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# Challenging Pitfalls and Mimickers in Diagnosing Anastomosing Capillary Hemangioma of the Kidney: Case Report and Literature Review

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
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**Conflict of interest:** None declared

**Patient:** Female, 55  
**Final Diagnosis:** Anastomosing capillary hemangioma in the left kidney  
**Symptoms:** Left flank pain  
**Medication:** —  
**Clinical Procedure:** Partial nephrectomy  
**Specialty:** Diagnostics • Laboratory

**Objective:** Rare disease

**Background:** Vascular tumors of the kidney are rare tumors that are usually diagnosed and confirmed by histopathological examination due to the difficulty in definitive diagnosis by clinical and radiological examination. Anastomosing hemangioma is a rare variant of capillary hemangioma that mimics angiosarcoma.

**Case Report:** Here, we present a case of a 55-year-old female with a history of partial nephrectomy due to clear cell renal cell carcinoma three years earlier, who presented with a contralateral anastomosing capillary hemangioma. The diagnosis was confirmed by histopathology and immunohistochemistry studies.

**Conclusions:** Anastomosing hemangioma is a rare variant of capillary hemangioma. It has a sinusoidal growth pattern which resembles splenic parenchyma. It mimics malignant neoplasms, thus, clinical and radiological examination are not enough for accurate diagnosis. In this paper, we discuss the most crucial differential diagnoses and the pitfalls in diagnosing this rare variant of hemangioma. Furthermore, we present a literature review of all cases reported in the English-language literature.

**MeSH Keywords:** Hemangioma, capillary • Kidney • Nephrectomy

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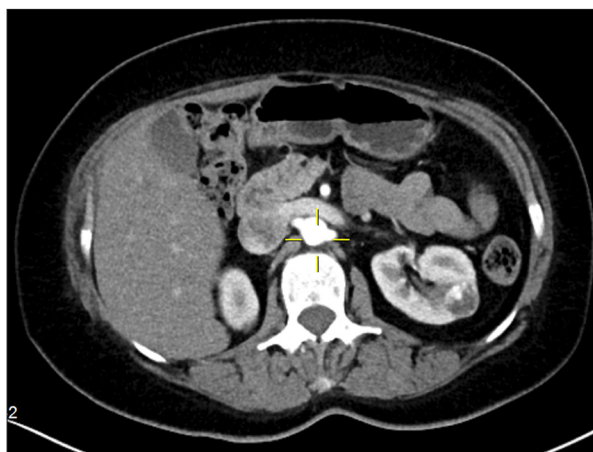


## Background

Vascular tumors of the kidney are rarely diagnosed entities, despite the fact that the kidney is a highly vascular organ that receives 25% of the cardiac output [1,2]. In the early literature, Virchow was the first to describe benign hemangioma in 1867 [3]. Hemangiomas are classified into two main types: capillary and cavernous [4]. Anastomosing hemangioma is a recently described variant of capillary hemangioma. This variant is characterized by a benign neoplastic growth of capillary-sized sinusoidal anastomosing vessels that resemble splenic parenchyma with infiltrative features. This variant might be mistaken for a malignant angiosarcoma [4,5], which is a rare, aggressive vascular tumor with poor prognosis and overall survival rate of 30%. Therefore, extensive surgical resection with widely negative margins should be considered. In 2009, Montgomery and Epstein were the first to describe this rare variant of hemangioma [1,2,4–6]. Only 29 cases in the literature have been confirmed to be anastomosing capillary hemangioma, including our presenting case [4]. To the best of our knowledge, there is no associated syndrome that has been reported with anastomosing hemangioma, including Klippel-Trenaunay and Sturge-Weber syndrome, which have been reported to show another systemic angiomasia [4,6]. However, some papers have shown a tendency of patients with end-stage renal disease (ESRD) to develop anastomosing hemangioma [2,4]. Only one case report showed two foci of capillary hemangioma-like vascular proliferation associated with clear cell renal cell carcinoma [7]. We present our case of a 55-year-old female with a history of radical nephrectomy three years prior from a clear cell renal cell carcinoma, who then presented with contralateral renal anastomosing hemangioma, to help better understand the biological behavior and associations of anastomosing hemangioma.

