Case Report

Cytology of Pleuropulmonary Blastoma: A Case Report

Pathology Section

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ABSTRACT

This case report describes the cytological features of pleuropulmonary blastoma (PPB), a rare aggressive paediatric tumour. The patient was a 13 year old male and he presented with recurrent lower respiratory tract infections and failure to grow. The smears which were prepared from the CT guided aspirates showed groups and clumps of two populations of cells. The predominant population consisted of large spindle shaped cells with round to oval nuclei, eosinophilic cytoplasm and irregular nuclear membranes. The nuclei possessed fine granular chromatin and inconspicuous nucleoli. The second population of cells was less abundant, interspersed amidst the spindle shaped cells and it consisted of small round cells with scanty eosinophilic cytoplasm. The nuclei possessed fine granular chromatin and inconspicuous nucleoli. Occasional mitoses were observed. There was no evidence of rosette or gland formation. The main differential diagnosis was PPB. The other differential diagnoses were teratoma, neuroblastoma, metastatic Wilm's tumour, rhabdomyosarcoma and malignant mesenchymoma. Histopathology confirmed the diagnosis of PPB. The age of presentation in the present case report was more than the reported median age of presentation. This tumour may be easily misdiagnosed due to the rarity of its occurrence. The cytological appearances may vary according to the various cell populations which are present.

Key Words: Pleuropulmonary blastoma, Lung, Cytology

INTRODUCTION

Pleuropulmonary blastoma (PPB) is a dysontogenic pleuropulmonary tumour which affects children who are less than five years of age. It was first identified as a distinct entity by Manivel in 1988 and it was thought to originate from the thoracopulmonary mesenchyme [1,2]. It is a rare, highly aggressive tumour which is distinct from pulmonary blastoma which is seen in adults. It is commonly associated with cystic malformations of the lung. It has been classified into three types by Dehner as the types 1, 2 and 3 [3]. Extensive search in the literature revealed only a few cases of PPB which have been described as diagnosed by fine needle aspiration cytology previously [4].

CASE REPORT

A 13-year-old male presented with recurrent lower respiratory tract infections and failure to grow. A routine chest X ray revealed a left sided lung mass which was attached to the pleura. A fine needle aspiration procedure was planned. The smears which were prepared from the multiple aspirates showed groups and clumps of two populations of cells against a haemorrhagic and chondro-myxoid background [Table/Fig-1a]. The predominant population consisted of large spindle shaped cells with round to oval nuclei, eosinophilic cytoplasm, and irregular nuclear membranes [Table/Fig-1b]. The second population of cells was less abundant, interspersed amidst the spindle cells and it consisted of small round cells with scanty eosinophilic cytoplasm. [Table/Fig-1c] The nuclei possessed fine granular chromatin and inconspicuous nucleoli. Occasional mitoses were observed. There was no evidence of rosette or gland formation. A cytological diagnosis of the malignant aspirate was reported. The main differential diagnosis was PPB. Other diagnoses which were considered, included teratoma, neuroblastoma, metastatic Wilm's tumour, rhabdomyosarcoma and malignant mesenchymoma. The surgical team planned a resection of the left lung and the pleura.

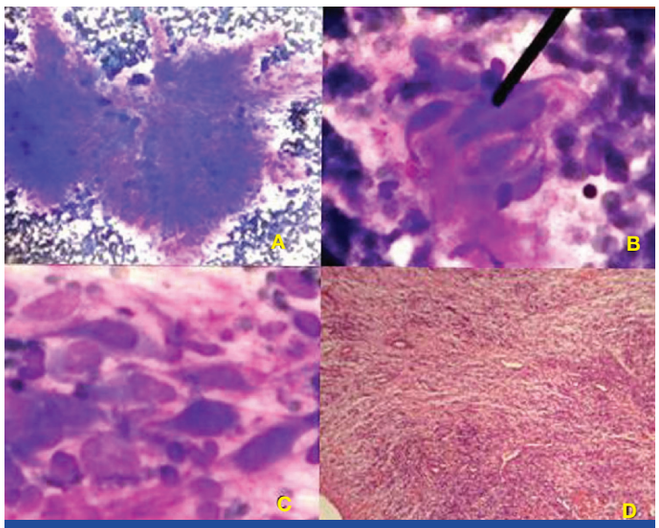
The specimen of the left lung revealed a tumour in the lower lobe. The resected pleura revealed a tumour which measured 6x5x1 centimeters. The tumour was well circumscribed along with the peripherally compressed lung. The cut surface was fleshy gray white to yellowish.

The tumour tissue consisted of two populations which comprised mainly of the long and short fascicles of cells which were arranged in a vague storiform pattern [Table/Fig-1d]. The second population of round blue cells which were interspersed with the spindle cell areas was very minor. Occasional mitoses were evident. There were areas of hyalinization, myxoid degeneration, necrosis and secondary bacterial colonization. The tumour formed sub-mucosal nodules and reached up to the bronchial epithelium. It also infiltrated the adjacent normal looking lung parenchyma. The inferior pulmonary veins and the resected lymph nodes were free of the tumour.

