UDK: 616.833-006.04

CASE REPORT

MALIGNANT PERIPHERAL NERVE SHEATH TUMOR IN THE RETROPERITONEUM NOT ASSOCIATED WITH THE RENAL OR PERIRENAL PARENCHYMA: A CASE REPORT

Petrova Chemerski N.[1], Mojsova-Mijovski M.[1,2], Panovska Petrusheva A.[1], Dohchev S.[3], Jovanovski Srceva M.[1], Gavrilovska Brzanov A.[1]

[1]University Clinic for Traumatology, Orthopedic Disease, Anesthesiology, Reanimation and Intensive Care Medicine and Emergency Department, Faculty of Medicine, "Ss Cyril and Methodius" University, Skopje, RN Macedonia
[2]Faculty of Medical Sciences,"Goce Delchev" University, Shtip, Republic of North Macedonia
[3]University Clinic for Urology, Faculty of Medicine, Ss. Cyril and Methodius University, Skopje, RN Macedonia

Abstract

The occurrence of an isolated malignant peripheral nerve sheath tumor (MPNST) in the retroperitoneum, unassociated with the kidney capsule, is exceedingly rare, often presenting with an insidious onset of non-specific and misleading symptoms, primarily characterized by lower back pain.
We present the case of a patient with a malignant peripheral nerve sheath tumor (MPNST), without neurofibromatosis with nonspecific localization in the retroperitoneum in front of vena cava inferior non associated with the kidney. A 62-years-old male patient was referred due to the presence of an abdominal tumor without accompanying pain. Computed tomography identified a substantial soft tissue retroperitoneal tumor situated anterior to the inferior vena cava. A total resection was performed. The pathological testing verified the existence of a malignant peripheral nerve sheath tumor. The patient received additional treatment through radiotherapy and chemotherapy.
This is the inaugural reported case of malignant peripheral nerve sheath tumor in the retroperitoneum without neurofibromatosis, unassociated with renal or perirenal parenchyma. We recommend incorporating malignant peripheral nerve sheath tumor into the differential diagnosis of abdominal masses.

Key Words: *Malignant peripheral nerve sheath tumor; prognosis; retroperitoneum, surgery.*

Introduction

Malignant peripheral nerve sheath tumors (MPNSTs) are rare soft-tissue sarcomas that commonly occur in the extremities and are often associated with neurofibromatosis. MPNSTs accounts for 5–10% of all soft-tissue sarcomas, and up to 50% occur in patients with neurofibromatosis type 1 (NF-1), with an incidence of 1 to 10 in 1000000 patients (1).

MPNSTs affect adults aged 20–50 years and are typically connected to the main trunks of nerves. Most MPNSTs are aggressive and have high rates of recurrence and distant metastases, with the lungs being the most common site of MPNST metastases (1,2). An MPNST of the kidney is an exceedingly rare occurrence. Only a few cases of MPNST in the retroperitoneum that is not associated with the kidneys have been reported in the literature (3). An aggressive surgical approach and combined chemotherapy are the accepted model of treatment (4).

