Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Oncology-Radiotherapy

Pediatric Bladder Rhabdomyosarcoma: Two Case Reports and Literature Review

A. D. Diawara[1*], D. Aroni Toto[1], S. I. R. Soulama[1], A. W. Sorgho[1], S. Latitioui[1], M. Saadoune[1], S. Barkiche[1], N. Oumghar[1], M. Darfaoui[1], A. Elomrani[1], M. Khouchani[1]

[1]Department of Oncology-Radiotherapy, Oncology-Hematology Hospital, Mohammed VI University Hospital, Marrakech, Morocco

DOI: https://doi.org/10.36347/sjmcr.2025.v13i09.039 | **Received:** 16.07.2025 | **Accepted:** 11.09.2025 | **Published:** 20.09.2025

***Corresponding author:** A. D. Diawara
Department of Oncology-Radiotherapy, Oncology-Hematology Hospital, Mohammed VI University Hospital, Marrakech, Morocco

Abstract **Case Report**

Objective: To analyze the clinical, therapeutic, and evolutionary characteristics of pediatric bladder rhabdomyosarcoma through two case reports and a literature review. ***Methods:*** A retrospective analysis of two cases of embryonal bladder rhabdomyosarcoma treated between 2020-2022, with a systematic literature review of the past 15 years. ***Results:*** Two boys aged 4 and 9 years presented with urinary symptoms evolving over 12 and 11 months, respectively. Imaging revealed stage III bladder cancer. Histological analysis confirmed the diagnosis, showing positivity for desmin and myogenin. Multimodal treatment included neoadjuvant chemotherapy, conservative surgery, and conformal radiotherapy (50.4 Gy). At 24 months, both patients were alive with excellent local control and preserved bladder function. ***Conclusion:*** Pediatric bladder rhabdomyosarcoma requires early multidisciplinary management. This combined therapeutic approach optimizes tumor control while preserving bladder function.

Keywords: Rhabdomyosarcoma, bladder, child, multimodal treatment, bladder function.

INTRODUCTION

Rhabdomyosarcoma (RMS) is the most common malignant mesenchymal tumor in children and adolescents, constituting approximately 3-5% of all pediatric cancers [1,2]. With an annual incidence of 5.2 cases per million children, this tumor has a bimodal distribution, with the first peak between 2-6 years of age and the second around 15-19 years of age [3,4].

Genitourinary localization accounts for 20-25% of cases, with the bladder being the preferred site, particularly in young children [5,6]. Pediatric bladder rhabdomyosarcoma poses specific therapeutic challenges that require a balance between oncological control and functional preservation.

Recent therapeutic advances, including the optimization of chemotherapy protocols, conservative surgical techniques, and precision radiotherapy, have significantly improved prognosis, with overall survival rates exceeding 70% in localized forms [7,8].

We report two cases of embryonic bladder rhabdomyosarcoma treated at our institution, analyzing their clinical, therapeutic, and evolutionary particularities, supplemented by an updated review of the literature.

MATERIALS AND METHODS

This descriptive retrospective study included all cases of pediatric bladder rhabdomyosarcoma diagnosed and treated in our department between January 2020 and December 2022. The inclusion criteria were as follows: age < 18 years, confirmed histological diagnosis of bladder rhabdomyosarcoma, and complete management at our institution.

The diagnosis was based on a combination of clinical, radiological (ultrasound, CT, MRI), histological, and immunohistochemical (desmin, myogenin, MyoD1) elements. Staging followed the Children's Oncology Group (COG) classification.

The multimodal treatment combined neoadjuvant chemotherapy according to the Vincristine-Actinomycin D-Cyclophosphamide (VAC) or Ifosfamide-Vincristine-Actinomycin D-Doxorubicin

(IVADo) protocols, conservative surgery, and 3D conformal radiotherapy (50.4 Gy in 28 fractions).

Clinical, biological, and radiological evaluations were performed at 3, 6, and 12 months and then annually. Bladder function was assessed by measuring post-void residue and validated questionnaires.

A systematic search of PubMed, Embase, and Cochrane (2008-2023) the keywords “rhabdomyosarcoma" and “bladder.”

CLINICAL OBSERVATIONS

Case 1

A 4-year-old boy with no particular history presented with hypogastric pain and urinary burning for 12 months. Clinical examination revealed a palpable mass in the hypogastric region.

Pelvic MRI revealed a 65 mm high budding solidocystic tumor process originating from the right anterolateral wall of the bladder neck, with local infiltration without extension to adjacent organs (Figure 1).

