Pleural fluid cytology

An unusual malignancy

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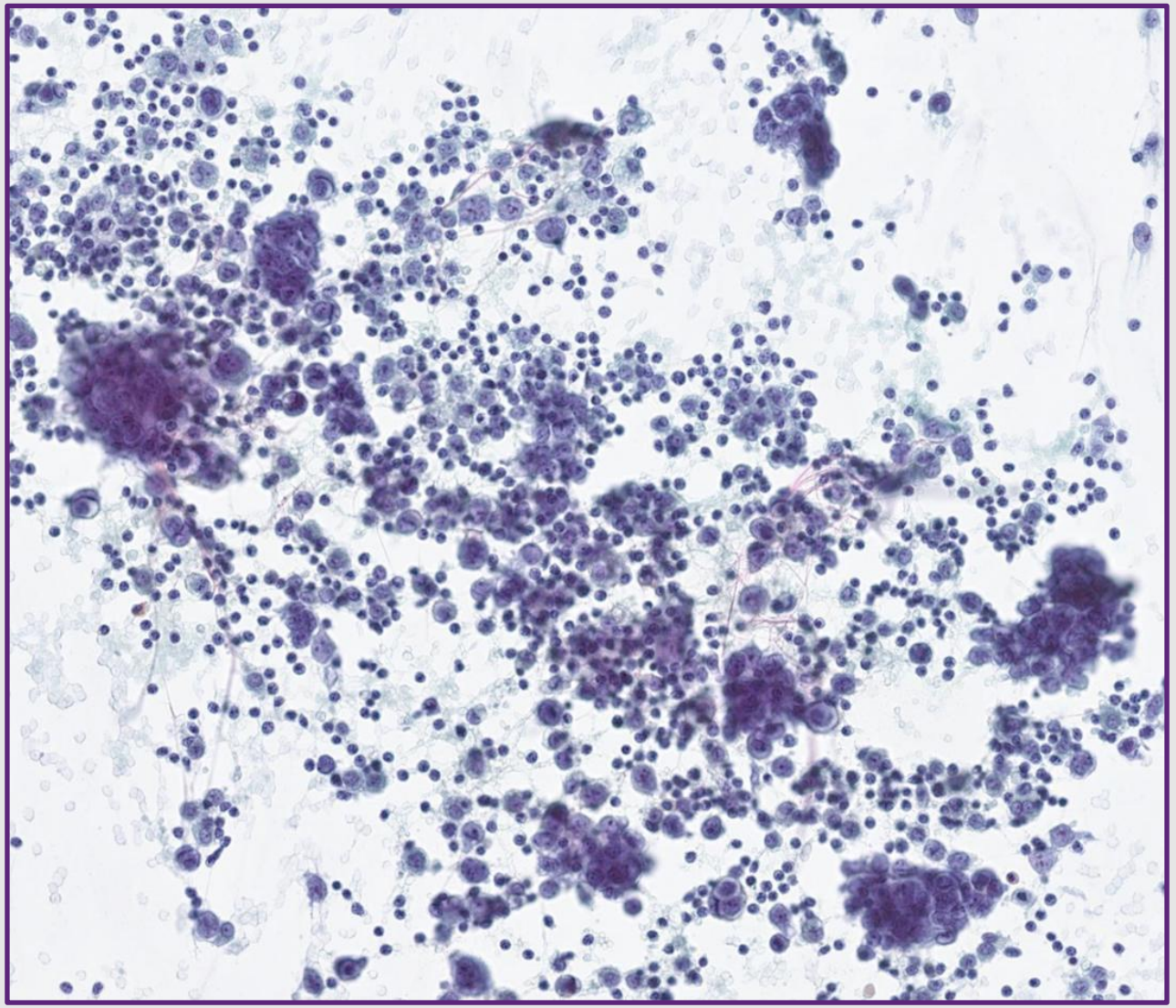
Clinical Information

- 24 year old male presented with a 10 day history of sudden onset cough, recent chest pain and fever.
- Patient history showed recent travel from West Africa and treatment for malaria.
- Initial investigations showed a mildly raised C-reactive protein, normal white cell count and positive Quantiferon gold test.
- Chest x-ray showed a large right pleural effusion. The patient developed significant spinal pain, limiting mobility. MRI showed an inflammatory soft tissue mass, suggestive of paravertebral abscess.
- Initial differential diagnosis included tuberculosis infection and malignancy. Analysis of the pleural fluid by microbiology did not identify acid-alcohol fast bacilli.

