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ASKIN'S TUMOR: A CASE REPORT AND LITERATURE REVIEW

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1

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ABSTRACT

Askin tumour is an uncommon form of malignant neoplasm that develops from the soft tissues of the thoracopulmonary wall and has a neuroectodermal origin and possess aggressive behavior. As it mimics other common pediatric disorders such as empyema, tuberculosis, lymphoma, rhabdomyosarcoma and neuroblastoma, it acts as a great diagnostic and therapeutic challenge to the treating clinicians. Its rarity, however, contributes greatly to the absence of standardized treatment protocols further facilitating detrimental prognosis. So, the major deciding factor of its survival rate is early and precise diagnosis followed by its treatment.

The present study reports a case Askin's tumor in a child which is locally aggressive and quite rare. While making the definitive diagnosis of an Askin's tumour of the thorcopulmonary region the possibility of the occurrence of other primitive neuroectodermal tumors (PNET) was not ruled out.

Keywords: Askin tumor, Case report, Neuroectodermal tumors, Lung biopsy

INTRODUCTION:

Ewing's Family Tumor (EFT) is a wide group of tumors comprising of Ewing's sarcoma of bone, extraosseous Ewing's sarcoma, Askin's tumor of thoracopulmonary region, and PNET which can be histologically viewed as small round hematoxylin stained cells. Hence, Askin's tumor can be termed to be a lesion of thoracopulmonary region mostly involving the chest wall which is neuroectodermal in origin [1].

Children and teenagers especially females (female predominance in 75% of cases) are more likely to encounter this condition, although it can occur at any stage of life [2]. Furthermore, it is a highly misdiagnosed and relatively rare disease with lack of standardized treatment protocol. This disease is metastatic in nature, although metastasis is seen more commonly in older patients.

Moreover, the prognosis of askin's tumor is poor i.e., 38% and 14% with 2 to 6 years of survival rates respectively[3]. Metastasis of these family tumors, commonly occurs in the lungs (50%), bone (25%), bone Marrow (15%) and liver (5%) [4].

The immunophenotypic profile of ES, PNET and Askin's Tumors are comparably alike. The chromosomal translocation t (11; 22) (q24; q12) resulting in the EWSR1-FL11 fusion gene is detected in nearly 90% of cases of ES, PNET and Askin's Tumor [5].

Because of its rarity, the provision of separate treatment trials is not possible, hence, the treatment for this disease is given in the context of EFT. Hence, adjuvant and neoadjuvant chemotherapy (CTR), Radiotherapy and surgical resection are the best adaptive treatment measures. Without CTR 90% of the patients show recurrence of the disease and die [5].

The rarity of Askin Tumor makes it essential to use the limited resources judiciously. Currently, a poor prognosis, unstandardized treatment protocols and a relatively low survival rate have been proposed. Hence, necessitating further studies making it clinically as well as academically important.

CASE REPORT:

An 8-month-old male patient was admitted to pediatric OPD, Latur complaints of fever, cough and cold for 4 days. He has a history of NICU stay in view of preterm low birth weight (1.7 kg) accompanied by respiratory distress. During the physical examination, the child seemed sick on presentation and in respiratory distress, vitals revealed tachycardia (158/min) with tachypnea (56/min). The child was pale in appearance, but signs of cyanosis, clubbing, lymphadenopathy and edema were absent.

On Respiratory system examination, suprasternal and intercostal retractions were found, percussion of respiratory zones further revealed stony dullness in right upper lobe areas while auscultation of the same area revealed reduced breath sounds. Systemic examination was normal. On radiographic examination, HRCT (High-Resolution Computed Tomography) revealed a large mass of 4.6x4.3x6.1 cm dimensions and a well-defined soft tissue density lesion was seen arising from the posterior mediastinum on the right side extending from D1 to D2 vertebral level with few foci of calcification. Apart from this a mild tracheal and mediastinal shift towards left side was also noted. Along with that, segmental and sub-segmental areas of consolidation with adjacent ground-glass opacity were seen in the anterior segment of the upper lobe.