## Case Report

Our case report was of a 55-year-old Saudi female with a history of right partial nephrectomy three years earlier due to clear cell renal cell carcinoma, Fuhrman nuclear grade II. The patient presented to the surgery clinic with “on-and-off” left flank pain for the past three months. She had a history for diabetes mellitus and hypertension for nine years ago which was controlled by medications. Her family and allergic history were irrelevant. She had no anamnesis of weight loss, night sweats, or hematuria. The patient never smoked. Her physical examination revealed soft lax abdomen with unremarkable systemic examination. Laboratory results showed no abnormalities except for microcytic hypochromic anemia (Hb: 9 g/L, MCV: 79.6 fl, MCH: 26.6 pg).

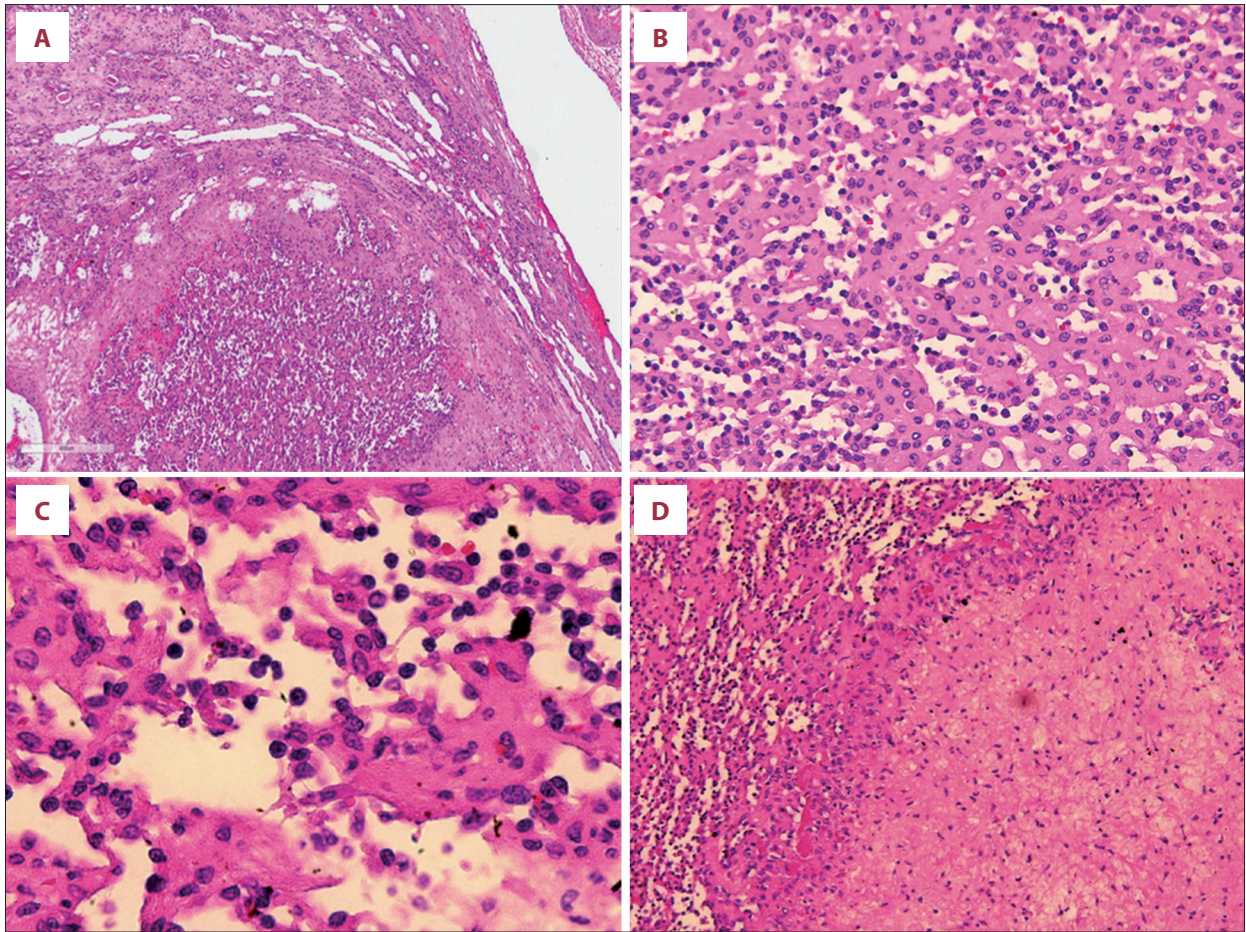


**Figure 1.** Enhanced CT scan shows left renal hypodense solid mass with areas of cystic degeneration and peripherally enhanced thick solid component.

The patient's initial kidney ultrasound showed a left renal ill-defined focal cortical mid pole faint hypoechoic lesion measuring 1 cm. Further evaluation by enhanced CT scan was ordered to rule out any underlying malignancy. The enhanced abdominal and pelvis CT scan showed a left renal hypodense solid mass measuring 2.6×2.7 cm in greatest dimensions with areas of cystic degeneration and peripherally enhanced thick solid component (Figure 1). According to the imaging