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REVIEW

Primary vascular tumours of the kidney

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Abstract

Primary vascular tumours of the kidney are rare and may pose diagnostic difficulties because of their similar clinical, morphological, and immunohistochemical features. This article summarizes the clinical and pathological features of primary renal angiosarcoma and anastomosing haemangioma of the kidney including epidemiology, genetics, and prognosis. Renal anastomosing haemangiomas are benign neoplasms characterized by anastomosing capillary-sized vascular channels. These tumours are rare, with about 75 cases reported in the literature. Most anastomosing haemangiomas are found incidentally on ultrasound, computed tomography, or magnetic resonance imaging. Common symptoms include abdominal pain, haematuria, and abdominal mass. Renal anastomosing haemangiomas are characterized by recurrent mutations in *GNAQ* and *GNA14* genes. The prognosis of anastomosing haemangioma is excellent.

Primary renal angiosarcomas are malignant tumours showing endothelial differentiation. To date, 76 cases have been described in the literature. Primary renal angiosarcomas are frequently symptomatic. The clinical features of renal angiosarcomas are similar to those of renal anastomosing haemangiomas, including abdominal pain, haematuria, and abdominal mass. Angiogenesis-related genes and vascular-specific receptor tyrosine kinases such as KDR, TIE1, SNRK, TEK, and FLT1 are upregulated in angiosarcomas. Primary renal angiosarcomas are highly aggressive neoplasms with a poor prognosis despite surgical treatment, chemotherapy, radiotherapy, or targeted therapy.

Key Words: Kidney; Renal tumours; Angiosarcoma; Haemangioma; Anastomosing haemangioma of the kidney; Vascular tumours

Core Tip: Primary vascular tumours of the kidney are extremely rare. This article

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INTRODUCTION

Although vascular tumours are relatively common in the skin and soft tissue, they are extremely rare in the kidney, ranging from benign to malignant neoplasms that may be diagnostically challenging because of the overlapping clinical, morphological and immunohistochemical features.

These tumours include renal angiosarcomas and renal haemangiomas. Various subtypes of haemangioma have been described in the kidney including cavernous, capillary, and anastomosing haemangiomas[1-4]. However, the most common subtype is anastomosing haemangioma[1,2,5].

This article provides an overview of the clinical and pathological features of anastomosing haemangioma of the kidney and primary angiosarcoma of the kidney, and discusses the epidemiology, genetics, and prognosis.

ANASTOMOSING HAEMANGIOMA OF THE KIDNEY

Renal anastomosing haemangiomas are benign neoplasms characterized by anastomosing capillary-sized vascular channels. These tumours are exceptionally rare with about 75 anastomosing haemangiomas reported in the literature[5-9]. These tumours occur in a wide age range from 10 to 83 years (mean, 49 years) with a male-to-female ratio of 2:1[10].

The aetiology and risk factors for renal anastomosing haemangiomas are unknown. Some cases have been reported in the setting of end stage renal disease[11,12].

The vast majority of anastomosing haemangiomas are found incidentally on radiological evaluation for other purposes. Common symptoms include abdominal pain, haematuria, and abdominal mass[5,10].

The imaging findings are non-specific. On computed tomography, these tumours are often circumscribed, hyperdense, and heterogeneous due to fatty or non-enhancing hypodense areas and show post-contrast enhancement[13].

Renal anastomosing haemangiomas are characterized by recurrent mutations in *GNAQ* and *GNA14* genes[14,15]. *GNAQ* gene encodes guanine nucleotide-binding protein G (q) subunit alpha (Gαq protein) that activates signalling pathways that regulates cell proliferation, survival, development, and function of blood vessels[14-16].

Grossly, anastomosing haemangiomas are typically small ranging from 0.1 cm to 12 cm (mean, 2.2 cm)[5,10,17]. These tumours are often well-demarcated spongy mahogany brown masses[5]. They are usually unilateral and solitary tumours; however, a few cases of bilateral[18] and multifocal[11] tumours have been described.

Histologically, anastomosing haemangiomas consist of anastomosing capillary-sized blood vessels, reminiscent of splenic sinusoids. The blood vessels are lined by bland endothelial cells. Typically, these tumours lack endothelial cell multilayering, papillary tufting, cytologic atypia, necrosis, and prominent mitotic figures. They may show extramedullary haematopoiesis, hyaline globules, and mild lymphocytic infiltrate[1,2,5,10,18].

Rarely, renal anastomosing haemangiomas may infiltrate perinephric fat, renal sinus fat[2,12], and the renal vein or its segmental branches[2,12,18,19]. The neoplastic cells are immunoreactive for CD31, CD34, ERG, FLI1, and factor VIII-related antigen (now rarely used)[5].

Renal anastomosing haemangiomas may co-exist with other renal neoplasms such as metanephric adenoma, papillary adenoma, papillary renal cell carcinoma, acquired cystic disease-associated renal cell carcinoma, and clear cell renal cell carcinoma[11,12].

Most patients with renal anastomosing haemangioma, described in the literature, were treated with radical nephrectomy, reflecting a tendency to overtreat these patients, probably because of inaccurate preoperative diagnosis (Table 1).

The prognosis of anastomosing haemangioma is excellent with no evidence of recurrence, metastasis or tumour-related death at an average follow-up of 24.8 mo (range, < 1-156 mo) (Table 1).

PRIMARY ANGIOSARCOMA OF THE KIDNEY

Renal angiosarcomas are malignant tumours showing endothelial differentiation. These tumours are very rare, with about 76 cases described in the literature as case series and reports[20-24]. There is a male-to-female ratio of 6:1, with patient age ranging from 24 years to 95 years (median, 62 years).

Although angiosarcomas arising in other anatomical sites have been associated with risk factors such as exposure to thorium dioxide, arsenic-based pesticides, polyvinyl chloride, and radiation therapy particularly for breast, endometrial and prostate cancers[25-27], no specific aetiology or risk factors have been established for primary angiosarcoma of the kidney[20,28].

The clinical features of renal angiosarcomas are identical to those of renal anastomosing haemangiomas. Common symptoms include abdominal pain, haematuria, abdominal mass, and weight loss. A rare case of spontaneous tumour rupture with retroperitoneal haematoma has been described[29].

Computed tomography imaging shows large masses with heterogeneous enhancement and hypervascularity[30].

Angiogenesis-related genes and vascular-specific receptor tyrosine kinases such as KDR, TIE1, SNRK, TEK, and FLT1, are upregulated in angiosarcomas[31]. High-level MYC gene amplifications are seen in most radiation-induced and chronic lymphoedema-associated angiosarcomas[32]. A subset of cases is characterized by PLCG1, KDR, and PTPRB mutations[33,34].

Some primary angiosarcomas, typically in young adults, have recurrent CIC gene rearrangements, with or without concurrent CIC mutations, and are characterized by upregulation of CIC-target genes including *ETV1*, *ETV4*, and *ETV5*[34]. Angiosarcomas with CIC gene abnormalities are associated with an inferior disease-free survival[34].

