *American Journal of Clinical Pathology*, vol. 60, no. 3, pp. 377–383, 1973.

[4] J. Gutmann, C. Cifuentes, R. Vicuna, V. Sobarzo, and M. A. Balzarini, “Intraoral angiomylipoma,” *Oral Surgery, Oral Medicine, Oral Pathology*, vol. 39, no. 6, pp. 945–948, 1975.

[5] C. Bures and L. Barnes, “Benign mesenchymomas of the head and neck,” *Archives of Pathology and Laboratory Medicine*, vol. 102, no. 5, pp. 237–241, 1978.

[6] K. T. K. Chen and V. Bauer, “Extrarenal angiomylipoma,” *Journal of Surgical Oncology*, vol. 25, no. 2, pp. 89–91, 1984.

[7] B. A. Chaitin, R. L. Goldman, and D. G. Linker, “Angiomylipoma of penis,” *Urology*, vol. 23, no. 3, pp. 305–306, 1984.

[8] D. A. Katz, D. Thom, P. Bogard, and M. S. Dermer, “Angiomylipoma of the fallopian tube,” *American Journal of Obstetrics and Gynecology*, vol. 148, no. 3, pp. 341–343, 1984.

[9] M. Miyahara, M. Kobayashi, I. Tada et al., “Giant hepatic angiomylipoma simulating focal nodular hyperplasia,” *Japanese Journal of Surgery*, vol. 18, no. 3, pp. 346–350, 1988.

[10] E. E. Dawlatly, I. T. Anim, and A. Y. El-Hassan, “Angiomylipoma of the nasal cavity,” *Journal of Laryngology and Otolology*, vol. 102, no. 12, pp. 1156–1158, 1988.

[11] S. C. Peh and V. Sivanesaratnam, “Angiomylipoma of the vagina—an uncommon tumour. Case report,” *British Journal of Obstetrics and Gynaecology*, vol. 95, no. 8, pp. 820–823, 1988.

[12] K. T. K. Chen, “Angiomylipoma of the vagina,” *Gynecologic Oncology*, vol. 37, no. 2, pp. 302–304, 1990.

[13] T. A. Castillenti and A. P. Bertin, “Angiomylipoma of the spermatic cord: case report and literature review,” *Journal of Urology*, vol. 142, no. 5, pp. 1308–1309, 1989.

[14] Y. Hikasa, T. Narabayashi, M. Yamamura et al., “Angiomylipoma of the colon: a new entity in colonic polypoid lesions,” *Gastroenterologia Japonica*, vol. 24, no. 4, pp. 407–409, 1989.

[15] R. F. Randazzo, P. Neustein, and M. A. Koyle, “Spontaneous perinephric hemorrhage from extrarenal angiomylipoma,” *Urology*, vol. 29, no. 4, pp. 428–431, 1987.

[16] P. Dittono, R. B. Smith, M. A. Koyle, J. Hannah, and A. Belledegrün, “Extrarenal angiomylipomas of the perinephric space,” *Journal of Urology*, vol. 147, no. 2, pp. 447–450, 1992.

[17] W. C. G. Peh, B. H. Lim, and P. C. Tam, “Case report: perinephric angiomylipomas in tuberous sclerosis,” *British Journal of Radiology*, vol. 67, no. 802, pp. 1026–1029, 1994.

[18] J. C. Angulo, J. I. Lopez, J. A. Carnicero, and N. Flores, “Extrarenal retroperitoneal angiomylipoma,” *Urologia Internationalis*, vol. 52, no. 1, pp. 58–60, 1994.

[19] P. Gupta and S. Guleria, “Adrenal angiomylipoma: a case report and review of literature,” *Research Journal of Medical Sciences*, vol. 5, no. 5, pp. 243–246, 2011.

[20] B. H. Liwnicz, D. A. Weeks, and C. W. Zuppan, “Extrarenal angiomyolipoma with melanocytic and hibernoma-like features,” *Ultrastructural Pathology*, vol. 18, no. 4, pp. 443–448, 1994.

[21] S. Y. K. Law, M. Fok, W. H. Shek, L. T. Ma, and J. Wong, “Retroperitoneal extrarenal angiomylipoma,” *Australian and New Zealand Journal of Surgery*, vol. 64, no. 6, pp. 449–451, 1994.

[22] Y. Mogi, R. Takimoto, T. Kura, M. Tamakawa, S. Sakamaki, and Y. Niitsu, “Retroperitoneal extrarenal angiomylipoma with early gastric carcinoma,” *Journal of Gastroenterology*, vol. 33, no. 1, pp. 86–90, 1998.

[23] D. P. Murphy, D. B. Glazier, E. S. Chenven, R. Principato, and S. M. Diamond, “Extrarenal retroperitoneal angiomylipoma: nonoperative management,” *Journal of Urology*, vol. 163, no. 1, pp. 234–235, 2000.

[24] C. A. Tseng, Y. S. Pan, Y. C. Su, D. C. Wu, C. M. Jan, and W. M. Wang, “Extrarenal retroperitoneal angiomylipoma: case report and review of the literature,” *Abdominal Imaging*, vol. 29, no. 6, pp. 721–723, 2004.

[25] W. Obara, K. Sato, Y. Owari et al., “Perinephric angiomylipoma: a unique development pattern surrounding the kidney,” *International Journal of Urology*, vol. 12, no. 3, pp. 305–307, 2005.

[26] C. Gupta, A. K. Malani, V. Gupta, J. Singh, and H. Ammar, “Metastatic retroperitoneal epithelioid angiomylipoma,” *Journal of Clinical Pathology*, vol. 60, no. 4, pp. 428–431, 2007.

[27] M. J. Metro, P. Ramchandani, M. P. Banner et al., “Angiomylipoma of the renal sinus: diagnosis by percutaneous biopsy,” *Urology*, vol. 55, no. 2, p. 286, 2000.

[28] L. J. Wang, Y. C. Wong, C. J. Chen, and L. C. See, “Computerized tomography characteristics that differentiate angiomylipomas from liposarcomas in the perinephric space,” *Journal of Urology*, vol. 167, no. 2, part 1, pp. 490–493, 2002.

[29] N. Takahashi, R. Kitahara, Y. Hishimoto, A. Ohguro, Y. Hashimoto, and T. Suzuki, “Malignant transformation of renal angiomylipoma,” *International Journal of Urology*, vol. 10, no. 5, pp. 271–273, 2003.

[30] J. E. Oesterling, E. K. Fishman, S. M. Goldman, and F. F. Marshall, “The management of renal angiomylipoma,” *Journal of Urology*, vol. 135, no. 6, pp. 1121–1124, 1986.
[31] M. S. Steiner, S. M. Goldman, E. K. Fishman, and F. F. Marshall, “The natural history of renal angiomyolipoma,” *Journal of Urology*, vol. 150, no. 6, pp. 1782–1786, 1993.

[32] S. I. Hajdu and F. W. Foote Jr., “Angiomyolipoma of the kidney: report of 27 cases and review of the literature,” *Journal of Urology*, vol. 102, no. 4, pp. 396–401, 1969.

[33] R. M. Hanna, M. H. Dahniya, N. Al-Marzouk, and E. Grexa, “Extrarenal angiomyolipomas of the perinephric space in tuberose sclerosis,” *Australasian Radiology*, vol. 41, no. 4, pp. 339–341, 1997.

[34] B. Marcheix, L. Brouchet, Y. Lamarche et al., “Pulmonary angiomyolipoma,” *Annals of Thoracic Surgery*, vol. 82, no. 4, pp. 1504–1506, 2006.