The THAI Journal of SURGERY 2025;46(4):204-210.
Official Publication of The Royal College of Surgeons of Thailand

Case Report

Retroperitoneal Extraosseous Ewing's Sarcoma in a Young Infant: A Case Report and Literature Review

Sasabong Tiyaamornwong, MD[1]
Parамee Thongsuksai, MD[2]
Jirameth Yiambunya, MD[1]
Pornpun Sripornsawan, MD[3]
Supika Kritsaneepaiboon, MD[4]
Surasak Sangkhathat, MD, PhD[1,5]

[1] *Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand*
[2] *Department of Radiology, Section of Pediatric Imaging, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand*
[3] *Department of Pediatric, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand*
[4] *Department of Pathology, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand*
[5] *Department of Biomedical Sciences and Biomedical Engineering, Faculty of Medicine, Prince of Songkla University, Songkhla, Thailand*

Abstract Ewing's sarcoma (ES) is a rare malignancy primarily affecting bone and soft tissue in children and adolescents. While often presenting with palpable masses and bone pain, extraskeletal Ewing's sarcoma (EES) can manifest with diverse symptoms depending on the location. Accurate diagnosis and prompt treatment of EES are crucial for minimizing recurrence and improving survival outcomes. This case report describes a young infant presenting with a palpable left-sided abdominal mass, ultimately diagnosed as retroperitoneal EES. An initial computed tomography (CT) scan of the abdomen revealed a necrotic mass on the left side, arising from the pancreatic body and tail, leading to a suspicion of pancreatoblastoma. An unexpected finding during surgical exploration revealed a large, well-circumscribed, yellowish, hypervascular retroperitoneal mass attached to the tail of the pancreas. Histopathological examination of the resected tumor confirmed the diagnosis of Ewing's sarcoma. The infant was subsequently treated with a combination of chemotherapy and radiation therapy due to a tumor attached to the tail of the pancreas. This report highlights the diagnostic challenges and management strategies for retroperitoneal EES in infants, contributing to the limited existing literature on this rare clinical entity.

Keywords: Ewing's sarcoma, Pediatric sarcoma, Pediatric tumor

Received for publication 14 January 2025; Revised 2 March 2025; Accepted 28 March 2025

Corresponding author: *Surasak Sangkhathat, MD, PhD, Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand 90110; E-mail: surasak.sa@psu.ac.th*

https://doi.org/10.64387/tjs.2025.273152

Introduction

Ewing's sarcoma family of tumors (ESFS) is a group of rare and aggressive malignancies that predominantly affect bone and soft tissue in children and adolescents.[1,2] ESFS was divided into four types based on the origin of cancer: Extraosseous Ewing's sarcoma or extraskeletal Ewing's sarcoma (EES), Ewing's sarcoma of bone (ES), peripheral primitive neuroectodermal tumor (pPNET) and Askin's tumor. EES, including the paravertebral spaces, lower extremities, head and neck, and pelvis, occurs in about 20% of all Ewing's sarcoma cases.[3] EES arises in various locations and accounts for approximately 10-15% of all Ewing's sarcoma cases, with the retroperitoneum being an uncommon primary site.[4] These tumors often present with nonspecific symptoms, such as abdominal pain, palpable mass, and distention, making early diagnosis challenging. Furthermore, the proximity of retroperitoneal EES to vital organs and structures can complicate surgical resection and increase the risk of complications. The incidence of EES is 0.4 per million individuals.[5] Moreover, previous reports revealed that EES has a bimodal distribution, which has the occurrence rate among children (< 5 years) and adults (> 35 years).[1] This report describes a rare case of retroperitoneal EES in a young infant presenting with a palpable left-sided abdominal mass. The diagnostic workup found that the mass arose from the pancreatic body and tail, but surgical management and histopathological findings confirmed Ewing's sarcoma, highlighting the importance of a multidisciplinary approach in managing this rare entity. This case contributes to the limited literature on retroperitoneal EES in infants and emphasizes the need for heightened awareness among clinicians to ensure prompt diagnosis and treatment.

Case Report

This case report was informed consent from the patient for publication of this case report and accompanying images.

