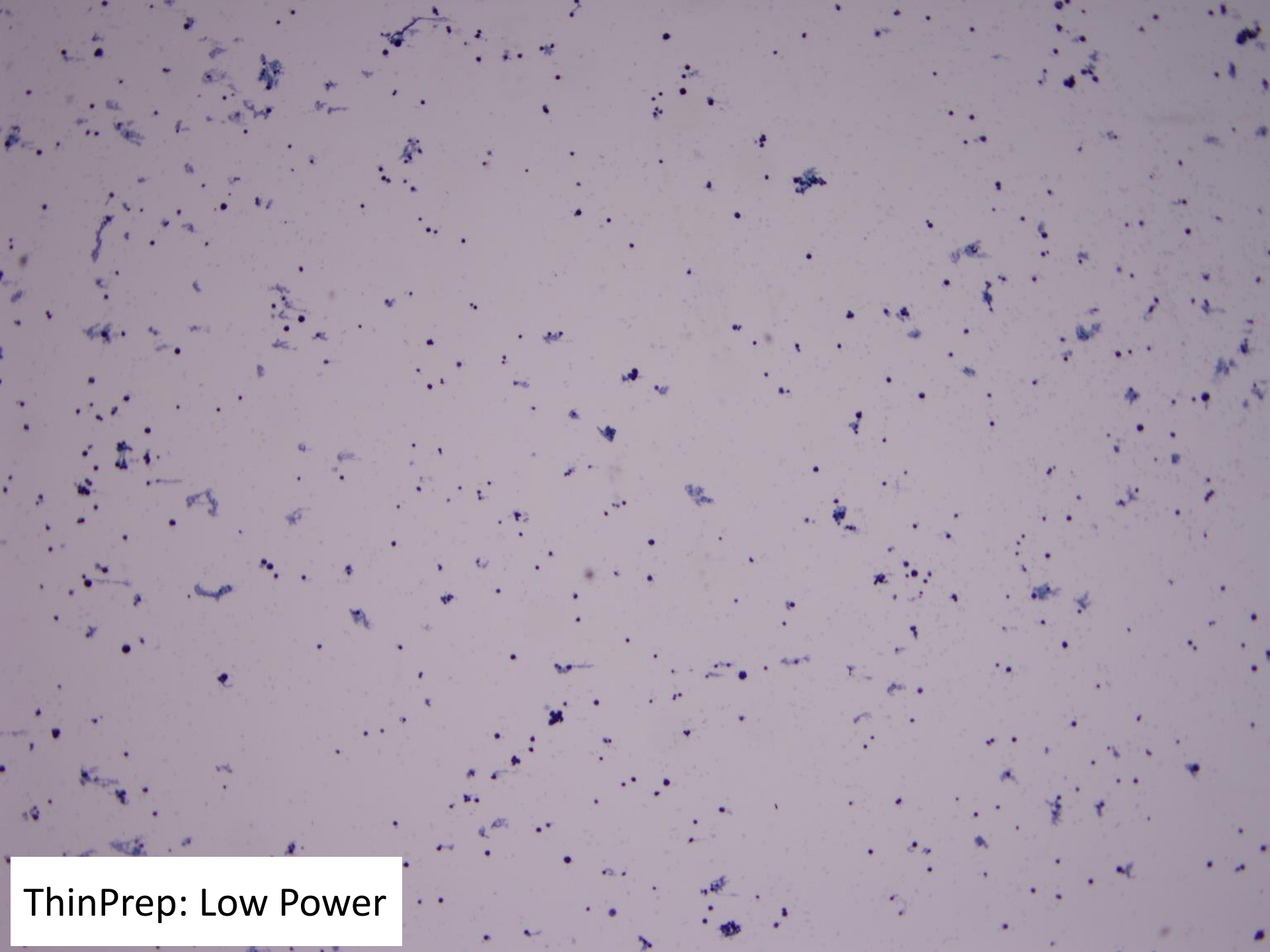


Interesting Case Conference

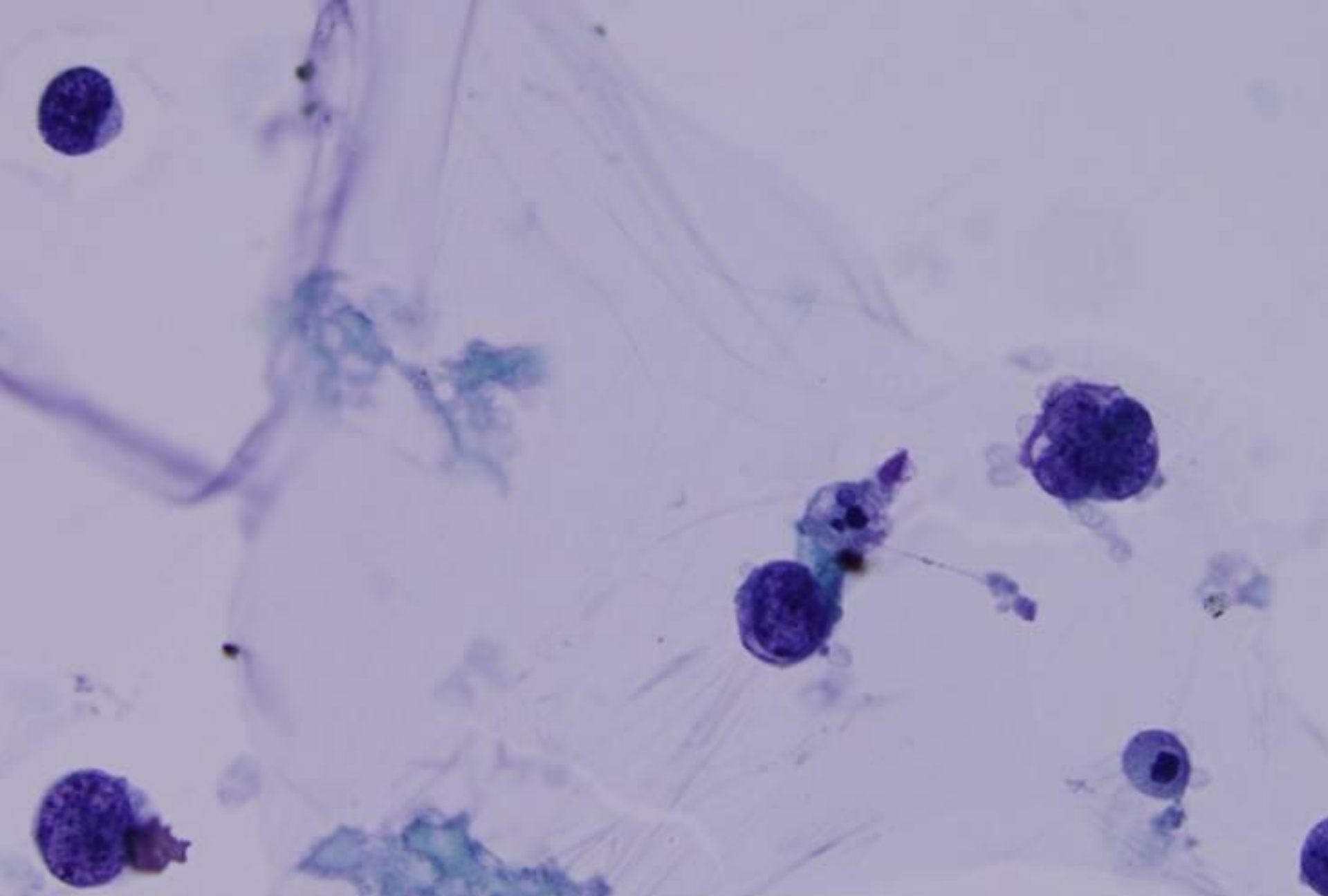
4/08/2013

HISTORY & PHYSICAL EXAM

- 18 year old female presents to emergency department with dyspnea and tachypnea
- Bedside ultrasound