Transcutaneous biopsy confirmed stage III embryonic rhabdomyosarcoma, with positive desmin and myogenin immunohistochemistry.

The patient received four cycles of VAC/VAD chemotherapy, achieving a 90% tumor reduction (from 65 mm to 12.5 mm). Complete excision was performed, followed by 3D conformal radiotherapy (50.4 Gy).

At 24 months, the patient had excellent local control with normal bladder function (post-void residue < 10 ml, age-appropriate bladder capacity).

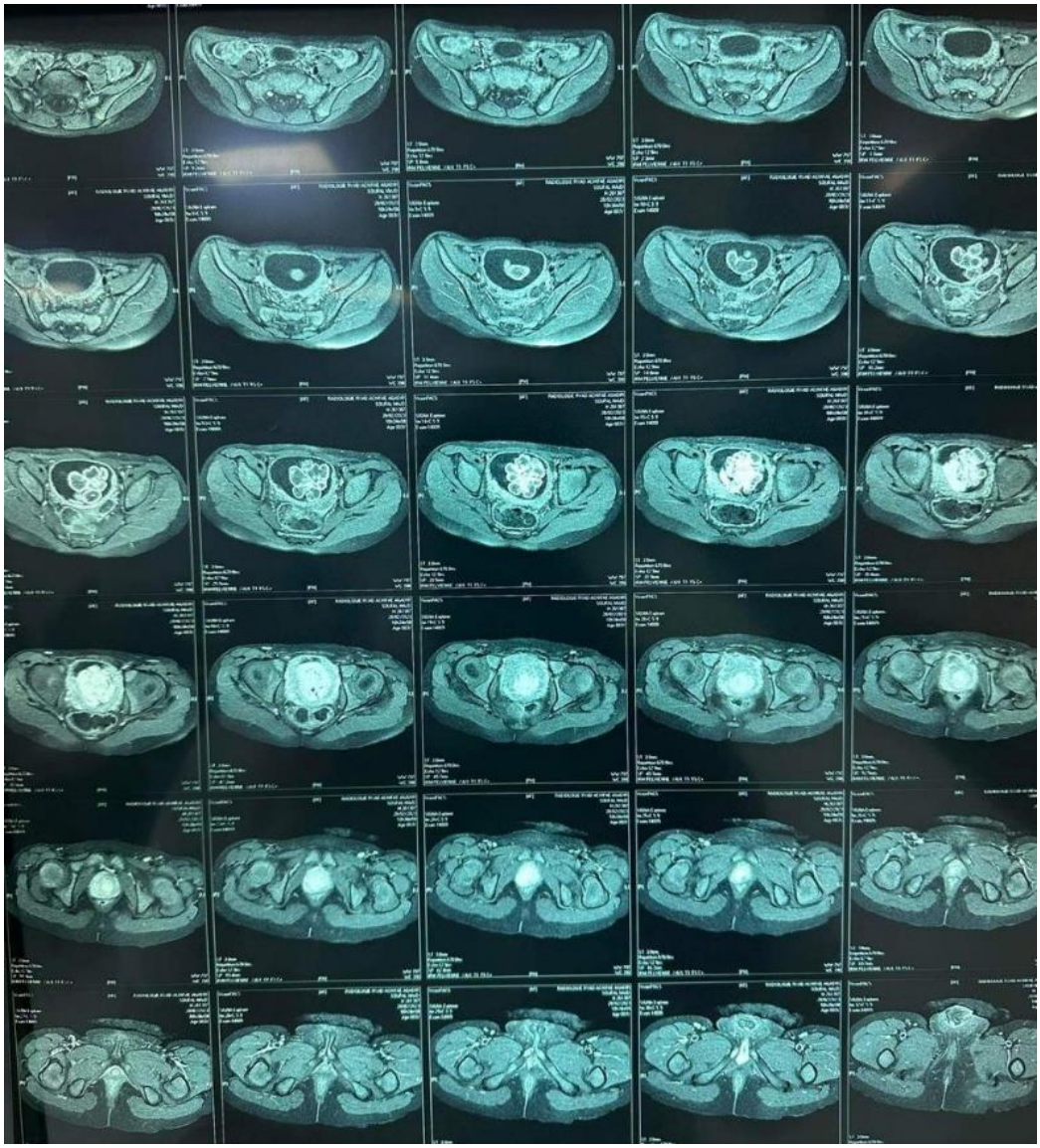

Figure 1: solid-cystic tumor mass (65 × 37 × 30 mm) of the bladder

Case 2

A 9-year-old boy with no medical history presented with dysuria, acute urinary retention, and deterioration of general condition for 11 months.

