INDONESIAN HEALTH JOURNAL
https://ihj.rivierapublishing.id/index.php/rp
Volume 5 Number 3, September 2026
P-ISSN: 2963-3044
E-ISSN: 2963-3036

Embryonal Rhabdomyosarcoma of The Urinary Bladder Complicated By Vesicocutaneous Fistula with Fatal Clinical Course: A Case Report

Andesty*, Joko Pitoyo
Universitas Riau, Indonesia
Email: andesty@gmail.com*

Keywords:
Embryonal Rhabdomyosarcoma; Bladder Pediatric; Vesicocutaneous Fistula; Ifosfamide-Induced Encephalopathy

ABSTRACT

This report describes a case of embryonal rhabdomyosarcoma of the urinary bladder in a 4-year-and-11-month-old boy with an aggressive clinical course complicated by multiple concurrent complications. A 4-year-and-11-month-old boy presented with a 2-month history of progressive abdominal distension, urinary retention, and abdominal pain. Ultrasonography revealed a solid mass infiltrating the urinary bladder with bilateral hydronephrosis. Contrast-enhanced computed tomography (CT) of the abdomen and pelvis demonstrated a mixed-density pelvic mass with infiltration of the posterior wall of the urinary bladder. Laparotomy biopsy and cystoscopy were performed, revealing multiple papillary lesions on the bladder mucosa. Histopathological examination confirmed embryonal rhabdomyosarcoma of the urinary bladder, and immunohistochemical analysis using antibodies against desmin, vimentin, Ki-67, and myogenin showed positive expression for all markers. The patient subsequently developed a vesicocutaneous fistula as a postoperative complication, followed by ifosfamide-induced encephalopathy after initiation of VAI chemotherapy, resulting in progressive clinical deterioration and death on the 18th day of the final hospitalization.Embryonal rhabdomyosarcoma of the urinary bladder is a rare malignancy that presents significant diagnostic challenges. Clinicians should maintain a high index of suspicion for this entity and perform immunohistochemical examinations as a critical step in establishing an accurate diagnosis. Multiple concurrent complications, such as vesicocutaneous fistula and ifosfamide-induced encephalopathy, may further worsen clinical outcomes, underscoring the importance of early diagnosis, nutritional optimization, and prompt multidisciplinary management.

INTRODUCTION

Rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma in children and adolescents, accounting for approximately 3% of all pediatric malignancies and nearly half of all pediatric soft tissue sarcomas (Bisogno et al., 2023; Ferrari et al., 2022; Harrison et al., 2024; Weiss & Harrison, 2024). Although RMS can arise in various anatomical locations, the genitourinary tract represents the second most frequent primary site after the head and neck region, with the urinary bladder and prostate being the predominant locations. Embryonal rhabdomyosarcoma (eRMS) is the most common histological subtype and generally has a more favorable prognosis than alveolar rhabdomyosarcoma when diagnosed and treated promptly.

Bladder eRMS typically affects children younger than five years of age and commonly presents with nonspecific urinary symptoms, including hematuria, dysuria, urinary retention, recurrent urinary tract infections, or a palpable lower abdominal mass. Because these clinical manifestations often mimic more common pediatric urinary disorders, diagnosis may be delayed until the tumor reaches an advanced stage, leading to local invasion, obstructive

uropathy, hydronephrosis, impaired renal function, and distant metastasis. Early recognition is therefore essential to improve treatment outcomes and reduce disease-related morbidity (Guiot et al., 2024; Patel et al., 2025; Srivastava et al., 2025; Zhang et al., 2023).

Accurate diagnosis requires a multidisciplinary approach integrating clinical findings, radiological imaging, histopathological examination, and immunohistochemical (IHC) analysis (Abdullakutty et al., 2024; Broggi et al., 2024; Cicerone et al., 2024; Ketineni et al., 2025; Ortega, 2026). Imaging modalities, including ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI), provide valuable information regarding tumor location, local extension, and metastatic spread. However, definitive diagnosis depends on tissue biopsy with immunohistochemical confirmation using myogenic markers such as desmin, myogenin, MyoD1, and vimentin, which help differentiate eRMS from other pediatric spindle cell malignancies (Barresi et al., 2026; Hamid et al., 2024; Jain et al., 2024; Pimenova & Rosenbaum, 2025).