appearance, the radiologist favored the diagnosis of renal cell carcinoma of the left kidney showing no recurrent right renal masses. Bone mineral densitometry was within normal range. Three weeks later the patient was scheduled for left partial nephrectomy under the urology team care.

## Pathologic findings

Grossly, under proper orientation, the partial resected left nephrectomy specimen showed a demarcated but unencapsulated round mass measuring 2×1.7×1 cm. The cut surface of the mass was fleshy, and mahogany brown with a spongy texture that was abutting but not invading the renal capsule. Microscopically, sections revealed fairly capsulated neoplastic growth. The borderlines were not sharply well-defined between the tumor cells and the adjacent kidney parenchyma (Figure 2A). High power examination revealed tumor cells exhibiting cords pattern with tightly packed prominent capillary-sized vessels “sieve-like” and anastomosing sinusoidal architecture (Figure 2B). Focal areas showed edema dissecting neoplastic growth. Cellular examination showed plumped cuboidal cells, round to oval uniform cells with scant cytoplasm (Figure 2C). Some of these vessels were lined by hobnail endothelial cells. Extravasated red blood cells are seen adjacent to the tumor cells (Figure 3A). No atypical cells, multi-layering, mitosis, necrosis, or apoptotic activity were seen. Focal areas showed an infiltrative growth pattern of tumor cells. The