Primary renal angiosarcomas are usually large ranging from 3.6 cm to 30 cm (mean, 13 cm). Typically, they are ill-defined haemorrhagic spongy masses with necrosis[1,20].

Microscopically, these tumours range from well-formed vasoformative areas to areas with solid morphology showing sparse vasoformation. These patterns are often mixed within the same tumour. Vasoformative areas are composed of small to medium-sized anastomosing blood vessels, lined by epithelioid and/or spindled endothelial cells showing nuclear pleomorphism, endothelial papillary tufting, multilayering, intraluminal budding, and hobnailing[1,20,28]. Solid areas consist of sheets of malignant epithelioid and/or spindled cells with subtle vasoformation, cytologic atypia, and mitotic figures. Necrosis may be present. Angiosarcomas usually have a haemorrhagic background and extravasated red blood cells are seen within the tumour[1,20,28].

Epithelioid angiosarcomas are composed of sheets of large atypical polygonal or epithelioid cells with nuclear pleomorphism, high nuclear to cytoplasmic ratio, prominent central nucleoli, mitotic figures, and moderate amounts of cytoplasm. Epithelioid angiosarcomas may be mistaken for carcinoma, melanoma, or lymphoma [20,28,35-37].

The neoplastic cells are positive for CD31, ERG, FLI1, CD34, and factor VIII-related antigen[20,28,38,39]. Epithelioid angiosarcomas may be positive for epithelial markers including CK7, Cam5.2, AE1/AE3, and EMA, which may lead to a misdiagnosis of carcinoma[20].

Similar to angiosarcomas arising at other locations, renal angiosarcomas have a tendency for widespread metastasis at diagnosis or afterwards in the course of the disease. Approximately 66% of patients develop metastases, most commonly to the lung and liver. Other sites of metastasis include bone, lymph nodes, peritoneum, small bowel, soft tissue, and skin. Currently, there are no specific standardized treatment guidelines for primary renal angiosarcomas. These tumours are treated with radical nephrectomy, chemotherapy, radiotherapy, or targeted therapy (Table 2).

Table 1 Treatment, follow-up, and outcome of patients with anastomosing haemangioma of the kidney

Author	Treatment	Follow-up (mo)	Outcome
Bean *et al*[14]	Nephrectomy	9	NED
Bean *et al*[14]	Nephrectomy	84	NED
Bean *et al*[14]	Nephrectomy	107	NED
Memmedoğlu and Musayev[41]	Nephrectomy	12	NED
Memmedoğlu and Musayev[41]	Nephrectomy	12	NED
Tahir and Folwell[42]	Nephrectomy	1	NED
Pantelides *et al*[6]	Nephrectomy	6	NED
Downes *et al*[7]	Nephrectomy	NA	NA
Downes *et al*[7]	Biopsy	NA	NA
Chandran *et al*[8]	Nephrectomy	NA	NA
Cha *et al*[9]	Nephrectomy	5	NED
Montgomery and Epstein[2]	Nephrectomy	12	NED
Montgomery and Epstein[2]	Nephrectomy	36	NED
Montgomery and Epstein[2]	Nephrectomy	NA	NA
Montgomery and Epstein[2]	Excision	8	NED
Heidegger *et al*[43]	Nephrectomy	156	NED
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Kryvenko *et al*[12]	Nephrectomy	NA	NA
Al-Maghrabi and Al-Rashed[44]	Partial nephrectomy	12	NED
Caballes *et al*[17]	Nephrectomy	18	NED
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Büttner *et al*[11]	Nephrectomy	NA	NA
Lee *et al*[45]	Nephrectomy	NA	NA
Zhao *et al*[46]	Nephrectomy	12	NED
Kryvenko *et al*[18]	Nephrectomy	7	NED

Kryvenko *et al*[18]	Nephrectomy	6	NED
Kryvenko *et al*[18]	Nephrectomy	3	NED
Kryvenko *et al*[18]	Nephrectomy	122	NED
Tao *et al*[47]	Nephrectomy	21	NED
Abboudi *et al*[48]	Nephrectomy	<1	NED
Silva *et al*[49]	Resection	NA	NA
Berker *et al*[50]	Partial nephrectomy	10	NED
Berker *et al*[50]	Nephrectomy	4	NED
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
O'Neill *et al*[13]	NA	NA	NA
Brown *et al*[1]	Nephrectomy	72	NED
Brown *et al*[1]	Nephrectomy	24	NED
Brown *et al*[1]	Partial nephrectomy	NA	NA
Brown *et al*[1]	Nephrectomy	24	NED
Brown *et al*[1]	Nephrectomy	NA	NA
Perdiki *et al*[51]	Partial nephrectomy	25	NED
Perdiki *et al*[51]	Nephrectomy	14	NED
Wetherell *et al*[52]	Nephrectomy	1	DFUD
Manohar *et al*[53]	Nephrectomy	24	NED
Omiyale *et al*[19]	Nephrectomy	10	NED
Johnstone *et al*[54]	Nephrectomy	NA	NA
Mehta *et al*[4]	Nephrectomy	3	NED
Mehta *et al*[4]	Nephrectomy	12	NED
Mehta *et al*[4]	Nephrectomy	3	NED
Tran and Pernicone[55]	Nephrectomy	NA	NA
Zhang *et al*[56]	Partial nephrectomy	16	NED
Cheon *et al*[57]	Nephrectomy	6	NED
Chou *et al*[58]	Nephrectomy	8	NED
Chou *et al*[58]	Nephrectomy	14	NED

DFUD: Died from unrelated disease; NED: No evidence of disease; NA: Not available.

Primary renal angiosarcomas are highly aggressive neoplasms with 76.3% of patients dying of tumour within 1 mo to 24 mo (mean, 7.5 mo), despite surgical and adjuvant therapy (Table 2). Poor prognostic factors for angiosarcomas occurring at other anatomic sites include age > 69 years, tumour size ≥ 5 cm, regional disease (*vs* localized disease), non-surgical treatment, and distant metastasis[40].

