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Embryonal Rhabdomyosarcoma: A Case Report on A 2 Months-Old Infant

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ABSTRACT

Rhabdomyosarcoma (RMS) is an aggressive malignant neoplasma of the musculoskeletal system that represents 50% of all soft tissue sarcoma in children. Rhabdomyosarcoma is the most common soft tissue sarcoma in children, while the majority of rhabdomyosarcoma cases occurs in children under the age of 6 years old, RMS is uncommon in infants. Since there is no clear evidence that the biology of RMS itself is different in infants, the reason for a poorer prognosis is unclear. This case report aims to further examine the pathological features, diagnosis and treatment for embryonal rhabdomyosarcoma. We present a case of a 2 months-old infant with post biopsy inci- sion 12 days prior to hospital admission which is then reffered to the oncologist for further obser- vation. An anatomy pathological examination was done, observed from a 2 x 0,5 x 0,5 brown firm sample which was then revealed as embryonal rhabdomyosarcoma.

ARTICLE DETAILS

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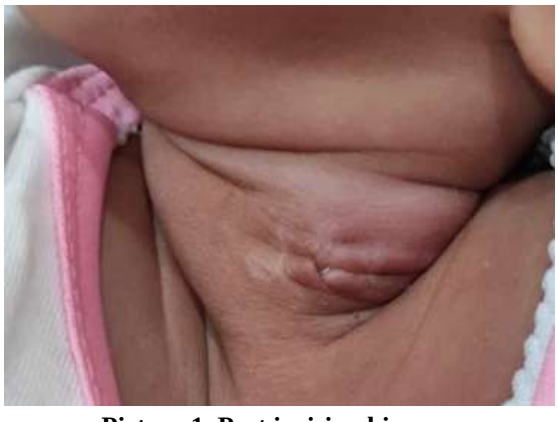
I. INTRODUCTION

Rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma found in children. Rhabdomyosarcoma often manifests as a mass expansion. Tumors in superficial locations can be palpated and detected relatively early, but deep-seated tumors, such as those in the retroperitoneum, can grow large and cause symptoms. Rhabdomyosarcoma is divided into two categories: parameningeal and nonparameningeal (Parviz, 2014). Parameningeal includes RMS in the nose, nasopharynx, paranasal sinuses, middle ear, mastoid, infratemporal fossa, and pterygopalatine fossa. The nonparameningeal category includes RMS in the scalp, orbit, parotid gland, oral cavity, oropharynx, and larynx (Malempati, et al., 2011). Histologically, RMS can be divided into three groups: embryonal, alveolar, and pleomorphic. The embryonal type is further subdivided into classic, spindle cell, and botryoid types. Embryonal rhabdomyosarcoma consists of a mixture of spindle cells, undifferentiated round cells, and immature striated muscle-like cells (rhabdomyoblasts) with abundant eosinophilic cytoplasm, arranged in a tight or loose pattern within a myxoid stroma (Anderson, et al., 2011). In this case report, we present a case of embryonal rhabdomyosarcoma in a 2-month-old child and demonstrate the histological features observed in this neoplasm.

II. CASE REPORT

A 2-month-old referral patient presented to the oncology surgical clinic following the excision of a tumor on the right neck. The patient came with complaints of irritability and a lump in the neck, which had previously undergone an incision biopsy. The patient arrived with histopathological anatomy examination results.



Picture 1. Post incision biopsy scar

The lesion obtained was subjected to histopathological examination via incision biopsy. The histopathological anatomy results from the tissue, measuring 2 x 0.5 x 0.5 cm, solid brown, and elastic, revealed tissue sections consisting of proliferating cells with round to oval nuclei, some spindle-shaped, exhibiting pleomorphism and hyperchromatism, with some nuclei resembling tadpoles. In certain areas, a hypercellular pattern was observed within an edematous fibromuscular connective tissue stroma. These findings suggest an embryonal rhabdomyosarcoma, and immunohistochemical examination (Desmin/MyoD1) is recommended to confirm the diagnosis.

III.DISCUSSION

Rhabdomyosarcoma (RMS) is the third most common extracranial malignant tumor in children, following neuroblastoma and Wilms tumor. The highest incidence of RMS occurs in children aged 1–4 years, with a lower incidence in those aged 10–14 years, and the lowest in those aged 15–19 years. There is a male predominance, with 58–73% of cases occurring in males. The majority of cases occur within the first two decades of life. Our patient, a 2-month-old infant, represents a rare and high-risk case (Malempati et al., 2011).

Rhabdomyosarcoma exhibits distinct gross histopathological features, typically appearing as a well-defined, infiltrative mass that is white and either soft or hard. Tumors are usually larger than 5 centimeters at diagnosis. The cell of origin for RMS is the rhabdomyoblast, which typically shows eccentric, granular eosinophilic cytoplasm rich in thick and thin filaments, with variable cell shapes that may be round or elongated, often referred to as strap cells or tadpole cells.

There are several histological subtypes of rhabdomyosarcoma with significant treatment and prognostic implications: embryonal rhabdomyosarcoma, botryoid and spindle cell (leiomyomatous), sclerosing and spindle cell, alveolar rhabdomyosarcoma, and other unspecified sarcomas (NOS). The 2013 WHO classification for myogenic tumors categorizes rhabdomyosarcoma into four groups: (1) embryonal, (2) alveolar, (3) pleomorphic, and (4) spindle cell/sclerosing. Anaplasia is considered by many pathologists as an additional factor indicating an unfavorable prognosis. Anaplasia in RMS is defined as the presence of enlarged hyperchromatic nuclei, three times larger than adjacent cells, with multipolar mitoses (Andrade, 2010).

