Title
Bladder angiosarcoma: a systematic literature review and survival analysis

Journal
Baylor University Medical Center Proceedings, 38(3)

ISSN
0899-8280

Authors
Silwal, Amisha
Sumie, BR
Rehman, Shafi
et al.

Publication Date
2025-05-04

DOI
10.1080/08998280.2025.2476319

Peer reviewed

PROC (BAYL UNIV MED CENT)
2025;38(3):305–312

https://doi.org/10.1080/08998280.2025.2476319

Taylor & Francis
Taylor & Francis Group

Bladder angiosarcoma: a systematic literature review and survival analysis

Amisha Silwal, MD[a], Sumie B.R., MD[b], Shafi Rehman, MBBS, MPhil[c], Ananya Daing, MD[d], Ragini Gopagoni, MBBS[e], Muhammad Alyas Akram, MBBS[f], Afaq Saeed, MBBS[g], Kaiser O'Sahil Sadiq, MBBS[h], Ameer Mustafa Farrukh, MD[i], and Arya Harikrishna, MD[j]

[a]Department of Medicine, Cagayan State University College of Medicine, Tuguegarao, Cagayan, Philippines; [b]Department of Medicine, KMCH Medical College Hospital, Coimbatore, India; [c]Department of Histopathology, Institute of Pathology and Diagnostic Medicine, Khyber Medical University, Peshawar, Pakistan; [d]Department of Medicine, Jonelta Foundation School of Medicine, University of Perpetual Help System Dalta, Las Piñas, Philippines; [e]Department of Medicine, Malla Reddy Institute of Medical Sciences, Hyderabad, India; [f]Department of Medicine, Islamic International Medical College, Rawalpindi, Pakistan; [g]Department of Medicine, Khyber Medical College, Peshawar, Pakistan; [h]Department of Surgery, University of California San Diego, San Diego, California, USA; [i]Department of Medicine, University of Galway School of Medicine, Galway, Ireland; [j]School of Medicine, European University, Engomi, Cyprus

ABSTRACT

Background: Bladder angiosarcoma is a rare type of cancer with only sporadic cases reported.

Methods: We performed a systematic review to describe clinicopathological features and survival outcomes.

Results: Thirty-five cases reporting 68 patients were reviewed. Among them, 35 (51.4%) were diagnosed with de novo bladder angiosarcoma and 33 (48.6%) with radiation-induced bladder angiosarcoma. The mean age at presentation was 65.255 years (±14.6), and the median tumor size was 4.6 cm (interquartile range 2.9–6.7). Hematuria was the most common symptom, reported in 52/68 patients (76.4%). Microscopic examination revealed an epithelioid-shaped morphology in 43/47 patients (91.5%), spindle-shaped cells in 13/47 (27.6%), and mixed epithelioid and spindle-shaped cells in 9/47 (19.1%). Immunohistochemical analysis showed that CD31 was positive in 36/36 patients (100%), CD34 in 17/23 (73.9%), and Factor VIII-related antigen in 17/20 (85%). Metastasis was reported in 43/60 patients (71.6%). Chemotherapy was administered to 22/68 patients (32.4%). The median follow-up time was 5 months (interquartile range 3–12). Of the 54 patients with available survival data, 16 (29.6%) survived and 38 (70.4%) died of the disease. Multivariate Cox regression analysis identified female gender (hazard ratio [HR], 2.59; $P = 0.01$), metastasis (HR, 2.58; $P = 0.01$), and chemotherapy (HR, 0.28; $P = 0.01$) as independent prognostic factors. No statistically significant differences in survival were observed between de novo and radiation-induced bladder angiosarcoma.

Conclusions: These findings suggest that BA is an aggressive disease regardless of its etiology. Early detection and timely initiation of chemotherapy may improve patient survival.

KEYWORDS Bladder angiosarcoma; chemotherapy; epithelioid morphology; gender; metastasis

Bladder angiosarcoma (BA) is an uncommon and aggressive tumor that originates from the vascular endothelial cells within the bladder. It can arise de novo without identifiable predisposing factors or secondary to radiation therapy, typically for urogenital cancers. Clinically, patients with BA frequently exhibit nonspecific symptoms, primarily hematuria. The average age at presentation is generally the sixth or seventh decade of life, with a significant male predominance. Histologically, BA is distinguished by epithelioid and/or spindle-shaped morphology. Metastasis is commonly documented and correlates with poor prognosis. The prognosis for BA is poor, with a

Corresponding author: Shafi Rehman, MBBS, MPhil (Scholar), Department of Histopathology, Institute of Pathology and Diagnostic Medicine, Khyber Medical University, F1 Phase-6 Rd, Phase 5 Hayatabad, Peshawar 25100 (e-mail: shafirehman@hotmail.com)
The authors report no funding or conflicts of interest.

Received November 28, 2024; Revised February 20, 2025; Accepted February 22, 2025.

median survival of <1 year. Therapeutic options typically involve a combination of surgical resection, chemotherapy, and radiation therapy with variable response.[1–33] To the best of our knowledge, only 35 cases of BA have been reported to date. The aim of this systematic review was to examine the clinicopathological characteristics, treatment options, and resulting outcomes and prognostic factors of BA.