Management of bladder eRMS requires multimodal treatment consisting of surgery, systemic chemotherapy, and selected use of radiotherapy according to tumor stage, histological subtype, and risk stratification (Al-Sattar et al., 2026; Basile et al., 2025; de Angelis et al., 2024; Jo & Yuk, 2024; Kaufmann et al., 2024; Kubik et al., 2025). Despite advances in multimodal therapy, patients presenting with advanced disease may experience severe complications, including obstructive nephropathy, malnutrition, postoperative fistula formation, chemotherapy-related toxicity, and treatment delays, all of which can significantly worsen prognosis and survival. Notably, the coexistence of vesicocutaneous fistula and ifosfamide-induced encephalopathy in a single pediatric patient with bladder eRMS has rarely been documented in the literature, making this case a valuable addition to existing evidence.

Reports describing bladder eRMS complicated simultaneously by vesicocutaneous fistula and ifosfamide-induced encephalopathy remain extremely limited. The coexistence of these complications poses considerable diagnostic and therapeutic challenges and may contribute to rapid clinical deterioration despite standard treatment. Consequently, documentation of such rare cases is important to enrich existing evidence and improve clinicians' awareness of potential complications and prognostic factors. Therefore, we report a rare case of embryonal rhabdomyosarcoma of the urinary bladder in a 4-year-and-11-month-old boy presenting with a large pelvic mass, acute urinary retention, bilateral hydronephrosis, postoperative vesicocutaneous fistula, and ifosfamide-induced encephalopathy, ultimately resulting in a fatal clinical outcome. This report aims to describe the diagnostic process, therapeutic management, clinical course, and lessons learned from this unusual presentation to support earlier recognition and multidisciplinary management of similar cases.

METHOD

This study used a descriptive case report design to describe the clinical course, diagnostic evaluation, therapeutic management, and outcome of a pediatric patient diagnosed with embryonal rhabdomyosarcoma (eRMS) of the urinary bladder complicated by vesicocutaneous fistula and ifosfamide-induced encephalopathy.

Clinical information was retrospectively obtained from the patient's medical records after treatment completion. The collected data included demographic characteristics, presenting symptoms, physical examination findings, laboratory results, radiological findings,

operative findings, histopathological and immunohistochemical results, therapeutic interventions, chemotherapy regimen, postoperative complications, and clinical outcomes.

The diagnosis was established through a comprehensive clinical assessment supported by abdominal ultrasonography, contrast-enhanced computed tomography (CT) of the abdomen and pelvis, cystoscopy, laparotomy biopsy, histopathological examination, and immunohistochemical analysis using desmin, vimentin, Ki-67, and myogenin markers.

The patient's clinical course, management strategies, and complications were descriptively analyzed and discussed in comparison with current evidence from the literature to highlight the diagnostic challenges, therapeutic considerations, and prognostic factors associated with bladder eRMS in children.

Patient confidentiality was maintained by removing all identifiable information. Written informed consent for publication of the clinical data and accompanying images was obtained from the patient's parents or legal guardian before manuscript preparation, in accordance with institutional ethical standards and the principles of the Declaration of Helsinki.

RESULTS AND DISCUSSION

Rhabdomyosarcoma (RMS) is a malignant soft tissue sarcoma arising from primitive mesenchymal cells that normally differentiate into skeletal muscle tissue. Based on histomorphological features and molecular profile, the WHO classifies RMS into four major subtypes: embryonal (eRMS), alveolar (aRMS), pleomorphic, and spindle cell/sclerosing. Among these, eRMS is the most common, with a relatively better prognosis compared to the other subtypes (Alghafees et al., 2022; Liu et al., 2020).