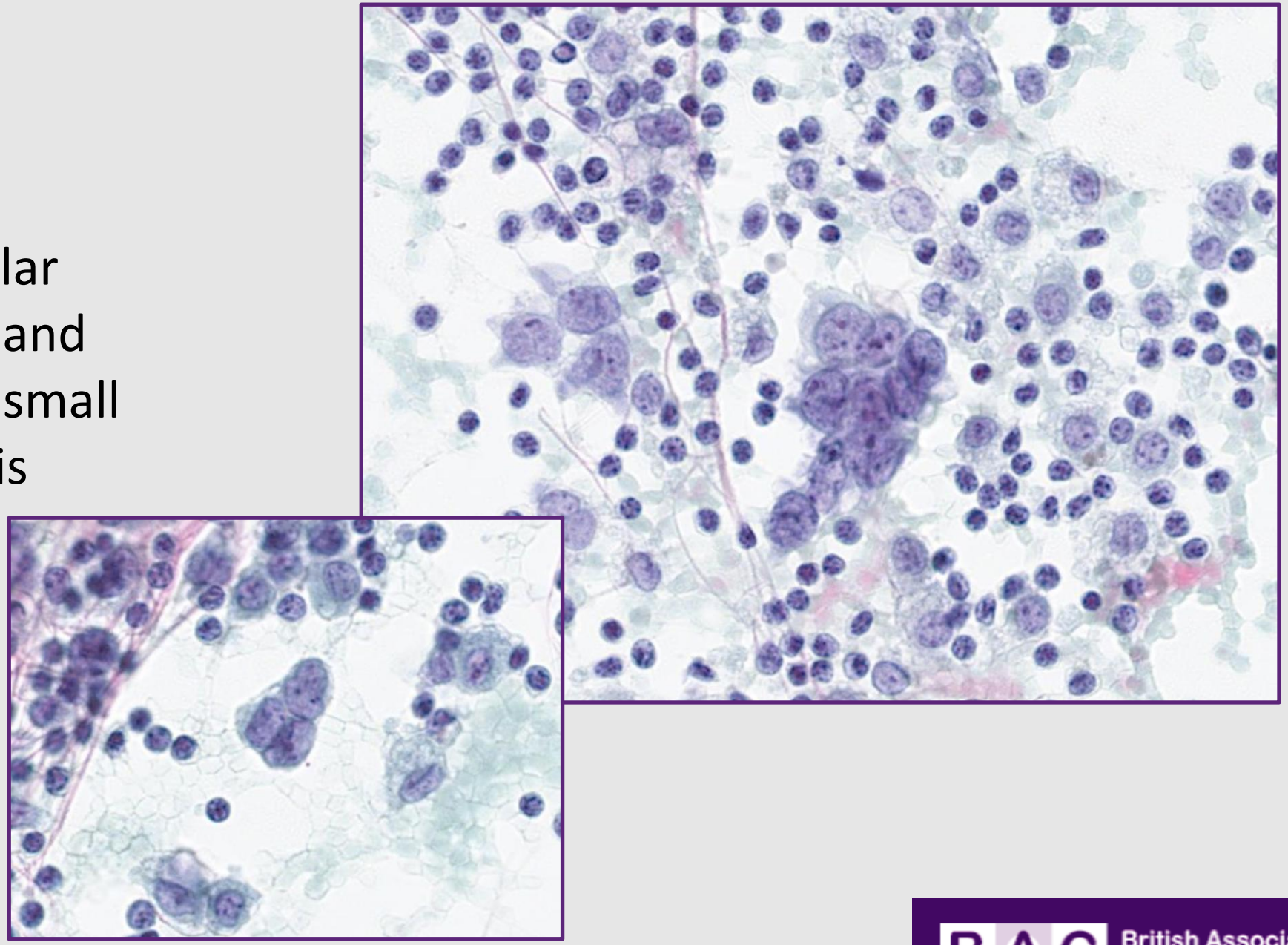
Cytology

The pleural effusion was aspirated and cytological examination revealed numerous large atypical cells in cohesive clusters with vesicular nuclei, relatively dark finely granular chromatin and small amounts of cytoplasm. (Pap X10).