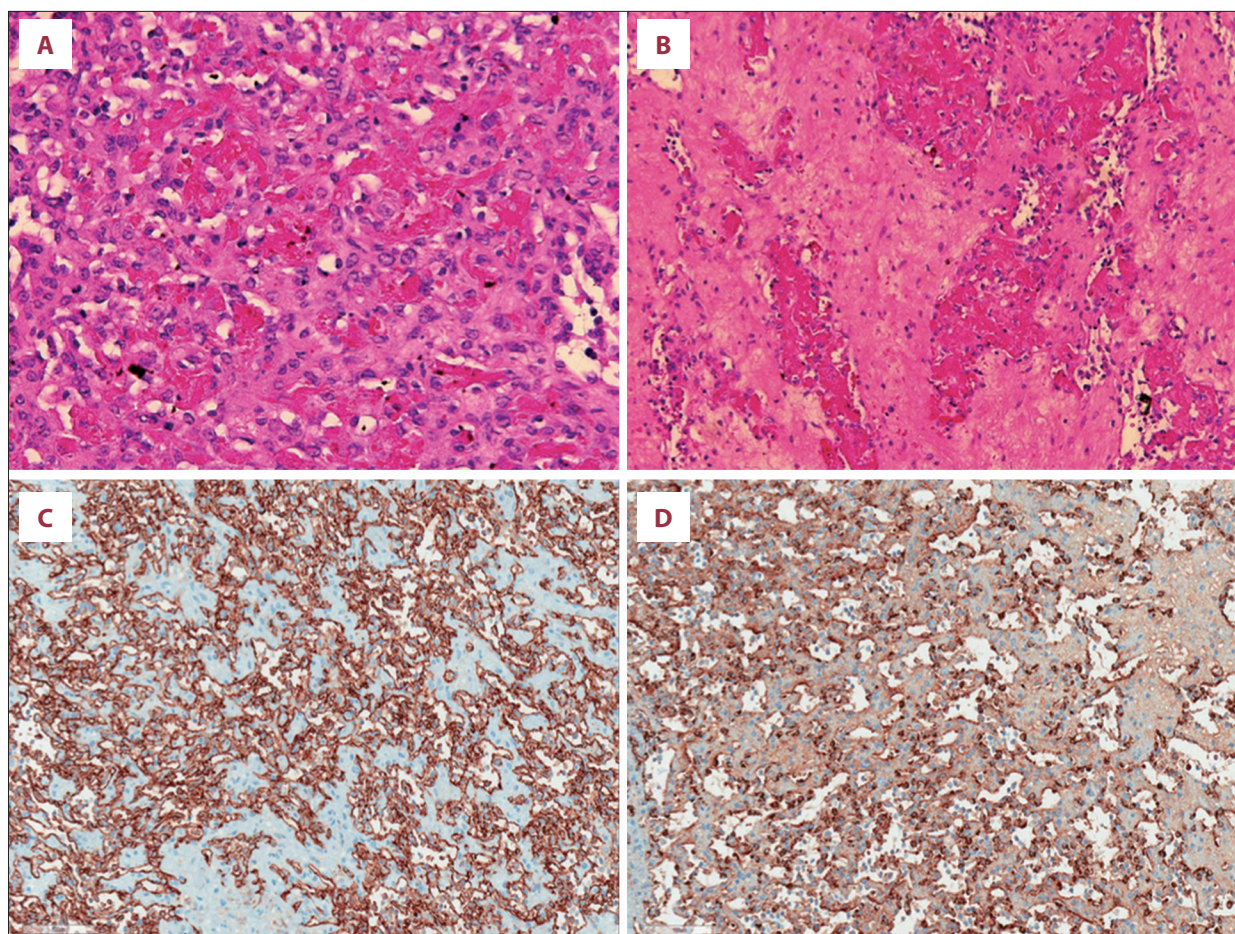
**Figure 2.** Histopathology of renal anastomosing hemangioma (H&E). (A) Low power micrograph (2×) histological examination showed a well-demarcated but un-encapsulated mass with small renal tubules entrapped at the periphery of the lesion. (B) Tumor cells are composed of sinusoidal anastomosing capillaries, similar to the red pulp of spleen (40×). (C) High power view demonstrate endothelial cells lining blood vessels are simple cuboidal in shape no significant cellular atypia are seen (H&E, 400×). (D) Stromal changes show sclerosis and deposition of collagen between the sinusoidal vascular channels (40×).

lining stroma showed areas of hemorrhage and vascular thrombi within the tumor tissue (Figure 3B); focal sclerotic changes were seen (Figure 2D). No evidence of intracytoplasmic hyaline globules or extramedullary hematopoiesis was seen. The adjacent kidney parenchyma showed mild inflammation, atrophic glomeruli, and tubules. Immunohistochemical studies showed diffuse positive staining for endothelial markers including CD31 (Figure 3C), CD34, factor VIII (Figure 3D), and vimentin; although negative for HMB45, CD10, RCC, CK7, SMA, desmin, D2-40, AFP, glypican3, HHV8, and S100 protein. EMA and cytokeratin AE1/AE3 highlighted the entrapped renal tubules. Together the histopathologic appearance and the immunohistochemical studies of this tumor were indicative of a diagnosis of anastomosing hemangioma of the kidney. The patient had a follow-up after surgery for 12 months and showed no more complications.