METHODS

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards.[34] Two authors conducted searches independently using MeSH terms across four databases (PubMed, Science Direct, Embase, Scopus) and Google Scholar, from their inception to July 2, 2024. Titles of the studies served as the principal criterion for screening, followed by the abstract and, if accessible, the complete text. Disputes were resolved through discussion between the two reviewers and, if required, by a third author.

Only case reports and case series of BA have been identified despite extensive research. Due to the lack of larger studies, this analysis consisted only of case reports and series. Publications in languages other than English, incomplete manuscripts, and animal studies were omitted. A manual search of the reference lists of the retrieved articles was performed to identify additional relevant publications.

The extracted data included age, tumor size, presenting symptoms, histology, immunohistochemistry, management, and survival outcomes. Categorical variables were classified as yes, no, or unavailable information. Microsoft Excel 2018 (Microsoft Corp., Redmond, WA, USA) was used for data extraction.

Descriptive statistics for categorical variables are expressed as frequencies and percentages, and continuous variables are expressed as mean ± standard deviation (SD) or median and interquartile range (IQR). The Shapiro-Wilk or Kolmogorov-Smirnov tests were used to assess normality when appropriate. Fisher's exact test and $\chi 2$ test were used for categorical variables, and the independent sample t test and Mann-Whitney U test were used for continuous variables. Statistical significance was set at $P < 0.05$. The Kaplan-Meier curve was used for survival analysis, and the log-rank test was used to differentiate between the two groups. Survival data of 54 patients were available. The duration from diagnosis to death or the last follow-up was used to ascertain survival, and patients who remained alive were censored. The Cox proportional hazards regression model was used to identify factors influencing overall survival. All inferential statistical analyses were performed using IBM SPSS Statistics Version 26.

RESULTS

In total, 1028 articles were identified during the initial search. After removing duplicates, 755 articles remained. After title, abstract, and full-text screening, 35 articles remained and were included in the present review *(Figure 1)*. All clinicopathological features are summarized in *Table 1*.

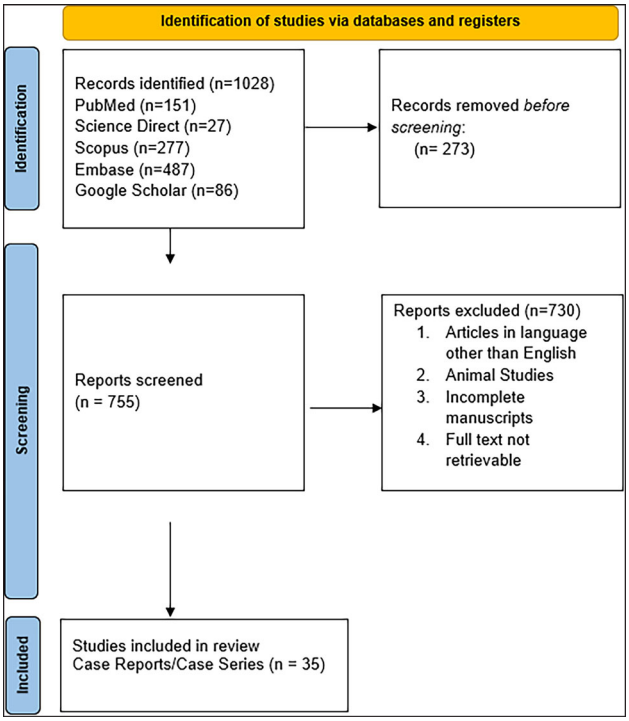

Figure 1. PRISMA flow chart.

Of 68 cases, 33 (48.5%) were diagnosed with radiation-induced BA and 35 (51.4%) were diagnosed as de novo BA. The mean age at presentation for BA was 65.25 ± 14.6 years. Patients with de novo BA were younger (58.71 ± 15.7 years) than those with radiation-induced BA (67.3 ± 13.5 years). This difference was statistically significant (independent sample t test, $P = 0.001$).

Data were available for 68 patients diagnosed with BA, of whom 49/68 (72.05%) were males and 19/68 (27.9%) were females. Of the radiation-induced BA, 19/33 (55.8%) were male and 14/33 (42.4%) were female; 30/35 (85.7%) males and 5/35 (14.2%) females were diagnosed with de novo BA. This difference was statistically significant (chi-square test, $P = 0.01$).

Histopathology

Necrosis was reported in 18/68 (26.4%) patients with BA. Of the radiation-induced BA, 6/33 (18.18%) patients reported necrosis on histopathology, and 12/35 (34.2%) patients with de novo BA reported necrosis. This difference was not statistically significant (chi-square test, $P = 0.13$). Pleomorphism was reported in 14/68 (20.5%) patients with BA, including 3/33 (9.09%) patients with radiation-induced BA and 11/35 (31.42%) with de novo BA. This difference was statistically significant (Fisher's exact test, $P = 0.03$).