 - Bilateral pleural effusions (right moderate, left mild)
 - Mild-to-moderate pericardial effusion
- History significant for _____

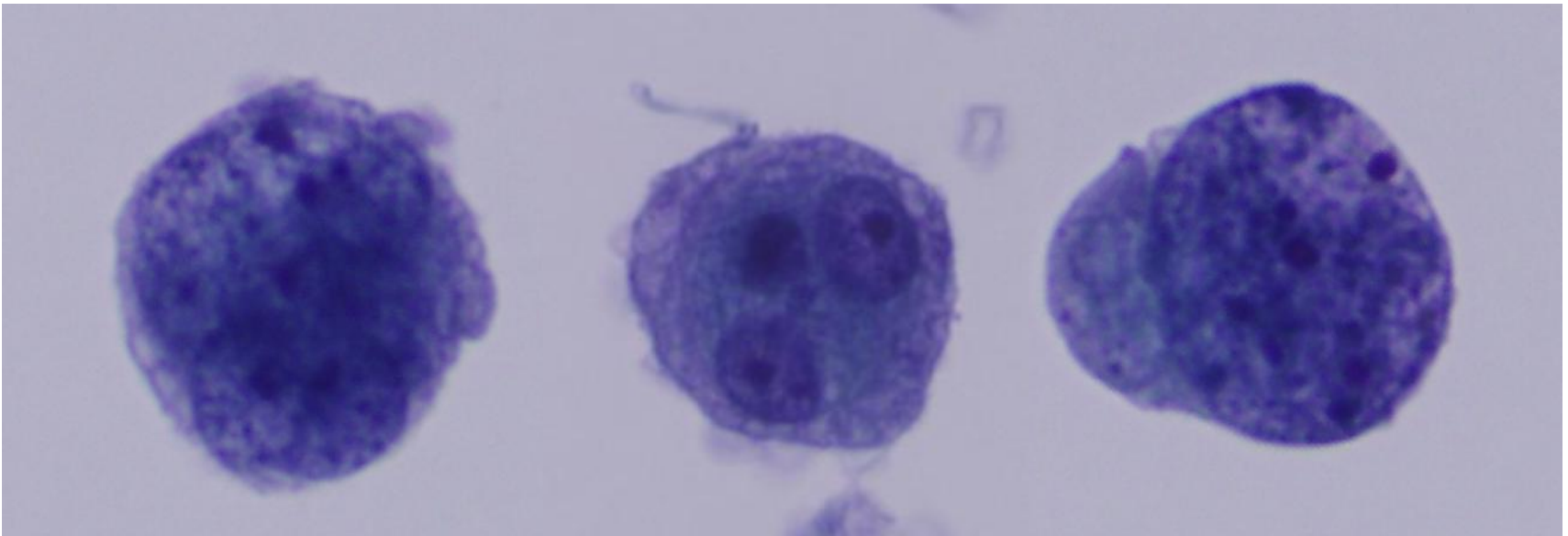
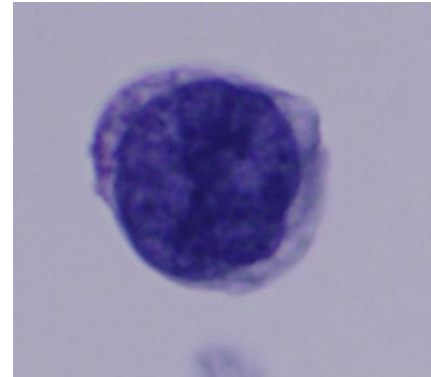
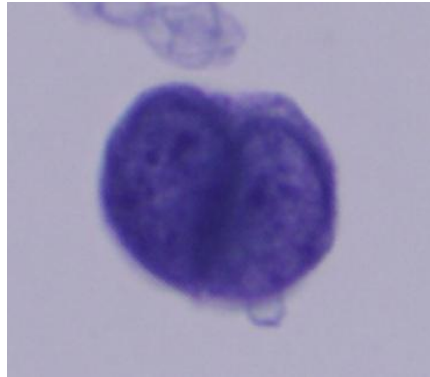
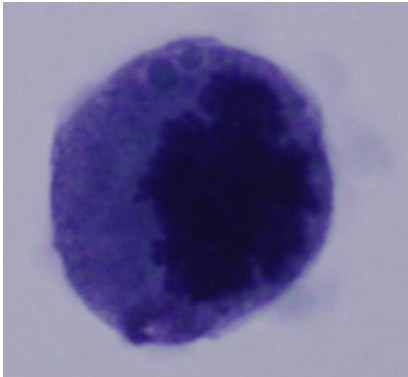