## Discussion

### Clinical findings

Anastomosing capillary hemangioma is a rare, recently described neoplasm of the kidney. Commonly it affects middle-aged adults, with an average age of 52 years (range 21–83 years) [4] with a slight male predominant 1.8 to 1 ratio [2]. Most patients are discovered incidentally or during regular follow-up and show no symptoms. Clinical findings might include abdominal pain, colicky pain, lower urinary tract symptoms, and hematuria. In one case report, the patient presented with chronic polycythemia which resolved completely after mass excision [8]. The clinical presentation of this tumor is non-specific. Unlike bladder hemangioma, renal hemangioma is not associated with tuberous sclerosis, Sturge-Weber syndrome, or Klippel-Trenaunay syndrome [4,6]. However, some studies have shown that patients with ESRD are more prone



**Figure 3.** (A) Vascular channels of tumor cells with extravasated red blood cells. (B) Sclerotic stroma with vascular fibrin thrombi deposition (A and B, H&E) (HE, 20×) (C) Immunohistochemistry: tumor cells showed diffuse strong positive for CD31 (4×). (D) Immunohistochemistry: intravascular stromal cells showed strongly positive for factor VIII (4×).

to develop renal capillary hemangioma [4,5]. The pathogenesis is not well understood, but these patients with ESRD have shown a potential to develop both epithelial and mesenchymal lesions like papillary RCC, clear cell RCC, papillary adenoma, and angiomyolipoma [2,5]. One case report of a multifocal capillary hemangioma-like vascular proliferation was associated with clear cell renal cell carcinoma [7], the authors suggested the possibility that these vascular proliferations were probably due to growth factors produced by the accompanied carcinoma [7]. Yet, the exact potential pathogenic factors are not well understood and not identified through reviewing the reported case. Overall, anastomosing hemangioma is not unique to any syndrome and can develop without any chronic disease as observed in the literature (Tables 1–3 and Figures 4, 5).

### Imaging finding

It is rarely possible to establish a pre-operative diagnosis using radiological studies alone and thus, conservative management is often not considered [6]. Ultrasound examination

usually reveals variable echogenicity [2,17]. Non-enhancing CT scans can show a lobulated hypo-attenuating mass, while enhanced CT imaging can demonstrate a solid, well-demarcated heterogeneous mass [11,17].

### Macroscopic finding

Hemangiomas, in general, are mesenchymal tumors that typically favor the skin and subcutaneous soft tissue [5]. Some reports have documented their involvement in vesical organs, commonly the liver [2,5,18]. One review showed that anastomosing hemangioma showed a predilection toward the genitourinary system, particularly the kidney [2,6]. Other locations include the ovaries [14], testes, thigh, abdominal wall [16], gastrointestinal tract [18], and adrenal gland [19]. In the kidney, anastomosing hemangiomas typically involve the hilum [2,20]. Moreover, other kidney locations have been reported such as the medulla and cortex, especially in the context of ESRD [6], perinephric adipose tissue, and renal sinus [2,6]. Some of these tumors abut but do not invade the renal capsule, similar to