Metastasis

Metastasis was present in 30/68 (44.11%) patients and absent in 38/68 (55.8%) patients with BA; 13/33 (39.3%)

Table 1. Clinicopathological features of patients with radiation-induced angiosarcoma and de novo angiosarcoma*

Variable	Radiation-induced angiosarcoma (n = 33)	De novo angiosarcoma (n = 35)	Overall (n = 68)
Mean age ± SD (years)	67.3 ± 13.5	58.71 ± 15.7	65.25 ± 14.6
Ethnicity			
Asian	0/4 (0%)	1/4 (25%)	1/8 (12.5%)
Caucasian	4/4 (100%)	3/4 (75%)	7/8 (87.5%)
N/A	29/33 (87.8%)	31/35 (88.57%)	60/68 (88.2%)
Gender			
Male	19/33 (55.8%)	30/35 (85.7%)	49/68 (72.05%)
Female	14/33 (42.4%)	5/35 (14.2%)	19/68 (27.9%)
N/A	0/33 (0%)	0/35 (0%)	0/68 (0%)
Median size of tumor (cm) (IQR1-IQR3)	4.9 (3–6.7)	3 (2.5–6.5)	4.6 (2.9–6.7)
Median follow-up (mo) (IQR1-IQR3)	5.5 (3–12.5)	5 (3–12)	5 (3–12)
Symptoms at presentation			
Hematuria	25/33 (75.75%)	27/35 (81.8%)	52/68 (76.4%)
Dysuria	0/33 (0%)	3/35 (8.5%)	3/68 (4.4%)
Risk factors			
Radiation exposure	33/33 (100%)	0/35 (0%)	33/68 (48.5%)
Foreign body exposure	0/33 (0%)	0/35 (0%)	0/68 (0%)
Organ transplant	1/33 (3.03%)	0/35 (0%)	1/68 (1.47%)
CCB intake	0/33 (0%)	0/35 (0%)	0/68 (0%)
Hemodialysis	0/33 (0%)	1/35 (2.8%)	1/68 (1.47%)
Smoking	1/33 (3.03%)	3/35 (8.5%)	4/68 (5.8%)
Vinyl chloride exposure	0/33 (0%)	0/35 (0%)	0/68 (0%)
Histopathology			
Epithelioid-shaped cells	21/22 (95.4%)	22/25 (88%)	43/47 (91.48%)
Spindle-shaped cells	7/22 (31.8%)	6/25 (24%)	13/47 (27.6%)
Mixed epithelioid and spindle cells	6/22 (27.27%)	3/25 (12%)	9/47 (19.14%)
Necrosis	6/33 (18.18%)	12/35 (34.2%)	18/68 (26.4%)
Mitosis	8/33 (24.24%)	11/35 (31.4%)	19/68 (27.9%)
Pleomorphism	3/33 (9.09%)	11/35 (31.42%)	14/68 (20.5%)
Prominent nucleoli	5/33 (15.15%)	8/35 (22.8%)	13/68 (19.11%)
Atypical endothelial cells	7/33 (21.2%)	9/35 (25.7%)	16/68 (23.5%)
Ulceration	6/33 (18.18%)	4/35 (11.42%)	10/68 (14.7%)
Anastomosing vascular channels	10/12 (83.3%)	13/16 (81.25%)	23/28 (82.1%)
Hemorrhage	6/6 (100%)	10/10 (100%)	16/16 (100%)
Metastasis	13/33 (39.3%)	17/35 (48.57%)	30/68 (44.11%)
Immunohistochemistry			
CD 31	18/18 (100%)	18/18 (100%)	36/36 (100%)
CK AE1/AE3	1/14 (7.1%)	7/16 (43.8%)	8/30 (26.7%)
CK 7	3/13 (23.1%)	2/11 (18.2%)	5/24 (20.9%)

(*Continued on next page*)

Table 1. Continued

Variable	Radiation-induced angiosarcoma (n = 33)	De novo angiosarcoma (n = 35)	Overall (n = 68)
CD 34	11/13 (84.6%)	6/10 (60%)	17/23 (73.9%)
Factor VIII related antigen	8/10 (80%)	9/10 (90%)	17/20 (85%)
*p*63	0/10 (0%)	0/6 (0%)	0/16 (0%)
GATA 3	0/9 (0%)	0/6 (0%)	0/15 (0%)
Vimentin	4/4 (100%)	7/8 (87.5%)	11/12 (91.7%)
ERG	7/7 (100%)	5/5 (100%)	12/12 (100%)
vWF	2/2 (100%)	0/0	2/2 (100%)
UEA	1/1 (100%)	1/1 (100%)	2/2 (100%)
Ki-67%: High	1/1 (100%)	3/4 (75%)	4/5 (80%)
Management			
Chemotherapy	10/33 (30.3%)	12/35 (34.3%)	22/68 (32.4%)
Radiotherapy	2/33 (6.1%)	5/35 (14.3%)	7/68 (10.3%)
Bladder biopsy	4/33 (12.1%)	10/35 (28.6%)	14/68 (20.6%)
TURBT	24/33 (72.7%)	23/35 (65.7%)	47/68 (69.1%)
Cystectomy	6/33 (18.2%)	7/35 (20%)	13/68 (19.1%)
Cystoprostatectomies	8/33 (24.2%)	9/35 (25.7%)	17/68 (25%)
Fulguration	0/33 (0%)	3/35 (8.6%)	3/68 (4.4%)
Recurrence after surgery	0/33 (0%)	9/35 (25.7%)	9/68 (13.2%)
Status of patient: Alive	8/26 (30.8%)	8/28 (28.6%)	16/54 (29.6%)

*Denominators are given for the number with information available. For the remainder of patients, the information was unavailable.
CCB indicates calcium channel blocker; IQR, interquartile range; SD, standard deviation; TURBT, transurethral resection of bladder tumor.

patients with radiation-induced BA and 17/35 (48.57%) patients with de novo BA presented with metastasis. This difference was not statistically significant (chi-square test, $P = 0.44$).