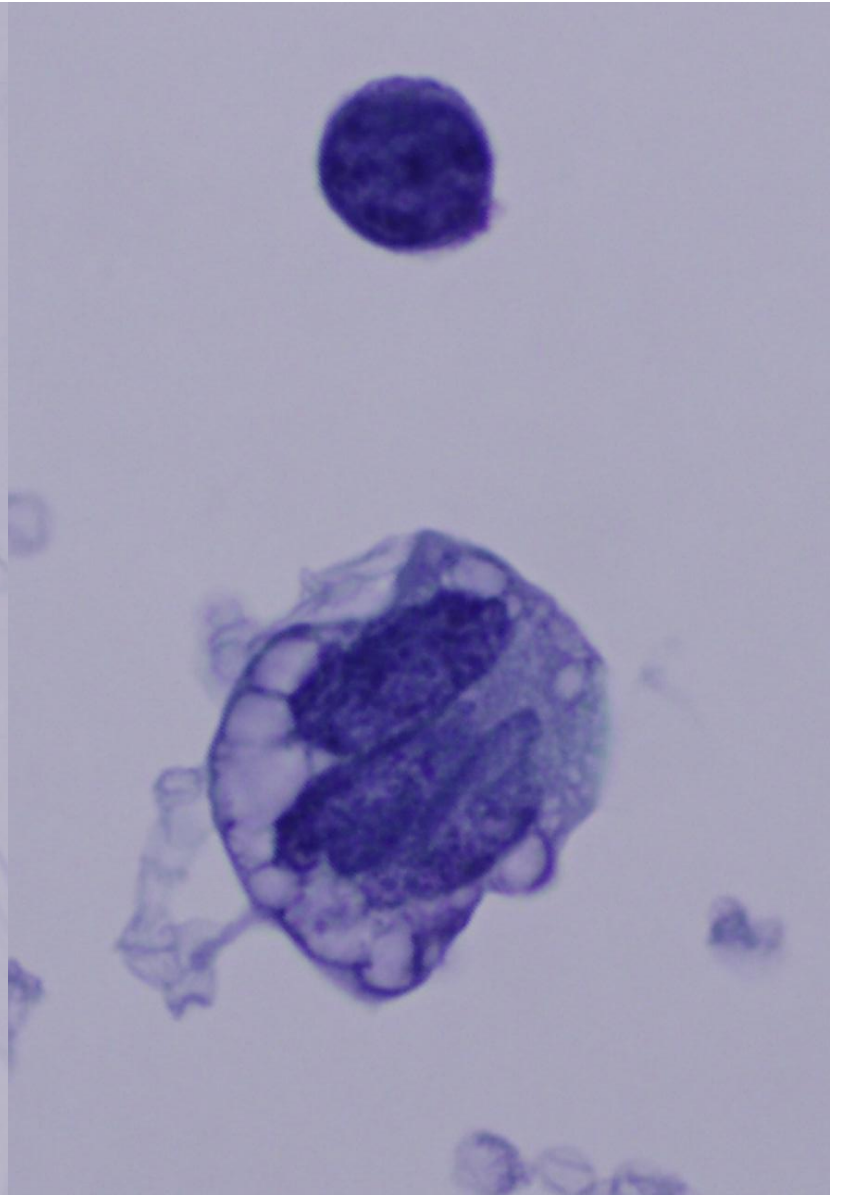
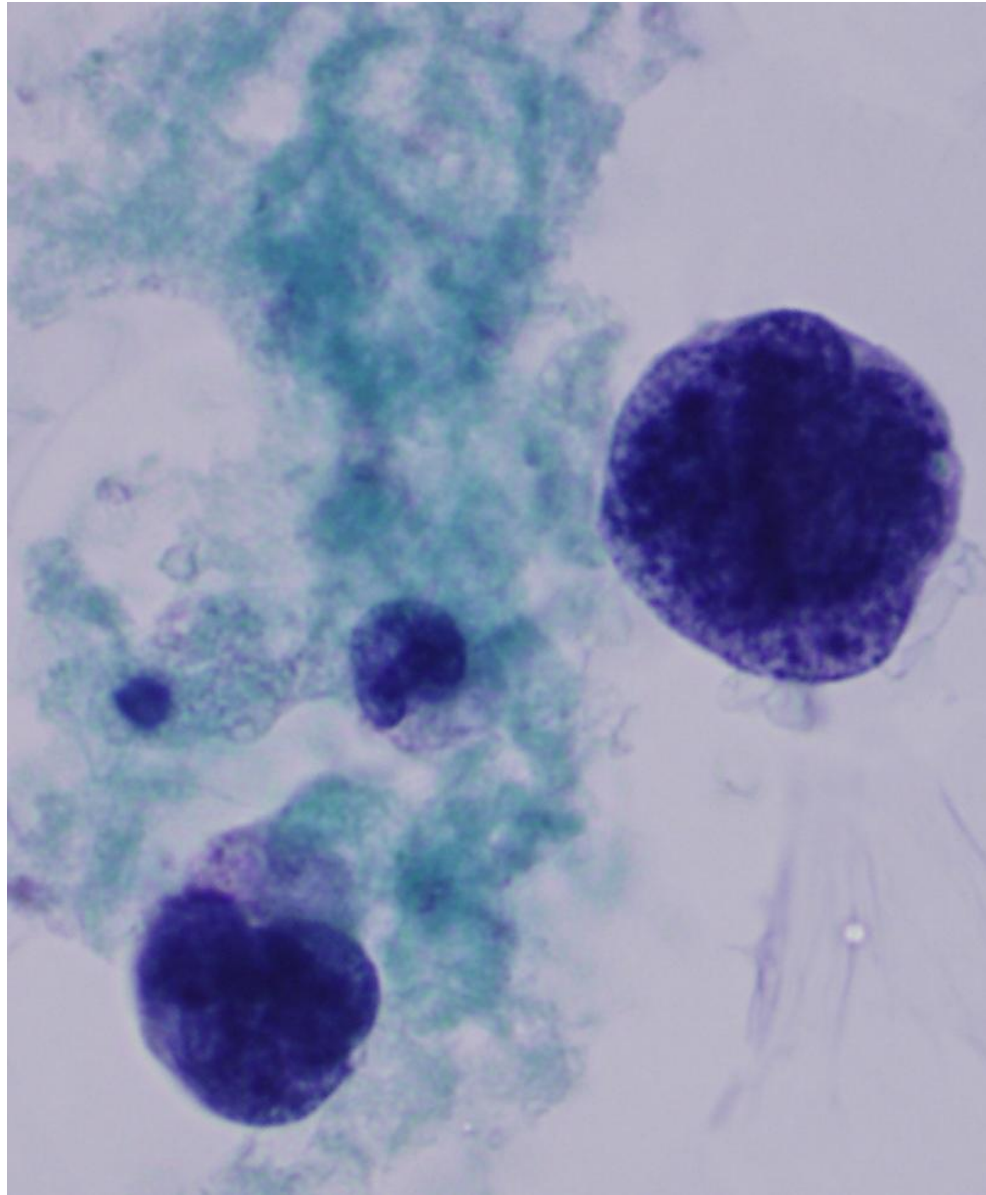
ThinPrep: Low Power

