Clinical Presentations and Endovascular Treatment Options for Renal Angiomyolipomas: Case Series and Review

Matthew Moccia, DO, Daniel Greentree, MD, Julien Wonderlick, MD, Matthew Recker, MD and Daniel Kloda, DO

Maine Medical Center, Portland, Maine

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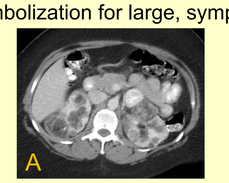
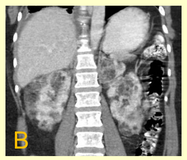
Purpose/Introduction

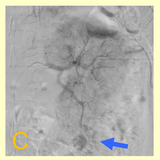
In this educational exhibit, we will review the various endovascular strategies utilized to treat renal angiomyolipomas (AMLs). Although renal AMLs are considered benign neoplasms, they are associated with significant morbidity including possible life-threatening hemorrhage. We will discuss the rationale for selecting a certain embolic agent depending on the clinical presentation of the patient. The most frequently utilized embolic materials include ethanol-ethiodized oil mixture or particles such as polyvinyl alcohol. Coil embolization is generally avoided when embolizing AMLs due to collateral vessel formation. However, coil monotherapy may be considered in cases of ruptured renal AMLs or associated pseudoaneurysms (PSAs). We will also review the indications, contraindications, and complications of AML embolization.

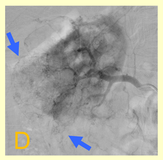
Case #1

A 38 year-old female with a history of tuberous sclerosis presents following initial particle embolization for large, symptomatic bilateral AMLs.

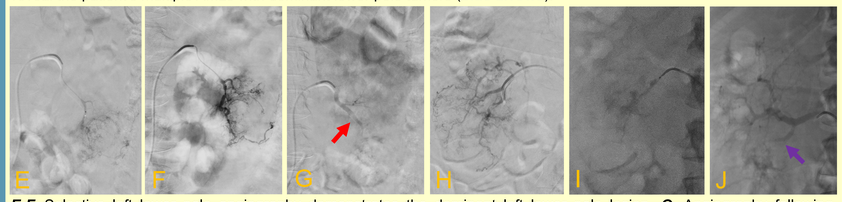








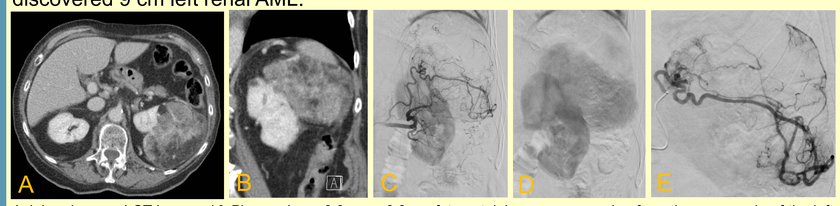
Axial and coronal CT images (***A-B***) demonstrate numerous bilateral renal AMLs. ***C-D,*** Selective bilateral renal angiograms reveal the patient's multiple AMLs with dominant lower pole tumors (blue arrows).



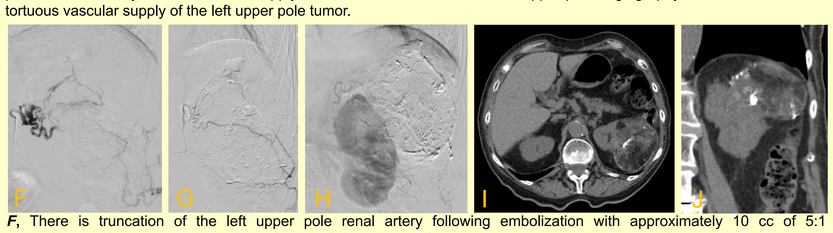
E-F, Selective left lower pole angiography demonstrates the dominant left lower pole lesion. ***G***, Angiography following embolization with 250 um Embozene particles reveals truncation of the left lower pole renal artery (red arrow). ***H***, Selective right lower pole angiography reveals the dominant right lower pole tumor. ***I,*** Particle embolization is performed with 400 um Embozene. ***J***, Post-embolization angiography reveals truncation of the right lower pole artery (purple arrow).