For obtaining a confirmatory diagnosis via histopathological means the smear was obtained from a right posterolateral thoracotomy via an incisional biopsy. The results obtained in the microscopic view were in the form of small round cells arranged in sheets and an alveolar pattern with dark round inconspicuous nuclei and scanty cytoplasm which is suggestive of round cell malignancy, likely of an Askin tumor, with immunohistochemical markers positive for CD-99. The treatment consisted of antibiotic injections of pipzo, Amikacin and methylprednisolone.

DISCUSSION:

Askin tumour is an uncommon form of malignant neoplasm that develops from the soft tissues of the thora-

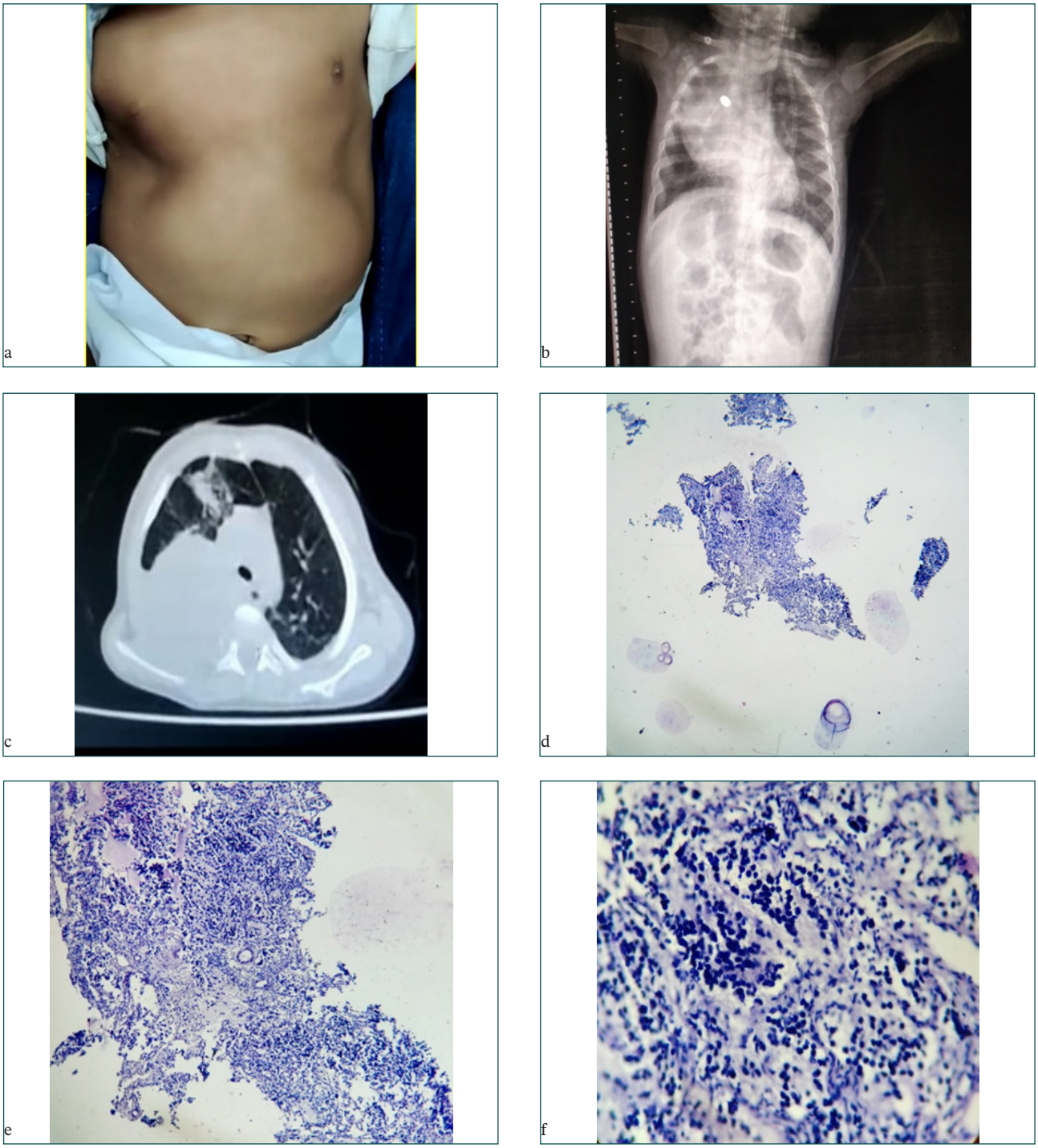

Figure A. patient abdominal view
Figure B. Chest X-ray showing large homogenous opacity in upper right lobe suggesting mass lesion and mild tracheal shift towards left.
Figure C. Chest computed tomography (CT) scan showing mass lesion arising from the posterior mediastinum
Figure D. 4x scanner view shows multiple bits of soft tissue showing predominance of blue cell population
Figure E. 10x low power view shows the homogenous population of small blue round cells in 10X low power magnification
Figure F. 40x high power view shows cells which are reduced in size and possess relatively less cytoplasm due to enlarged nuclei having normal chromatin material and inconspicuous nucleoli.

Table 1. Differential table for Askin Tumor

Sr.no.	Diseases	Diagnostic Comparisons		
		Origin	Radiological Findings	IHC markers
1.	Askin's Tumor	Develops from the soft tissue of chest wall.	Heterogenous soft tissue mass, rib destruction, pleural effusion, hemorrhage, necrosis and cystic degeneration.	CD99+, NSE+, Vimentin, S-100
2.	Ewing Sarcoma	Mostly arises from bone, in some cases (15-29%) it arises from soft tissue being itself surrounded by .bones	Heterogeneous structure and blurred borders, soft tissue portion is usually homogenous, aggressive Bone destruction and large soft-tissue mass.	CD99+, NSE+/-, CK+/-, CAV+, Flil+
3.	Neuroblastoma	Immature nerve cells i.e. neural crest cells	Tumor around spine, Displacement of spinal cord or nerve root and well defined epidural spread.	NB84a+, CD99-
4.	Rhabdomayosarcoma	Originates from primitive mesenchymal cells	Homogeneous masses with ill-defined margins and minimal necrosis, resulting in destruction of adjacent bone.	26