A 1-year-old boy presented with a palpable painless abdominal mass that had been progressively enlarging for over one month. The mass was located in the left upper quadrant and was not associated with any other significant symptoms, such as anorexia, weight loss, fever, obstipation, vomiting, or hematuria.

At a local hospital, an abdominal examination confirmed a large, non-tender mass in the left upper quadrant. A computerized tomography (CT) scan of the abdomen revealed a heterogeneously enhanced mass with internal necrosis measuring $8.2 \times 8.6 \times 9.9$ cm at the left anterior pararenal space. The pancreatic body and tail were posteriorly displaced without normal fat plane separation, raising suspicion of a pancreatoblastoma originating from the pancreatic body and tail. The adjacent spleen was compressed with a hypodense area, suggesting perfusion abnormality. The left kidney was also posteriorly displaced without invasion. No liver or adrenal metastasis was identified (Figure 1). Based on these findings, a differential diagnosis of pancreatic tumor or retroperitoneal tumor was considered, and the patient was then referred to our hospital for further management.

Upon admission to our hospital, a physical examination revealed a large, non-movable, non-tender mass in the left upper quadrant, measuring approximately 8×8 cm. The remainder of the physical examination was unremarkable. Laboratory investigations, including liver function tests, complete blood count, and electrolytes, were all within normal ranges. Tumor markers, including CA19-9, β-HCG, AFP, and NSE, were all negative. A review of the abdominal CT scan confirmed the previous findings. To further evaluate metastatic disease, a CT scan of the chest and a bone scan were performed, both of which were negative for evidence of metastasis.

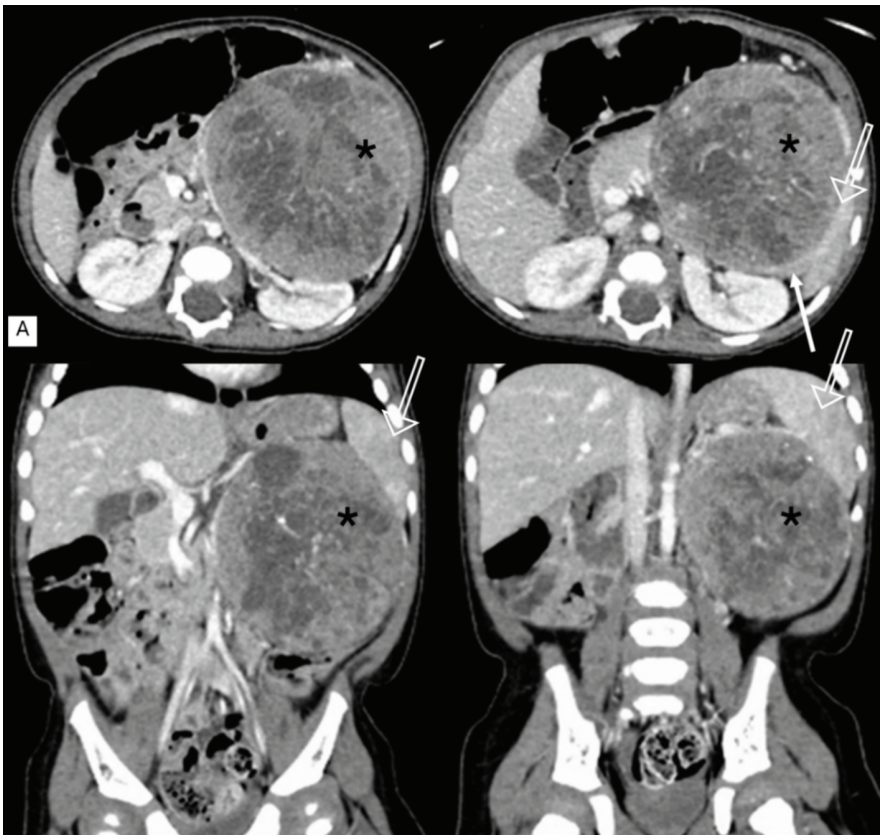

Figure 1 Computerized tomography scan of the whole abdomen (CTWA) axial view (A, B) and coronal view (C, D) demonstrated a heterogeneously enhanced mass with internal necrosis at the left anterior pararenal space (asterisk). There was a mass effect to posteriorly displace pancreatic body and tail (white arrow), laterally displace spleen with perfusion abnormality (open arrow)

