

7. Stavroulopoulos A, Cassidy MJ, Porter CJ, Hosking DJ, Roe SD. Vitamin D status in renal transplant recipients. *Am J Transplant.* 2007;7:2546-52.
8. de Sevaux RG, Hoitsma AJ, van Hoof HJ, Corstens FJ, Wetzels JF. Abnormal vitamin D metabolism and loss of bone mass after renal transplantation. *Nephron Clin Pract.* 2003;93:C21-8.
9. Querings K, Girdt M, Geisel J, Georg T, Tilgen W, Reichrath J. 25-hydroxyvitamin D deficiency in renal transplant recipients. *J Clin Endocrinol Metab.* 2006;91:526-9.
10. Ewers B, Gasbjerg A, Moelgaard C, Frederiksen AM, Marckmann P. Vitamin D status in kidney transplant patients: need for intensified routine supplementation. *Am J Clin Nutr.* 2008;87:431-7.
11. Mikuls TR, Julian BA, Bartolucci A, Saag KG. Bone mineral density changes within six months of renal transplantation. *Transplantation.* 2003;75:49-54.
12. Rubello D, Giannini S, D'Angelo A, et al. Secondary hyperparathyroidism is associated with vitamin D receptor polymorphism and bone density after renal transplantation. *Biomed Pharmacother.* 2005;59:402-7.
13. Giannini S, D'Angelo A, Carraro G, et al. Persistently increased bone turnover and low bone density in long-term survivors to kidney transplantation. *Clin Nephrol.* 2001;56:353-63.
14. Cayco AV, Wysolmerski J, Simpson C, et al. Posttransplant bone disease: evidence for a high bone resorption state. *Transplantation.* 2000;70:1722-8.
15. Nouri-Majalan N, Sanadgol H, Rahimian M, Soleimani H. Bone mineral density in kidney transplant recipients and patients on hemodialysis: a comparison with healthy individuals. *Iran J Kidney Dis.* 2008;2:154-9.
16. Omidvar B, Ghorbani A, Shahbazian H, Beladi Mousavi SS, Shariat Nabavi SJ, Alasti M. Comparison of alendronate and pamidronate on bone loss in kidney transplant patients for the first 6 months of transplantation. *Iran J Kidney Dis.* 2011;5:420-4.
17. Casez JP, Lippuner K, Horber FF, Montandon A, Jaeger P. Changes in bone mineral density over 18 months following kidney transplantation: the respective roles of prednisone and parathyroid hormone. *Nephrol Dial Transplant.* 2002;17:1318-26.
18. Marcen R, Caballero C, Pascual J, et al. Lumbar bone mineral density in renal transplant patients on neoral and tacrolimus: a four-year prospective study. *Transplantation.* 2006;81:826-31.
19. Bagni B, Gilli P, Cavallini A, et al. Continuing loss of vertebral mineral density in renal transplant recipients. *Eur J Nucl Med.* 1994;21:108-12.
20. Malyszko J, Wolczynski S, Malyszko JS, Konstantynowicz J, Kaczmarski M, Mysliwiec M. Correlations of new markers of bone formation and resorption in kidney transplant recipients. *Transplant Proc.* 2003;35:1351-4.
21. Messa P, Sindici C, Cannella G, et al. Persistent secondary hyperparathyroidism after renal transplantation. *Kidney Int.* 1998;54:1704-13.
22. Bayat N, Einollahi B, Pourfarzian V, et al. Bone mineral density changes within 11 months of renal transplantation in Iranian patients. *Transplant Proc.* 2007;39:1039-43.
23. Marcen R, Caballero C, Galeano C, et al. Lumbar bone mineral density after kidney transplantation: a three-year prospective study. *Transplant Proc.* 2005;37:1466-7.
24. Patel S, Kwan JT, McCloskey E, et al. Prevalence and causes of low bone density and fractures in kidney transplant patients. *J Bone Miner Res.* 2001;16:1863-70.
25. Pichette V, Bonnardeaux A, Prudhomme L, Gagne M, Cardinal J, Ouimet D. Long-term bone loss in kidney transplant recipients: a cross-sectional and longitudinal study. *Am J Kidney Dis.* 1996;28:105-14.
26. Grotz WH, Mundinger FA, Gugel B, Exner VM, Kirste G, Schollmeyer PJ. Bone mineral density after kidney transplantation. A cross-sectional study in 190 graft recipients up to 20 years after transplantation. *Transplantation.* 1995;59:982-6.
27. Chadban S, Chan M, Fry K, et al. The CARI guidelines. Nutritional interventions for the prevention of bone disease in kidney transplant recipients. *Nephrology (Carlton).* 2010;15 Suppl 1:S43-7.