**Table 1.** Summary of the reported cases of anastomosing hemangioma in the kidney.

Case N	Author [reference]	Age/Sex	Presentation	Site	Size	Treatment	Follow-up (months)
1	Our case	55/female	Flank pain	Right kidney	2.6×2.7 cm	Nephrectomy	NED* (12)
2	Jai Seong Cha (2016) [9]	43/male	Incidental (regular check up)	Right kidney	4.3×3.8 cm	Laparoscopic radical nephrectomy	NED (5)
3	Wei Zhang et al. (2015) [4]	29/female	Regular check up	Right kidney	1.5×1.5 cm	Laparoscopic right partial nephrectomy	NED (16)
4	Isabel Heidegger et al. (2014) [10]	56/male	Incidental (admitted as a case of febrile prostatitis)	Right kidney	7×5 cm	Laparoscopic right partial nephrectomy	NED (3)
5	Li-Li Tao et al. (2014) [11]	32/male	Incidental (Routine check up)	Left kidney	3.4×2.7 cm	Nephrectomy	NED (21)
6	Ming Zhao et al. (2013) [5]	48/male	Incidental (regular check up)	Right kidney	2.1×2.0 cm	Laparoscopic right partial nephrectomy	NED (12)
7	Shaun.Chou et al. (2013) [12]	50/female	Incidental	Left kidney	1.0 cm	Nephrectomy	NED (14)
8	Shaun.Chou et al. (2013) [12]	60/male	Incidental (post transplant)	Left kidney	0.5×1.8 cm	Nephrectomy	NED (8)
9	David R. Wetherell et al. (2013) [6]	74/male	Lower urinary tract symptoms	Right kidney	5.0×4.5×4.0 cm	Nephrectomy	DUD** (1)
10	Vikas Mehta et al. (2012) [13]	49/male	ESRD***	Unknown	2.0 cm	Radical nephrectomy	NED (3)
11	Vikas Mehta et al. (2012) [13]	55/male	ESRD, papillary adenomas	Unknown	0.6 cm	Radical nephrectomy	NED (3)
12	Vikas Mehta et al. (2012) [13]	45/male	ESRD	Unknown	1.9 cm	Radical nephrectomy	NED (12)
13	Oleksandr Kryvenko et al. (2011) [14]	51/female	Incidental (pre transplantation evaluation)	Right kidney	1.0 cm	Nephrectomy	NED (7)
14	Oleksandr Kryvenko et al. (2011) [14]	39/male	Incidental (chronic polycythemia)	Right kidney	5.0 cm	Nephrectomy	NED (112)
15	Oleksandr Kryvenko et al. (2011) [14]	67/female	Incidental (Pulmonary embolism)	Left kidney	1.2 cm	Nephrectomy	NED (6)
16	Oleksandr Kryvenko et al. (2011) [14]	54/female	Incidental (pre transplantation evaluation)	Right kidney	1.6 cm	Nephrectomy	NED (3)
17	Oleksandr Kryvenko et al. (2011) [14]	54/female	Incidental (pre transplantation evaluation)	Left kidney	0.6 cm	Nephrectomy	NED (3)
18	Brown, Jeffrey G et al. (2010) [15]	56/male	NA****	Right kidney	1.3 cm	Partial nephrectomy	NA
19	Brown, Jeffrey G et al. (2010) [15]	33/male	NA	Left kidney	3.2 cm	Nephrectomy	NA
20	Brown, Jeffrey G et al. (2010) [15]	21/male	Incidental (post transplant)	Right kidney	2.2 cm	Nephrectomy	NED (24)
21	Brown, Jeffrey G et al. (2010) [15]	44/female		Left kidney	2.0 cm	Nephrectomy	NED (72)
22	Brown, Jeffrey G et al. (2010) [15]	83/female		Left kidney	3.5 cm	Nephrectomy	NED (24)