Approximately 75% of bladder eRMS cases are diagnosed before the age of 5 years (Mahandita et al., 2023), consistent with the bimodal age distribution of RMS, which peaks at 2–4 years and 15–19 years (Alghafees et al., 2022). In the case we report, the patient was 4 years and 11 months old, fully consistent with the peak incidence of this age group.

The clinical symptoms of bladder eRMS depend on the location of the mass and the degree of obstruction it causes, including acute urinary retention, hematuria, dysuria, and a palpable abdominal mass (Castle et al., 2023). A similar case in an 18-month-old boy presenting with voiding difficulty and hematuria, confirmed as botryoid eRMS through biopsy and immunohistochemistry, has previously been reported (Mahandita et al., 2023). In our case, the chief complaint of progressive abdominal distension with complete urinary retention reflects the compressive effect of a large retrovesical mass on the bladder neck and bilateral ureters. The absence of hematuria in this case represents a clinical variation that can occur, depending on the growth pattern and relative location of the mass with respect to the bladder mucosa.

Imaging plays an important role in the local evaluation of genitourinary eRMS. Ultrasonography is generally the first radiological examination performed and also allows initial assessment of lymph nodes (Merks et al., 2025). In our case, abdominal ultrasonography showed an inhomogeneous, isohypoechoic lesion in the posteroinferior aspect of the bladder, amorphous in shape with reasonably well-defined but irregular borders, measuring 7.8 x 8.8 cm, infiltrating the bladder wall. The impression was of a predominantly solid mass with a cystic component suspicious for malignancy, with bilateral hydronephrosis and no para-aortic lymphadenopathy.

Contrast-enhanced pelvic MRI is the preferred modality because of its ability to precisely assess tumor extension into surrounding organs and tumor margins for procedural planning (Merks et al., 2025). Contrast-enhanced abdominopelvic CT is used to assess mass spread and lymph node involvement; chest CT is recommended for evaluating pulmonary metastasis, while PET-CT is indicated for evaluating lymph node involvement, bone metastasis, and non-pulmonary lesions in high-risk cases, and is considered superior to bone scintigraphy, which is no longer recommended (Merks et al., 2025). In our case, abdominopelvic CT showed a septated, mixed-density mass in the pelvic cavity with infiltration of the posterior bladder wall and bilateral hydronephrosis.

This case showed histological features characteristic of the botryoid subtype of eRMS, a variant that grows polypoid within the lumen of epithelium-lined hollow organs such as the bladder, with a macroscopic appearance resembling a cluster of grapes (Mahandita et al., 2023). Microscopically, the pathognomonic finding was the cambium layer — a dense zone of tumor cells (rhabdomyoblasts) directly beneath the surface epithelium, with a looser myxoid stroma in the deeper layers, along with tadpole or tennis-racket-shaped cells as markers of skeletal muscle differentiation (Ahsaini et al., 2018). In general, the botryoid subtype is associated with a better prognosis than other RMS subtypes due to a better response to chemotherapy (Saini et al., 2025). Similar histopathological features have been reported in previous cases of bladder eRMS (Mahandita et al., 2023).

Immunohistochemical (IHC) examination is a mandatory confirmatory step in establishing a definitive diagnosis of RMS. The recommended IHC panel includes at minimum Desmin, MyoD1, Myogenin, and Vimentin for all RMS cases. Desmin is an intermediate filament protein expressed in smooth muscle, skeletal muscle, and myocardium, serving as a diagnostic marker through its cytoplasmic positivity in tumor cells (Mahandita et al., 2023). Confirmation of RMS diagnosis requires the combination of Desmin with Myogenin and MyoD1 — both of which are myogenic transcription factors with more specific nuclear expression, and nearly all RMS cases show positivity for all three markers (Saini et al., 2025). Vimentin is an intermediate filament protein expressed in mesenchymal cells, but it is not specific for RMS as it can also be found in certain carcinomas, lymphomas, and melanomas. Nonetheless, Vimentin remains recommended as part of the IHC panel because its negativity may indicate inadequate tissue quality for IHC examination or the absence of mesenchymal differentiation (Jayaraman et al., 2025).