Correspondence to:
Behzad Einollahi, MD
Nephrology and Urology Research Center, Baqiyatallah
University of Medical Sciences,
Ground Floor of Baqiyatallah Hospital, Mollasdra Ave, Vanak Sq,
Tehran, Iran
E-mail: einollahi@numonthly.com

Is Management of Angiomyolipoma Different After Kidney Transplantation?

Alireza Ghadian

Nephrology and Urology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

See the article on page 311

Angiomyolipoma (AML) is a common benign lesion of various organs,¹ which was first described

by Morgan and colleagues.² Despite its benign behavior and no reportedly metastasis, it can

cause massive hemorrhage that makes it a life threatening tumor. Angiomyolipoma contains blood vessels, smooth muscle cells, and fat in various amounts, and because of that many call it hamartoma. It presents as 2 separate categories: sporadic without a known syndrome, that includes 80% of cases, and as a part of tuberous sclerosis complex (TSC), accounting 20% of cases. Tuberous sclerosis complex associated AML has specific properties. It is more likely to be bilateral and multicentric and present earlier with larger tumors and can cause hemorrhage more frequently than the sporadic type.³ Moreover, the TSC-associated type is more likely to grow and require surgical intervention.⁴ However, sporadic AML presents as a solitary lesion that can growth much slower than TSC associated tumors.⁴

Classic symptoms of AML are known as a triad of flank pain, gross hematuria, and palpable tender mass. It is commonly found as an incidental mass on ultra sonographic evaluation for other reasons. Frequently, it can cause fever, anemia, hypertension or hypotension, nausea, and rarely, kidney failure. Angiomyolipoma is the second most common cause of spontaneous retroperitoneal hemorrhage, after renal cell carcinoma,⁵ which is due to spontaneous rupture of the tumor.

Angiomyolipoma has a unique property on ultrasonography and computed tomography (CT) scan due to having fat elements that are echogenic and the combination of hypodense fat with the absence of any calcification or vascular elements.⁶ On plain CT scan, tissue attenuation of less than -10 HU is characteristic of fat tissue. Although some authors reported several cases of renal cell carcinoma that contained fat on CT scan, all of them had visible calcification.⁶ Fat tissue is high signal on unenhanced T1-weighted magnetic resonance imaging images and low signal intensity in T2-weighted images and is isosignal intensity with retroperitoneal fat,⁷ which is in contrast to renal cell carcinoma characteristics⁸; therefore, magnetic resonance imaging can be used for differentiating AML from renal cell carcinoma. This diagnostic modality is helpful when CT scan is equivocal and in pregnancy.⁹

Many cases with AML do not need any treatment, but if present with pain, spontaneous hemorrhage causing significant symptoms, or risk of rupture and hematuria and if it is suspicious for malignant

tumor, it needs intervention. Indeed asymptomatic tumors may need treatment that should be based on many factors including tumor size, association with TSC, kidney function, activity, and child bearing age.⁴ When AML is diagnosed, the patient should be assessed with brain magnetic resonance imaging, abdominal CT scan, chest radiography, echocardiography, fundoscopy, and skin examination, and neurologic consultation is necessary for concomitant lesions of TSC.¹⁰