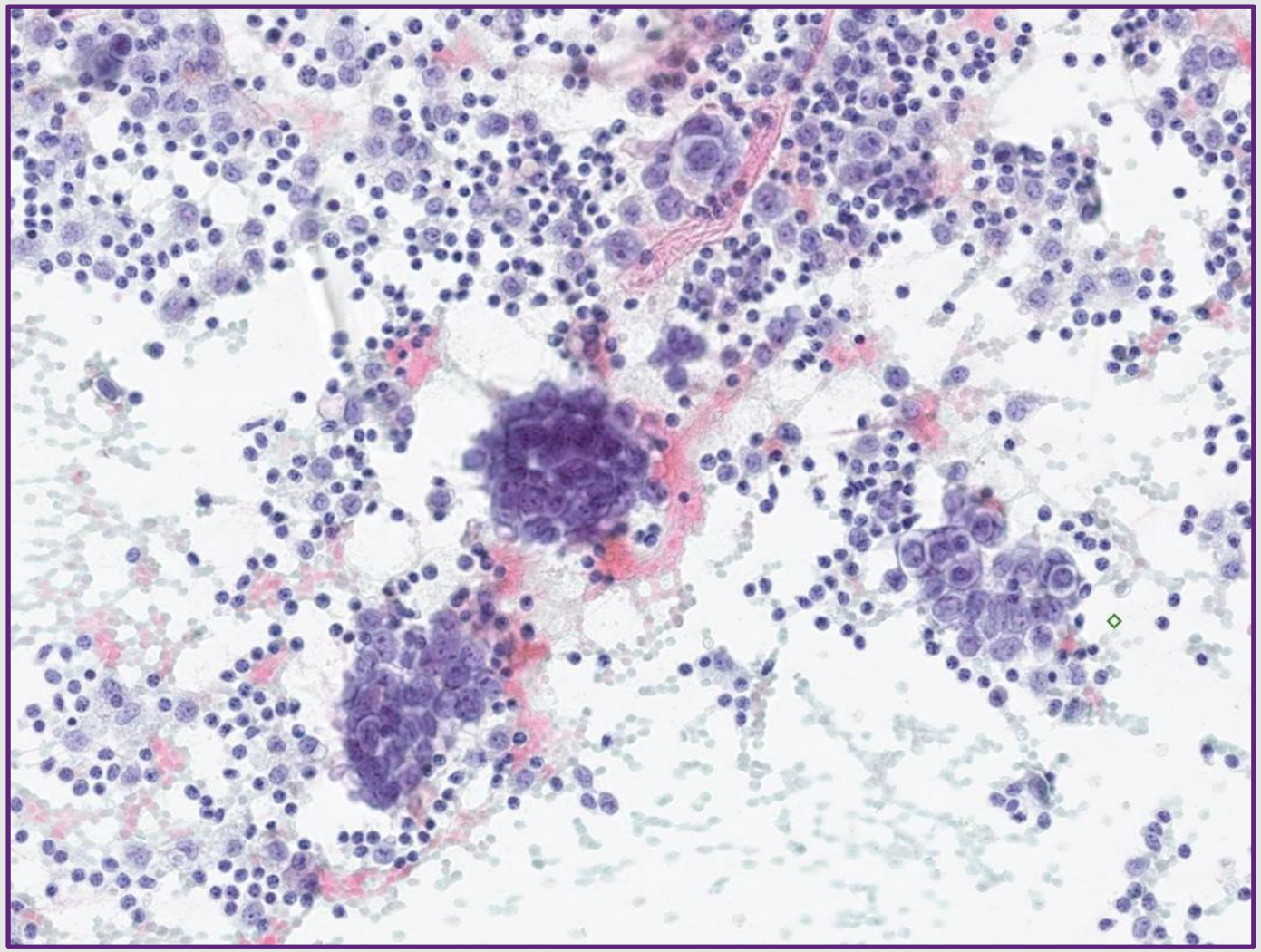


Cytology

The cells have irregular nuclear membranes and variable numbers of small nucleoli. Chromatin is clumped. (Pap X40).