Preoperative planning and surgery

Given the close proximity of the tumor to the splenic vessels, as demonstrated on the CT scan, preoperative pneumococcal vaccination against encapsulated organisms was administered to mitigate the risk of post-splenectomy sepsis in the event of accidental splenic injury. The tissue biopsy was not performed because the primary suspicion was pancreatoblastoma, and the gold standard management was complete resection of the tumor. Neoadjuvant chemotherapy was obtained when primary surgical resection was not possible.[2] The case was discussed at the multidisciplinary meeting, and the decision was made to proceed with surgery for tumor removal.

The patient underwent exploratory laparotomy. We performed a transverse incision in the left upper abdomen to allow easy access to the tumor. The left side of the colon was then mobilized to expose the mass. Unexpectedly, the intraoperative findings revealed a large, well-circumscribed retroperitoneal mass measuring 10 × 10 cm on the left side of the abdomen. The mass was attached to the tail of the pancreas but did not appear to originate from it. Notably, the mass was also adherent to the splenic vessels (Figure 2). Careful dissection allowed for complete separation of the tumor from the tail of the pancreas and splenic vessels, enabling total tumor removal with preservation of the pancreas and spleen. The tumor was resected with close margins to the pancreas, so a biopsy of the pancreatic tail was performed to evaluate for pancreatic invasion. There were no intraoperative complications.

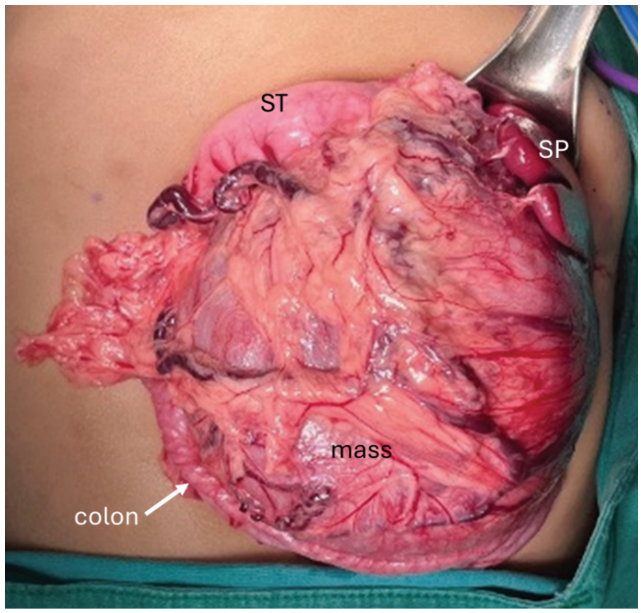

Figure 2 Intraoperative findings show a large hypervascularized retroperitoneal mass attached to the stomach at the superior margin (ST), splenic vessel, and spleen at the lateral margin (SP).

Pathological examination

Gross examination of the resected specimen revealed a yellowish, well-circumscribed, hypervascular mass measuring 10 × 10 cm. There was no evidence of tumor rupture (Figure 3). Cut sections of the mass showed pale-yellow, rubbery tissue with small areas of cystic degeneration. A small 2 cm satellite lymph node was identified at the lower pole of the main tumor mass (Figure 3).

Microscopic examination (H&E stain) showed uniform, small, round cells arranged in sheets separated by dense fibrous tissue (Figure 4). The tumor cells had round nuclei, finely stippled chromatin, indistinct nucleoli, and scant clear to pale eosinophilic cytoplasm. Homer-Wright rosettes (tumor cells arranged around a central area of fibrillary material) and patchy areas of necrosis were observed in the small satellite nodule. Periodic acid-Schiff (PAS) stain was positive and diastase-sensitive, indicating the presence of intracytoplasmic glycogen. Immunohistochemical stains demonstrated diffuse membrane staining for CD99 and focal positivity for neuron-specific enolase (NSE). The tumor cells were negative for AE1/AE3, EMA, CD56, S100, desmin, SMA, MyoD1, WT-1, chromogranin, and synaptophysin. Pancreatic tissue was not involved by tumor cells. These histomorphological and immunohistochemical findings were consistent with the diagnosis of Ewing's sarcoma, and resection margins were clear.