Chemotherapy

Chemotherapy was administered in 22/68 (32.4%) and was not administered to 46/68 (67.6%) patients with BA. In the radiation-induced BA group, chemotherapy was administered in 10/33 (30.3%) and was not administered in 23/33 (69.7%). In the de novo BA group, chemotherapy was administered in 12/35 (34.3%) patients and was not administered in 23/35 (65.7%) patients. This difference was not statistically significant (chi-square test, $P = 0.72$).

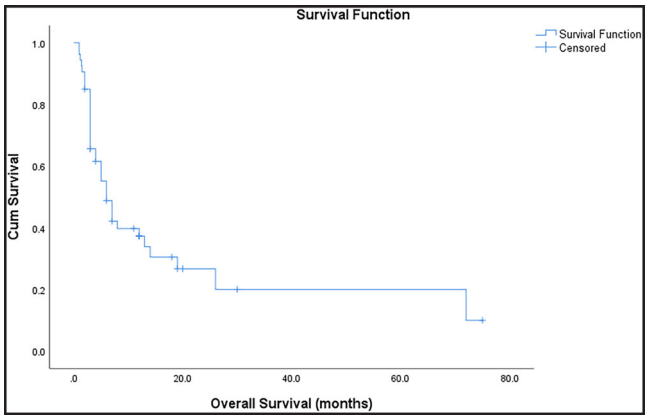

Figure 2. Overall survival of bladder angiosarcoma.

Survival analysis

Patients were followed for a median duration of 5 months (IQR, 3–12 months). In the case of radiation-induced BA, the median follow-up period was 5.5 months (IQR, 3–12.5 months). Of the 26 reported cases of radiation-induced BA, 18 died of the disease, while eight were alive at the last follow-up. The median follow-up period for de novo BA was 5 months (IQR, 3–12 months). Of the 28 reported cases, 20 patients died and eight were still alive at the last follow-up. The median overall survival time for both types of BA was 5 months *(Figure 2)*. Although the median survival time for de novo BA (5 months) was slightly shorter than for radiation-induced BA (5.5 months), this difference was not statistically significant (log-rank test, $P = 0.6$) *(Figure 3a)*.

Survival analysis demonstrated a significant difference between males and females in terms of overall survival.