CONCLUSION

Primary vascular tumours of the kidney are rare neoplasms. Unlike primary renal

Table 2 Treatment, follow-up, and outcome of patients with primary angiosarcoma of the kidney

Ref.	Treatment	Follow-up (mo)	Outcome
Costero-Barrios *et al*[59]	Nephrectomy, Chemo, RT	12	AWD
Peters *et al*[60]	Nephrectomy	2	DOD
Singh *et al*[35]	NA	NA	NA
Kern *et al*[61]	Nephrectomy	3	DOD
Kern *et al*[61]	Nephrectomy	1.5	DOD
Aydogdu *et al*[62]	Nephrectomy	NA	NA
Akkad *et al*[63]	Nephrectomy	30	NED
Witczak *et al*[64]	nephrectomy	NA	NA
Chaabouni *et al*[38]	Nephrectomy	1	DOD
Johnson *et al*[65]	Rapid deterioration	NA	DOD
Zenico *et al*[66]	Nephrectomy	4	DOD
Nguyen *et al*[67]	Nephrectomy, Chemo	18	DOD
Terris *et al*[68]	Nephrectomy, RT	10	DOD
Matter *et al*[69]	Nephrectomy, Chemo, RT	18	DOD
Yoshida *et al*[70]	Nephrectomy, Recombinant IL-2	13	DOD
Pauli and Strutton[71]	Nephrectomy, RT	2	DOD
Martínez-Piñeiro *et al*[72]	Nephrectomy, S	4	DOD
Bernstein *et al*[73]	NA	NA	NA
Liu *et al*[36]	Nephrectomy, RT	6	NED
Yau *et al*[74]	Nephrectomy, Chemo, RT	3	DOD
Carnero López *et al*[75]	Nephrectomy, Chemo	5	DOD
Kazaz *et al*[76]	Nephrectomy, Chemo	NA	NA
Souza *et al*[77]	Nephrectomy	1	DFUD
Detorakis *et al*[78]	Nephrectomy, Chemo	11	DOD
Komoto *et al*[79]	Nephrectomy	9.2	DOD
Boni *et al*[80]	Nephrectomy, Chemo	15	DOD
Chang *et al*[81]	Nephrectomy, Chemo, RT	NA	NA
Iannaci *et al*[82]	Nephrectomy	NA	DOD
Subramanian *et al*[83]	Nephrectomy	NA	NA
Waqas *et al*[84]	Nephrectomy, Chemo	NA	NA
Gourley *et al*[85]	Nephrectomy	NA	DOD
Su[86]	Nephrectomy, Chemo	NA	DOD
López Cubillana *et al*[87]	Nephrectomy, Chemo	5	DOD
Juan *et al*[88]	Nephrectomy, Chemo, RT	9	DOD
Prince[21]	Nephrectomy, RT	NA	A and W
Sesar *et al*[22]	Nephroureterectomy	NA	NA
Testa *et al*[23]	Nephrectomy	27	DFUD
Xuan[24]	Nephrectomy	NA	NA
Brown *et al*[1]	NA	6	DOD
Brown *et al*[1]	NA	11	DOD
Brown *et al*[1]	NA	1	DOD

Brown *et al*[1]	NA	NA	NA
Brown *et al*[1]	NA	1	DOD
Brown *et al*[1]	Nephrectomy	NA	NA
Brown *et al*[1]	Nephrectomy	NA	NA
Brown *et al*[1]	Nephrectomy	2	DFUD
Hiratsuka *et al*[89]	Nephrectomy	29	NED
Adjiman *et al*[90]	Nephrectomy	NA	DOD
Limmer *et al*[91]	Nephrectomy	1	DOD
Darlington *et al*[92]	Nephrectomy, Chemo	12	NED
Allred *et al*[93]	Nephrectomy, Chemo	3	DOD
Fukunaga *et al*[94]	Nephrectomy	13	DOD
Desai *et al*[95]	Nephrectomy, Chemo	4	DOD
Sabharwal *et al*[96]	Nephrectomy, Chemo	>1	NA
Aksoy *et al*[29]	Nephrectomy, S	3	DOD
Heo *et al*[97]	Nephrectomy	NA	NA
Mordkin *et al*[98]	Nephrectomy, Chemo, S	NA	NA
Berretta *et al*[99]	Nephrectomy, Chemo	8	DOD
Lodhi *et al*[100]	Chemo	NA	AWD
Cason *et al*[101]	Nephrectomy, RT	10	DOD
Askari *et al*[102]	Nephrectomy	4	DOD
Guan *et al*[103]	Nephrectomy, Chemo	4	DOD
Papadimitriou *et al*[104]	Nephrectomy	NA	A and W
Celebi *et al*[105]	Nephrectomy, Chemo, TKI, VEGF Inhibitor	13	DOD
Rüb *et al*[106]	Nephrectomy, Chemo	12	AWD
Zhang *et al*[107]	Nephrectomy	NA	NA
Tsuda *et al*[108]	Nephrectomy	21	DOD
Grapsa *et al*[109]	NA	NA	NA
Li *et al*[37]	NA	NA	NA
Qayyum *et al*[110]	Palliative (patient's decision)	NA	NA
Leggio *et al*[30]	Nephrectomy	8	DOD
Garmendia *et al*[111]	Nephrectomy	NA	NA
Sanyal *et al*[112]	Nephrectomy, RT	24	DOD
Cerilli *et al*[113]	Nephrectomy, RT	6	DOD
Douard *et al*[114]	Nephrectomy	3	DOD
Yamamoto *et al*[115]	Nephrectomy, RT	19	NED

RT: Radiotherapy; Chemo: Chemotherapy; TKI: Tyrosine kinase inhibitor; S: Splenectomy; DOD: Died of disease; AWD: Alive with disease; A and W: Alive and well; DFUD: Died from unrelated disease; NED: No evidence of disease; NA: Not available.

angiosarcoma, the prognosis of renal anastomosing haemangioma is excellent with no evidence of recurrence or metastasis. These tumours share similar clinical, morphological and immunohistochemical features, and must be distinguished from each other. Features that favour angiosarcomas include the presence of malignant spindled and/or epithelioid cells with a variable degree of vasoformation, cytologic atypia, prominent mitotic figures, endothelial multilayering, papillary tufting, and necrosis.

REFERENCES

1 **Brown JG**, Folpe AL, Rao P, Lazar AJ, Paner GP, Gupta R, Parakh R, Cheville JC, Amin MB. Primary vascular tumors and tumor-like lesions of the kidney: a clinicopathologic analysis of 25 cases. *Am J Surg Pathol* 2010; **34**: 942-949 [PMID: 20534992 DOI: 10.1097/PAS.0b013e3181e4f32a]

2 **Montgomery E**, Epstein JI. Anastomosing hemangioma of the genitourinary tract: a lesion mimicking angiosarcoma. *Am J Surg Pathol* 2009; **33**: 1364-1369 [PMID: 19606014 DOI: 10.1097/PAS.0b013e3181ad30a7]

3 **Sethi S**, Agarwal V, Chopra P. Cavernous hemangioma of the kidney: A report of two cases and review of the literature. *Urol Ann* 2012; **4**: 187-190 [PMID: 23248529 DOI: 10.4103/0974-7796.102674]

4 **Mehta V**, Ananthanarayanan V, Antic T, Krausz T, Milner J, Venkataraman G, Picken MM. Primary benign vascular tumors and tumorlike lesions of the kidney: a clinicopathologic analysis of 15 cases. *Virchows Arch* 2012; **461**: 669-676 [PMID: 23090628 DOI: 10.1007/s00428-012-1333-9]