The embryonal subtype is the most common, accounting for up to 60% of all rhabdomyosarcoma cases. Morphologically, embryonal rhabdomyosarcoma displays variable cellularity with typical rhabdomyoblasts arranged in large sheets and nests within a myxoid matrix. Alveolar rhabdomyosarcoma is characterized by fibrous septa with rhabdomyoblasts arranged in discohesive alveolar patterns and nests, often associated with FOXO1 rearrangements, such as t(1;13) (PAX3-FOXO1) or t(2;13) (PAX7-FOXO1), confirmed through genetic testing. Pathological identification of rhabdomyosarcoma can be challenging due to its similarity to other small, round, blue cell tumors of childhood, including lymphoma, small cell osteosarcoma, mesenchymal chondrosarcoma, and the Ewing sarcoma tumor family. Immunohistochemical examination may be necessary to confirm the diagnosis (Ognjanovic, 2010).

Immunohistochemistry is a highly useful diagnostic tool for RMS, typically showing positive staining for myogenin, desmin, sarcomeric actin, and myoglobin (Gallego, 2005). RMS is usually negative for NKX2.2, CD99, CD45, CK, S100, and NSE. Pathological classification of rhabdomyosarcoma has proven to be a prognostic indicator. Botryoid and spindle cell subtypes are associated with an intermediate prognosis, while alveolar sarcoma and undifferentiated sarcoma indicate a poor prognosis (Parham & Barr, 2013).

Current management of most pediatric sarcomas is based on data from large multi-institutional trials, which have led to significant improvements in outcomes over recent decades. The standard frontline treatment for all risk groups of RMS involves a multimodal approach, consisting of chemotherapy, surgical resection, and/or radiation therapy. In North America, the backbone of standard chemotherapy includes vincristine, actinomycin D, and cyclophosphamide (VAC) (Table 1) (Maurer et al., 1993). While in Europe, it consists of ifosfamide, vincristine, and actinomycin D (IVA) (Table 1) (Koscielniak et al., 1999).

Surgery remains the most effective method for removing the pathology and is a cornerstone of treatment. However, curative goals cannot be achieved without additional therapies (Dall'Igna, 2014). In principle, resectability means that the tumor and surrounding tumor-free tissue can be removed without unacceptable surgical risks or postoperative morbidity. In cases where excisional biopsy is performed without adequate surgical margins, re-excision of the tumor bed should be considered (Cecchetto, 2001).

Generally, resectability is determined by anatomical factors such as site, size, and involvement of vital structures. However, in cases where primary definitive surgery cannot achieve complete resection without significant morbidity, delayed primary resection after neoadjuvant chemotherapy should be considered to preserve organs without compromising long-term survival outcomes. When planning delayed primary resection after neoadjuvant treatment, patient compliance must also be considered. Unresolved tumor-related symptoms and psychosocial factors can affect therapeutic adherence (Chen et al., 2013). Therefore, surgery plays an integral role in the early stages of decision-making for multimodal treatment of pediatric RMS.

VAC		
Vincristine (max 2mg)	2 mg/m^2 per week IV	For 12 weeks
Actinomycin-D	0.015 mg/kg/d IV	For 5 days

(max. 0.5 mg fig/day) every 3 month for 5 or 6 course		
Cyclophosphamide	2.5 fig/kg/day P.O.	For 2 years
IVA		
Ifosfamide (with mesna)	3000 mg/m^2 IV	Day 1, 2
Dactinomycin	1.5 mg/m^2 IV (max 2 mg)	Day 1
Vincristine	1.5 mg/m^2 IV (max 2 mg)	Day 1

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Notes :

The dosage is reduced in children under 1 year of age (50% reduction for children under 6 months and 33% reduction for children between 6 and 12 months). Patients with completely resected primary tumors receive 3 courses of IVA. Patients with incompletely resected tumors receive 6–10 courses of IVA (and/or doxorubicin + cisplatin, with or without radiotherapy) depending on the staging.

Doxorubicin	60 mg/m^2 IV	Day 1
Cisplatin	100 mg/m^2 IV	Day 1

Table 1. Soft Tissue Sarcoma Treatment (Handbook of Cancer Therapy)

Complete eradication of the primary gross tumor is achieved through a combination of surgery and/or radiotherapy (RT), in addition to the standard systemic chemotherapy backbone. RT is included in frontline treatment for nearly all RMS patients, although long-term toxicity is a significant concern, particularly in younger patients (Eaton, 2013).

Strategies to reduce radiation-related toxicity include the incorporation of intensity-modulated radiotherapy (IMRT) or proton beam RT and the use of brachytherapy for specific sites, such as the bladder or vagina, both of which are considered to reduce late toxicities (e.g., skeletal muscle/soft tissue changes, joint stiffness).Additionally, RMS patients may benefit from molecularly targeted approaches and immunotherapy, which could reduce treatment-related toxicities caused by current chemotherapy and radiotherapy (RT). Due to limited funding for drug development for rare pediatric cancers like RMS, preclinical research focuses on actionable molecular targets that have been studied in other human cancers, many of which have clinically approved therapies (Chen et al., 2013).

IV. CONCLUSION

Rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma found in children. It often manifests as a mass expansion. The embryonal subtype is the most prevalent, accounting for up to 60% of all rhabdomyosarcoma cases. Current management of most pediatric sarcomas is based on data from large multi-institutional trials, which have led to remarkable improvements in outcomes over recent decades. Although surgery remains the most effective method for removing the pathology and serves as a cornerstone of treatment, curative goals cannot be achieved without additional therapies.

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