Case Presentation

A 62-years-old male, a former smoker with a known history of hypertension managed with Enalapril 5mg once daily, obesity (body mass index: 34.6kg/m²), and benign prostatic hyperplasia treated with Tamsulosin 0.4mg once daily, was incidentally found to have a retroperitoneal mass on abdominal ultrasound and computed tomography (CT). The patient was asymptomatic at the time of presentation and his physical examination was unremarkable. There was no personal or familial history of von Recklinghausen's disease. Laboratory investigations revealed hemoglobin (Hb) of 108g/L, leukocytes (Le) at 6.3 x 10^9/L, erythrocytes (Er) at 5.01 x 10^{12}/L, hematocrit (Hct) at 0.352L/L, platelets (Tr) at 320 x 10^9/L, fasting glucose at 5.17mmol/L, urea at 7.6mmol/L, creatinine at 77.6µmol/L, sodium (Na) at 140mmol/L, potassium (K) at 3.6mmol/L, chloride (Cl) at 106mmol/L, and calcium (Ca) at 2.28mmol/L. A chest radiograph demonstrated findings consistent with chronic bronchitis. Abdominal CT confirmed the presence of a 9x9cm retroperitoneal soft tissue mass, predominantly solid, with distal sections containing a small amount of fluid. The lesion was positioned anteriorly to the inferior vena cava, extending towards the right hepatic lobe and the quadrate lobe of the liver, without definitive imaging evidence of hepatic origin. Given the deep location of the lesion, percutaneous biopsy under CT guidance was deemed unsuitable. The patient was scheduled for tumor resection and presented to the operating room in an awake and alert state, albeit with mild preoperative anxiety. Pre-induction vital signs were as follows: blood pressure (BP) 182/98mmHg, heart rate (HR) 95bpm, respiratory rate (RR) 20 breaths per minute, and oxygen saturation (SaO2) 97%. Standard monitoring, including electrocardiographic (ECG) leads, noninvasive blood pressure measurement, and peripheral oximetry, was applied. A thoracic epidural catheter was placed at the Th12-L1 interspace and tested with 2mL of 0.5% bupivacaine, which yielded a negative response. Preoxygenation was performed with 100% oxygen via a face mask, and the patient was premedicated with intravenous midazolam (2mg). Anesthesia induction was achieved with fentanyl (0.2mg), propofol (200mg), and rocuronium (50mg). Cricoid pressure was applied, and an 8.5mm cuffed endotracheal tube was successfully inserted. Post-induction hemodynamics remained elevated, with BP ranging from 160-180/95-100mmHg and HR at 90-95bpm, with a normal sinus rhythm. Anesthesia was maintained with a mixture of air and oxygen, supplemented with sevoflurane at 0.6-0.7 minimum alveolar concentration (MAC). Analgesia was provided using fentanyl (0.3mg) in divided doses, along with epidural administration of fentanyl (0.1mg) and 8mL of 0.25% bupivacaine. However, 20-30 minutes into the procedure, a progressive rise in both systolic and diastolic blood pressure was observed, accompanied by sinus tachycardia (HR 110-120bpm). Blood pressure escalated to 270/130mmHg, with intermittent premature ventricular contractions detected on ECG. Initial management included intravenous enalapril (1.25mg), which was ineffective. Consequently, an infusion of remifentanil (2mg/40mL) was initiated at 0.125mg/kg/min, alongside intravenous administration of esmolol (10mg), magnesium sulfate (15%, 0.3mg), and glyceryl trinitrate (0.5mcg/kg/min). Upon tumor removal, the patient experienced a precipitous drop in systolic BP to 50mmHg. Immediate resuscitative measures included

administration of prednisolone (100mg), ephedrine (9mg), and 500mL of 6% hydroxyethyl starch (130/0.4), which restored BP to 110/60mmHg. The procedure was completed without major intraoperative blood loss. The patient was subsequently administered atropine (1mg) and neostigmine (2.5mg). Following adequate spontaneous respiration and response to stimuli, extubating was performed, and the patient was transferred to the postoperative recovery unit. During the immediate postoperative period, the patient's BP remained within normal limits. After two hours of monitoring, he was discharged to the Department of Urology. The patient recovered uneventfully and was discharged home on the fifth postoperative day. He was subsequently referred to the Clinic of Oncology for adjuvant radio-chemotherapy. Surgical Findings and Histopathological Examination reviled resected tumor mass weighed 150g and measured 9.5×7.5×5cm. The encapsulated lesion exhibited a soft consistency. Gross pathology revealed a gray-yellowish tumor with a well-demarcated, cystic lumen (3cm in diameter) containing blood. Microscopic examination identified a malignant mesenchymal neoplasm composed of epithelioid cells with abundant eosinophilic cytoplasm and pleomorphic to bizarre nuclei. Tumor necrosis was observed. Immunohistochemical analysis demonstrated positivity for vimentin, while markers for desmin, CD117 and CD34 were negative. Based on these findings, the final diagnosis was malignant peripheral nerve sheath tumor (MPNST), epithelioid variant.