Cytoplasmic Desmin positivity and nuclear Myogenin positivity in tumor cells as confirmatory markers of bladder eRMS have been reported in similar cases (Mahandita et al., 2023). Identical findings were observed in our case. Distinguishing the eRMS subtype from aRMS through IHC carries significant prognostic and therapeutic implications, given that aRMS has a considerably worse prognosis and requires a different risk stratification (Kaseb et al., 2024; Mahandita et al., 2023). In this case, four IHC markers showed positive results — Desmin, Ki-67, Vimentin, and Myogenin (duplicate testing) — collectively confirming the definitive diagnosis of eRMS.

The complications encountered in this case involved several concurrent conditions. Bilateral hydronephrosis is a common obstructive complication of bladder eRMS, occurring due to compression or direct infiltration of the tumor mass into the bilateral ureters (Mahandita et al., 2023; Jayaraman et al., 2025). If not adequately managed, hydronephrosis can lead to

irreversible chronic kidney impairment. In this case, the patient presented with bilateral hydronephrosis, which caused decreased renal function and limited chemotherapy regimen options from the outset.

The acute urinary retention that was the chief complaint at emergency department admission occurred due to direct compression of the tumor mass on the bladder neck — a site that is indeed a predilection location for bladder eRMS (Ahsaini et al., 2018). In this case, multiple papillary lesions were found throughout the bladder mucosal surface with active bleeding, indicating extensive tumor infiltration. As an initial decompression measure, a Foley catheter was inserted until definitive treatment could be planned.

Vesicocutaneous fistula following laparotomy biopsy is a rarely reported complication of eRMS. The formation of an abnormal tract between the tumor-infiltrated bladder and the abdominal skin occurs due to direct tumor infiltration that disrupts the integrity of the bladder wall — a mechanism similar to that reported in bladder malignancies with aggressive local invasion into the abdominal wall (Agarwal et al., 2025). This condition was worsened by hypoalbuminemia and malnutrition, which significantly impaired wound healing. Hypoalbuminemia reflects the degree of systemic inflammatory response that disrupts tissue's ability to recover after surgical trauma, and it has been shown to be an independent risk factor for chemotherapy failure and increased mortality (Soeters et al., 2019). Most vesicocutaneous fistulas have the potential to close spontaneously; however, failure of spontaneous closure typically occurs when the fistula tract has undergone complete epithelialization or is influenced by a neoplastic process, as in this case (Assaker et al., 2021).

Management of RMS requires a multimodal approach involving surgery, radiotherapy, and systemic chemotherapy to achieve optimal outcomes. Treatment decisions must be tailored according to patient age, tumor size, histological subtype, and primary anatomical location. The standard chemotherapy regimen for RMS is the combination of Vincristine, Actinomycin-D, and Cyclophosphamide (VAC) in North America, while in Europe the combination of Ifosfamide, Vincristine, and Actinomycin-D (IVA) is used — neither has shown a significant difference in clinical outcomes (Zarrabi et al., 2023). In this case, the VAI regimen was selected because the main metabolite of Cyclophosphamide is known to cause hemorrhagic cystitis and bladder damage, which could potentially worsen the condition of a bladder already massively infiltrated by tumor (Chiruvella et al., 2020).

In the final phase of care, the patient experienced decreased consciousness, recurrent seizures, and hypoglycemia that did not respond to repeated correction. This condition was most likely a manifestation of ifosfamide-induced encephalopathy (IIE), a neurological complication resulting from ifosfamide toxicity. The mechanism of IIE occurs when ifosfamide metabolism produces an accumulation of chloroacetaldehyde (CAA) via monoamine oxidase activity, which subsequently inhibits the mitochondrial respiratory chain and disrupts intracellular NAD/NADH balance, resulting in an energy deficit in brain cells. The presence of hypoalbuminemia in this patient also contributed as a risk factor that aggravated the occurrence of IIE (Furui et al., 2023). The clinical course in this case ended fatally, reflecting the cumulative impact of advanced-stage disease, delayed diagnosis, and multiple concurrent complications.