5.	Lymphoma	Arises from immature thymic T cells	Enlarged lymph nodes in body	TdT+, CD45-/+, CD99+(B,T lineage markers variously expressed)
6.	Tuberculosis	Mcyobacterium is responsible for infection	Hilar and mediastinal nodes	Anti-MPT64
7.	Empyema	Caused by infections such as pneumonia, resulting in pleural effusion.	Extension of air-fluid levels to the chest wall, air-fluid level across fissure lines and a tapering border of the air-fluid collection.	Pan-B-Cell Markers including CD20, CD79a

copulmonary wall and has neuroectodermal origin. It is a locally aggressive tumor which mimics other common pediatric conditions such as empyema, tuberculosis, lymphoma, neuroblastoma and rhabdomyosarcoma. Hence, early diagnosis and timely interventions are critical for the favorable outcomes of patients.

Keehn B et al in his study discussed that, Ewing's family tumors are likely to represent the same unit with slight differences in differentiation. For example, PNET is more distinguished in its appearance of neural elements. The Ewing sarcoma family of tumors are also comparable in genetic terms, such that they validate non-random t (11; 22) (q24; q12) chromosomal relocations resulting in the formation of the Ewing sarcoma E26 transformation-specific fusion gene [16].

Vural C et al concluded that, 90% of the patients show reciprocal chromosomal translocations and fused genes (e.g., fusion of the EWS gene on chromosome 22q12 with the FLI-1 gene on chromosome 11). The incidence of this chromosomal translocation in addition with positive immunostaining of CD99 represents that sensitive and specific assays currently accessible for establishing the diagnosis of EWS/pPNET. 90% of the patients show reciprocal chromosomal translocations and fused genes (e.g., fusion of the EWS gene on chromosome 22q12 with the FLI-1 gene on chromosome 11). The incidence of this chromosomal translocation in addition to positive immunostaining of CD99 represents that sensitive and specific assays are currently accessible for establishing the diagnosis of EWS/pPNET.6 In our case, IHC for CD99 was strongly positive.

The following table gives a brief idea about the differential diagnosis of Askin's tumor mimicking other pediatric diseases.