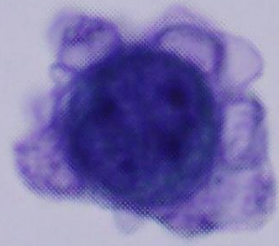
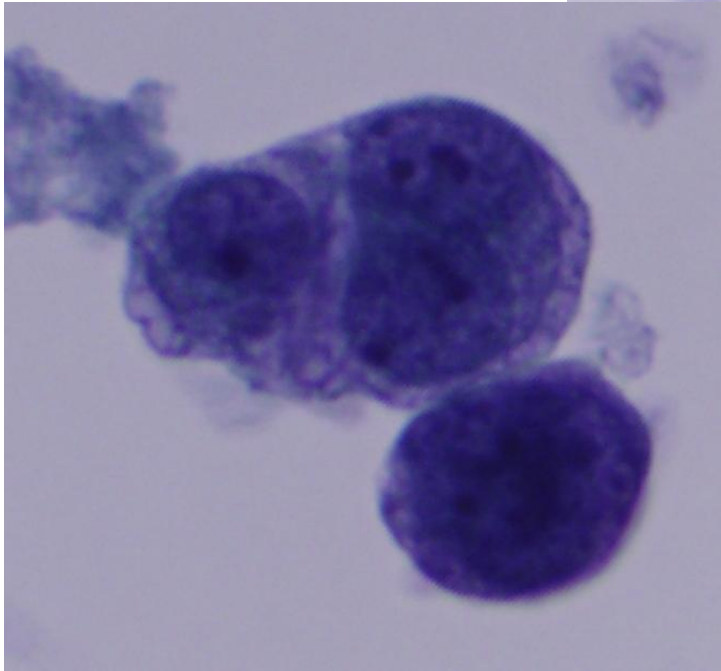
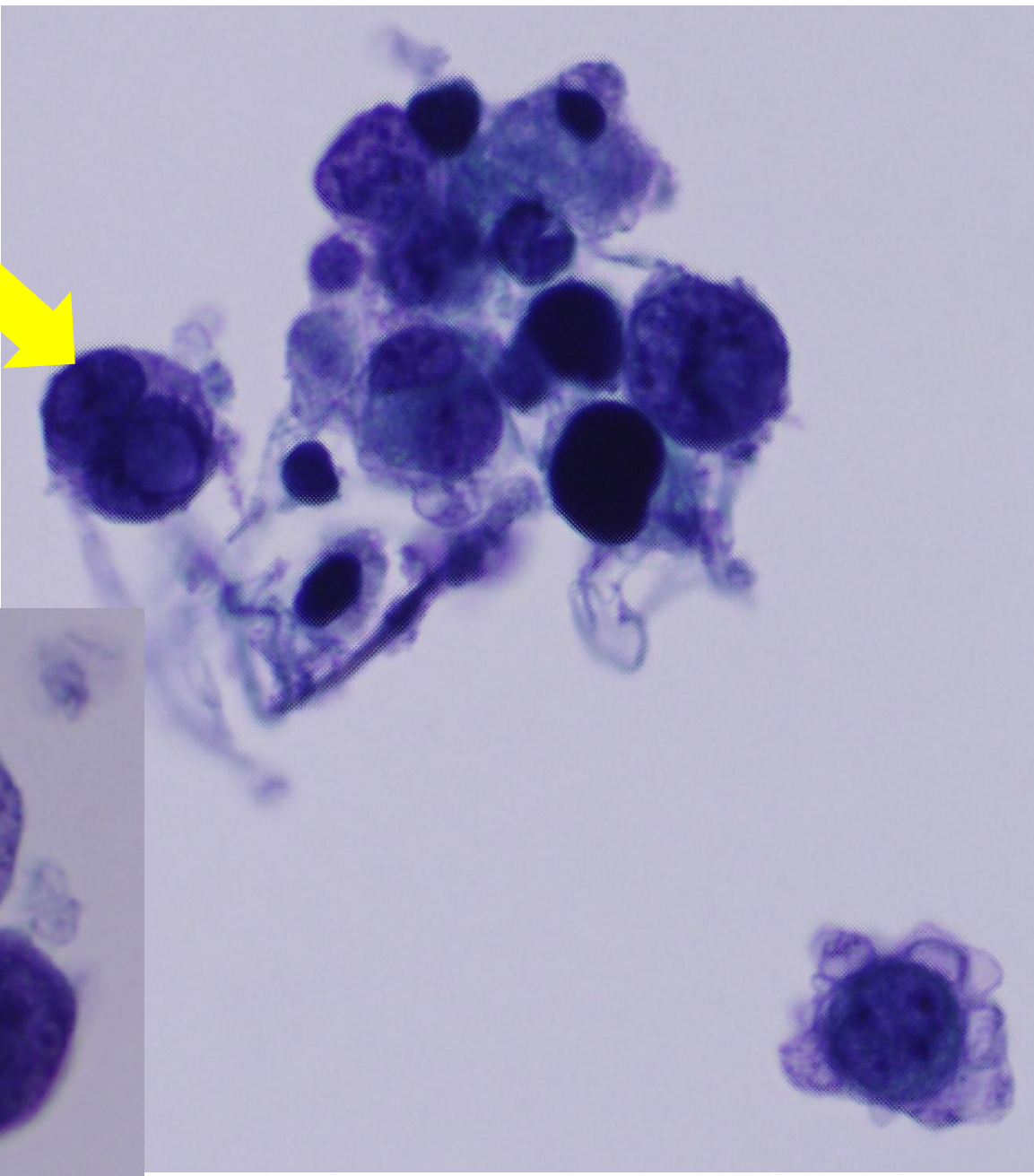