Discussion

Malignant peripheral nerve sheath tumors (MPNSTs) are exceptionally rare, with an incidence ranging from 1 to 10 per 1,000,000, accounting for approximately 3% to 12% of all soft tissue sarcomas. These tumors predominantly arise in patients between 20 and 50 years of age, with common locations including the head and neck, trunk, or extremities (1,2,5). While MPNSTs in the retroperitoneal area are uncommon, several case reports have documented their occurrence (3,6). The prognosis for MPNSTs is generally poor, with reported five-years disease-specific survival rates ranging from 16% to 60% (6). Surgical resection followed by adjuvant radiotherapy remains the most effective treatment modality (5,7). Contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) play a critical role in the assessment of MPNSTs, allowing for precise delineation of tumor extent and suggesting a neurogenic origin (1). In our presented case, MRI findings indicative of malignancy include heterogeneity, areas of necrosis and hemorrhage, and increased uptake on positron emission tomography (PET). Given the aggressive nature of these tumors, a multidisciplinary approach is essential to ensure complete surgical excision and optimal patient’s outcomes (1,7). Histological and immunohistochemical analysis are crucial for an accurate diagnosis of MPNST. Grossly, these tumors appear fusiform, typically exceed 5 cm in diameter, and exhibit a gray-tan coloration (8). Those findings were revealed in our presented case. Microscopically, MPNSTs display spindle cell morphology with a fascicular pattern, varying degrees of mitosis, necrosis and occasional tumor calcification (9). Immunohistochemical markers, including S-100 protein, neuron-specific enolase, actin, cytokeratin (CK), smooth muscle actin (SMA), desmin and vimentin, help differentiate MPNST from other spindle cell sarcomas. MPNSTs are often highly aggressive, demonstrating a high propensity for local recurrence and metastasis, even with multimodal therapy. Although these tumors frequently arise in patients with neurofibromatosis type 1 (NF-1), isolated cases without NF-1 have been reported. MPNSTs originating in the retroperitoneum, particularly those not associated with the kidney or perirenal structures, are exceedingly rare (10). Our case represents a retroperitoneal MPNST without renal or perirenal involvement and in the absence of NF-1. Similar cases in the literature underscore the aggressive nature of these tumors and their variable response to treatment. Costa et al.

described an MPNST with diaphragmatic and pulmonary invasion; despite surgical resection, the patient developed local recurrence and succumbed to the disease within 15 months (11). Jankulovski et al. reported an MPNST infiltrating the psoas muscle and left renal capsule, requiring radical nephrectomy, with adjuvant radiotherapy and chemotherapy resulting in six-months disease-free survival (3). Longer survival has been noted in select cases. A case of renal MPNST with metastatic spread to the scalp, lung, and shoulder was managed with neoadjuvant doxorubicin and extensive surgical resection, achieving disease-free survival at two years (12). Similarly, patients with MPNST of the renal pelvis have demonstrated survival durations of 24 to 36 months following aggressive surgical intervention (13). Despite advances in multimodal therapy, including radical surgical resection and adjuvant radiotherapy, the prognosis for MPNST remains poor, emphasizing the need for early diagnosis and comprehensive treatment planning to improve patient's outcomes (14).

Conclusion

Malignant peripheral nerve sheath tumors (MPNSTs) of the retroperitoneum, particularly those without renal or perirenal involvement, are exceedingly rare and present a significant diagnostic and therapeutic challenge. Our case is an accidental find of MPNST differential diagnostically suspected for suprarenal tumor and highlights the importance of early detection and a multidisciplinary approach in managing these aggressive tumors. Surgical resection remains the cornerstone of treatment, with adjuvant radiotherapy and chemotherapy playing a critical role in disease control. Despite optimal management, MPNSTs have a high propensity for recurrence and metastasis, underscoring the need for vigilant postoperative surveillance. Given the aggressive nature and poor prognosis associated with these tumors, further research into novel therapeutic strategies is essential to improve patient outcomes.