Abdominal-pelvic computed tomography (CT) revealed a left latero-vesical tumor process × 47x27 mm, infiltrating the urogenital sinus with minimal right hydronephrosis.

Histological analysis confirmed stage III embryonic rhabdomyosarcoma with positive immunostaining for desmin and myogenin.

Six cycles of IVADo chemotherapy induced significant regression (47x27 mm to 29.2x13.4 mm). Complete tumor excision was followed by conformal radiotherapy (CRT).

At 24 months, local control was excellent, with complete functional recovery (normal spontaneous urination and absence of significant residue).

DISCUSSION

Our observations confirm the male predominance (2:1 sex ratio) and young age at diagnosis, which are classic characteristics of pediatric bladder RMS [9,10]. The long diagnostic delay (11-12 months) highlights the difficulty of early diagnosis due to initial aspecific symptoms.

The clinical presentation combining voiding disorders and palpable mass corresponds to the published series, where urinary retention is often the first symptom [11,12].

Pelvic MRI is superior to CT for the evaluation of local extension and surgical planning, confirming the current recommendations [13]. Immunohistochemistry remains essential, as the co-expression of the mine/myogenin is highly specific to RMS [14,15].

Our results illustrate the efficacy of the sequential therapeutic approach recommended by international protocols [16,17]. Neoadjuvant chemotherapy allowed for significant tumor reduction (90% and 38%, respectively), facilitating optimal conservative surgery.

The use of different protocols (VAC/VAD vs. IVADo) reflects therapeutic adaptation according to risk factors and tolerance, an approach validated by recent studies [18,19].

Contemporary series have confirmed high rates of bladder preservation after neoadjuvant chemotherapy and conservative surgery, with favorable functional outcomes [25].

3D conformal radiotherapy at a dose of 50.4 Gy was effective and well tolerated, with no significant acute toxicity. This approach allows for optimal local control while limiting the irradiation of organs at risk [20,21].

Emerging techniques (intensity-modulated radiotherapy and proton therapy) could further improve the therapeutic index, particularly in young children [22].

Functional assessment at 24 months showed complete preservation of bladder function in both cases, which is a major objective of modern care. This functional preservation, associated with oncological control, justifies a multimodal conservative approach [25,26].

A recent review highlighted that it is now possible to adopt conservative approaches (minimal surgery, targeted chemotherapy, and tailored radiotherapy) while maintaining high therapeutic efficacy [26].

Our patients had several factors with a good prognosis: age < 10 years, embryonic histology, absence of metastases, and response to neoadjuvant chemotherapy [23,24]. Long-term follow-up is necessary to detect late recurrence or functional complications.

Recent data from the EpSSG group show that children with localized RMS now have up to an 80% chance of long-term survival because of the RMS-2005 protocol strategies [28]. The PDQ clinical updates (April 2025) highlight the importance of using multiple treatments based on age and report survival rates by risk group. Advances in molecular biology, especially in cell death processes such as apoptosis and the unfolded protein response (UPR), could help create new targeted treatments for rhabdomyosarcoma [27].

This limited series did not allow for an in-depth statistical analysis. Longer follow-up is needed to assess long-term survival and the delayed sequelae. The lack of psychosocial assessment is another limitation of this study.

CONCLUSION

Pediatric bladder rhabdomyosarcoma is a rare pathology that requires multidisciplinary expertise. The modern therapeutic approach, which combines effective chemotherapy, conservative surgery, and precision radiotherapy, makes it possible to optimize tumor control while preserving bladder function.

Our encouraging short-term results require confirmation through prolonged follow-up. Future efforts should focus on improving early diagnosis, optimizing personalized treatment strategies, and assessing the long-term quality of life.

Ethical considerations: This study was approved by the Institutional Ethics Committee. Informed consent was obtained.

Conflicts of interest: The authors declare no conflicts of interest.

Funding: No specific funding.