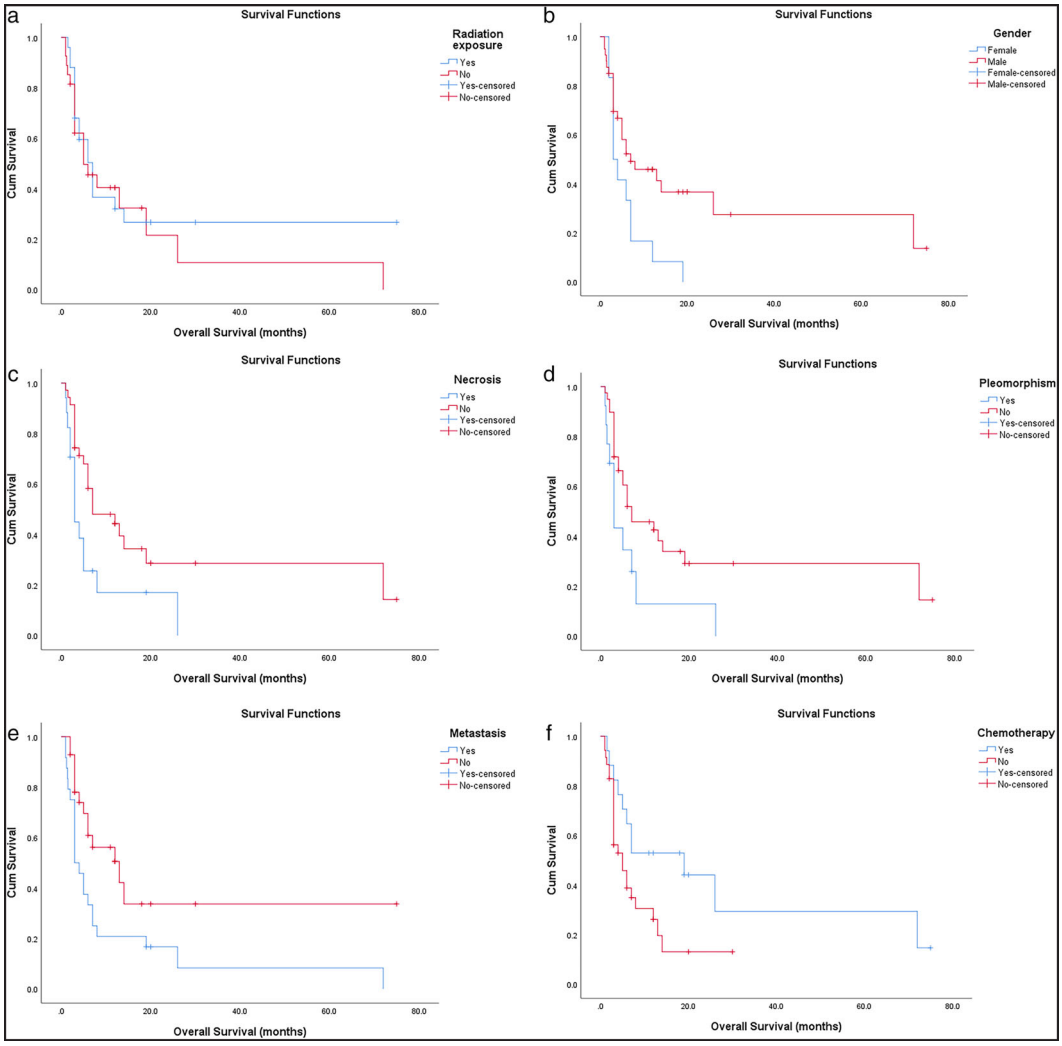

Figure 3. Kaplan-Meier survival curves for **(a)** radiation exposure versus no radiation exposure; **(b)** males versus females; **(c)** presence versus absence of necrosis; **(d)** presence versus absence of pleomorphism; **(e)** presence versus absence of metastasis; and **(f)** chemotherapy versus no chemotherapy.

Females with BA had a shorter median survival time of 3 months compared to 7 months in males *(Figure 3b)*. This difference was statistically significant, with a log-rank test result of $P = 0.02$.

Histopathological factors also played a crucial role in survival outcomes. Tumors exhibiting necrosis, pleomorphism, and metastasis were associated with significantly worse survival rates. Patients with necrotic tumors had a median survival time of 3 months compared with 7 months for those without necrosis (log-rank $P = 0.01$) *(Figure 3c)*. Similarly, pleomorphism was associated with a median survival time of 3 months, whereas patients without pleomorphism survived for 7 months (log-rank $P = 0.03$; *Figure 3d*). The presence of metastasis was particularly detrimental, with patients showing metastasis having a median survival time of 3 months compared with 13 months for those without metastasis (log-rank $P = 0.01$) *(Figure 3e)*. These findings suggest that these histopathological features are strongly associated with poor prognosis in patients with BA.

The impact of treatment on survival was also evident. Patients who received chemotherapy showed significantly improved survival compared with those who did not undergo treatment. The median survival time of patients treated with chemotherapy was 19 months, whereas the no-treatment group had a median survival time of 5 months (log-rank $P < 0.05$) *(Figure 3f)*.

Subsequently, the univariate analysis identified several significant predictors of survival. Females were found to have a 2.15-fold higher risk of death compared to males with a P value of 0.03. Necrosis was associated with a 2.15-fold increased risk of death ($P = 0.02$). Pleomorphism also significantly affected survival, conferring a 2.09-fold higher risk of death ($P = 0.04$). The presence of metastasis almost doubled the risk of death, with a P value of 0.02.

Furthermore, a multivariate Cox regression model was used to adjust for potential confounders and identify independent predictors of survival, as shown in *Table 2*. After adjusting for other variables, gender remained a significant predictor, with females continuing to exhibit a higher risk of death ($P = 0.01$). However, the association between necrosis and survival was not significant after adjustment ($P = 0.52$), suggesting that necrosis may not independently predict

Table 2. Regression analysis to identify independent predictors of survival in angiosarcoma

Variable	Log rank (Kaplan-Meier)	Univariate Cox regression analysis HR	95% CI	P value	Multivariate Cox regression analysis HR	95% CI	P value
Gender	0.02	2.15	1.0–4.3	0.03	2.59	1.1–5.6	0.01
Necrosis	0.01	2.15	1.0–4.2	0.02	1.33	0.5–3.1	0.52
Pleomorphism	0.03	2.09	1.0–4.3	0.04	1.54	0.5–4.1	0.38
Metastasis	0.01	2.20	1.1–4.3	0.02	2.58	1.1–5.6	0.01
Chemotherapy	0.04	0.48	0.2–1	0.06	0.28	0.1–0.6	0.01

CI indicates confidence interval; HR, hazard ratio.

survival when other factors are considered. Similarly, the effect of pleomorphism on survival was not significant in the multivariate model ($P = 0.38$). On the other hand, metastasis remained a strong independent predictor of poor survival, with a P value of 0.01. The protective effect of chemotherapy persisted even after adjustment, further reducing the risk of death ($P = 0.01$).

DISCUSSION

BA is a rare and aggressive vascular tumor that presents significant diagnostic and therapeutic challenges. BA arises de novo or secondary to radiation therapy, and both etiologies have similar presentations, histology, and survival rates, as shown in *Table 1* and *Figure 3a*. This review found that de novo BA occurs in younger populations than radiation-induced BA, similar to what was found in a previous retrospective study.[35] In BA, older age at onset (>65 years) had a worse overall survival of 5 months compared to 13 months in patients aged < 65 years; however, this difference was not statistically significant (log-rank $P = 0.2$).

The present review found a male preponderance (72.05%) in contrast to previous studies.[36,37] Women showed poorer survival, which may be a result of women presenting with advanced stages of urothelial bladder carcinoma. Several multifactorial reasons also play a role, such as carcinogens (i.e., tobacco and chemicals), as well as genetic, anatomic, hormonal, and societal factors. In addition, quality of care and regional variations also contribute to poorer outcomes for bladder carcinoma in women.[38] A previous study comparing outcomes for angiosarcomas at various anatomical sites reported improved survival in women.[39] Men with cutaneous angiosarcomas involving the head and neck had better outcomes on univariate analysis but not on multivariate analysis.[40,41] Given these conflicting findings, further investigation is warranted to clarify the role of sex as a prognostic factor, which may vary depending on the anatomic location of this pathology. Gender has been included as a prognosticator for outcomes in various prediction tools for urothelial carcinomas[42,43] and may be of similar value in BA.