The tumour cells were positive for vimentin and cytokeratin was positive in the epithelial elements. The tumour cells were negative for smooth muscle actin and chromogranin. The above features were consistent with the diagnosis of PPB. Chemotherapy was also planned for the patient. However; the patient died of recurrent tumour, nine months after the removal of the presenting tumour.

DISCUSSION

PPB has been recognized as a distinct entity, since around two decades. Clinically, the patients usually have an uneventful neonatal course [5]. The retrospective evaluation of prenatal sonograms usually does not yield any significant information. The median age



[Table/Fig-1]:
(A) (X40, Giemsa): Photomicrograph showing groups of cells in a hemorrhagic background.
(B) (× 400, Giemsa): Photomicrograph showing spindle shaped cells.
(C) (× 400, Giemsa): Photomicrograph showing small round cells amidst the spindle shaped cells
(D) (× 200, H&E): Photomicrograph of the spindle cells on histopathology.

of presentation which was quoted by most of the authors was nine months for type 1 PPB, 31 months for type 2 PPB and 42 months for type 3 PPB. The most common presenting complaints were the symptoms and signs of the influenza infection, which included dyspnoea, fever, tachyponea and laboured respiration. The other clinical features at presentation may be attributed to a superimposed pneumothorax and compression of the intrathoracic structures, with or without mediastinal shift [2,4]. In the case which is under discussion, the age of presentation was thirteen years, which was more than the median age group of presentation of PPB.

The radiological findings are variable depending upon the type of tumour, whether it is cystic or solid. On gross examination, the type 1 tumours are benign appearing and they are peripherally located thin walled cysts which are covered by smooth visceral pleura, containing fine septae. No grossly observable, solid, nodular or plaque like thickenings are present. The type 2 tumours consist of thick plaque like areas. The type 3 tumours are well circumscribed, solid, mucoid, tan white friable masses with pleural attachments. Plain film radiography is unable to distinguish pleuropulmonary blastoma from other lung lesions. The CT scan image reveals a heterogeneous mass of low attenuation along with pleural effusion.

It may be associated with other tumours in the patient or there may be a family history of cystic nephroma, sarcoma, medulloblastoma, thyroid, malignant giant cell tumour, intestinal polyp, lymphoma and leukaemia. The tumour is known to metastasize to distant sites, which include the brain, spinal cord, bone, liver, kidney, pancreas and the adrenal glands. Regional lymph node metastasis is also known to occur [2,4].

The microscopic examination of type 1 pleuropulmonary blastoma reveals variably cellular walls which are lined by bland low cuboidal epithelium. The sub-epithelial region shows a continuous thick layer or focal condensations of tumour cells. The cells may be stellate, round or spindle shaped and they are noted beneath the cyst lining cells, imparting a cambium layer like appearance. The primitive cells are hyperchromatic, they possess a high nucleocytoplasmic ratio and they reveal mitoses. Small foci of nodules of cartilage may be seen. Type 2 pleuropulmonary blastoma may sometimes show only a microscopic evidence of cyst formation. The solid or plaque like areas show an overgrowth of rhabdomyosarcomatous, spindle cell sarcomatous or blastematous cells.

Type 3 pleuropulmonary blastoma shows one or more of the four histological patterns which may blend with each other. The blastematous pattern resembles Wilm's tumour and it consists of cohesive aggregates of primitive small cells with hyperchromatic nuclei, a high nucleocytoplasmic ratio and brisk mitoses [2,4].

The spindle cell component consists of spindle, stellate or small ovoid cells in a myxoid matrix, resembling rhabdomyosarcoma. Another spindle cell component may resemble synovial sarcoma or infantile fibrosarcoma. Nodules of immature or malignant cartilage may be present. The tumour has to be differentiated from malignant teratoma. However, no malignant epithelial component is present [2,4].

In the case of the patient in discussion, the tumour belonged to the type 3 category of Dehner. The predominant population was that of spindle shaped cells. The only other component was that of blastematous cells, which were lesser in number.

The three pathological categories of Dehner are related along a spectrum of increasing biological aggressiveness as the neoplasm acquires solid features. The clinical progression of the type I to type 2 and 3 tumours is well documented in known cases of congenital lung cyst or congenital adenomatoid malformation.

Immunohistochemical analysis for the blastematous pattern of cells reveals a positive reaction for vimentin. Cytokeratin is positive for the flattened cuboidal epithelial cells and negative for the tumour cells. The rhabdomyoblastic differentiation is revealed by desmin, muscle specific actin, myogenin and myo D1. The cartilaginous nodules reveal S100 positivity [2,4].

The most commonly known genetic abnormalities include the trisomy and tetrasomy ofchromosome 8. Others include the loss of 17p, loss of 10q, rearrangement of 11p, loss of Xp, gain of chromosomes 1q, 2 and 7q and loss of 6q and 18p [6].

This tumour can be easily misdiagnosed due to the rarity of its occurrence. Therefore, it must be included in the differential diagnosis and it can be identified by aspiration cytology. The prognosis is worse for the Dehner types 2 and 3. The cytological appearances vary according to the various cell populations which are present. The final diagnosis is however, provided by histopathological examination and immunohistochemistry.

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