REFERENCES

1. Sultan, I., Qaddoumi, I., Yaser, S., Rodriguez-Galindo, C., & Ferrari, A. (2009). Comparing adult and pediatric rhabdomyosarcoma in the surveillance, epidemiology and end results program, 1973 to 2005: an analysis of 2,600 patients. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 27(20), 3391–3397. https://doi.org/10.1200/JCO.2008.19.7483.
2. Ognjanovic, S., Linabery, A. M., Charbonneau, B., & Ross, J. A. (2009). Trends in childhood rhabdomyosarcoma incidence and survival in the United States, 1975-2005. Cancer, 115(18), 4218–4226. https://doi.org/10.1002/cncr.24465.
3. Pappo, A. S., Shapiro, D. N., Crist, W. M., & Maurer, H. M. (1995). Biology and therapy of pediatric rhabdomyosarcoma. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 13(8), 2123–2139. https://doi.org/10.1200/JCO.1995.13.8.2123.
4. Meza, J. L., Anderson, J., Pappo, A. S., Meyer, W. H., & Children's Oncology Group (2006). Analysis of prognostic factors in patients with nonmetastatic rhabdomyosarcoma treated on intergroup rhabdomyosarcoma studies III and IV: the Children's Oncology Group. Journal of clinical oncology : official journal of the American Society of Clinical Oncology, 24(24), 3844–3851. https://doi.org/10.1200/JCO.2005.05.3801.
5. Raney, R. B., Anderson, J. R., Barr, F. G., Donaldson, S. S., Pappo, A. S., Qualman, S. J., Wiener, E. S., Maurer, H. M., & Crist, W. M. (2001). Rhabdomyosarcoma and undifferentiated sarcoma in the first two decades of life: a selective review of intergroup rhabdomyosarcoma study group experience and rationale for Intergroup Rhabdomyosarcoma Study V. Journal of pediatric hematology/oncology, 23(4), 215–220. https://doi.org/10.1097/00043426-200105000-00008.
6. Ferrari, A., Bisogno, G., Macaluso, A., Casanova, M., D'Angelo, P., Pierani, P., Zanetti, I., Alaggio, R., Cecchetto, G., & Carli, M. (2007). Soft-tissue sarcomas in children and adolescents with neurofibromatosis type 1. Cancer, 109(7), 1406–1412. https://doi.org/10.1002/cncr.22533.
7. Oberlin, O., Rey, A., Lyden, E., Bisogno, G., Stevens, M. C., Meyer, W. H., Carli, M., and Anderson, J. R. (2008). Prognostic factors in metastatic rhabdomyosarcomas: results of a pooled analysis from United States and European cooperative groups. Journal of Clinical Oncology: Official Journal of the American Society of Clinical Oncology, 26(14), 2384–2389. https://doi.org/10.1200/JCO.2007.14.7207.
8. Hawkins, D. S., Spunt, S. L., Skapek, S. X., & COG Soft Tissue Sarcoma Committee (2013). Children's Oncology Group's 2013 blueprint for research: Soft tissue sarcomas. Pediatr Blood Cancer, 60(6), 1001–1008. https://doi.org/10.1002/pbc.24435.
9. Maurer, H. M., Beltangady, M., Gehan, E. A., Crist, W., Hammond, D., Hays, D. M., Heyn, R., Lawrence, W., Newton, W., & Ortega, J. (1988). The Intergroup Rhabdomyosarcoma Study-I. A final report. Cancer, 61(2), 209–220. https://doi.org/10.1002/1097-0142(19880115)61:2<209::aid-cncr2820610202>3.0.co;2-l.
10. Crist, W., Gehan, E. A., Ragab, A. H., Dickman, P. S., Donaldson, S. S., Fryer, C., Hammond, D., Hays, D. M., Herrmann, J., & Heyn, R. (1995). The Third Intergroup Rhabdomyosarcoma Study. Journal of Clinical Oncology: Official Journal of the American Society of Clinical Oncology, 13(3), 610–630. https://doi.org/10.1200/JCO.1995.13.3.610.
11. Hays, D. M., Raney, R. B., Jr, Lawrence, W., Jr, Soule, E. H., Gehan, E. A., & Tefft, M. (1982). Bladder and prostatic tumors in the intergroup Rhabdomyosarcoma study (IRS-I): results of therapy. Cancer, 50(8), 1472–1482. https://doi.org/10.1002/1097-0142(19821015)50:8<1472::aid-cncr2820500805>3.0.co;2-y.
12. Rodeberg, D. A., Anderson, J. R., Arndt, C. A., Ferrer, F. A., Raney, R. B., Jenney, M. E., Brecht, I. B., Koscielniak, E., Carli, M., Bisogno, G., Oberlin, O., Rey, A., Ullrich, F., Stevens, M. C., & Meyer, W. H. (2011). Comparison of outcomes based on treatment algorithms for rhabdomyosarcoma of the bladder/prostate: combined results from the Children's Oncology Group, German Cooperative Soft Tissue Sarcoma Study, Italian Cooperative Group, and International Society of Pediatric Oncology Malignant Mesenchymal Tumors Committee. International journal of cancer, 128(5), 1232–1239. https://doi.org/10.1002/ijc.25444.
13. Koscielniak, E., Harms, D., Henze, G., Jürgens, H., Gadner, H., Herbst, M., Klingebiel, T., Schmidt, B. F., Morgan, M., Knietig, R., & Treuner, J. (1999). Results of treatment for soft tissue sarcoma in childhood and adolescence: a final report of the German Cooperative Soft Tissue Sarcoma Study CWS-86. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 17(12), 3706–3719. https://doi.org/10.1200/JCO.1999.17.12.3706.
14. Parham, D. M., & Barr, F. G. (2013). Classification of rhabdomyosarcoma and its molecular basis. Advances in anatomic pathology, 20(6), 387–397. https://doi.org/10.1097/PAP.0b013e3182a92d0d.