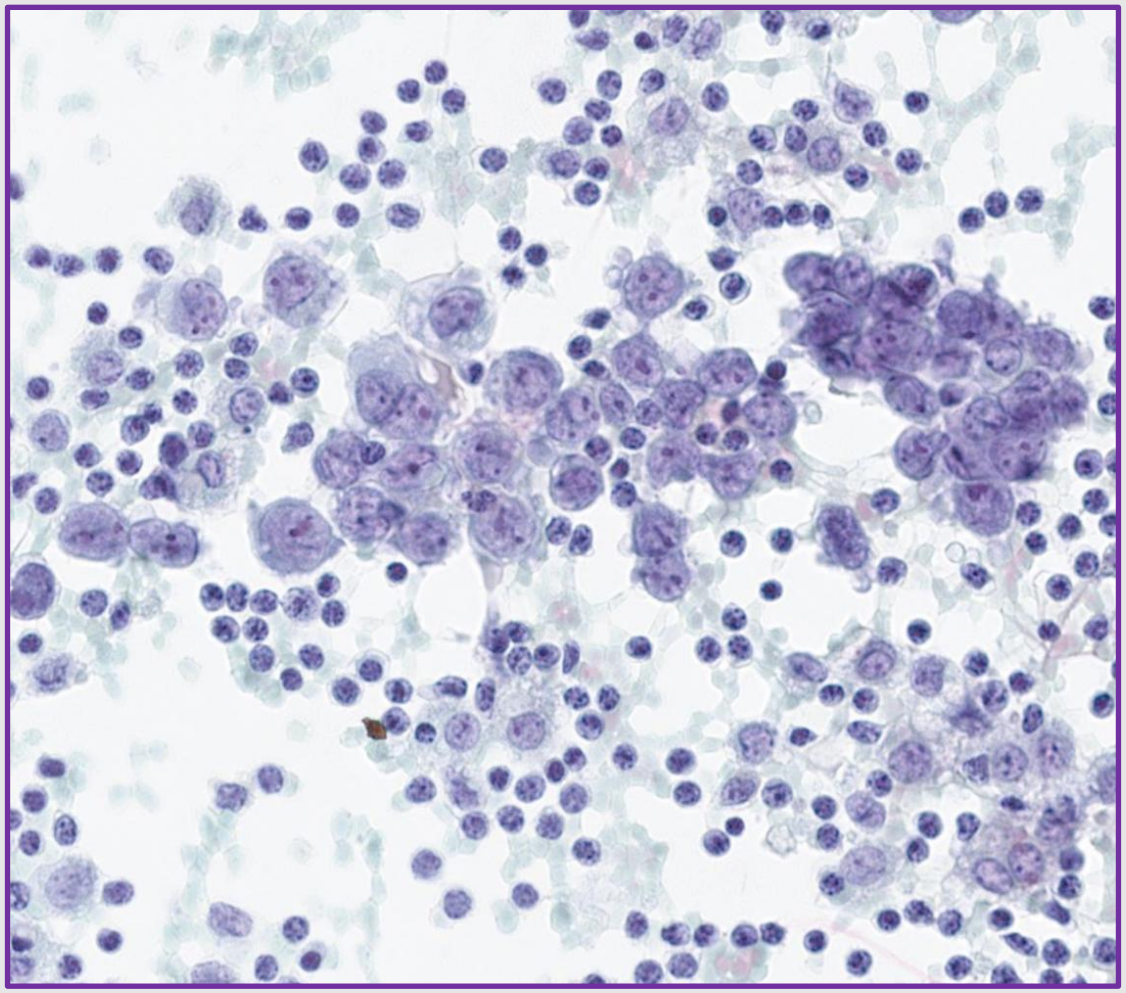


Cytology



The groups of atypical cells varied in size from a few cells to larger three dimensional clusters showing disorganisation and crowding. (Pap X10).

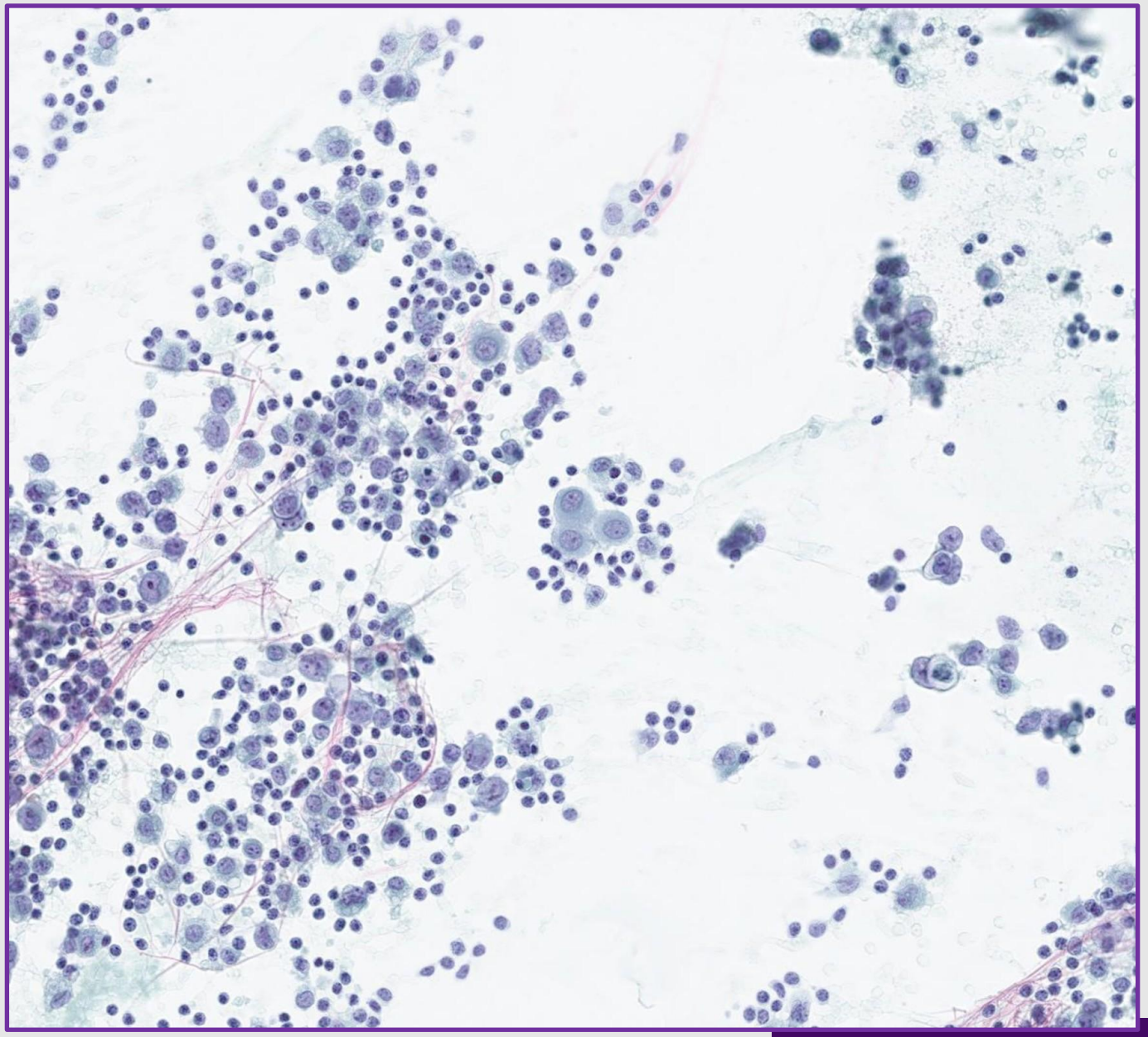
Cytology



Some single cells showed paler chromatin and more cytoplasm than cells within groups. (Pap X40).