References:

1. John L, William M, Pictorial E. Cross-sectional imaging of peripheral nerve sheath tumors. Characteristic signs on CT, MR imaging, and sonography. AJR Am J Roentgenal 2001; 176:75–82.
2. Fuchs B, Spinner RJ., Rock MG.Malignant peripheral nerve sheath tumors: an update. J Surg Orthop Adv 2005; 14:168–74.
3. Jankulovski N, Stankov O, Banev S, et al. Isolated malignant peripheral nerve sheath tumor of kidney capsule. Contribution 2008; 2:361–369.
4. Cameron RB, Loehrer PJ, Thomas J. Neoplasms of the mediastinum. Cancer Principles and practice of Oncology 6th ed,. Lippincott Williams and Wilkins, USA (2001) 1031–1032.
5. Somatilaka BN, Sadek A, McKay RM, Le LQ. Malignant peripheral nerve sheath tumor: models, biology, and translation. Oncogene. 2022 Apr;41(17):2405-2421. doi: 10.1038/s41388-022-02290-1. Epub 2022 Apr 7. PMID: 35393544; PMCID: PMC9035132.
6. Cai Z, Tang X, Liang H, Yang R, Yan T, Guo W. Prognosis and risk factors for malignant peripheral nerve sheath tumor: a systematic review and meta-analysis. World J Surg Oncol. 2020 Sep 30;18(1):257. doi: 10.1186/s12957-020-02036-x. PMID: 32998743; PMCID: PMC7528472.

7. Seres R, Hameed H, McCabe MG, Russell D, Lee ATJ. The Multimodality Management of Malignant Peripheral Nerve Sheath Tumours. *Cancers*. 2024; 16(19):3266. https://doi.org/10.3390/cancers16193266.
8. Magro G, Broggi G, Angelico G, Puzzo L, Vecchio GM, Virzì V, Salvatorelli L, Ruggieri M. Practical Approach to Histological Diagnosis of Peripheral Nerve Sheath Tumors: An Update. Diagnostics (Basel). 2022 Jun 14;12(6):1463. doi: 10.3390/diagnostics12061463. PMID: 35741273; PMCID: PMC9222088.
9. Kar M, Deo SV, Shukla NK, Malik A, DattaGupta S, Mohanti BK, Thulkar S. Malignant peripheral nerve sheath tumors (MPNST)--clinicopathological study and treatment outcome of twenty-four cases. World J Surg Oncol. 2006 Aug 22;4:55. doi: 10.1186/1477-7819-4-55. PMID: 16923196; PMCID: PMC1560134.
10. Miettinen M. Immunohistochemistry of soft tissue tumours - review with emphasis on 10 markers. Histopathology. 2014 Jan;64(1):101-18. doi: 10.1111/his.12298. Epub 2013 Nov 28. PMID: 24111893; PMCID: PMC7670586.
11. Costa R, Maximo J, Fernandes P, Guimarães S, Silva R, Magalhães A. A rare case of pulmonary malignant peripheral nerve sheath tumor. Pulmonology. 2023 Nov-Dec;29(6):574-575. doi: 10.1016/j.pulmoe.2023.01.006. Epub 2023 Mar 10. PMID: 36907816.
12. Shurell-Linehan E, DiPardo BJ, Elliott IA, Graham DS, Eckardt MA, Dry SM, Nelson SD, Singh AS, Kalbasi A, Federman N, Bernthal NM, Eilber FC. Pathologic Response to Neoadjuvant Therapy is Associated With Improved Long-term Survival in High-risk Primary Localized Malignant Peripheral Nerve Sheath Tumors. Am J Clin Oncol. 2019 May;42(5):426-431. doi: 10.1097/COC.0000000000000536. PMID: 30913092.
13. Zhang L, Lemberg KM, Calizo A, Varadhan R, Siegel AH, Meyer CF, Blakeley JO, Pratilas CA. Analysis of treatment sequence and outcomes in patients with relapsed malignant peripheral nerve sheath tumors. Neurooncol Adv. 2023 Dec 2;5(1):vdad156. doi: 10.1093/noajnl/vdad156. PMID: 38130899; PMCID: PMC10733661.
14. Somaiah N, Paudyal B, Winkler RE, Van Tine BA, Hirbe AC. Malignant Peripheral Nerve Sheath Tumor, a Heterogeneous, Aggressive Cancer with Diverse Biomarkers and No Targeted Standard of Care: Review of the Literature and Ongoing Investigational Agents. Target Oncol. 2024 Sep;19(5):665-678. doi: 10.1007/s11523-024-01078-5. Epub 2024 Jul 2. PMID: 38954182; PMCID: PMC11392982.