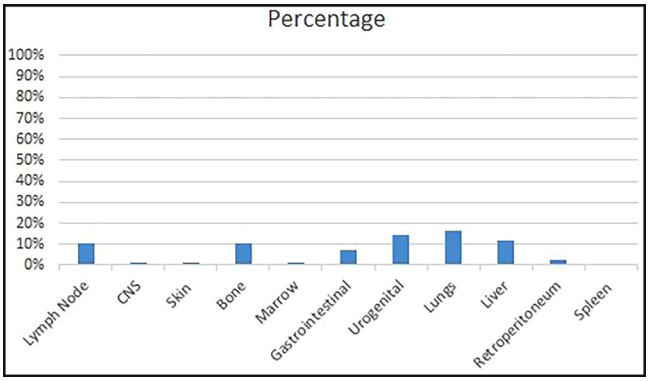

Figure 4. Sites of metastasis.

BA typically presents as a highly vascular lesion with irregularly shaped blood vessels that exhibit infiltrative growth patterns. Pleomorphic tumor cells often have enlarged nuclei and prominent nucleoli, which reflect high cellular atypia. The stroma may exhibit areas of necrosis, hemorrhage, and inflammatory infiltrates. These tumors may be epithelioid, spindle-shaped, or less commonly have a mixed morphology. Metastasis was common (44.1%) and frequently involved the lungs (16%), urogenital region (15%), liver (12%), and lymph nodes (10%) *(Figure 4)*. In line with our findings, metastases also correlate with poorer outcomes in cutaneous head and neck angiosarcoma.[44] Therefore, early detection and intervention before metastasis may lead to improved survival. Necrosis and pleomorphism appeared to correlate with poor outcomes; however, this was not significant in the multivariate analysis. Further studies are required to clarify the impact of these histological features on survival.

If the histological appearance is not definitive, numerous immunohistochemical stains can help establish the diagnosis of BA. The most commonly used strains are summarized in *Table 1* and *Figure 5*. Both groups (de novo and radiation-induced) showed universal positivity for CD31, confirming endothelial origin, while other markers such as CK AE1/AE3 showed a significant difference (7.1% in radiation-induced vs 43.8% in de novo), suggesting differing degrees of differentiation and possibly different therapeutic approaches. A

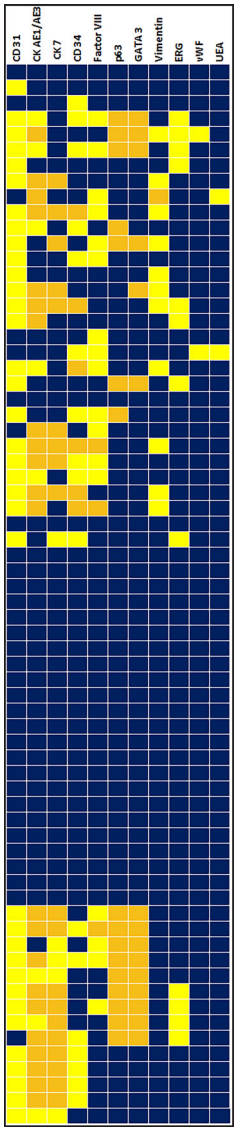

Figure 5. Immunohistochemistry heat maps.

larger sample size and further molecular analysis are needed to decipher any differences.

The treatment of BA typically involves a multimodal approach, as this rare and aggressive tumor often presents with advanced disease. Surgical resection is the mainstay of treatment. Adjuvant radiotherapy and chemotherapy should be considered. Our review showed that chemotherapy alone improves survival outcomes, thereby underscoring the importance of its inclusion in the treatment regimen.

The primary limitations of this review are the small sample size and reliance on case reports. This rarity makes it challenging to draw definitive conclusions regarding disease characteristics and outcomes. Furthermore, inconsistency in terms of treatment modalities and follow-up may introduce bias when analyzing survival outcomes. Many cases lacked comprehensive data, particularly regarding histopathological findings and immunohistochemical markers, which may have altered our findings, if available.

Another significant limitation is the absence of large prospective studies. The majority of the available literature consists of case reports and retrospective analyses, making it difficult to standardize treatment efficacy assessments. The short median follow-up duration of only 5 months also limits the ability to evaluate long-term survival and recurrence. Finally, the underreporting of ethnicity and regional variations introduces a potential gap in the understanding of biological differences in tumor behavior across populations.

In conclusion, BA is an extremely rare and aggressive vascular malignancy with poor overall survival regardless of its etiology. Hematuria is the most common presenting symptom, and histopathology and immunohistochemistry are necessary for a definitive diagnosis, with CD31 being positive in all cases. Metastasis and female sex are associated with poor prognosis, whereas chemotherapy offers a survival benefit. Therefore, early initiation of chemotherapy may contribute to improved outcomes. Further research and standardized treatment protocols are necessary to better understand the disease and to develop more effective treatment strategies.