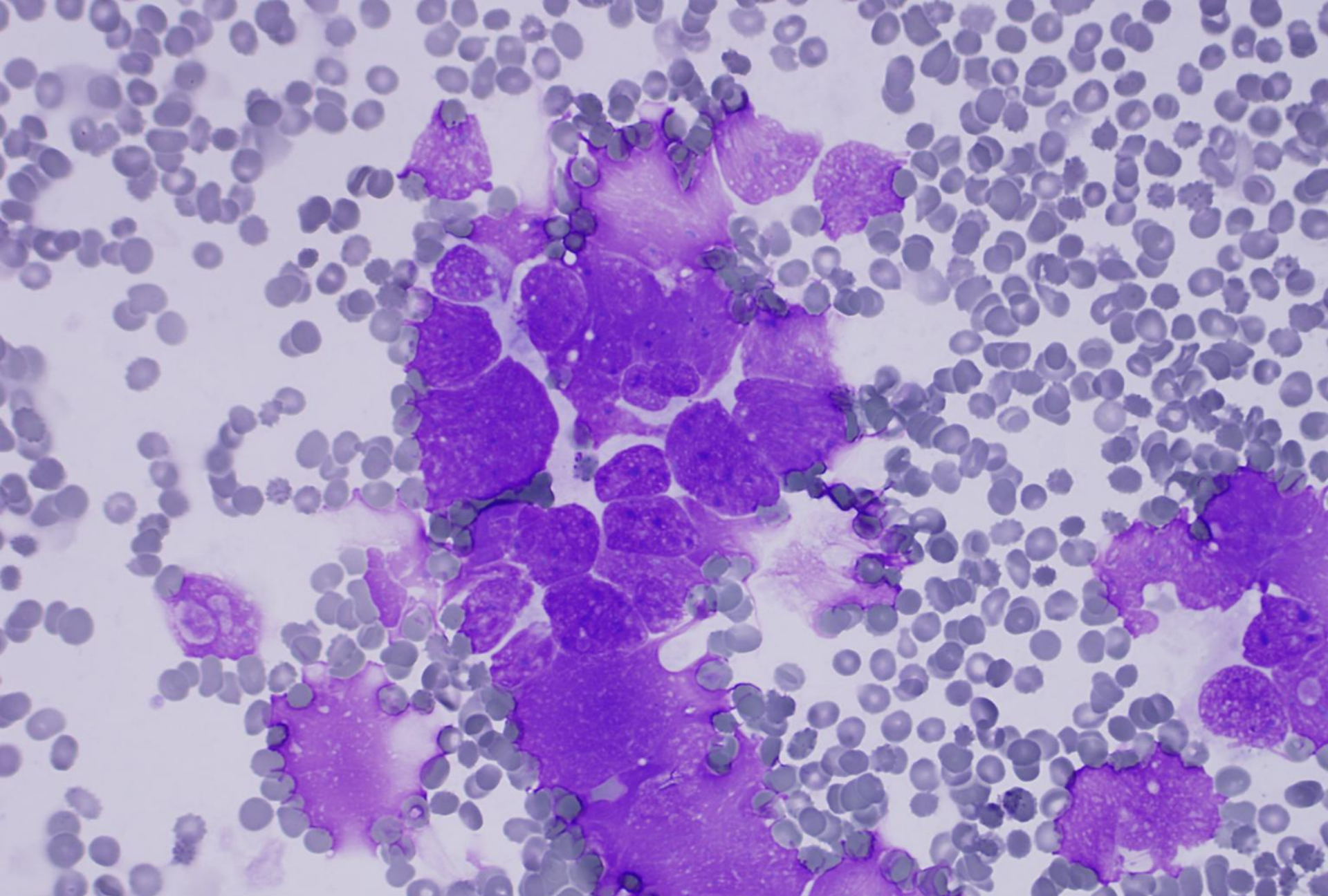
ThinPrep: High N/C ratio, multinucleation