15. Rudzinski, E. R., Anderson, J. R., Lyden, E. R., Bridge, J. A., Barr, F. G., Gastier-Foster, J. M., Bachmeyer, K., Skapek, S. X., Hawkins, D. S., Teot, L. A., & Parham, D. M. (2014). Myogenin, AP2β, NOS-1, and HMGA2 are surrogate markers of fusion status in rhabdomyosarcoma: a report from the soft tissue sarcoma committee of the children's oncology group. The American journal of surgical pathology, 38(5), 654–659. https://doi.org/10.1097/PAS.0000000000000195.
16. Arndt, C. A., Stoner, J. A., Hawkins, D. S., Rodeberg, D. A., Hayes-Jordan, A. A., Paidas, C. N., Parham, D. M., Teot, L. A., Wharam, M. D., Breneman, J. C., Donaldson, S. S., Anderson, J. R., & Meyer, W. H. (2009). Vincristine, actinomycin, and cyclophosphamide compared with vincristine, actinomycin, and cyclophosphamide alternating with vincristine, topotecan, and cyclophosphamide for intermediate-risk rhabdomyosarcoma: children's oncology group study D9803. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 27(31), 5182–5188. https://doi.org/10.1200/JCO.2009.22.3768.
17. Bisogno, G., Jenney, M., Bergeron, C., Gallego Melcón, S., Ferrari, A., Oberlin, O., Carli, M., Stevens, M., Kelsey, A., De Paoli, A., Gaze, M. N., Martelli, H., Devalck, C., Merks, J. H., Ben-Arush, M., Glosli, H., Chisholm, J., Orbach, D., Minard-Colin, V., De Salvo, G. L., … European paediatric Soft tissue sarcoma Study Group (2018). Addition of dose-intensified doxorubicin to standard chemotherapy for rhabdomyosarcoma (EpSSG RMS 2005): a multicentre, open-label, randomised controlled, phase 3 trial. The Lancet. Oncology, 19(8), 1061–1071. https://doi.org/10.1016/S1470-2045(18)30337-1.
18. Malempati, S., & Hawkins, D. S. (2012). Rhabdomyosarcoma: review of the Children's Oncology Group (COG) Soft-Tissue Sarcoma Committee experience and rationale for current COG studies. Pediatric blood & cancer, 59(1), 5–10. https://doi.org/10.1002/pbc.24118.
19. Dantonello, T. M., Int-Veen, C., Harms, D., Leuschner, I., Schmidt, B. F., Herbst, M., Juergens, H., Scheel-Walter, H. G., Bielack, S. S., Klingebiel, T., Dickerhoff, R., Kirsch, S., Brecht, I., Schmelzle, R., Greulich, M., Gadner, H., Greiner, J., Marky, I., Treuner, J., & Koscielniak, E. (2009). Cooperative trial CWS-91 for localized soft tissue sarcoma in children, adolescents, and young adults. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 27(9), 1446–1455. https://doi.org/10.1200/JCO.2007.15.0466.
20. Wolden, S. L., Anderson, J. R., Crist, W. M., Breneman, J. C., Wharam, M. D., Jr, Wiener, E. S., Qualman, S. J., & Donaldson, S. S. (1999). Indications for radiotherapy and chemotherapy after complete resection in rhabdomyosarcoma: A report from the Intergroup Rhabdomyosarcoma Studies I to III. Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 17(11), 3468–3475. https://doi.org/10.1200/JCO.1999.17.11.3468.
21. 21.Dávila Fajardo, R., Magelssen, H., Cameron, A. L., Boterberg, T., & Mandeville, H. C. (2025). Current and Future Developments in Radiation Oncology Approach for Rhabdomyosarcoma. Cancers, 17(10), 1618. https://doi.org/10.3390/cancers17101618.