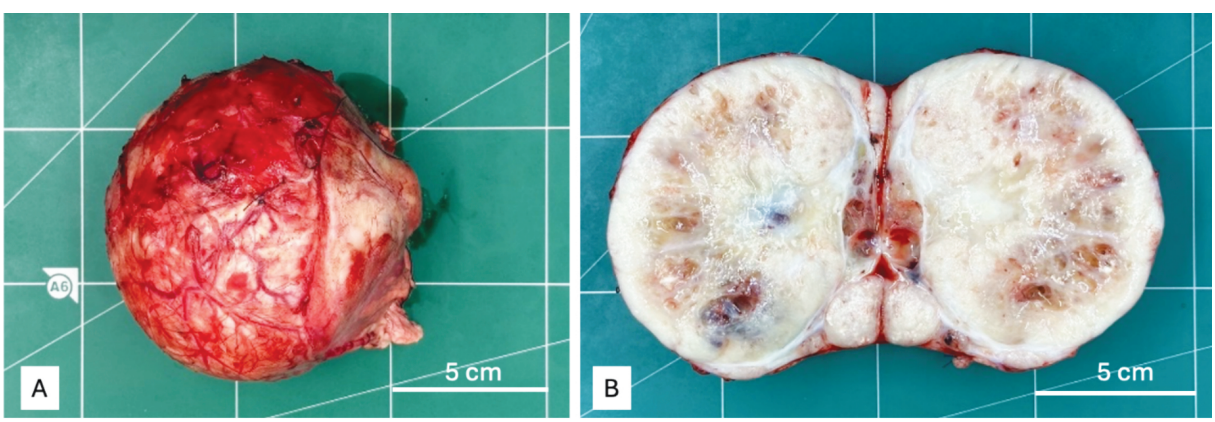

Figure 3 (A) Gross pathology revealed yellowish and hypervascular well-circumscribed mass. (B) Cross section of the mass showed two pale-yellow rubbery tissues with slight cystic degeneration (black arrow).