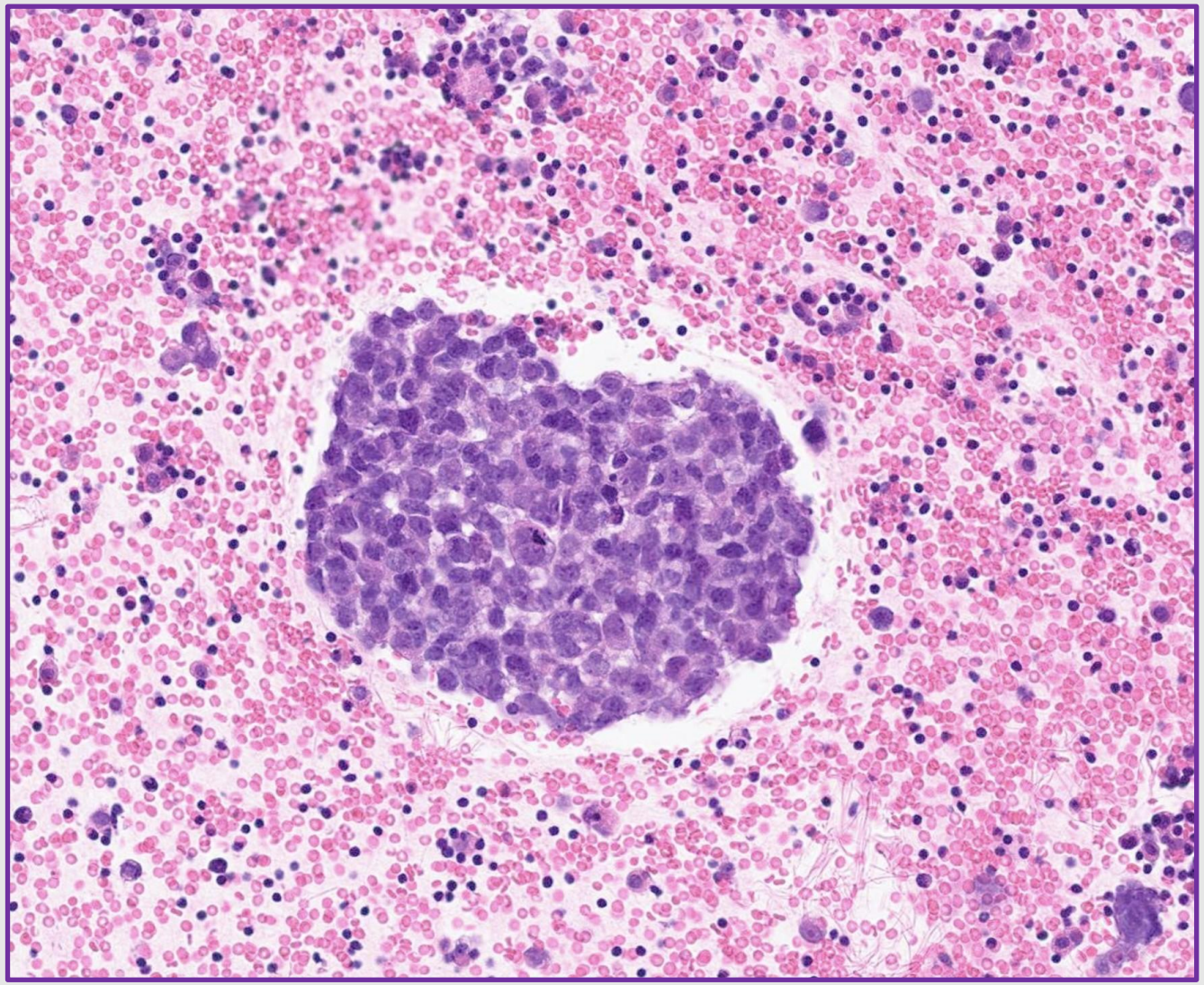
Cytology

The background contained mesothelial cells and an inflammatory cell population comprising a majority of lymphocytes. (Pap X10).