22. Ladra, M. M., Szymonifka, J. D., Mahajan, A., Friedmann, A. M., Yong Yeap, B., Goebel, C. P., MacDonald, S. M., Grosshans, D. R., Rodriguez-Galindo, C., Marcus, K. J., Tarbell, N. J., & Yock, T. I. (2014). Preliminary results of a phase II trial of proton radiotherapy for pediatric rhabdomyosarcoma. Journal of clinical oncology : official journal of the American Society of Clinical Oncology, 32(33), 3762–3770. https://doi.org/10.1200/JCO.2014.56.1548.
23. Rodeberg, D. A., Garcia-Henriquez, N., Lyden, E. R., Davicioni, E., Parham, D. M., Skapek, S. X., Hayes-Jordan, A. A., Donaldson, S. S., Brown, K. L., Triche, T. J., Meyer, W. H., & Hawkins, D. S. (2011). Prognostic significance and tumor biology of regional lymph node disease in patients with rhabdomyosarcoma: a report from the Children's Oncology Group. Journal of clinical oncology : official journal of the American Society of Clinical Oncology, 29(10), 1304–1311. https://doi.org/10.1200/JCO.2010.29.4611.
24. Breneman, J. C., Lyden, E., Pappo, A. S., Link, M. P., Anderson, J. R., Parham, D. M., Qualman, S. J., Wharam, M. D., Donaldson, S. S., Maurer, H. M., Meyer, W. H., Baker, K. S., Paidas, C. N., & Crist, W. M. (2003). Prognostic factors and clinical outcomes in children and adolescents with metastatic rhabdomyosarcoma: a report from the Intergroup Rhabdomyosarcoma Study IV. Journal of Clinical Oncology: Official Journal of the American Society of Clinical Oncology, 21(1), 78–84. https://doi.org/10.1200/JCO.2003.06.129.
25. Ellerkamp, V., Schmidt, A., Warmann, S. W., Eckert, F., Schaefer, J., Paulsen, F., & Fuchs, J. (2023). Detailed functional results after bladder-preserving surgery and high-dose-rate brachytherapy in pediatric bladder/prostate rhabdomyosarcoma. Journal of Cancer Research and Clinical Oncology, 149(7), 3161–3170. https://doi.org/10.1007/s00432-022-04209-5.
26. Castle, J. T., Levy, B. E., Allison, D. B., Rodeberg, D. A., & Rellinger, E. J. (2023). Pediatric Rhabdomyosarcomas of the Genitourinary Tract. Cancers, 15(10), 2864. https://doi.org/10.3390/cancers15102864.
27. Zarrabi, A., Perrin, D., Kavoosi, M., Sommer, M., Sezen, S., Mehrbod, P., Bhushan, B., Machaj, F., Rosik, J., Kawalec, P., Afifi, S., Bolandi, S. M., Koleini, P., Taheri, M., Madrakian, T., Łos, M. J., Lindsey, B., Cakir, N., Zarepour, A., Hushmandi, K., and Ghavami, S. (2023). Rhabdomyosarcoma:

Current Therapy, Challenges, and Future Approaches to Treatment Strategies. Cancers, 15(21), 5269. https://doi.org/10.3390/cancers15215269.

28. Merks, J. H. M., Brack, E., Ebinger, M., Minard-Colin, V., Defachelles, A.-S., Hladun, R., Rogers, T., Fuchs, J., Godzinski, J., van Scheltinga, S. T., Burrieza, G. G., Mandeville, H., Timmermann, B., Fajardo, R. D., van Rijn, R. R., Schäfer, J., Rees, H., Ferrari, A., Alaggio, R., Bisogno, G. (2025). European standard clinical practice recommendations for children and adolescents with Rhabdomyosarcoma a joint EpSSG, CWS and ERN PaedCan project. EJC Paediatric Oncology, 5. https://doi.org/10.1016/j.ejcped.2025.100229.