**Table 1 continued.** Summary of the reported cases of anastomosing hemangioma in the kidney.

Case N	Author [reference]	Age/Sex	Presentation	Site	Size	Treatment	Follow-up (months)
23	Elizabeth Montgomery et al. (2009) [16]	74/male	Intermittent hematuria	Na	1.5 cm	Nephrectomy	NED (36)
24	Elizabeth Montgomery et al. (2009) [16]	75/male	Intermittent hematuria	Kidney in adipose tissue near ureter	2.0 cm	Nephrectomy	NA
25	Elizabeth Montgomery et al. (2009) [16]	65/female	Vague abdominal pain	Perinephric adipose tissue	2.0 cm	Excision of lesion	NED (8)
26	Elizabeth Montgomery et al. (2009) [16]	49/male	NA	Renal hilum	1.3 cm	Nephrectomy	NED (12)
27	Hak-Soo Lee et al. (2000) [17]	31/male	Abdominal pain & hematuria	Right kidney	1.8 cm	Radical nephrectomy	NA
28	Hak-Soo Lee et al. (2000) [17]	43/male	Gross hematuria & pain in the left flank	Left kidney	1.5 cm	Left nephrectomy	NA
29	Hak-Soo Lee et al. (2000) [17]	43/male	Left lower abdominal pain	Left kidney	2.0 cm	Left nephrectomy	NA

\* NED – no evidence of disease; \*\* DUD – indicates dead of unrelated disease; \*\*\* ESRD – end-stage renal disease; \*\*\*\* NA – not available.

**Table 2.** One-way ANOVA with posthoc analysis of variance of the size of lesion and age at presentation of the reported cases of anastomosing hemangioma.

Size of lesion	Sum of squares	df	Mean square	F	Sig.
Between groups	6.235	3	2.078	.915	.448
Within groups	56.815	25	2.273		
Total	63.050	28			

our case. One case report showed a segmental involvement of the renal vein [1] and larger veins like the inferior vena cava [6]. However, all reported cases showed no malignant features or vascular invasion either gross or microscopic. The average size of tumors was 1.5 cm (range, 0.1–7 cm) [2]. The largest tumor size reported was 7 cm, which was discovered incidentally during follow-up exam [10]. The tumors were typically unilateral, with only four cases reported as bilateral tumors [2,14]. Multifocality was also reported in patients with nephrectomy for renal cell carcinoma [7]. The latter is usually associated with ESRD patients [2].

### Differential diagnosis

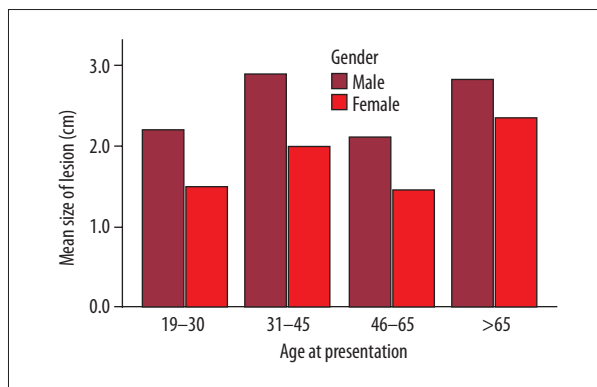
The differential diagnosis includes angiosarcoma, Kaposi sarcoma, intravascular papillary endothelial hyperplasia (IPEH),

and angiomyolipoma. Other less likely differential diagnoses are hemangioblastoma and glomus tumors.

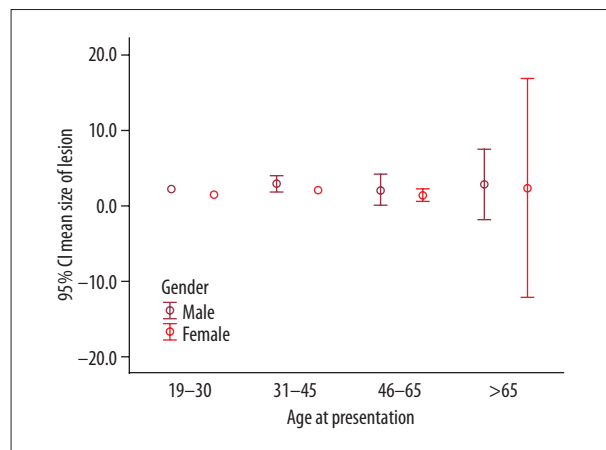
It is believed that anastomosing hemangioma is a great mimicker of some tumors, most importantly capillary angiosarcoma. Both show overlapping histological features like the presence of hyaline globules and have positive immunochemistry stains for endothelial markers [2]. Angiosarcoma is an aggressive malignant neoplasm with a tendency to occur in the sixth to seventh decade of life [2]. It is often larger in size with areas of necrosis, and commonly metastasizes to the liver, lung, and bone. Histological features include infiltrative renal lesion with dissecting vascular channels exhibiting anastomosing capillary network lined by hobnail endothelium demonstrating highly atypical cells with prominent nucleoli and a high nuclear to cytoplasmic ratio. The lesion is usually rich in cellularity with