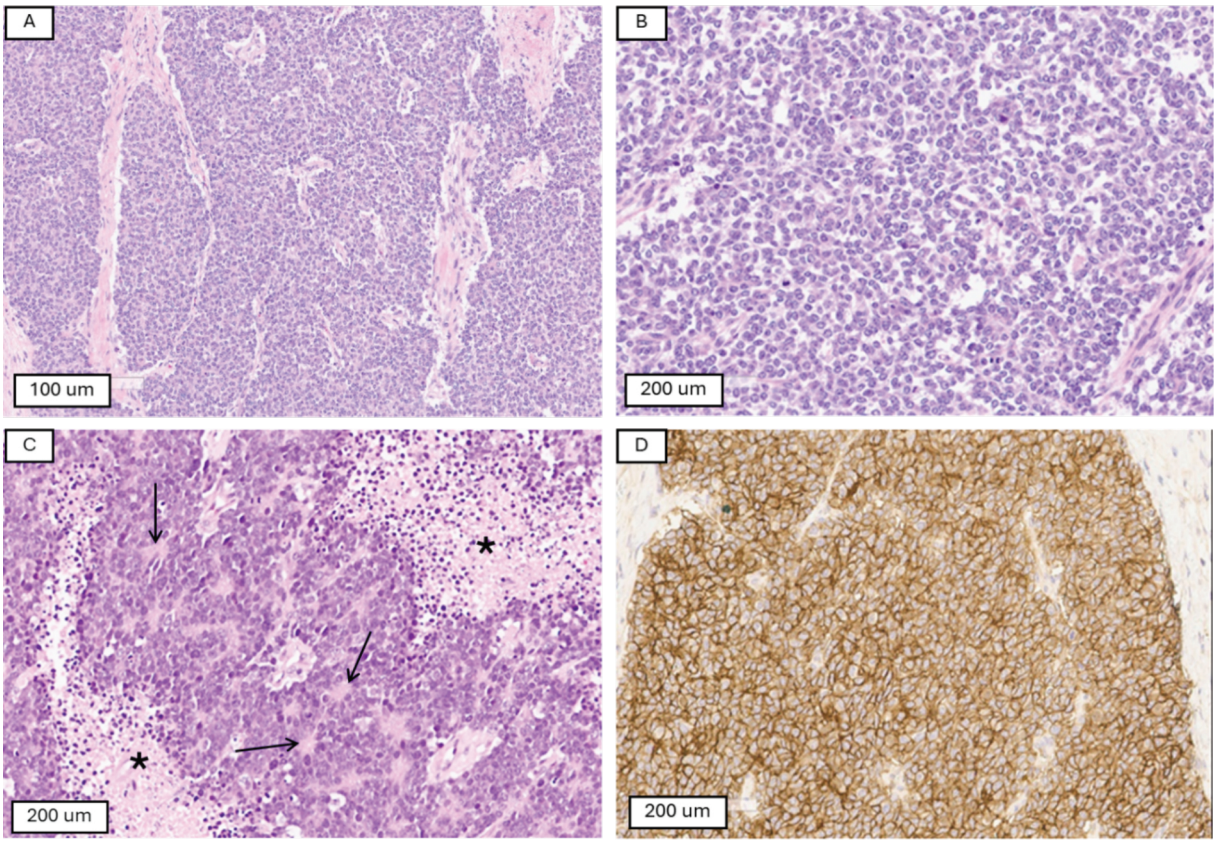

Figure 4 Morphologic features of the tumor. (A) and (B) H&E section (100× and 200× original magnification) Sheets of uniform round cells separated by fibrous tissue. (C) Homer-Wright rosettes (arrow) and tumor necrosis (asterisk). (D) Intense membrane immunostaining for CD99 (200×).

Postoperative management and outcome

Following surgery, a postoperative CT scan of the abdomen at one month showed no gross residual tumor at the resection margins. The patient received interval-compressed adjuvant chemotherapy consisting of vincristine (2 mg/m²), doxorubicin (37.5 mg/m²/day), cyclophosphamide (1,200 mg/m²), and mesna (300 mg/m²/dose) alternating with ifosfamide (1,800 mg/m²/day) and etoposide (100 mg/m²/day) every 2 weeks for a total of 14 cycles for systemic control.[15]

A patient with localized EES underwent surgical resection. Intraoperatively, we found a tumor close to the margin of the pancreas, but the pathological report revealed Ewing's sarcoma and resection margins were clear. The case was discussed at the multidisciplinary meeting, and the decision was made to receive the local control by external beam radiation therapy (45 + 5.4 Gy/28 fractions) over a total of 6 weeks to avoid the recurrence of Ewing's sarcoma. The patient is under regular follow-up care and remains cancer-free at 1-year post-treatment.

Discussion

EES accounts for approximately 10-15% of all Ewing's sarcoma cases. While EES can occur anywhere in the body, the most common locations include the paravertebral region, chest wall, lower extremities, and the retroperitoneum.[4] Diagnosing Ewing sarcoma in such atypical sites is challenging and usually requires an integrated approach combining histology, immunohistochemistry, and molecular techniques.[1] Differential diagnoses of retroperitoneal mass near the tail of the pancreas in an infant include teratoma, neuroblastoma, rhabdomyosarcoma, and other non-rhabdomyosarcoma soft tissue tumors. We can differentiate the diagnosis of a retroperitoneal mass by its location and other markers, such as rising AFP levels in yolk sac tumors, rising β-HCG levels in choriocarcinoma, bone involvement in Ewing sarcoma, and bone marrow involvement in neuroblastoma. However, the definitive diagnosis is based on histologic results from percutaneous biopsy or resection.[5] Our patient had previously been diagnosed with a

pancreatic tumor based on imaging, so we considered the potential for surgical resection. Unfortunately, intraoperative findings revealed that the mass did not arise from the pancreas but from the retroperitoneum, attaching to the tail of the pancreas. Therefore, we performed a complete resection with pancreatic tail biopsy to obtain the specimen for histopathological study. The pathologic reports showed Ewing's sarcoma and resection margins were clear.