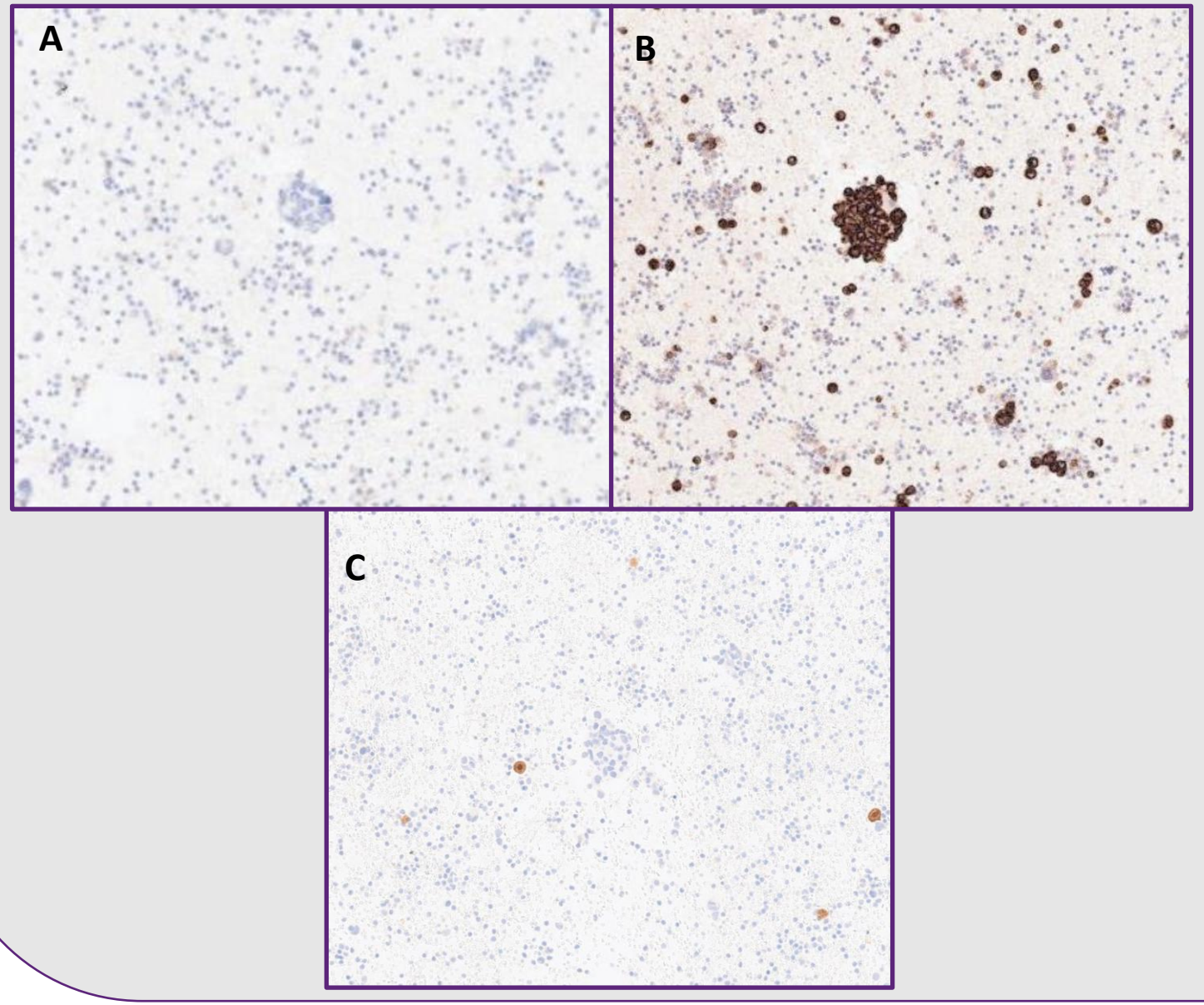


Cytology

The cell block shows similar groups of malignant cells (H&E X20).