High N/C ratio, multinucleation, prominent nucleoli, vesicular nuclei

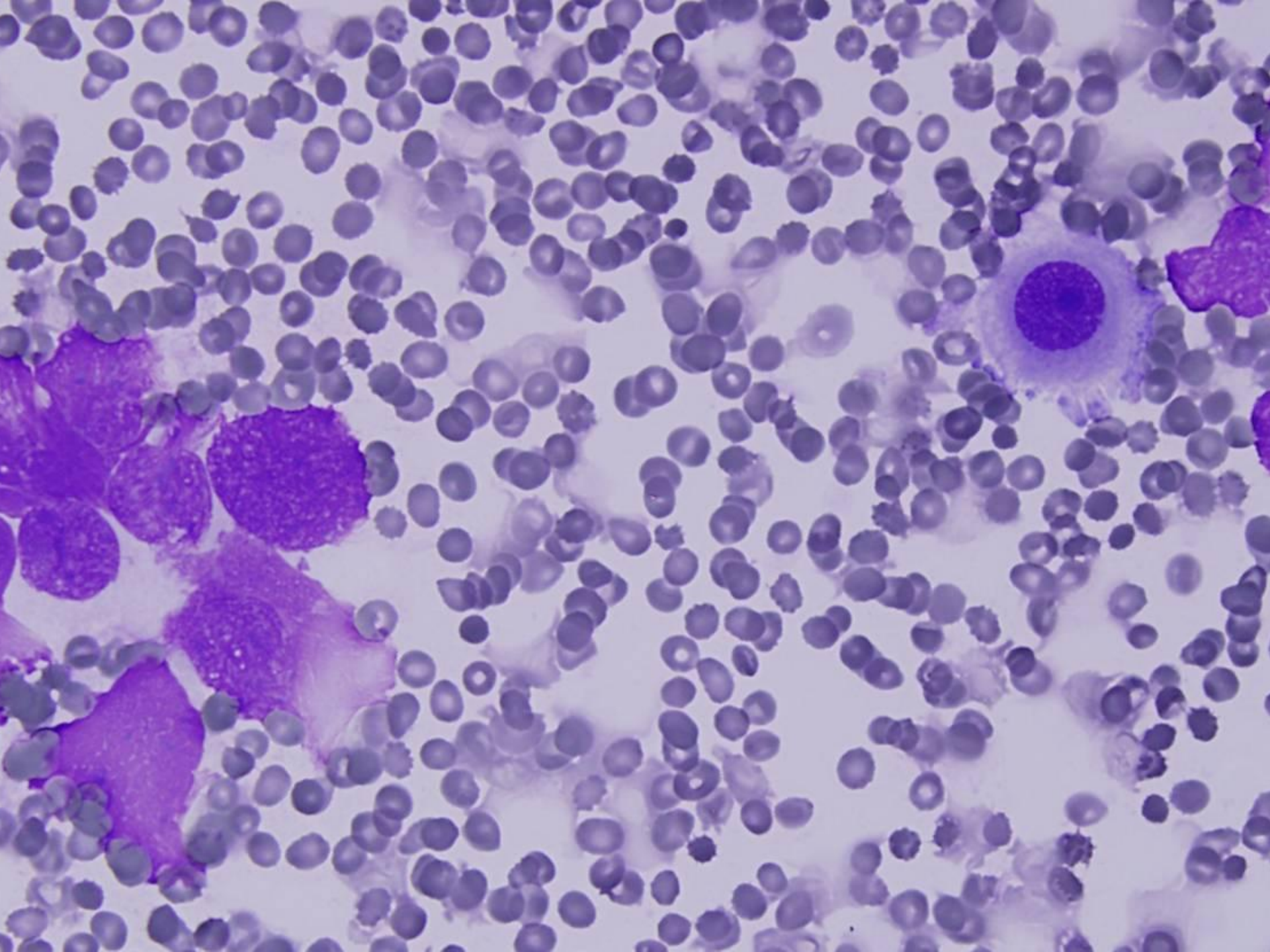


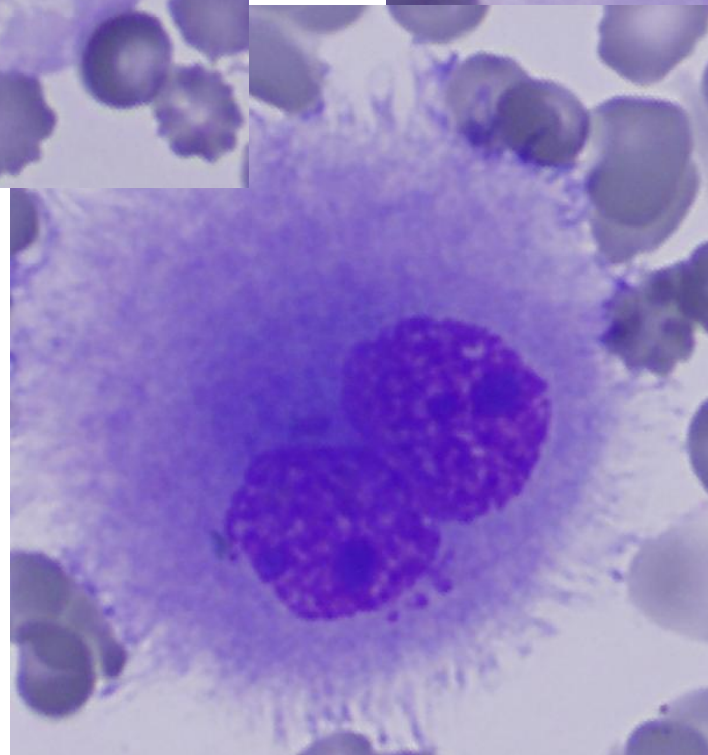
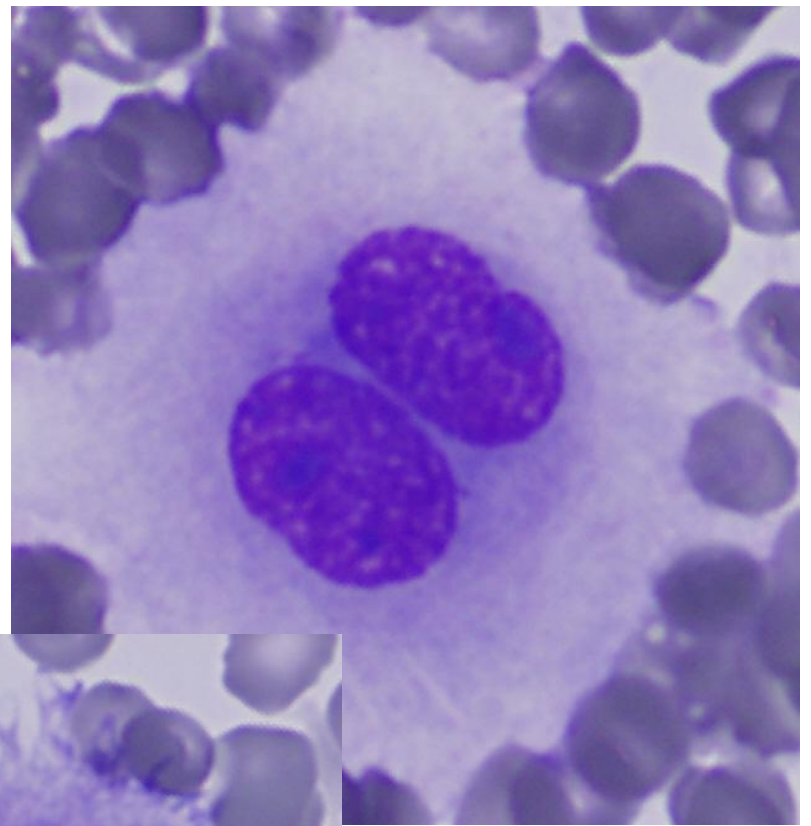
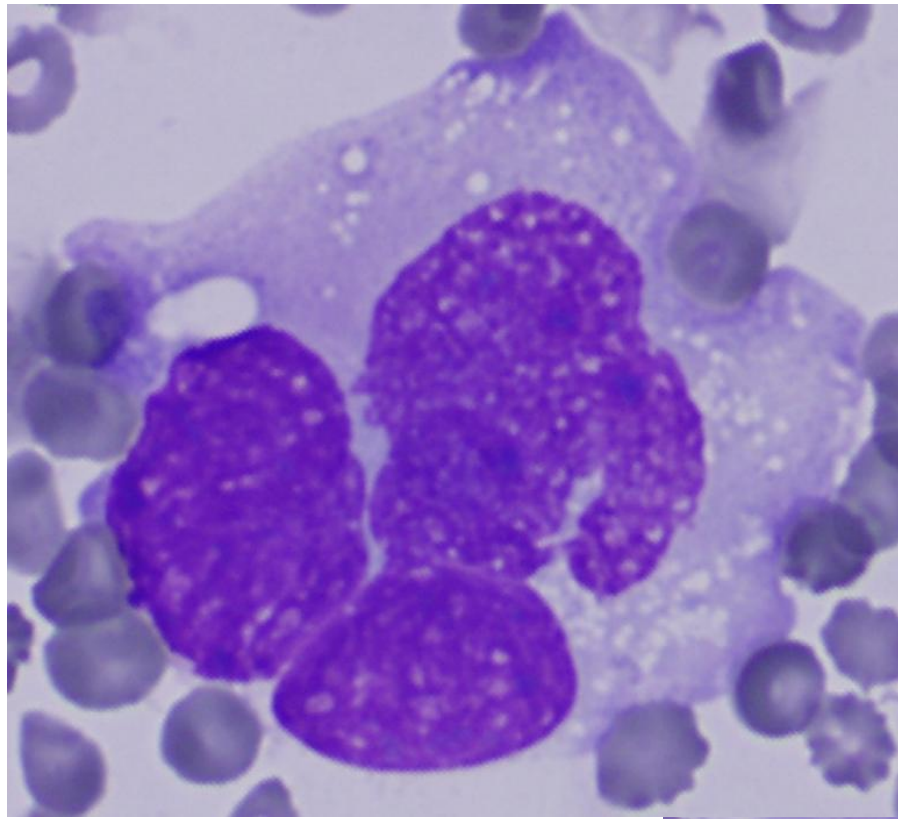