**Table 3.** One-way ANOVA with posthoc analysis of variance of the size of lesion and age at presentation of the reported cases of anastomosing hemangioma (dependent variable: size of lesion) scheffe.

(I) Age at presentation	(J) Age at presentation	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
					Lower bound	Upper bound
19-30	31-45	-.9389	1.1785	.887	-4.469	2.591
	46-65	.0423	1.1450	1.000	-3.388	3.472
	>65	-.7900	1.2613	.941	-4.568	2.988
31-45	19-30	.9389	1.1785	.887	-2.591	4.469
	46-65	.9812	.6537	.532	-.977	2.939
	>65	.1489	.8409	.998	-2.370	2.668
46-65	19-30	-.0423	1.1450	1.000	-3.472	3.388
	31-45	-.9812	.6537	.532	-2.939	.977
	>65	-.8323	.7933	.777	-3.209	1.544
>65	19-30	.7900	1.2613	.941	-2.988	4.568
	31-45	-.1489	.8409	.998	-2.668	2.370
	46-65	.8323	.7933	.777	-1.544	3.209



**Figure 4.** A bar chart demonstrating the reported cases of anastomosing hemangioma in the kidney correlating gender, age at presentation and mean size of the lesion.



**Figure 5.** An error bar demonstrating the relationship between gender, age at presentation, and mean size of the lesion of the reported cases of anastomosing hemangioma.

increased mitotic activity [2,4,5,10,11,20]. Kaposi sarcoma is a malignant neoplasm that grows in a slit-like space and shows hyaline globules. HHV-8 is a good marker, which stains positively in Kaposi sarcoma unlike anastomosing hemangioma.

Intravascular papillary endothelial hyperplasia (IPEH) is a vascular lesion that mimics anastomosing hemangioma in its non-specific presentation together with endothelial marker positivity. However, IPEH tends to form papillary architecture lined by stratified hyperplastic endothelial lining without the formation of sinusoidal spaces seen in anastomosing hemangioma. Angiomyolipoma is a mesenchymal neoplasm of the PEComa

family; which demonstrates a triphasic pattern of vascular, smooth muscle cells, and fat tissue components. The tumor stains perfectly for melanocytic markers such as HMB-45 and Melan-A, which would be negative in anastomosing hemangioma staining [2]. Hemangioblastoma shows more large cells with abundant cytoplasm, and stains specifically for S100 proteins, NSE, and inhibin [21]. Glomus tumors are usually nests and oval-shaped tumor cells which are randomly distributed around expanded capillaries, no anastomosing or hobnail endothelial cells are seen. Alpha smooth muscle actin ( $\alpha$ -SMA) is a good stain for glomus [22,23].

## Conclusions

In conclusion, anastomosing hemangioma is a rare variant of capillary hemangioma. It has a sinusoidal growth pattern which resembles splenic parenchyma. It mimics malignant neoplasms, thus, clinical and radiological examination are not enough for accurate diagnosis. Careful histopathological and

immunohistochemical studies are required to establish the correct diagnosis.

## Competing interests

None to disclose. We declare that there are no financial or other relationships that might lead to a conflict of interest.

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