5 **Omiyale AO**. Anastomosing hemangioma of the kidney: a literature review of a rare morphological variant of hemangioma. *Ann Transl Med* 2015; **3**: 151 [PMID: 26244138 DOI: 10.3978/j.issn.2305-5839.2015.06.16]

6 **Pantelides NM**, Agrawal S, Mawson I, Hazell S, Gibbons N. An Anastomosing Haemangioma: A Rare Vascular Tumour Presenting as a Solid Renal Mass. *Br J Med Surg Urol* 2012; **5**: 84-86 [DOI: 10.1016/j.bjmsu.2011.01.003]

7 **Downes MR**, Dickson BC, Cheung CC. Anastomosing haemangioma of kidney: morphologic features and diagnostic considerations of an unusual vasoformative tumour. *Diagn Histopathol* 2014; **20**: 208-212 [DOI: 10.1016/j.mpdhp.2014.03.002]

8 **Chandran N**, Kannan MS, Veeramani M. Renal anastomosing hemangioma: a diagnosis to ponder. *Indian J Transplant* 2019; **13**: 59-61 [DOI: 10.4103/ijot.ijot_63_18]

9 **Cha JS**, Jeong YB, Kim HJ. Anastomosing hemangioma mimicking renal cell carcinoma. *Korean J Urol Oncol* 2016; **14**: 88-92 [DOI: 10.22465/kjuo.2016.14.2.88]

10 **Omiyale AO**, Carton J. Clinicopathological and genetic features of anastomosing haemangioma of the kidney: a narrative review. *AME Med J* 2021; **6**: 30 [DOI: 10.21037/amj-20-181]

11 **Büttner M**, Kufer V, Brunner K, Hartmann A, Amann K, Agaimy A. Benign mesenchymal tumours and tumour-like lesions in end-stage renal disease. *Histopathology* 2013; **62**: 229-236 [PMID: 23020314 DOI: 10.1111/j.1365-2559.2012.04349.x]

12 **Kryvenko ON**, Haley SL, Smith SC, Shen SS, Paluru S, Gupta NS, Jorda M, Epstein JI, Amin MB, Truong LD. Haemangiomas in kidneys with end-stage renal disease: a novel clinicopathological association. *Histopathology* 2014; **65**: 309-318 [PMID: 24548339 DOI: 10.1111/his.12394]

13 **O'Neill AC**, Craig JW, Silverman SG, Alencar RO. Anastomosing hemangiomas: locations of occurrence, imaging features, and diagnosis with percutaneous biopsy. *Abdom Radiol (NY)* 2016; **41**: 1325-1332 [PMID: 26960722 DOI: 10.1007/s00261-016-0690-2]

14 **Bean GR**, Joseph NM, Gill RM, Folpe AL, Horvai AE, Umetsu SE. Recurrent GNAQ mutations in anastomosing hemangiomas. *Mod Pathol* 2017; **30**: 722-727 [PMID: 28084343 DOI: 10.1038/modpathol.2016.234]

15 **Bean GR**, Joseph NM, Folpe AL, Horvai AE, Umetsu SE. Recurrent GNA14 mutations in anastomosing haemangiomas. *Histopathology* 2018; **73**: 354-357 [PMID: 29574926 DOI: 10.1111/his.13519]

16 **Urtatiz O**, Van Raamsdonk CD. Gnaq and Gna11 in the Endothelin Signaling Pathway and Melanoma. *Front Genet* 2016; **7**: 59 [PMID: 27148356 DOI: 10.3389/fgene.2016.00059]

17 **Caballes AB**, Abelardo AD, Farolan MJ, Veloso JAD. Pediatric Anastomosing Hemangioma: Case Report and Review of Renal Vascular Tumors in Children. *Pediatr Dev Pathol* 2019; **22**: 269-275 [PMID: 30369288 DOI: 10.1177/1093526618809230]

18 **Kryvenko ON**, Gupta NS, Meier FA, Lee MW, Epstein JI. Anastomosing hemangioma of the genitourinary system: Eight cases in the kidney and ovary with immunohistochemical and ultrastructural analysis. *Am J Clin Pathol* 2011; **136**: 450-457 [PMID: 21846922 DOI: 10.1309/AJCPJPW34QCQYTMT]

19 **Omiyale AO**, Golash A, Mann A, Kyriakidis D, Kalyanasundaram K. Anastomosing Haemangioma of the Kidney Involving a Segmental Branch of the Renal Vein. *Case Rep Surg* 2015; **2015**: 927286 [PMID: 26435872 DOI: 10.1155/2015/927286]

20 **Omiyale AO**, Carton J. Clinical and Pathologic Features of Primary Angiosarcoma of the Kidney. *Curr Urol Rep* 2018; **19**: 4 [PMID: 29383452 DOI: 10.1007/s11934-018-0755-6]

21 **Prince CL**. Primary angio-endothelioma of the kidney: report of a case and brief review. *J Urol* 1942; **47**: 787-789 [DOI: 10.1016/S0022-5347%2817%2970875-0]

22 **Sesar P**, Ulamec M, Šoša D, Trnski D, Tomas D. Primary renal angiosarcoma. *Acta Clin Croat* 2012; **51**: 182

23 **Testa G**, Talamona G, Tufano A, Marino-Marsilia G. Primary renal angiosarcoma: a case report. *Acta Urologica Italica* 1998; **12**: 225-227

24 **Xuan Y**. Primary renal angiosarcoma: one case report and literature review. *Chin J Clin Oncol* 2008; **5**: 229-230 [DOI: 10.1007/s11805-008-0229-6]

25 **Penel N**, Grosjean J, Robin YM, Vanseymortier L, Clisant S, Adenis A. Frequency of certain established risk factors in soft tissue sarcomas in adults: a prospective descriptive study of 658 cases.