Lonergan GJ et. al in his study concluded that, for assessing neuroblastic tumors CT scan proved to be a standard

Table 1. Cases reported in past 10 years

Sr. no.	Author	Year	No. of Cases	Age	Sex	Location	Diameter	Method for Radiological finding	Differential diagnosis	Immunohistochemistry	Management	Prognosis
1.	Bikash Shrestha et. al[1]	2011	1	3 year	Male	Lungs	6.1×5.6×5.1 cm	CT scan	-	Strongly positive for CK and CD-99 and negative for LCA and CD-34	Chemotherapy	-
2.	Shu-Guang Jin et. al[10]	2013	1	13 day old	Female	Left arm	4.6×3.7 cm	CT scan	-	EWSR1 translocation positive. Marker CD-99 AND Ki-67 were positive.	Chemotherapy	Recurrence after 3 months and died within a week
3.	Sushant S Mane et. al[11]	2018	1	11 month old	Female	Lower half of the left thigh	7.5×8×11.3 cm	Magnetic Resonance Imaging (MRI)	rhabdomyosarcoma	Strongly positive for CD99 markers.	surgical excision and adjuvant chemotherapy	Died before completion of treatment
4.	Ioana Badiu Tisa et. al[12]	2019	1	3 year old	Male	Posterior Superior Mediastinum	4.5×3.5 cm	CT Scan	Ganglioneuroblastoma	Positive for Neuron-specific enolase(NSE), Positive for protein S100 Positive for CD 99	Complete resection of tumor followed by chemotherapy.	Not specified
5.	Clara Chiloeches et. al[13]	2020	1	5 month old	Female	Left lateral lower eyelid	-	MRI	Infantile Hemangiomas	NSE (neuron-specific enolase) was the only positive Tumor marker.	-	Died after a year
6.	Mehmet Azizoglu et. al[14]	2020	1	3 year old	Female	Abdomen	52×50×75 cm	MRI	Neuroblastoma	CD99, FLI-1 and FISH testing for EWSR1 translocation were positive	Surgery, Radiotherapy and chemotherapy	Not specified

7.	Alijie Keka Sylaj et. al[15]	2022	1	4 year old	Female	Lungs	95×75×70 mm	CT Scan	Neuroblastoma	immunohistochemical (IHC) examination of the markers CD99 , S-100 , and Ki-67 showed that the tumor cells stained positively for S-100 and CD99.	resection, radiotherapy, and chemotherapy	Died before starting the treatment

modality for imaging as Origin and degree of vascular encasement, swollen or large lymph nodes (adenopathy) and calcification can be promptly visualized in a CT scan. For assessing and spotting intraspinal extension of primary tumor along with hepatic metastasis in infants MRI is always preferred over CT scan [9].

Silvia Triarico, Marec- Be' rard P et. al. confirmed in their study that surgical resection is essential for treatment of Askin's tumor in pediatric patients. Moreover, a multimodel management, including resection, chemotherapy, and radiotherapy, should be preferred over a unidirectional approach to improve the overall survival [7, 8].

To scrutinize the best possible management of the disease in the interest of pediatric health, we have vouched the case report with literature reviews of all the cases reported in the past ten years

The most common treatment modality for cancer includes the incorporation of neoadjuvant chemotherapy followed by surgical excision. However, once the tumour has been resected long- term chemotherapy along with or without it, is preferred.

Radical surgeries are always preferred for better prognosis; however, their feasibility in vital structures like the chest wall is questionable. Such patients require post-operative radiation. Neoadjuvant chemotherapy is proven to be helpful in a significant reduction of tumor size, such reduced size tumor shows more clear operative margins, as noted in the cited literatureas as in the index case [16].

Sawin et al. in their study found, chemotherapy is proved to be helpful in the reduction of tumor size and decreasing chances of recurrence [17].

Veronesi et al. succinctly summarise the advantages of pre-operative chemotherapy which included reduced risk of tumour rupture and tumour cell dissemination and increased likelihood of R0 resection and post-operative function preservation. Apart from this, it enables the practitioner to opt for a conservative surgical approach whilst reducing the chances of distant metastasis [18].

As this disease is only diagnosed at its advanced stage also has a very low i.e. 5 years of survival rate ranging from 10 to 60%. Surgery with wide resection may assure the best prognosis for this disease. Recurrence, metastasis, extraosseous primary tumor are the indicators of poor prognosis.