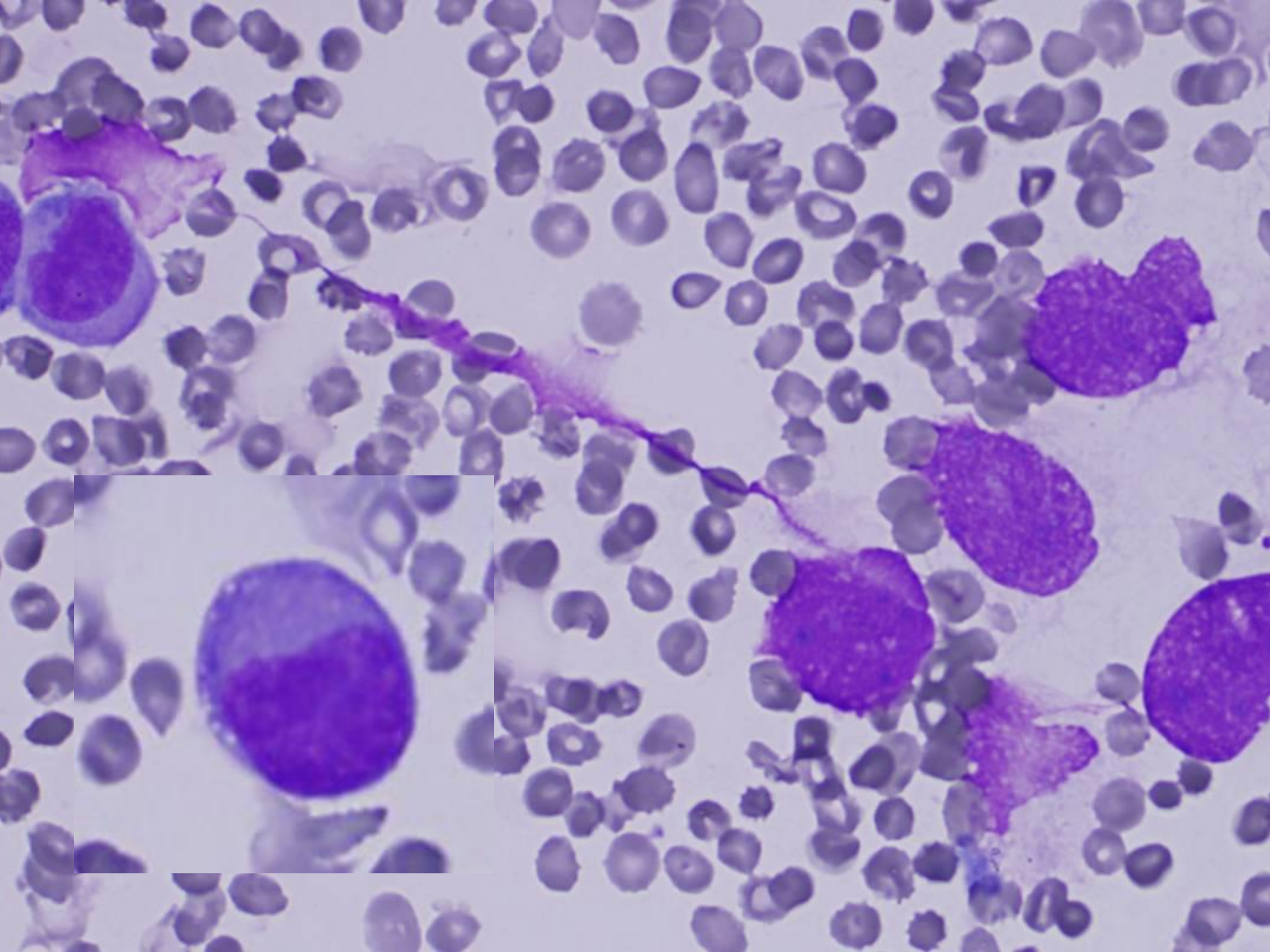




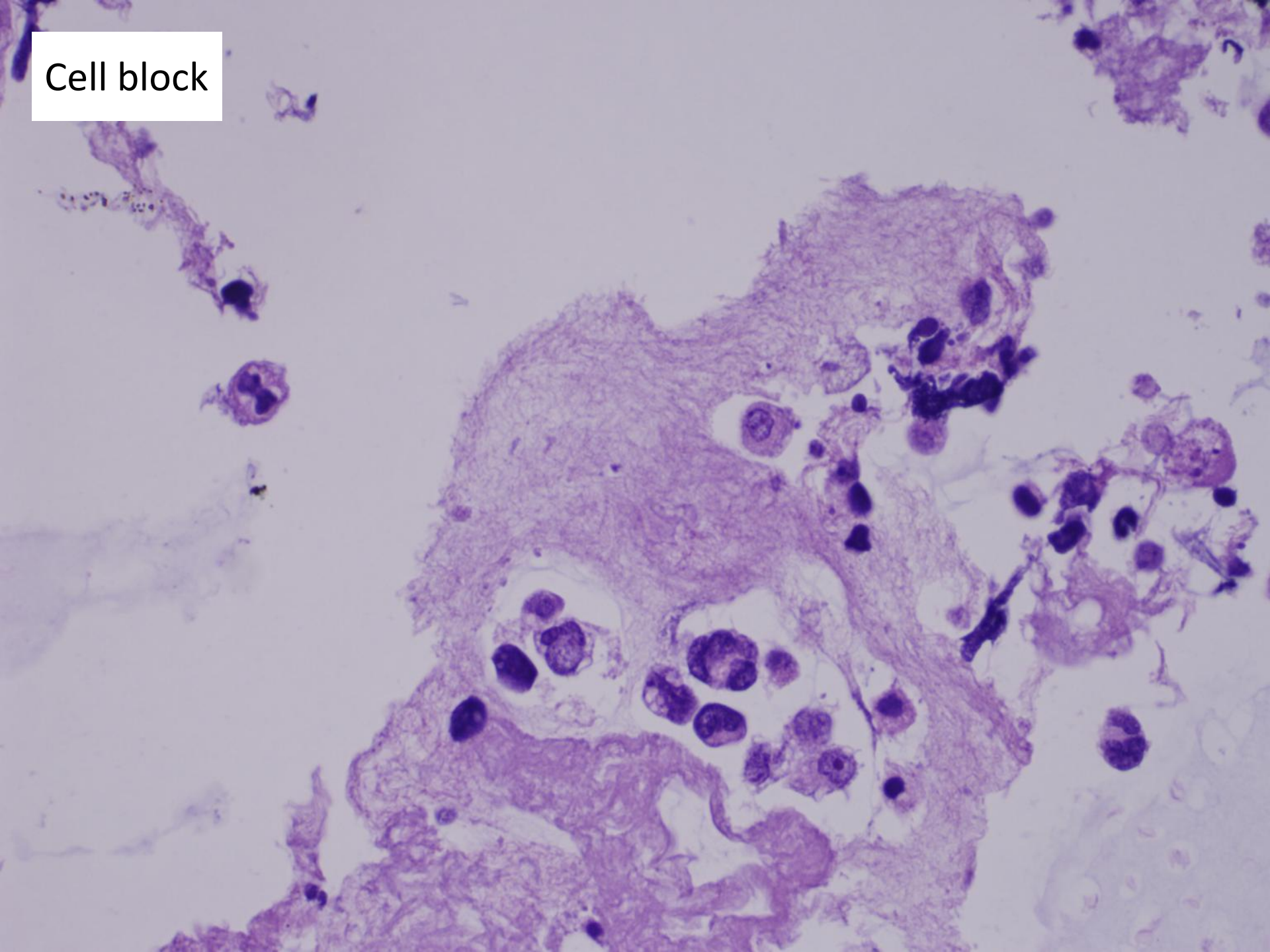
DQ: Enlarged nuclei, plemorphism, multiple prominent nucleoli, molding