Case #2

A 95 year-old female with a history of hypertension presents with an incidentally discovered 9 cm left renal AML.



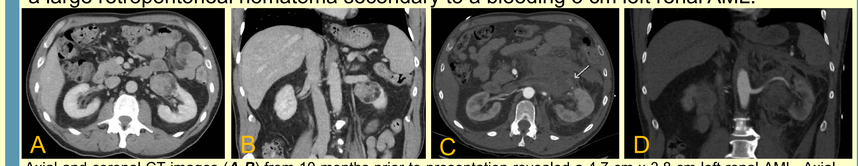
Axial and coronal CT images (***A-B***) reveals an 8.9 cm x 6.8 cm fat-containing mass emerging from the upper pole of the left kidney compatible with a large AML. ***C-D***, Selective left renal angiography with parenchymal phase demonstrates an upper pole left renal artery as the dominant supply to the tumor. ***E***, Subselective left upper pole angiography reveals the extensive tortuous vascular supply of the left upper pole tumor.



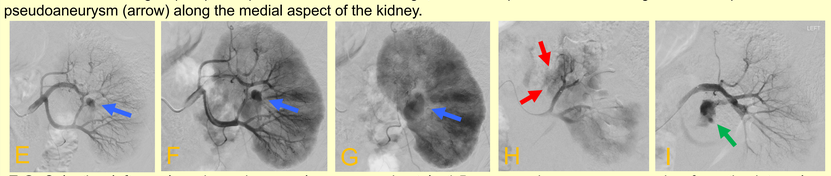
F, There is truncation of the left upper pole renal artery following embolization with approximately 10 cc of 5:1 ethanol/ethiodol mixture. ***G-H***, Subselective left upper pole angiography with parenchymal phase demonstrates devitalization of the tumor. ***I-J***, Follow-up CT obtained 5 months following embolization demonstrates decreased size of the left renal AML with numerous internal calcifications.

Case #3:

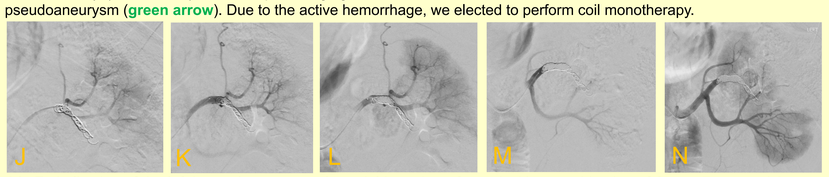
A 69 year-old male presents with left-sided abdominal pain while urinating. CT revealed a large retroperitoneal hematoma secondary to a bleeding 5 cm left renal AML.



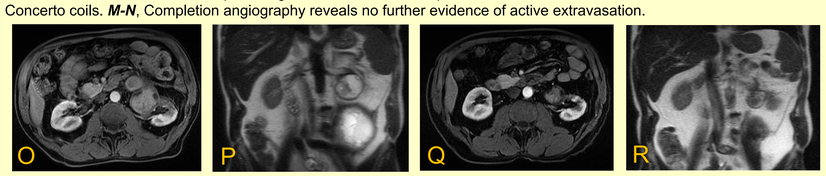
Axial and coronal CT images (***A-B***) from 10 months prior to presentation revealed a 4.7 cm x 3.8 cm left renal AML. Axial and coronal CTA images (***C-D***) from presentation reveal a large, acute retroperitoneal hemorrhage with a suspected small pseudoaneurysm (arrow) along the medial aspect of the kidney.