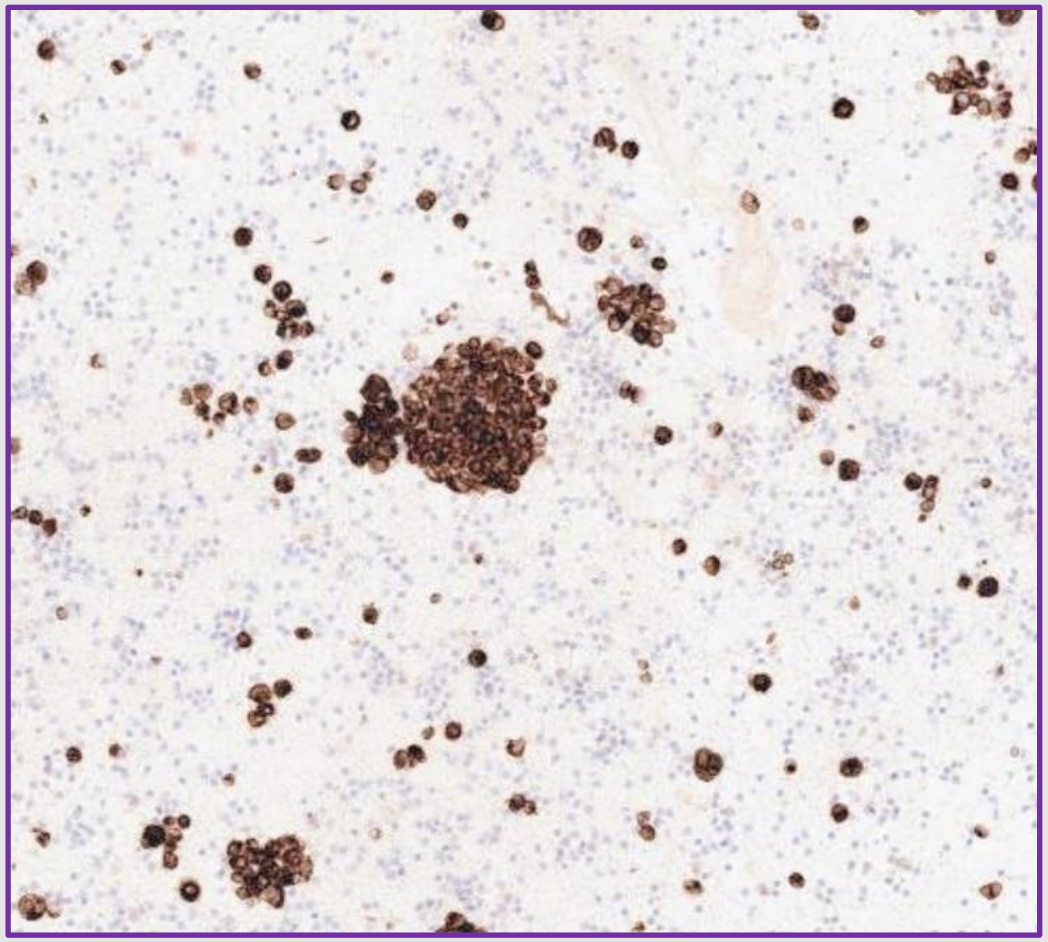


Immunohistochemistry



A panel of immunocytochemistry was performed on the cell block. AE1/AE3 showed negative staining (A X20), whereas WT1 showed cytoplasmic staining of the malignant cells (B X20). Staining for Calretinin was negative, highlighting positive staining mesothelial cells (C X20).

Immunohistochemistry



Stains for epithelial, melanocytic , lymphoid and germ cell markers markers all showed negative results. Subsequently a desmin stain was performed for which the neoplastic cells were positive.

Diagnosis

Further imaging by CT showed a diffuse lobulated pleural thickening. An ultrasound guided biopsy of the paraspinal mass revealed a neoplasm composed of medium sized cells with raised nucleus to cytoplasmic ratio with some background apoptosis and necrosis. The core biopsies showed desmin positive tumour cells with morphological and immunohistochemical characteristics of a rhabdomyosarcoma.

Initially the pleural fluid was reported as showing involvement with malignant cells, but could not be certain about the tumour type. A subsequent report on the pleural fluid cytology, in conjunction with the biopsy, suggested involvement by rhabdomyosarcoma.

Discussion

Clinically the initial differential diagnosis for this case was wide and pleural fluid cytology showed a malignancy with few specific morphological features. A broad panel of immunohistochemistry was performed on the cell block to narrow the likely primary site. By far the most common metastatic malignancy found in pleural fluid is carcinoma, specifically adenocarcinoma.
However, in a young patient an inflammatory or infectious nature is more likely, and a number of the antibodies used in the first instance showed negative staining.

Discussion

Rhabdomyosarcoma is a malignancy of skeletal muscle most commonly occurring in children and adolescents with the majority presenting as soft tissue masses. In the United Kingdom in 2022 there were 5345 cases of sarcoma, with rhabdomyosarcoma cases totalling only 119 in this tumour group. These tumours can be categorised into embryonal, alveolar, spindle cell/sclerosing and pleomorphic types, with the first two types being predominant.

Documented characteristic morphological features include round or elongated cells with eosinophilic cytoplasm and presence of rhabdomyoblasts in embryonal rhabdomyosarcoma, whereas alveolar type contains round hyperchromatic cells with scant cytoplasm and multinucleated giant cells.

Discussion

There is limited information published about the diagnosis of rhabdomyosarcoma in adults and a rhabdomyosarcoma in an adult presenting with pleural effusion is rarer still. In this case the fluid was cellular with a mixed morphology of cohesive and discohesive cells and variable cytoplasm. There have been other reports in literature regarding the variability of cytological morphology of alveolar rhabdomyosarcomas in pleural fluid.

Discussion

The age and clinical presentation of this patient led to a wide differential, including metastatic carcinoma and required a large panel of immunohistochemistry.

Immunocytochemically rhabdomyosarcomas stain with desmin in keeping with muscle differentiation. Positive diffuse staining with myogenin or MyoD1 and identification of molecular rearrangements in Pax3/7-FOX01 suggest alveolar rhabdomyosarcoma whereas gene fusions are not typically seen in the embryonal subtype. In this case analysis of gene translocations was performed externally to our establishment and reported a rearrangement of Pax3-FOXO1 t(2;13) confirming the tumour to be of alveolar rhabdomyosarcoma subtype.