Sarcoma 2008; **2008**: 459386 [PMID: 18497869 DOI: 10.1155/2008/459386]
26 **Kulaga A**, Yilmaz A, Wilkin RP, Trpkov K. Epithelioid angiosarcoma of the bladder after irradiation for endometrioid adenocarcinoma. *Virchows Arch* 2007; **450**: 245-246 [PMID: 17149614 DOI: 10.1007/s00428-006-0336-9]
27 **Chandan VS**, Wolsh L. Postirradiation angiosarcoma of the prostate. *Arch Pathol Lab Med* 2003; **127**: 876-878 [PMID: 12823047 DOI: 10.5858/2003-127-876-PAOTP]
28 **Omiyale AO**. Clinicopathological features of primary angiosarcoma of the kidney: a review of 62 cases. *Transl Androl Urol* 2015; **4**: 464-473 [PMID: 26816844 DOI: 10.3978/j.issn.2223-4683.2015.05.04]
29 **Aksoy Y**, Gürsan N, Ozbey I, Biçgi O, Keleş M. Spontaneous rupture of a renal angiosarcoma. *Urol Int* 2002; **68**: 60-62 [PMID: 11803270 DOI: 10.1159/000048419]
30 **Leggio L**, Addolorato G, Abenavoli L, Ferrulli A, D'Angelo C, Mirijello A, Vonghia L, Schinzari G, Arena V, Perrone L, Citterio F, Bonomo L, Rapaccini GL, Capelli A, Barone C, Gasbarrini G. Primary renal angiosarcoma: a rare malignancy. A case report and review of the literature. *Urol Oncol* 2006; **24**: 307-312 [PMID: 16818182 DOI: 10.1016/j.urolonc.2005.10.002]
31 **Antonescu CR**, Yoshida A, Guo T, Chang NE, Zhang L, Agaram NP, Qin LX, Brennan MF, Singer S, Maki RG. KDR activating mutations in human angiosarcomas are sensitive to specific kinase inhibitors. *Cancer Res* 2009; **69**: 7175-7179 [PMID: 19723655 DOI: 10.1158/0008-5472.CAN-09-2068]
32 **Guo T**, Zhang L, Chang NE, Singer S, Maki RG, Antonescu CR. Consistent MYC and FLT4 gene amplification in radiation-induced angiosarcoma but not in other radiation-associated atypical vascular lesions. *Genes Chromosomes Cancer* 2011; **50**: 25-33 [PMID: 20949568 DOI: 10.1002/gcc.20827]
33 **Behjati S**, Tarpey PS, Sheldon H, Martincorena I, Van Loo P, Gundem G, Wedge DC, Ramakrishna M, Cooke SL, Pillay N, Vollan HKM, Papaemmanuil E, Koss H, Bunney TD, Hardy C, Joseph OR, Martin S, Mudie L, Butler A, Teague JW, Patil M, Steers G, Cao Y, Gumbs C, Ingram D, Lazar AJ, Little L, Mahadeshwar H, Protopopov A, Al Sannaa GA, Seth S, Song X, Tang J, Zhang J, Ravi V, Torres KE, Khatri B, Halai D, Roxanis I, Baumhoer D, Tirabosco R, Amary MF, Boshoff C, McDermott U, Katan M, Stratton MR, Futreal PA, Flanagan AM, Harris A, Campbell PJ. Recurrent PTPRB and PLCG1 mutations in angiosarcoma. *Nat Genet* 2014; **46**: 376-379 [PMID: 24633157 DOI: 10.1038/ng.2921]
34 **Huang SC**, Zhang L, Sung YS, Chen CL, Kao YC, Agaram NP, Singer S, Tap WD, D'Angelo S, Antonescu CR. Recurrent CIC Gene Abnormalities in Angiosarcomas: A Molecular Study of 120 Cases With Concurrent Investigation of PLCG1, KDR, MYC, and FLT4 Gene Alterations. *Am J Surg Pathol* 2016; **40**: 645-655 [PMID: 26735859 DOI: 10.1097/PAS.0000000000000582]
35 **Singh C**, Xie L, Schmechel SC, Manivel JC, Pambuccian SE. Epithelioid angiosarcoma of the kidney: a diagnostic dilemma in fine-needle aspiration cytology. *Diagn Cytopathol* 2012; **40** Suppl 2: E131-E139 [PMID: 21698784 DOI: 10.1002/dc.21762]
36 **Liu H**, Huang X, Chen H, Wang X, Chen L. Epithelioid angiosarcoma of the kidney: A case report and literature review. *Oncol Lett* 2014; **8**: 1155-1158 [PMID: 25120677 DOI: 10.3892/ol.2014.2292]
37 **Li N**, Li W, Li Z. Primary renal epithelioid angiosarcoma with transitional cell carcinoma in renal pelvis. *Zhonghua Waike Zazhi* 1997; **35**: 294-295 [PMID: 10374567]
38 **Chaabouni A**, Rebai N, Chabchoub K, Fourati M, Bouacida M, Slimen MH, Bahloul A, Mhiri MN. Primary renal angiosarcoma: Case report and literature review. *Can Urol Assoc J* 2013; **7**: E430-E432 [PMID: 23826057 DOI: 10.5489/cuaj.1396]
39 **Iacovelli R**, Orlando V, Palazzo A, Cortesi E. Clinical and pathological features of primary renal angiosarcoma. *Can Urol Assoc J* 2014; **8**: E223-E226 [PMID: 24839487 DOI: 10.5489/cuaj.1585]
40 **Zhang C**, Xu G, Liu Z, Xu Y, Lin F, Baklaushev VP, Chekhonin VP, Peltzer K, Mao M, Wang X, Wang G, Zhang C. Epidemiology, tumor characteristics and survival in patients with angiosarcoma in the United States: a population-based study of 4537 cases. *Jpn J Clin Oncol* 2019; **49**: 1092-1099 [PMID: 31612920 DOI: 10.1093/jjco/hyz113]
41 **Memmedoğlu A**, Musayev J. Spontaneous rupture of the kidney in the patients with synchronous renal hemangioma and nephrogenic hypertension. *Turk J Urol* 2015; **41**: 231-234 [PMID: 26623154 DOI: 10.5152/tud.2015.48264]
42 **Tahir M**, Folwell A. Anastomosing haemangioma of kidney: a rare subtype of vascular tumour of the kidney mimicking angiosarcoma. *ANZ J Surg* 2016; **86**: 838-839 [PMID: 25041271 DOI: 10.1111/ans.12779]
43 **Heidegger I**, Pichler R, Schäfer G, Zelger B, Aigner F, Bektic J, Horninger W. Long-term follow up of renal anastomosing hemangioma mimicking renal angiosarcoma. *Int J Urol* 2014; **21**: 836-838 [PMID: 24650180 DOI: 10.1111/iju.12433]
44 **Al-Maghrabi HA**, Al Rashed AS. Challenging Pitfalls and Mimickers in Diagnosing Anastomosing Capillary Hemangioma of the Kidney: Case Report and Literature Review. *Am J Case Rep* 2017; **18**: 255-262 [PMID: 28286335 DOI: 10.12659/ajcr.902939]
45 **Lee HS**, Koh BH, Kim JW, Kim YS, Rhim HC, Cho OK, Hahm CK, Woo YN, Park MH. Radiologic findings of renal hemangioma: report of three cases. *Korean J Radiol* 2000; **1**: 60-63 [PMID: 11752931 DOI: 10.3348/kjr.2000.1.1.60]
46 **Zhao M**, Li C, Zheng J, Sun K. Anastomosing hemangioma of the kidney: a case report of a rare subtype of hemangioma mimicking angiosarcoma and review of the literature. *Int J Clin Exp Pathol* 2013; **6**: 757-765 [PMID: 23573324]

47 **Tao LL**, Dai Y, Yin W, Chen J. A case report of a renal anastomosing hemangioma and a literature review: an unusual variant histologically mimicking angiosarcoma. *Diagn Pathol* 2014; **9**: 159 [PMID: 25102914 DOI: 10.1186/s13000-014-0159-y]