Several poor prognostic factors occurring concurrently in this case T4 stage, bilateral hydronephrosis, severe malnutrition, vesicocutaneous fistula, delayed chemotherapy initiation,

and IIE complication synergistically contributed to the fatal outcome, underscoring the importance of early detection, nutritional optimization, and prompt initiation of chemotherapy without delay in advanced-stage eRMS.

CONCLUSION

Embryonal rhabdomyosarcoma of the urinary bladder is a rare pediatric malignancy that may follow an aggressive clinical course. Definitive diagnosis requires tissue biopsy with immunohistochemical confirmation using a panel of markers, including desmin, myogenin, MyoD1, and vimentin. This case illustrates how the presence of multiple poor prognostic factors, including advanced disease stage, malnutrition, vesicocutaneous fistula, and delayed initiation of chemotherapy, may contribute to a fatal outcome. Early multidisciplinary management, comprehensive nutritional support, and close monitoring for chemotherapy-related complications are essential in managing similar cases.

REFERENCES

Abdullakutty, F., Akbari, Y., Al-Maadeed, S., Bouridane, A., Talaat, I. M., & Hamoudi, R. (2024). Histopathology in focus: A review on explainable multi-modal approaches for breast cancer diagnosis. *Frontiers in Medicine, 11*, 1450103.

Agarwal, N., Kumawat, R. K., Sharma, S., Gupta, P., & Jangid, D. K. (2025). Silent but invasive: A case report of a sarcomatoid bladder carcinoma in a 29-year-old male presenting as vesico-cutaneous fistula without hematuria. *Cureus, 17*(7), e88261.

Ahsaini, M., Ouattar, K., Azelmad, H., Mellas, S., Ammari, J. E., Tazi, M. F., et al. (2018). A rare pure embryonal rhabdomyosarcoma of the urinary bladder in an adult successfully managed with neoadjuvant chemotherapy and surgery: A case report. *Journal of Medical Case Reports, 12*(1), 329.

Al-Sattar, H., Ding, H., Okoli, O., Okoli, S., Ghose, A., Banna, G. L., Wan, S., Haroon, A., Wong, J., & Teoh, J. (2026). A multi-modal approach for decision making in bladder cancer. *Nature Reviews Urology*, 1–24.

Alghafees, M. A., Musalli, Z., Alqahtani, M. A., Alhussin, G. I., & Alasker, A. (2022). Bladder embryonal rhabdomyosarcoma among children: A descriptive overview from Saudi Arabia. *Cureus, 14*(4), e23904.

Barresi, S., Rullo, E., Arciuolo, D., & Alaggio, R. (2026). Next-generation sequencing in pediatric soft tissue tumors: Pediatric malignancies. In *Next-generation sequencing in solid tumor histopathology: Practical insights and applications* (pp. 125–142). Springer.

Basile, G., Uleri, A., Leni, R., Cannoletta, D., Afferi, L., Baboudjian, M., Diana, P., D'Andrea, D., Teoh, J., & Pradere, B. (2025). En bloc versus conventional transurethral resection of bladder tumors: A systematic review and meta-analysis of oncological, histopathological, and surgical outcomes. *European Urology Oncology, 8*(2), 520–533.

Bisogno, G., Minard-Colin, V., Zanetti, I., Ferrari, A., Gallego, S., Dávila Fajardo, R., Mandeville, H., Kelsey, A., Alaggio, R., & Orbach, D. (2023). Nonmetastatic rhabdomyosarcoma in children and adolescents: Overall results of the European pediatric soft tissue sarcoma study group RMS2005 study. *Journal of Clinical Oncology, 41*(13), 2342–2349.