ORCID

Shafi Rehman http://orcid.org/0000-0002-7262-0300
Kaiser O'Sahil Sadiq http://orcid.org/0009-0006-5050-6626

1. Seethala RR, Gomez JA, Vakar-Lopez F. Primary angiosarcoma of the bladder. *Arch Pathol Lab Med*. 2006;130(10):1543–1547. doi:10.5858/2006-130-1543-PAOTB.
2. Pazona JF, Gupta R, Wysock J, Schaeffer AJ, Smith ND. Angiosarcoma of bladder: long-term survival after multimodal therapy. *Urology*. 2007;69(3):575.e9–575.10. doi:10.1016/j.urology.2007.01.021.
3. Beyazal M, Pirinççi N, Yavuz A, Özkaçmaz S, Bulut G. Computed tomography and magnetic resonance imaging findings of primary bladder angiosarcoma: a case report. *Clin Imaging*. 2014;38(2):212–214. doi:10.1016/j.clinimag.2013.10.003.
4. Nizam A, Paquette EL, Wang BG, Aragon-Ching JB. Epithelioid angiosarcoma of the bladder: a case report and review of the literature. *Clin Genitourin Cancer*. 2018;16(6):e1091–e1095. doi:10.1016/j.clgc.2018.07.010.
5. Tynski Z, Barrett AJ, Bastacky SI. Primary urinary bladder angiosarcoma with ascites. *Hum Pathol Case Rep*. 2017;10:5–9. doi:10.1016/j.ehpc.2017.02.003.
6. Alessandra F, Guido C. Post-radiation epithelioid angiosarcoma of the bladder: a true pathological diagnostic challenge. *Hum Pathol Case Rep*. 2020;22:200430. doi:10.1016/j.ehpc.2020.200430.
7. Pierce D, Connelly ZM, Boyd F, Heinsimer K. De novo angiosarcoma of the bladder: a case report. *Curr Probl Cancer Case Rep*. 2023;11:100259. doi:10.1016/j.cpccr.2023.100259.
8. Akbari M, Kulaga A, Yilmaz A, Wilkin RP, Trpkov K. Epithelioid angiosarcoma of the bladder after therapeutic irradiation for endometrioid carcinoma. *Pathol Res Pract*. 2004;200(9):632.
9. Aragona F, Ostardo E, Prayer-Galetti T, Piazza R, Capitanio G. Angiosarcoma of the bladder: a case report with regard to histologic and immunohistochemical findings. *Eur Urol*. 1991;20(2):161–163. doi:10.1159/000471688.
10. Curra M, Martins MD, Martins MAT, Meurer L, Munerato MC. Oral metastasis of angiosarcoma of the bladder: a case report. *Head Neck Oncol*. 2014;6(3):1–3.