48 **Abboudi H**, Tschobotko B, Carr C, DasGupta R. Bilateral Renal Anastomosing Hemangiomas: A Tale of Two Kidneys. *J Endourol Case Rep* 2017; **3**: 176-178 [PMID: 29279869 DOI: 10.1089/cren.2017.0018]

49 **Silva MA**, Fonseca EKUN, Yamauchi FI, Baroni RH. Anastomosing hemangioma simulating renal cell carcinoma. *Int Braz J Urol* 2017; **43**: 987-989 [PMID: 28727378 DOI: 10.1590/S1677-5538.IBJU.2016.0653]

50 **Berker NK**, Bayram A, Tas S, Bakir B, Caliskan Y, Ozcan F, Kilicaslan I, Ozluk Y. Comparison of Renal Anastomosing Hemangiomas in End-Stage and Non-End-Stage Kidneys: A Meta-Analysis With a Report of 2 Cases. *Int J Surg Pathol* 2017; **25**: 488-496 [PMID: 28436289 DOI: 10.1177/1066896917706025]

51 **Perdiki M**, Datseri G, Liapis G, Chondros N, Anastasiou I, Tzardi M, Delladetsima JK, Drakos E. Anastomosing hemangioma: report of two renal cases and analysis of the literature. *Diagn Pathol* 2017; **12**: 14 [PMID: 28118845 DOI: 10.1186/s13000-017-0597-4]

52 **Wetherell DR**, Skene A, Manya K, Manecksha RP, Chan Y, Bolton DM. Anastomosing haemangioma of the kidney: a rare morphological variant of haemangioma characteristic of genitourinary tract location. *Pathology* 2013; **45**: 193-196 [PMID: 23250038 DOI: 10.1097/PAT.0b013e32835c782b]

53 **Manohar V**, Krishnamurthy S, Ranganathan J, Pai VD. A case of giant anastomosing hemangioma of the kidney with extramedullary hematopoiesis: A great mimicker. *Indian J Pathol Microbiol* 2020; **63**: 292-294 [PMID: 32317537 DOI: 10.4103/IJPM.IJPM_434_18]

54 **Johnstone KJ**, Strutton GM, Perry-Keene JL, Hazratwala K, Delahunt B. Multifocal anastomosing haemangioma of the kidney with intravascular growth and sinus fat invasion: a rare benign mimic of angiosarcoma. *Pathology* 2020; **52**: 394-396 [PMID: 32111399 DOI: 10.1016/j.pathol.2020.01.681]

55 **Tran TA**, Pernicone P. Anastomosing hemangioma with fatty changes of the genitourinary tract: a lesion mimicking angiomyolipoma. *Cent European J Urol* 2012; **65**: 40-42 [PMID: 24578924 DOI: 10.5173/ceju.2012.01.art13]

56 **Zhang W**, Wang Q, Liu YL, Yu WJ, Liu Y, Zhao H, Zhuang J, Jiang YX, Li YJ. Anastomosing hemangioma arising from the kidney: a case of slow progression in four years and review of literature. *Int J Clin Exp Pathol* 2015; **8**: 2208-2213 [PMID: 25973131]

57 **Cheon PM**, Rebello R, Naqvi A, Popovic S, Bonert M, Kapoor A. Anastomosing hemangioma of the kidney: radiologic and pathologic distinctions of a kidney cancer mimic. *Curr Oncol* 2018; **25**: e220-e223 [PMID: 29962849 DOI: 10.3747/co.25.3927]

58 **Chou S**, Subramanian V, Lau HM, Achan A. Renal Anastomosing Hemangiomas With a Diverse Morphologic Spectrum: Report of Two Cases and Review of Literature. *Int J Surg Pathol* 2014; **22**: 369-373 [PMID: 23816823 DOI: 10.1177/1066896913492850]

59 **Costero-Barrios CB**, Oros-Ovalle C. Primary renal angiosarcoma. *Gac Med Mex* 2004; **140**: 463-466 [PMID: 15456157]

60 **Peters HJ**, Nuri M, Münzenmaier R. Hemangioendothelioma of the kidney: a case report and review of the literature. *J Urol* 1974; **112**: 723-726 [PMID: 4548091 DOI: 10.1016/s0022-5347(17)59836-5]

61 **Kern SB**, Gott L, Faulkner J 2nd. Occurrence of primary renal angiosarcoma in brothers. *Arch Pathol Lab Med* 1995; **119**: 75-78 [PMID: 7802558]

62 **Aydogdu I**, Turhan O, Sari R, Ates M, Türk M. Coincidental acute myeloblastic leukemia in a patient with renal angiosarcoma. *Haematologia (Budap)* 1999; **29**: 313-317 [PMID: 10438072]

63 **Akkad T**, Tsankov A, Pelzer A, Peschel R, Bartsch G, Steiner H. Early diagnosis and straight forward surgery of an asymptomatic primary angiosarcoma of the kidney led to long-term survival. *Int J Urol* 2006; **13**: 1112-1114 [PMID: 16903939 DOI: 10.1111/j.1442-2042.2006.01490.x]

64 **Witczak W**, Szubstarski F, Szymański C, Rajca Z, Staszczyk S. Renal hemangiosarcoma. *Pol Tyg Lek* 1993; **48**: 483-484 [PMID: 8170817]

65 **Johnson VV**, Gaertner EM, Crothers BA. Fine-needle aspiration of renal angiosarcoma. *Arch Pathol Lab Med* 2002; **126**: 478-480 [PMID: 11900578 DOI: 10.5858/2002-126-0478-FNAORA]

66 **Zenico T**, Saccomanni M, Salomone U, Bercovich E. Primary renal angiosarcoma: case report and review of world literature. *Tumori* 2011; **97**: e6-e9 [PMID: 21989448 DOI: 10.1700/950.10412]

67 **Nguyen T**, Auquier MA, Renard C, Cordonnier C, Saint F, Remond A. Hemoptysis and spontaneous rupture of a primary renal angiosarcoma: a case report. *J Radiol* 2010; **91**: 1313-1317 [PMID: 21242919 DOI: 10.1016/s0221-0363(10)70201-8]

68 **Terris D**, Plaine L, Steinfeld A. Renal angiosarcoma. *Am J Kidney Dis* 1986; **8**: 131-133 [PMID: 3740062 DOI: 10.1016/s0272-6386(86)80126-3]

69 **Matter LE**, Flury R, Hailemariam S, Hauri D, Sulser T. Angiosarcoma of the kidney. Case report and review of the literature. *Urologe A* 1999; **38**: 65-68 [PMID: 10081105 DOI: 10.1007/s001200050248]

70 **Yoshida K**, Ito F, Nakazawa H, Maeda Y, Tomoe H, Aiba M. A case of primary renal angiosarcoma. *Rare Tumors* 2009; **1**: e28 [PMID: 21139907 DOI: 10.4081/rt.2009.e28]

71 **Pauli JL**, Strutton G. Primary renal angiosarcoma. *Pathology* 2005; **37**: 187-189 [PMID: 16028856 DOI: 10.1080/00313020500058979]

72 **Martínez-Piñeiro L**, López-Ferrer P, Picazo ML, Martínez-Piñeiro JA. Primary renal angiosarcoma.