E-G, Selective left renal angiography reveals an approximately 1.5 cm pseudoaneurysm emerging from the interpolar segmental renal artery branches (blue arrows). ***H***, Subselective angiogram reveals tumor blush within the midportion of the left kidney (red arrows). ***I***, Subsequent angiogram demonstrates frank extravasation of contrast from the site of the pseudoaneurysm (green arrow). Due to the active hemorrhage, we elected to perform coil monotherapy.



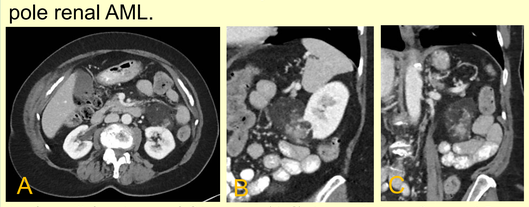
J-L, Embolization of the left interpolar segmental arterial branch performed with a combination of 6 mm, 7 mm and 8 mm Concerto coils. ***M-N***, Completion angiography reveals no further evidence of active extravasation.



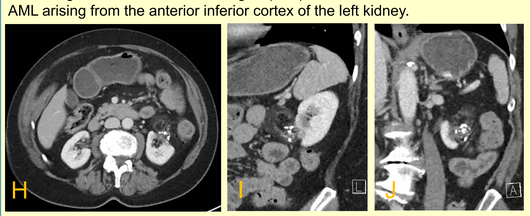
O-P, Axial and coronal images obtained one month following embolization demonstrates the left renal AML and adjacent hematoma. ***Q-R***, Axial and coronal MR images obtained 5 months following embolization reveals that the AML has decreased in size and that the hematoma has resolved.

Case #4

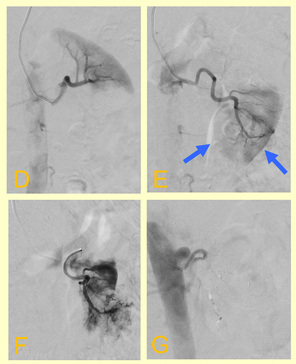
A 75 year-old female with a history of hypertension presents with an incidentally discovered 6 cm left lower pole renal AML.



Axial, sagittal and coronal CT images (***A-C***) demonstrates a 6 cm x 4.5 cm AML arising from the anterior inferior cortex of the left kidney.



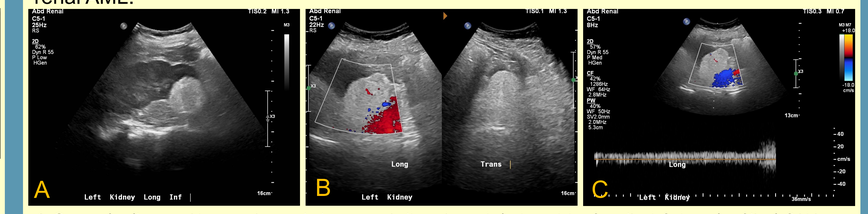
Axial, sagittal and coronal CT images (***H-J***) obtained 3 months following embolization demonstrates interval reduction in size of the left renal AML measuring 3.3 cm x 3.2 cm with development of coarse internal calcifications.



D, Selective angiography of the superior left renal artery branch reveals normal perfusion of the superior pole. ***E***, Selective angiography of the inferior left renal artery branch reveals perfusion of the large left renal AML (blue arrows). ***F***, Embolization performed with a 7:3 mixture of ethanol to ethiodol. ***G***, Completion angiography demonstrates lack of perfusion of the left renal AML.

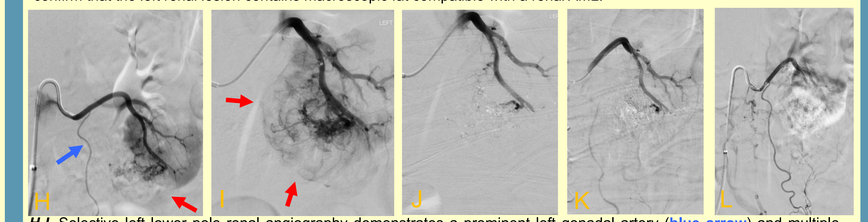
Case #5

A 52 year-old female presents with an incidentally discovered 4.6 cm left lower pole renal AML.