CONCLUSION:

Due to the reduced occurrence of Askin's tumor, establishing a proper diagnosis may come with its own set of hardships one of which is the need for immunohistochemical analysis and radiological investigations. Proper management of such a tumour can only be achieved with the coordinated harmony between clinicians, pathologists, and surgeons from the very first step of its diagnosis.

REFERENCES

1. Shrestha B, Kapur BN, Karmacharya K, et.al.A Dual Case Study. Int J Pediatr. 2011;2011:252196.

2. Hari S, Jain TP, Thulkar S, et.al. Imaging features of peripheral primitive neuroectodermal tumors. Br J Radiol 2008; 8l (972): 975–83.
3. Contesso G, Llombart-Bosch A, Terrier P et al. Does malignant small round cell tumor of the thoracopulmonary region (Askin tumor) constitute a clinicopathologic entity? An analysis of 30 cases with immunohistochemical and electron-microscopic support treated at the institute Gustave Roussy. Cancer 1992; 69: 1012–20.
4. Xu Q, Xu K, Yang C, et. al. Askin tumor: Four case reports and a review of the literature. Cancer Imaging. 2011; 11(1):184-8.
5. Abbas AA, Almaghraby HQ. The AskinRosai Tumor: A Clinicopathological Review. Clin Surg. 2020; 5: 2914.
6. Vural C, Uluo_glu O, Akyu¨rek N, O_guz A, et. al . The evaluation of CD99 immunoreactivity and EWS/FLI1 translocation by fluorescence in situ hybridization in central PNETs and Ewing's sarcoma family of tumors. Pathol Oncol Res 2011;17:619e25.
7. Marec-Be´rard P, Chotel F, Claude L. PNET/Ewing tumours: current treatments and future perspectives. Bull Cancer 2010; 97:707e13.
8. Triarico, S., Attinà, G., Maurizi, P. et al. Multimodal treatment of pediatric patients with Askin's tumors: our experience. World J Surg Onc 16, 140 (2018).
9. Lonergan GJ, Schwab CM, Suarez ES, et. al. Neuroblastoma, ganglioneuroblastoma and ganglioneuroma: Radiologic-pathologic correlation. Radiographics. 2002;22(4):911–34.
10. Jin SG, Jiang XP, Zhong L. Congenital Ewing's Sarcoma/Peripheral Primitive Neuroectodermal Tumor: A Case Report and Review of the Literature. Pediatr Neonatol. 2016 Oct; 57(5):436-439.
11. Mane S S, Prabhudesai A A. Primitive Neuroectodermal Tumor in Infancy - An Unusual Clinical Presentation. Pediatr Oncall J. 2018; 15: 43-45.
12. Badiu T I, Samașca G, Aldea C, et. al. Ganglioneuroblastoma in children. Neurol Sci. 2019 Sep;40(9):1985-1989.
13. Chiloeches FC, Feito RM, Rodríguez BA, et.al. Metastatic neuroblastoma mimicking an infantile hemangioma. Pediatr Dermatol. 2021 Jan;38 (1):316-317.
14. Azizoglu M, Demirsoy U, Kulac I et. al. EWSR1 (22q12) Translocation Positive Pediatric Adrenal Tumor with Loss of 1p, 11q, and Unbalanced Gain of 17q: Neuroblastoma or Ewing Sarcoma? Fetal Pediatr Pathol. 2021 Dec;40(6):717-722.
15. Keka-SA, Ramosaj A, Baloku A, et .al. Peripheral primitive neuroectodermal tumor: a case report. J Med Case Rep. 2022 Mar 31;16(1):128.
16. Keehn B, Jorgensen SA, Towbin AJ, et. al. Askin tumor. Appl Radiol. 2017;46(6):32-33.
17. Sawin RS, Conrad EU, Park JR, et al. Preresection chemotherapy improves survival for children with Askin tumors. Arch Surg. 1996 Aug;131(8):877-80.
18. Veronesi U, Bonadonna G, Zurrida S, et. al. Conservation surgery after primary chemotherapy in large carcinomas of the breast. Ann Surg. 1995 Nov;222(5):612-8.