The hallmark of Ewing's sarcoma is a monotonous population of small, round cells with scant cytoplasm and high nuclear-to-cytoplasmic ratios, typically arranged in sheets or nests.[6] The nuclei are round and uniform in size, with finely dispersed chromatin and inconspicuous nucleoli. Areas of necrosis and hemorrhage are common, reflecting the tumor's rapid growth and vascularity. Homer-Wright rosettes (cells arranged in a circle around a central fibrillary space) may be present but are not as common as in other small round blue cell tumors. The diagnosis of ES in our patient was based on this typical histopathology. It was supported by positive immunostaining of CD99, which was the most sensitive marker for Ewing's sarcoma, showing strong and diffuse membrane staining in almost all cases. The genetic hallmark of Ewing's sarcoma is the translocation-fusion between the EWS RNA binding protein 1 (EWSR1) gene or the fused in sarcoma/translocated in sarcoma (FUS) gene and a member of the ETS family of transcription factors, which the most common is the FLI1 gene on chromosome 11.[3,7,8] Recent studies have found other somatic mutations in ES patients, such as mutations in tumor protein 53 (TP53) and stromal antigen 2 (STAG2). The benefit of somatic mutation in Ewing's sarcoma patients is to identify appropriate treatment because patients with increased somatic mutations are more aggressive and treatment-resistant than tumors with minimal mutations.[9] In our case, we could not perform the fusion gene analysis because the RNA quality of the collected specimen was limited.

EES may be presented as localized or metastatic disease. Localized EES carries a better prognosis, with 10-year event-free survival (EFS) and overall survival (OS) rates of 77.5% and 85.5%, respectively, compared to 11.1% and 29.5% for metastatic disease. This difference persists despite both groups receiving surgery, radiotherapy, and chemotherapy, except for patients with small, completely resected tumors who may not require radiotherapy.[10]

The current treatment recommended by the National Comprehensive Cancer Network (NCCN) for EES involves local and systemic control.[5] Local control is achieved through surgery and/or radiotherapy, with complete surgical resection being the gold standard for localized disease. Systemic treatment relies on chemotherapy, typically combined with doxorubicin, cyclophosphamide, vincristine, actinomycin-D, ifosfamide, and etoposide.[11-14] While EES is radiosensitive, surgery is the preferred method for local control to minimize radiation-associated risks. Wide resection without radiation is ideal for localized lesions with no evidence of microscopic residual disease. The overall 5-year survival rate is better in patients who undergo complete resection, with wide surgical margins compared with suboptimal margins.[5] However, if the tumor is not resectable with clear margins or if the surgery involves vital fixed structures, postoperative radiotherapy may be added for incomplete resection.[5,15] Some reports, such as by R. AL Rashed et al., describe retroperitoneal EES invading the left adrenal gland, which was completely resected, and a partial left adrenalectomy with negative margin resection. The patient then received adjuvant chemotherapy without radiotherapy.[16] However, Wu et al. reported a case of large retroperitoneal EES with a mass effect on the left kidney. The patient underwent exploratory laparotomy with tumor resection and left radical nephrectomy. The pathological report showed free margin resection, but the patient received adjuvant chemotherapy and radiotherapy to avoid recurrence.[17] Both cases showed good outcomes with no recurrence. In our case report, a patient with localized EES underwent surgical resection. He received adjuvant chemotherapy and radiotherapy by an oncologist and radiation oncologist because of the intraoperative finding of a tumor close to the margin of the pancreas to avoid the recurrence of EES. The patient will undergo surveillance imaging every 2-3 months for the first three years, which is the recommended follow-up for localized, non-metastatic EES.[13] Our patient was followed up.

Conclusion

We report a case of EES in a male infant who presented with an abdominal mass. The patient underwent successful surgical resection, but intraoperatively, the tumor was found to be close to the margin of the pancreas. As a result, the patient received adjuvant chemotherapy and external radiation to avoid the recurrence of EES.

The study suggests that EES should be considered as one of the differential diagnoses for retroperitoneal masses during infancy and highlights the role of external radiation therapy in cases of close-margin resection to avoid the recurrence of EES.