Case report and review of the literature. *Scand J Urol Nephrol* 1995; **29**: 103-108 [PMID: 7618041 DOI: 10.3109/00365599509180547]

73 **Bernstein ML**, Leclerc JM, Bunin G, Brisson L, Robison L, Shuster J, Byrne T, Gregory D, Hill G, Dougherty G. A population-based study of neuroblastoma incidence, survival, and mortality in North America. *J Clin Oncol* 1992; **10**: 323-329 [PMID: 1732433 DOI: 10.1200/JCO.1992.10.2.323]

74 **Yau T**, Leong CH, Chan WK, Chan JK, Liang RH, Epstein RJ. A case of mixed adult Wilms' tumour and angiosarcoma responsive to carboplatin, etoposide and vincristine (CEO). *Cancer Chemother Pharmacol* 2008; **61**: 717-720 [PMID: 17571263 DOI: 10.1007/s00280-007-0529-1]

75 **Carnero López B**, Fernández Pérez I, Carrasco Alvarez JA, Lázaro Quintela ME, López Jato C, Jorge Fernández M, Gentil González M, Vázquez Tuñas L, Castellanos Díez J. Renal primary angiosarcoma. *Clin Transl Oncol* 2007; **9**: 806-810 [PMID: 18158986 DOI: 10.1007/s12094-007-0144-y]

76 **Kazaz IO**, Ersoz S, Colak F, Teoman AS, Kazaz SN, Karaguzel E, Kutlu O. Primary renal angiosarcoma: A case report and a short review of literature. *Indian J Pathol Microbiol* 2020; **63**: S44-S46 [PMID: 32108626 DOI: 10.4103/IJPM.IJPM_66_19]

77 **Souza OE**, Etchebehere RM, Lima MA, Monti PR. Primary renal angiosarcoma. *Int Braz J Urol* 2006; **32**: 448-450 [PMID: 16953913 DOI: 10.1590/s1677-55382006000400011]

78 **Detorakis EE**, Chryssou E, Raissaki M, Androulidakis E, Heretis I, Haniotis V, Karantanas A. Primary renal angiosarcoma: radiologic-pathologic correlation and literature review. *Tumori* 2013; **99**: e111-e116 [PMID: 24158078 DOI: 10.1700/1334.14817]

79 **Komoto H**, Kitajima K, Kawanaka Y, Yoshimura N, Kunimoto R, Yokoyama H, Shinkai Y, Kaizuka Y, Yamamoto S, Kihara T, Kimura N, Hirota S, Yamakado K. CT Findings of Primary Renal Angiosarcoma. *Case Rep Oncol* 2021; **14**: 212-216 [PMID: 33776706 DOI: 10.1159/000512015]

80 **Boni A**, Cochetti G, Sidoni A, Bellezza G, Lepri E, Giglio A, Turco M, Vermandois JAR, Zingaro MD, Cirocchi R, Mearini E. Primary Angiosarcoma of the Kidney: Case Report and Comprehensive Literature Review. *Open Med (Wars)* 2019; **14**: 443-455 [PMID: 31410364 DOI: 10.1515/med-2019-0048]

81 **Chang CW**, Chien CC, Juan YS, Chueh KS. Primary renal angiosarcoma mimicking urothelial carcinoma - A case report and literature reviews. *Urol Case Rep* 2021; **34**: 101407 [PMID: 33145170 DOI: 10.1016/j.eucr.2020.101407]

82 **Iannaci G**, Crispino M, Cifarelli P, Montella M, Panarese I, Ronchi A, Russo R, Tremiterra G, Luise R, Sapere P. Epithelioid angiosarcoma arising in schwannoma of the kidney: report of the first case and review of the literature. *World J Surg Oncol* 2016; **14**: 29 [PMID: 26842370 DOI: 10.1186/s12957-016-0789-5]

83 **Subramanian H**, Parepalli D, Srinivas BH, Gochhait D, Ks S. Primary Renal Angiosarcoma With Lymph Node Metastasis- A Rare Intriguing Malignancy With a Grim Outcome. *Urology* 2021; **153**: 14-16 [PMID: 33621584 DOI: 10.1016/j.urology.2021.02.016]

84 **Waqas M**, Rahim W, Shohab D, Khawaja MA, Ali Z, Mamoon N. Primary Renal Epithelioid Angiosarcoma. *J Coll Physicians Surg Pak* 2018; **28**: S66-S68 [PMID: 29482713 DOI: 10.29271/jcpsp.2018.03.S66]

85 **Gourley E**, Digman G, Nicolas M, Kaushik D. Primary renal angiosarcoma. *BMJ Case Rep* 2018; **2018** [PMID: 30061122 DOI: 10.1136/bcr-2017-222672]

86 **Su YC**. Angiosarcoma of kidney with calcification: A rare case report. *Kaohsiung J Med Sci* 2017; **33**: 367-368 [PMID: 28738979 DOI: 10.1016/j.kjms.2017.03.009]

87 **López Cubillana P**, Martínez Barba E, Server Pastor G, Prieto González A, Ferri Níguez B, Cao Avellaneda E, López López AI, Nicolás Torroalba JA, Rigabert Montiel M, Tornero Ruiz J, García Hernández JA, Gómez Gómez G, Martínez Pertusa P, Guardiola Mas A, Pérez Albacete M. Fatal evolution of a renal angiosarcoma. *Arch Esp Urol* 2004; **57**: 425-426 [PMID: 15270285]

88 **Juan CJ**, Yu CY, Hsu HH, Chian CP, Huang GS, Fan HC, Lin CC, Ching Jiunn Wu JW, Hsiao HS, Chen CY. Visceral and non-visceral angiosarcoma: imaging features and clinical correlation. *Chin J Radiol* 2000; **25**: 183-189

89 **Hiratsuka Y**, Nishimura H, Kajiwara I, Matsuoka H, Kawamura K. Renal angiosarcoma: a case report. *Int J Urol* 1997; **4**: 90-93 [PMID: 9179675 DOI: 10.1111/j.1442-2042.1997.tb00148.x]

90 **Adjiman S**, Zerbib M, Flam T, Brochard M, Deslignères S, Boissonnas A, Debré B, Steg A. Genitourinary tumors and HIV1 infection. *Eur Urol* 1990; **18**: 61-63 [PMID: 2401309 DOI: 10.1159/000463869]

91 **Limmer S**, Wagner T, Leipprand E, Arnholdt H. Primary renal hemangiosarcoma. Case report and review of the literature. *Pathologe* 2001; **22**: 343-348 [PMID: 11572116 DOI: 10.1007/s002920100481]