A, Grayscale ultrasound images demonstrate an exophytic, echogenic lesion arising from the inferior pole of the left kidney. ***B-C***, Doppler images demonstrate internal vascularity with flow within the lesion.

D-E, Coronal and axial MRI images reveal a 4.6 cm left lower pole renal lesion. ***F-G***, In and out of phase axial MRI images confirm that the left renal lesion contains macroscopic fat compatible with a renal AML.



H-I, Selective left lower pole renal angiography demonstrates a prominent left gonadal artery (blue arrow) and multiple branches supplying the left lower pole AML (red arrows). ***J-K***, Left renal AML embolization performed with approximately 1.5 cc of 7:3 ethanol to ethiodol mixture. L, Completion left renal angiography demonstrated complete stasis within the arterial branched supplying the left lower pole AML.

Conclusion

Transarterial embolization is considered the standard of care for symptomatic renal AMLs and those measuring greater than 4 cm. Multiple embolic materials are utilized to treat renal AMLs including liquid embolics, particles, and microcoils.

References

1. Bishay, V. L., Crino, P. B., Wein, A. J., Malkowicz, S. B., Trerotola, S. O., Soulen, M. C., & Stavropoulos, S. W. (2010). Embolization of Giant Renal Angiomyolipomas: Technique and Results. *Journal of Vascular and Interventional Radiology*, *21*(1), 67–72. https://doi.org/10.1016/j.jvir.2009.09.020
2. Ginat, D. T., Saad, W. E. A., & Turba, U. C. (2010). Transcatheter Renal Artery Embolization for Management of Renal and Adrenal Tumors. *Techniques in Vascular and Interventional Radiology*, *13*(2), 75–88. https://doi.org/10.1053/j.tvir.2010.02.003
3. Kervancioglu, S., & Yilmaz, F. (2015). Urgent arterial embolization of ruptured renal angiomyolipoma. *Open Medicine*, *10*(1). https://doi.org/10.1515/med-2015-0035
4. Kiefer, R. M., & Stavropoulos, S. W. (2017). The Role of Interventional Radiology Techniques in the Management of Renal Angiomyolipomas. *Current Urology Reports*, *18*(5). https://doi.org/10.1007/s11934-017-0687-6
5. Lenton, J., Kessel, D., & Watkinson, A. F. (2008). Embolization of renal angiomyolipoma: immediate complications and long-term outcomes. *Clinical Radiology*, *63*(8), 864–870. https://doi.org/10.1016/j.crad.2008.02.005
6. Murray, T. E., Doyle, F., & Lee, M. (2015). Transarterial Embolization of Angiomyolipoma: A Systematic Review. *Journal of Urology*, *194*(3), 635–639. https://doi.org/10.1016/j.juro.2015.04.081
7. Sawada, Y., Shimohira, M., Hashizume, T., Sobue, R., Mori, S., Nakagawa, M., Ozawa, Y., Naiki, T., Nagai, T., Yasui, T., & Shibamoto, Y. (2017). Transcatheter Arterial Embolization for Renal Angiomyolipoma Using a Micro-balloon Catheter and a Mixture of Ethanol and Lipiodol. *CardioVascular and Interventional Radiology*, *40*(12), 1933–1939. https://doi.org/10.1007/s00270-017-1731-0
8. Villalta, J. D., Sorensen, M. D., Durack, J. C., Kerlan, R. K., & Stoller, M. L. (2011). Selective Arterial Embolization of Angiomyolipomas: A Comparison of Smaller and Larger Embolic Agents. *Journal of Urology*, *186*(3), 921–927. https://doi.org/10.1016/j.juro.2011.04.082