11. Paranici C, Achim S, Enache V, Bara M. Primary bladder angiosarcoma synchronous with prostatic acinar adenocarcinoma in an 82-year-old male. *Arch Clin Cases*. 2020;7(3):52–56. doi:10.22551/2020.28.0703.10173.
12. Nawar NA, Olsen J, Jelic TM, He C. Primary urinary bladder angiosarcoma with osteoclast-like multinucleated giant cells: a case report and literature review. *Am J Case Rep*. 2016;17:143–149. doi:10.12659/ajcr.896266.
13. Williams SK, Romaguera RL, Kava B. Angiosarcoma of the bladder: case report and review of the literature. *Sci World J*. 2008;8(1):508–511. doi:10.1100/tsw.2008.79.
14. Silvestri L. Angiosarcoma tumor–an unusual localization of a rare tumor: a case report. *J Surg Proce Case Rep*. 2021;3:1–5.
15. Madiraju S, Nkansah-Amankra K, Buck B, Petros FG. Muscle-invasive angiosarcoma of the urinary bladder: case report. *Urol Case Rep*. 2023;51:102593. doi:10.1016/j.eucr.2023.102593.
16. Gerbaud F, Ingels A, Ferlicot S, Irani J. Angiosarcoma of the bladder: review of the literature and discussion about a clinical case. *Urol Case Rep*. 2017;13:97–100. doi:10.1016/j.eucr.2016.12.007.
17. Cito G, Santi R, Gemma L, et al. Angiosarcoma of the urinary bladder following radiotherapy: report of a case and review of the literature. *Medicina*. 2021;57(4):329. doi:10.3390/medicina57040329.
18. Morgan MA, Moutos DM, Pippitt CH Jr, et al. Vaginal and bladder angiosarcoma after therapeutic irradiation. *South Med J*. 1989;82(11):1434–1436. doi:10.1097/00007611-198911000-00025.
19. Navon JD, Rahimzadeh M, Wong AK, Carpenter PM, Ahlering TE. Angiosarcoma of the bladder after therapeutic irradiation for prostate cancer. *J Urol*. 1997;157(4):1359–1360. doi:10.1016/S0022-5347(01)64980-2.
20. Abbasov B, Munguia G, Mazal PR, et al. Epithelioid angiosarcoma of the bladder: report of a new case with immunohistochemical profile and review of the literature. *Pathology*. 2011;43(3):290–293. doi:10.1097/PAT.0b013e328344e2fb.
21. Gupta S, Erickson LA. Postirradiation angiosarcoma of the urinary bladder. *Mayo Clin Proc*. 2022;97(7):1406–1408. doi:10.1016/j.mayocp.2022.05.019.
22. Ojerholm E, Stripp D, Mamtani R, Van Arsdalen K, Tripp P. Angiosarcoma of the bladder following prostate radiotherapy. *Am J Med*. 2015;128(5):e11–e12. doi:10.1016/j.amjmed.2014.11.022.
23. Bahouth Z, Masarwa I, Halachmi S, Nativ O. Primary angiosarcoma of the urinary bladder: 13th reported patient. *Case Rep Oncol Med*. 2015;2015:652870. doi:10.1155/2015/652870.
24. Stroup RM, Chang YC. Angiosarcoma of the bladder: a case report. *J Urol*. 1987;137(5):984–985. doi:10.1016/s0022-5347(17)44323-0.
25. Kulaga A, Yilmaz A, Wilkin RP, Trpkov K. Epithelioid angiosarcoma of the bladder after irradiation for endometrioid adenocarcinoma. *Virchows Arch*. 2007;450(2):245–246. doi:10.1007/s00428-006-0336-9.
26. Elatreisy A, Hussein MRA, Shalkamy O, et al. A primary epithelioid angiosarcoma arising in a bilharzial urinary bladder: a reappraisal and case report. *Asian Pac J Cancer Prev*. 2023;24(1):87–92. doi:10.31557/APJCP.2023.24.1.87.
27. Warne RR, Ong JS, Snowball B, Vivian JB. Primary angiosarcoma of the bladder in a young female. *BMJ Case Rep*. 2011;2011(1):bcr1120103484–bcr1120103484. doi:10.1136/bcr.11.2010.3484.
28. Rallabandi HB, Swain M, Gowrishankar S, Sinha S. Postradiation angiosarcoma of the bladder with extensive osseous metaplasia. *Indian J Pathol Microbiol*. 2016;59(1):78–80. doi:10.4103/0377-4929.178234.
29. Schindler S, De Frias DVS, Yu GH. Primary angiosarcoma of the bladder: cytomorphology and differential diagnosis. *Cytopathology*. 1999;10(2):137–143. doi:10.1046/j.1365-2303.1999.00119.x.
30. Wang G, Black PC, Skinnider BF, Hayes MM, Jones EC. Post-radiation epithelioid angiosarcoma of the urinary bladder and prostate. *Can Urol Assoc J*. 2016;10(5-6):E197–E200. doi:10.5489/cuaj.3220.
31. Jha S, Parwani A, Lobo A, et al. Epithelioid angiosarcoma of the urinary bladder: a multi-institutional study of twenty-three cases with literature review. *Lab Invest*. 2022;102(Suppl 1):604–605.
32. Matoso A, Epstein JI. Epithelioid angiosarcoma of the bladder: a series of 9 cases. *Am J Surg Pathol*. 2015;39(10):1377–1382. doi:10.1097/PAS.0000000000000444.
33. Tavora F, Montgomery E, Epstein JI. A series of vascular tumors and tumorlike lesions of the bladder. *Am J Surg Pathol*. 2008;32(8):1213–1219. doi:10.1097/PAS.0b013e31816293c5.
34. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *Ann Intern Med*. 2009;151(4):W65–W94. doi:10.7326/0003-4819-151-4-200908180-00136.
35. Hung J, Hiniker SM, Lucas DR, et al. Sporadic versus radiation-associated angiosarcoma: a comparative clinicopathologic and molecular analysis of 48 cases. *Sarcoma*. 2013;2013:798403–798408. doi:10.1155/2013/798403.
36. Colas M, Gérazime A, Popescu D, et al. Angiosarcoma: a population-based cancer registry descriptive study of 45 consecutive cases diagnosed between 1979 and 2016. *Rare Tumors*. 2020;12:2036361320979216. doi:10.1177/2036361320979216.
37. Zhang C, Xu G, Liu Z, et al. 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(12):1092–1099. doi:10.1093/jjco/hyz113.
38. Marks P, Soave A, Shariat SF, Fajkovic H, Fisch M, Rink M. Female with bladder cancer: what and why is there a difference? *Transl Androl Urol*. 2016;5(5):668–682. doi:10.21037/tau.2016.03.22.
39. Yan Q, Fernandez RA, Elmi M, Gelfond J, Davies MG. Outcomes of interventions for angiosarcoma. *Front Surg*. 2022;9:819099. doi:10.3389/fsurg.2022.819099.
40. Cassidy RJ, Switchenko JM, Yushak ML, et al. The importance of surgery in scalp angiosarcomas. *Surg Oncol*. 2018;27(4):A3–A8. doi:10.1016/j.suronc.2018.07.010.
41. Patel SH, Hayden RE, Hinni ML, et al. Angiosarcoma of the scalp and face: the Mayo Clinic experience. *JAMA Otolaryngol Head Neck Surg*. 2015;141(4):335–340. doi:10.1001/jamaoto.2014.3584.
42. May M, Bastian PJ, Brookman-May S, et al. Gender-specific differences in cancer-specific survival after radical cystectomy for patients with urothelial carcinoma of the urinary bladder in pathologic tumor stage T4a. *Urol Oncol*. 2013;31(7):1141–1147. doi:10.1016/j.urolonc.2011.09.011.
43. Aziz A, Shariat SF, Roghmann F, et al. Prediction of cancer-specific survival after radical cystectomy in pT4a urothelial carcinoma of the bladder: development of a tool for clinical decision-making. *BJU Int*. 2016;117(2):272–279. doi:10.1111/bju.12984.
44. Dettenborn T, Wermker K, Schulze HJ, et al. Prognostic features in angiosarcoma of the head and neck: a retrospective monocenter study. *J Craniomaxillofac Surg*. 2014;42(8):1623–1628. doi:10.1016/j.jcms.2014.05.002.