After kidney transplantation and because of immunosuppressive agents, risk of malignancies such as renal cell carcinoma and infections will increase.¹¹ Several cases of AML are reported concomitant with other renal masses or after kidney transplantation.^{8,12-16} Indeed several kidney transplantations are done in TSC patients that almost all of them had good graft survival, but renal cell carcinoma or AML was diagnosed after transplantation.¹⁷ In these instances, different treatment methods are successfully described, such as partial or total nephrectomy and conservative managements.^{14,15,18} In this issue of the *Iranian Journal of Kidney Diseases*, Roozbeh and coworkers describe a rare case of isolated angiomyolipoma in a kidney allograft occurred 3 years after transplantation.¹⁶ They treated the tumor with partial nephrectomy of the kidney allograft. It seems that AML of the kidney allograft can be managed with the same indications for surgery or conservative surveillance.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Murphy DP, Glazier DB, Chenven ES, Principato R, Diamond SM. Extrarenal retroperitoneal angiomyolipoma: nonoperative management. *J Urol.* 2000;163:234-5.
2. Morgan GS, Straumfjord JV, Hall EJ. Angiomyolipoma of the kidney. *J Urol.* 1951;65:525-7.
3. Stillwell TJ, Gomez MR, Kelalis PP. Renal lesions in tuberous sclerosis. *J Urol.* 1987;138:477-81.
4. Steiner MS, Goldman SM, Fishman EK, Marshall FF. The natural history of renal angiomyolipoma. *J Urol.* 1993;150:1782-6.
5. Hellstrom PA, Mehik A, Talja MT, Siniluoto TM, Perala JM, Leinonen SS. Spontaneous subcapsular or perirenal haemorrhage caused by renal tumours. A urological emergency. *Scand J Urol Nephrol.* 1999;33:17-23.
6. Lemaitre L, Claudon, M., Dubrulle, F. and Mazeman, E. Imaging of angiomyolipomas. *Semin Ultrasound CT MR.* 1997;18:100.

7. Wagner BJ, Wong-You-Cheong, J. J. and Davis, C. J., Jr. Adult renal hamartomas. *Radiographics*. 1997;17:155.
8. Uhlenbrock D, Fischer, C. and Beyer, H. K. Angiomyolipoma of the kidney: comparison between magnetic resonance imaging, computed tomography, and ultrasonography for diagnosis. *Acta Radiol*. 1988;29:523.
9. Nelson CP, Sanda MG. Contemporary diagnosis and management of renal angiomyolipoma. *J Urol*. 2002;168:1315-25.
10. Gomez MR. Phenotypes of the tuberous sclerosis complex with a revision of diagnostic criteria. *Ann N Y Acad Sci*. 1991;615:1-7.
11. Koch MJ. Considerations in retransplantation of the failed renal allograft recipient. *Adv Chronic Kidney Dis*. 2006;13:18-28.
12. Aliasgari M, Ghadian A. Coincidence of angiomyolipoma and pheochromocytoma. *Urol J*. 2006;3:61-3; discussion 3-4.
13. Einollahi B. Genitourinary Neoplasia after Kidney Transplantation. *Nephro-Urology Monthly*. 2010;2:491-6.
14. Lappin DW, Hutchison AJ, Pearson RC, O'Donoghue DJ, Roberts IS. Angiomyolipoma in a transplanted kidney. *Nephrol Dial Transplant*. 1999;14:1574-5.
15. Mosunjac M, Scukanec-Spoljar M, Popovic-Uroic T, Manojlovic S. Angiomyolipoma in the transplanted kidney. A case report. *Tumori*. 1992;78:52-4.
16. Roozbeh J, Geramizadeh B, Nikeghbalian S, Salehipour M, Malek-Hosseini SA. A rare incidence of angiomyolipoma after kidney transplantation. *Iran J Kidney Dis*. 2012;6:311-3.
17. Corsenca A, Aebersold F, Moch H, et al. Combined nephrectomy and pre-emptive renal transplantation in a tuberous sclerosis patient with angiomyolipoma, renal carcinoma and life-threatening abdominal haemorrhages. *Nephrol Dial Transplant*. 2007;22:3330-3.
18. Colman P, Gray DW, Dunnill M, Morris PJ. Angiomyolipoma masquerading as malignancy in renal transplantation. *Nephrol Dial Transplant*. 1993;8:642-3.

Correspondence to:

Alireza Ghadian, MD

Nephrology and Urology Research Center, Baqiyatallah

University of Medical Sciences, Ground Floor of Baqiyatallah

Hospital, Mollasdra Ave, Vanak Sq, Tehran, Iran

E-mail: p_ghadian@yahoo.com