92 **Darlington D**, Anitha FS. Primary Renal Angiosarcoma Mimicking Renal Cell Carcinoma: A Case Report. *Cureus* 2019; **11**: e3841 [PMID: 30891382 DOI: 10.7759/cureus.3841]

93 **Allred CD**, Cathey WJ, McDivitt RW. Primary fenal angiosarcoma: a case report. *Hum Pathol* 1981; **12**: 665-668 [PMID: 7196879 DOI: 10.1016/s0046-8177(81)80054-8]

94 **Fukunaga M**. Angiosarcoma of the kidney with minute clear cell carcinomas: a case report. *Pathol Res Pract* 2009; **205**: 347-351 [PMID: 19147300 DOI: 10.1016/j.prp.2008.11.005]

95 **Desai MB**, Chess Q, Naidich JB, Weiner R. Primary renal angiosarcoma mimicking a renal cell carcinoma. *Urol Radiol* 1989; **11**: 30-32 [PMID: 2734970 DOI: 10.1007/BF02926469]

96 **Sabharwal S**, John NT, Kumar RM, Kekre NS. Primary renal angiosarcoma. *Indian J Urol* 2013;

29: 145-147 [PMID: 23956520 DOI: 10.4103/0970-1591.114040]
97 **Heo SH**, Shin SS, Kang TW, Kim GE. Primary renal angiosarcoma with extensive hemorrhage: CT and MRI findings. *Int Braz J Urol* 2019; **45**: 402-405 [PMID: 30735338 DOI: 10.1590/S1677-5538.IBJU.2018.0375]
98 **Mordkin RM**, Dahut WL, Lynch JH. Renal angiosarcoma: a rare primary genitourinary malignancy. *South Med J* 1997; **90**: 1159-1160 [PMID: 9386065 DOI: 10.1097/00007611-199711000-00023]
99 **Berretta M**, Rupolo M, Buonadonna A, Canzonieri V, Brollo A, Morra A, Berretta S, Bearz A, Tirelli U, Frustaci S. Metastatic angiosarcoma of the kidney: a case report with treatment approach and review of the literature. *J Chemother* 2006; **18**: 221-224 [PMID: 16736893 DOI: 10.1179/joc.2006.18.2.221]
100 **Lodhi HT**, Inayat F, Munir A, Ilyas G. Primary renal angiosarcoma: a diagnostic and therapeutic challenge. *BMJ Case Rep* 2018; **2018** [PMID: 30244222 DOI: 10.1136/bcr-2018-225484]
101 **Cason JD**, Waisman J, Plaine L. Angiosarcoma of kidney. *Urology* 1987; **30**: 281-283 [PMID: 3629777 DOI: 10.1016/0090-4295(87)90258-5]
102 **Askari A**, Novick A, Braun W, Steinmuller D. Late ureteral obstruction and hematuria from de novo angiosarcoma in a renal transplant patient. *J Urol* 1980; **124**: 717-719 [PMID: 7005464 DOI: 10.1016/s0022-5347(17)55625-6]
103 **Guan H**, Zhang L, Zhang Q, Qi W, Xie S, Hou J, Wang H. Primary angiosarcoma arising in an angiomyolipoma of the kidney: case report and literature review. *Diagn Pathol* 2018; **13**: 53 [PMID: 30111336 DOI: 10.1186/s13000-018-0730-z]
104 **Papadimitriou VD**, Stamatiou KN, Takos DM, Adamopoulos VM, Heretis IE, Sofras FA. Angiosarcoma of kidney: a case report and review of literature. *Urol J* 2009; **6**: 223-225 [PMID: 19711281]
105 **Celebi F**, Pilanci KN, Saglam S, Balci NC. Primary renal angiosarcoma with progressive clinical course despite surgical and adjuvant treatment: A case report. *Oncol Lett* 2015; **9**: 1937-1939 [PMID: 25789072 DOI: 10.3892/ol.2015.2902]
106 **Rüb J**, Bauer S, Pastor J, Noldus J, Palisaar RJ. Primary renal angiosarcoma. Uncommon manifestation of a rare malignancy. *Urologe A* 2015; **54**: 849-853 [PMID: 25805159 DOI: 10.1007/s00120-015-3809-0]
107 **Zhang HM**, Yan Y, Luo M, Xu YF, Peng B, Zheng JH. Primary angiosarcoma of the kidney: case analysis and literature review. *Int J Clin Exp Pathol* 2014; **7**: 3555-3562 [PMID: 25120734]
108 **Tsuda N**, Chowdhury PR, Hayashi T, Anami M, Iseki M, Koga S, Matsuya F, Kanetake H, Saito Y, Horita Y. Primary renal angiosarcoma: a case report and review of the literature. *Pathol Int* 1997; **47**: 778-783 [PMID: 9413038 DOI: 10.1111/j.1440-1827.1997.tb04457.x]
109 **Grapsa D**, Sakellariou S, Politi E. Fine-needle aspiration cytology of primary renal angiosarcoma with histopathologic and immunocytochemical correlation: a case report. *Diagn Cytopathol* 2014; **42**: 872-876 [PMID: 24166896 DOI: 10.1002/dc.23051]
110 **Qayyum S**, Parikh JG, Zafar N. Primary renal angiosarcoma with extensive necrosis: a difficult diagnosis. *Case Rep Pathol* 2014; **2014**: 416170 [PMID: 25133004 DOI: 10.1155/2014/416170]
111 **Garmendia JC**, López García JA, Acinas García O, Garrido Rivas C, Sanroma Ortueta C, Arocena Lanz F. Angiosarcoma of the kidney. *Actas Urol Esp* 1989; **13**: 223-224 [PMID: 2763892]
112 **Sanyal B**, Mehrotra ML, Gupta S, Pant GC. Radiotherapy in renal angiosarcoma. *J Indian Med Assoc* 1979; **72**: 85-86 [PMID: 574526]
113 **Cerilli LA**, Huffman HT, Anand A. Primary renal angiosarcoma: a case report with immunohistochemical, ultrastructural, and cytogenetic features and review of the literature. *Arch Pathol Lab Med* 1998; **122**: 929-935 [PMID: 9786357]
114 **Douard A**, Pasticier G, Deminière C, Wallerand H, Ferrière JM, Bernhard JC. Primary angiosarcoma of the kidney: case report and literature review. *Prog Urol* 2012; **22**: 438-441 [PMID: 22657265 DOI: 10.1016/j.purol.2011.11.006]
115 **Yamamoto Y**, Izaki H, Harada A, Taue R, Kishimoto T, Tanimoto S, Fukumori T, Takahashi M, Nishitani MA, Kanayama HO, Sano N, Uema K. A case of renal capsular hemangiosarcoma. *Hinyokika Kiyo* 2006; **52**: 215-217 [PMID: 16617877]

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