REFERENCES

1. Khoury JD. Ewing sarcoma family of tumors: a model for the new era of integrated laboratory diagnostics. Expert Rev Mol Diagn. 2008;8(1):97-105. doi: 10.1586/14737159.8.1.97.
2. Glick RD, Pashankar FD, Pappo A, et al. Management of pancreatoblastoma in children and young adults. J Pediatr Hematol Oncol. 2012;34(Suppl 2):S47-50. doi: 10.1097/MPH.0b013e31824e3839.
3. Liu KX, Lamba N, Hwang WL, et al. Risk stratification by somatic mutation burden in Ewing sarcoma. Cancer. 2019;125(8):1357-64. doi: 10.1002/cncr.31919.
4. Applebaum MA, Worch J, Matthay KK, et al. Clinical features and outcomes in patients with extraskeletal Ewing sarcoma. Cancer. 2011;117(13):3027-32. doi: 10.1002/cncr.25840.
5. Abboud A, Masrouha K, Saliba M, et al. Extraskeletal Ewing sarcoma: Diagnosis, management and prognosis (Review). Oncol Lett. 2021;21(5):354. doi: 10.3892/ol.2021.12615.
6. Desai SS, Jambhekar NA. Pathology of Ewing's sarcoma/PNET: Current opinion and emerging concepts. Indian J Orthop. 2010;44(4):363-8. doi: 10.4103/0019-5413.69304.
7. Zhang J, Zhang Y, Li Z, et al. Bioinformatics analysis of Ewing's sarcoma: Seeking key candidate genes and pathways. Oncol Lett. 2019;18(6):6008-16. doi: 10.3892/ol.2019.10936.
8. Ebegboni VJ, Jones TL, Brownmiller T, et al. ETS1, a target gene of the EWSR1::FLI1 fusion oncoprotein, regulates the expression of the focal adhesion protein TENSIN3. Mol Cancer Res. 2024;22(7):625-41. doi: 10.1158/1541-7786.MCR-23-1090.
9. Tirode F, Surdez D, Ma X, et al. Genomic landscape of Ewing sarcoma defines an aggressive subtype with co-association of STAG2 and TP53 mutations. Cancer Discov. 2014;4(11):1342-53. doi: 10.1158/2159-8290.CD-14-0622.
10. Livellara V, Bergamaschi L, Puma N, et al. Extraosseous Ewing sarcoma in children and adolescents: A retrospective series from a referral pediatric oncology center. Pediatr Blood Cancer. 2022;69(5):e29512. doi: 10.1002/pbc.29512.
11. Galyfos G, Karantzikos GA, Kavouras N, et al. Extraosseous Ewing sarcoma: Diagnosis, prognosis and optimal management. Indian J Surg. 2016;78(1):49-53. doi: 10.1007/s12262-015-1399-0.
12. Boyce-Fappiano D, Guadagnolo BA, Ratan R, et al. Evaluating the soft tissue sarcoma paradigm for the local management of extraskeletal Ewing sarcoma. Oncologist. 2021;26(3):250-60. doi: 10.1002/onco.13616.
13. Womer RB, West DC, Krailo MD, et al. Randomized controlled trial of interval-compressed chemotherapy for the treatment of localized Ewing sarcoma: a report from the Children's Oncology Group. J Clin Oncol. 2012;30(33):4148-54. doi: 10.1200/JCO.2011.41.5703.
14. Ghandour M, Lehner B, Klotz M, et al. Extraosseous Ewing sarcoma in children: A systematic review and meta-analysis of clinico-demographic characteristics. Children (Basel). 2022;9(12):1859. doi: 10.3390/children9121859.
15. Iwamoto Y. Diagnosis and treatment of Ewing's sarcoma. Jpn J Clin Oncol. 2007;37(2):79-89. doi: 10.1093/jjco/hyl142.
16. AlRashed R, AlHarbi H, Abdulfattah F, et al. A case report of retroperitoneal Ewing sarcoma requiring adrenalectomy. Int J Surg Case Rep. 2022;95:106966. doi: 10.1016/j.ijscr.2022.106966.
17. Wu SY, Hsu CK, Yue CT, et al. Large retroperitoneal extraskeletal Ewing's sarcoma with renal pedicle invasion: a case report. BMC Urol. 2023;23(1):95. doi: 10.1186/s12894-023-01272-z.