References

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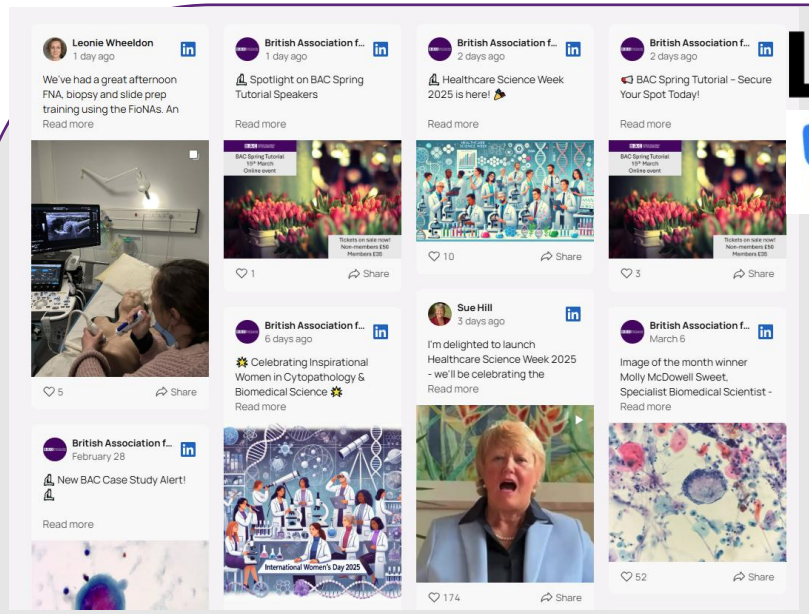

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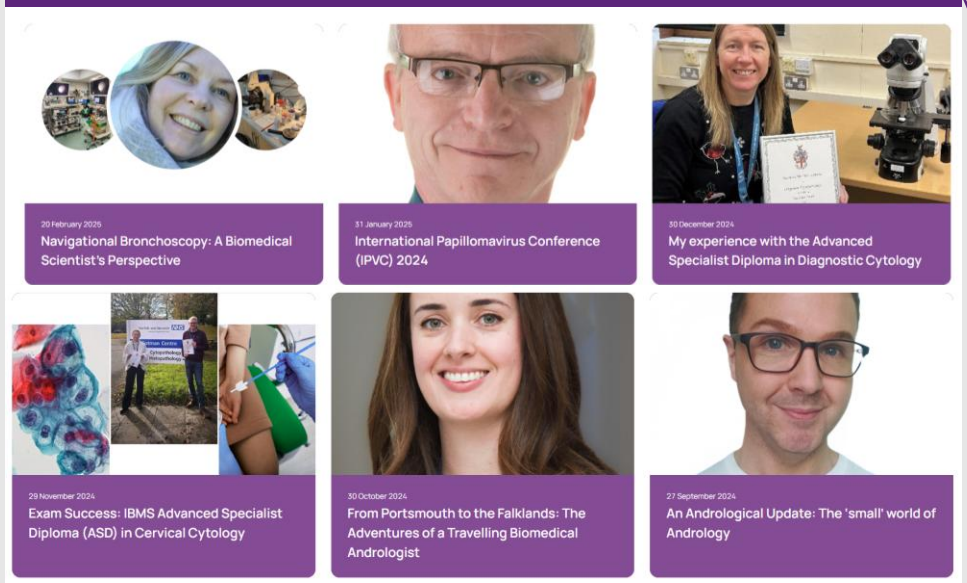

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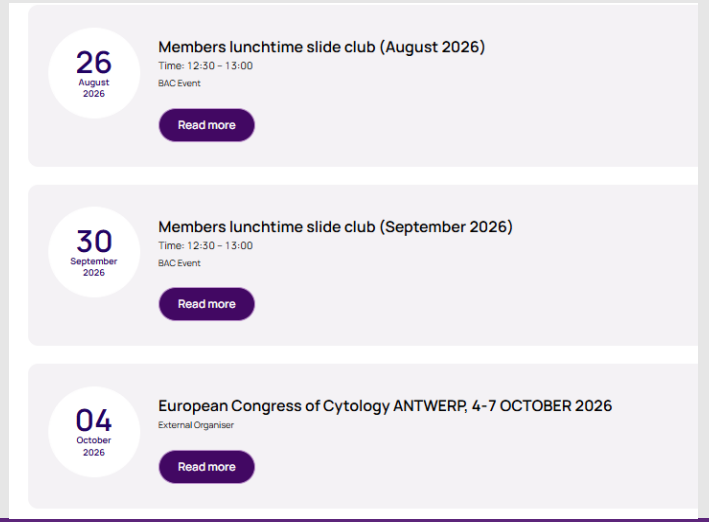

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