Broggi, G., Maniaci, A., Lentini, M., Palicelli, A., Zanelli, M., Zizzo, M., Koufopoulos, N., Salzano, S., Mazzucchelli, M., & Caltabiano, R. (2024). Artificial intelligence in head and neck cancer diagnosis: A comprehensive review with emphasis on radiomics, histopathological, and molecular applications. *Cancers, 16*(21), 3623.

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.
Chiruvella, V., Annamaraju, P., & Guddati, A. K. (2020). Management of nephrotoxicity of chemotherapy and targeted agents: 2020. *American Journal of Cancer Research, 10*(12), 4151–4164.
Cicerone, C., D'Amico, F., Allocca, M., Zilli, A., Parigi, T. L., Danese, S., & Furfaro, F. (2024). A comprehensive multidisciplinary approach to diagnosing chronic inflammatory bowel diseases: Integration of clinical, endoscopic, and imaging modalities. *Diagnostics, 14*(14), 1530.
de Angelis, M., Baudo, A., Siech, C., Jannello, L. M. I., Di Bello, F., Goyal, J. A., Tian, Z., Longo, N., De Cobelli, O., & Chun, F. K. H. (2024). Non-surgical bladder-sparing multimodal management in organ-confined urothelial carcinoma of the urinary bladder: A population-based analysis. *Cancers, 16*(7), 1292.
Ferrari, A., Brennan, B., Casanova, M., Corradini, N., Berlanga, P., Schoot, R. A., Ramirez-Villar, G. L., Safwat, A., Guillen Burrieza, G., & Dall'Igna, P. (2022). Pediatric non-rhabdomyosarcoma soft tissue sarcomas: Standard of care and treatment recommendations from the European Paediatric Soft Tissue Sarcoma Study Group (EpSSG). *Cancer Management and Research*, 2885–2902.
Furui, Y., Komori, K., Kurata, T., & Sakashita, K. (2023). Ifosfamide-induced encephalopathy successfully prevented by methylene blue: A pediatric case report and review of the literature. *Cureus, 15*(6), e40213.
Guiot, J., Miedema, J., Cordeiro, A., De Vries-Bouwstra, J. K., Dimitroulas, T., Søndergaard, K., Tzouvelekis, A., & Smith, V. (2024). Practical guidance for the early recognition and follow-up of patients with connective tissue disease-related interstitial lung disease. *Autoimmunity Reviews, 23*(6), 103582.
Hamid, G. A., Hariri, F., & Luisetto, M. (2024). Advances in molecular diagnosis and personalized treatment of soft tissue sarcomas. *International Research Journal of Oncology, 7*, 239–259.
Harrison, D. J., Qumseya, A., Xue, W., Arnold, M., Lautz, T. B., Hiniker, S. M., Thomas, S. M., Venkatramani, R., Weiss, A. R., & Mascarenhas, L. (2024). Adolescents and young adults with rhabdomyosarcoma: A report from the Soft Tissue Sarcoma Committee of the Children's Oncology Group. *Pediatric Blood & Cancer, 71*(4), e30847.
Jain, E., Munjal, G., Sharma, S., Brar, Z., Bhardwaj, N., Dewan, A., Jain, D., Jha, S., Lobo, A., & Malik, V. (2024). Multifaceted spindle cell/sclerosing rhabdomyosarcoma with role of immunohistochemistry in avoiding misdiagnosis: A multi-institutional study of 45 distinct tumors. *International Journal of Surgical Pathology, 32*(3), 496–506.
Jayaraman, S., Koenig, J., Meier, K. M., Fricke, L., & Campbell, K. (2025). Nephrostomy tubes for management of a bladder occupying embryonal rhabdomyosarcoma in a 2-year-old: A case report and review of the literature. *Urology Case Reports, 59*, 102938.
Jo, Y., & Yuk, H. D. (2024). Trimodal therapy in the treatment of muscle-invasive bladder cancer. *Journal of Urologic Oncology, 22*(3), 256–267.
Kaseb, H., Kuhn, J., & Gasalberti, D. P. (2024). Rhabdomyosarcoma. In *StatPearls*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK507721/
Kaufmann, E., Aeppli, S., Arnold, W., Balermpas, P., Beyer, J., Bieri, U., Cathomas, R., de Bari, B., Dressler, M., & Engeler, D. S. (2024). Follow-up strategies after trimodal treatment for muscle-invasive bladder cancer: A systematic review. *World Journal of Urology, 42*(1), 527.
Ketineni, R. R., Singh, B., Chandralekha, A. R., MS, I., Soni, K., Lodha, N., & Singh, B. (2025). Advances in radiological imaging modalities and their expanding role in the early diagnosis, monitoring, and prognosis of internal medicine disorders: A comprehensive review. *Cureus, 17*(12).

Kubik, A., das Virgens, I. P. A., Varga, N., Szabó, A., Keszthelyi, A., Fehérvári, P., Hegyi, P., Ács, N., Nyirády, P., & Szarvas, T. (2025). Radical surgery compared to bladder-preserving approaches for limited stage small-cell bladder cancer: Systematic review and meta-analysis. *Clinical Genitourinary Cancer*, 102389.

Liu, S., Wang, Z., Lian, X., He, A., Zhang, A., Li, X., et al. (2020). Characteristics and prognosis of embryonal rhabdomyosarcoma in children and adolescents: An analysis of 464 cases from the SEER database. *Cancer Medicine, 9*(24), 9536–9545.

Mahandita, I. M., Daryanto, B., & Nurhadi, P. (2023). Bladder embryonal rhabdomyosarcoma in an 18-months-old boy: A case report. *Indonesian Journal of Urology, 30*(1), 51–56.

Merks, J. H. M., Brack, E., Ebinger, M., Minard-Colin, V., Defachelles, A. S., Hladun, R., et al. (2025). European standard clinical practice recommendations for children and adolescents with rhabdomyosarcoma: A joint EpSSG, CWS and ERN PaedCan project. *EJC Paediatric Oncology, 5*, 100229.

Ortega, R. M. (2026). Exploring the role of immunohistochemistry in diagnostic pathology. *Corps et Psychisme: Recherches en Psychanalyse et Sciences Humaines, 13*(1), 994–999.

Patel, S., Huang, M., & Miliara, S. (2025). Understanding treatment adherence in chronic diseases: Challenges, consequences, and strategies for improvement. *Journal of Clinical Medicine, 14*(17), 6034.

Pimenova, M., & Rosenbaum, M. W. (2025). Spindle cell neoplasms of the gastrointestinal tract: A review of the differential diagnosis and diagnostic algorithms. *Diagnostic Histopathology*.

Saini, A., Sharma, U., Makkar, A., Paighan, N. M., & Saxena, S. A. (2025). Rhabdomyosarcoma of the urinary bladder in a young adult: A case report and current literature analysis. *Journal of Urological Surgery*. https://doi.org/10.4274/jus.galenos.2025.2025-1-7

Soeters, P. B., Wolfe, R. R., & Shenkin, A. (2019). Hypoalbuminemia: Pathogenesis and clinical significance. *JPEN Journal of Parenteral and Enteral Nutrition, 43*(2), 181–193.

Srivastava, V., Kumar, R., Wani, M. Y., Robinson, K., & Ahmad, A. (2025). Role of artificial intelligence in early diagnosis and treatment of infectious diseases. *Infectious Diseases, 57*(1), 1–26.

Weiss, A. R., & Harrison, D. J. (2024). Soft tissue sarcomas in adolescents and young adults. *Journal of Clinical Oncology, 42*(6), 675–685.

Zarrabi, A., Perrin, D., Kavoosi, M., Sommer, M., Sezen, S., Mehrbod, P., et al. (2023). Rhabdomyosarcoma: Current therapy, challenges, and future approaches to treatment strategies. *Cancers, 15*(21), 5269.

Zhang, B., Shi, H., & Wang, H. (2023). Machine learning and AI in cancer prognosis, prediction, and treatment selection: A critical approach. *Journal of Multidisciplinary Healthcare*, 1779–1791.