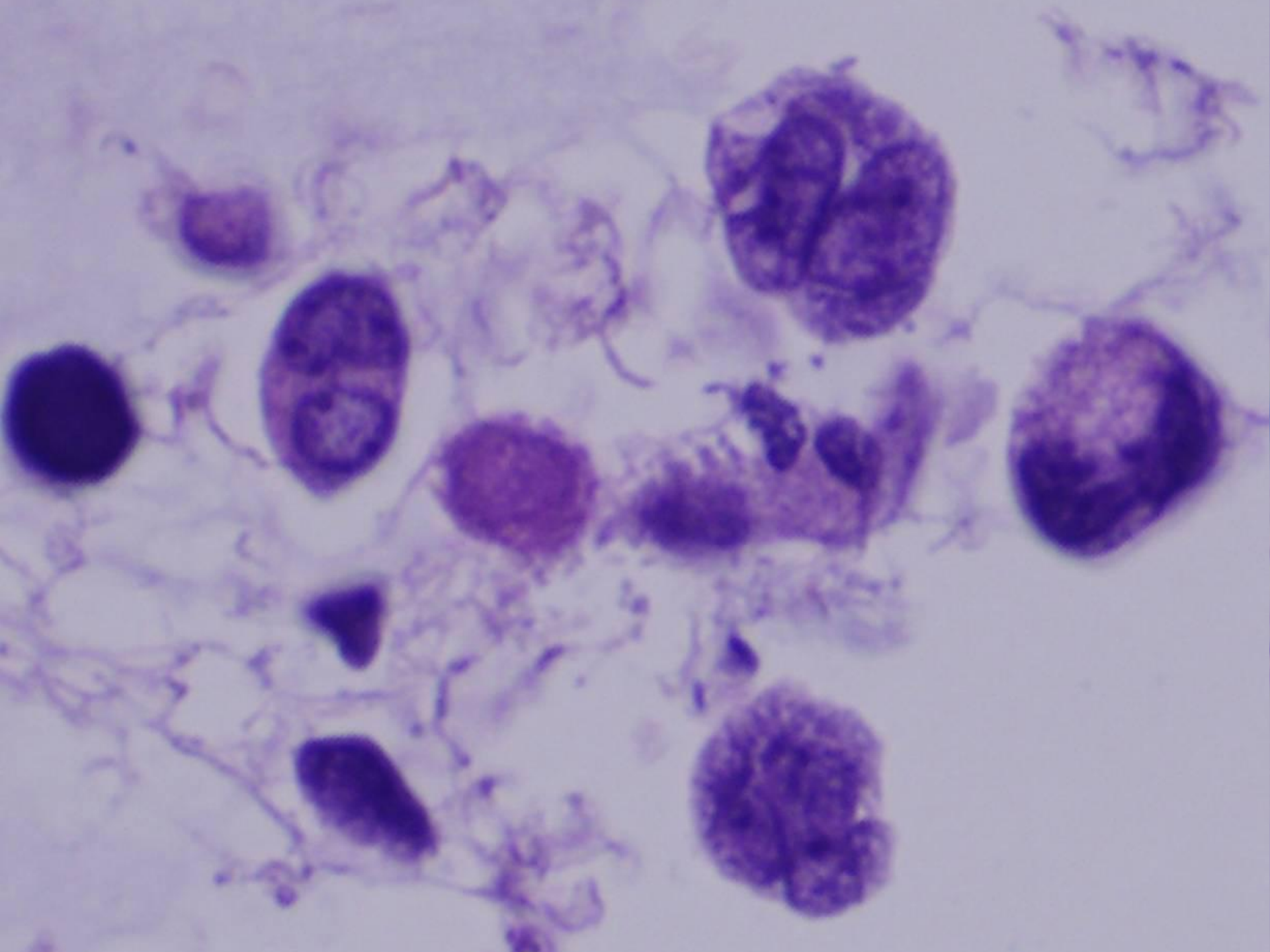






Cell block





Differential Diagnosis

- Melanoma
- Small round blue cell tumor
- Sarcoma
- Lymphoma
- Poorly differentiated carcinoma
- Adenocarcinoma

FINAL DIAGNOSIS & HISTORY

- Right pleural fluid:
 - Positive for malignant cells, consistent with metastasis from the patient's rhabdomyosarcoma.
 - Cytomorphology was identical to that seen in an earlier fluid specimen (tumor cells documented to be myogenin-positive)
- Initial diagnosis 2011 and completed chemotherapy 10/2012
- 3 months later with metastatic relapse
- Began salvage chemotherapy recently
- Current admission: Discharged home few days later with home hospice

Diagnostic Evaluation of Metastatic Rhabdomyosarcoma in Effusion Specimens

Megan A. Alderman, M.D., Dafydd G. Thomas, M.D., Ph.D.,
and Michael H. Roh, M.D., Ph.D

Sarcomas, including rhabdomyosarcoma (RMS), are rarely encountered in effusion specimens; therefore, difficulties in the accurate diagnosis of metastatic sarcomas in effusions can occasionally arise. Immunohistochemistry for myogenin has emerged as a useful adjunct in the diagnosis of RMS, especially in small biopsy specimens. To date, there are no published series describing the utility of immunocytochemistry for myogenin in the diagnosis of RMS in effusion specimens. A total of 15 patients, for whom metastatic sarcomas were diagnosed in effusion specimens between 1998 and 2012, were identified for analysis: alveolar RMS (n = 5); embryonal RMS (n = 1); pleomorphic RMS (n = 1); angiosarcoma (n = 1); Ewing's sarcoma (n = 2); osteosarcoma (n = 1); endometrial stromal sarcoma (n = 1); unclassified spindle cell sarcoma (n = 1); unclassified/undifferentiated pleomorphic sarcoma (n = 1); and leiomyosarcoma (n = 1). Immunocytochemistry for myogenin was performed for each of these cases as well as for 102 effusions that were positive for metastatic carcinoma. Immunocytochemistry for myogenin diffusely and strongly highlighted the nuclei of the tumor cells in six (86%) of seven cases of metastatic RMS; specifically, the five alveolar RMS and one embryonal RMS cases. The one case of pleomorphic RMS, the eight remaining metastatic sarcoma cases, and all 102 cases of metastatic carcinoma were completely negative for myogenin expression. In conclusion, immunocytochemistry for myogenin is a sensitive and specific ancillary adjunct in the diagnostic evaluation of metastatic RMS in effusion specimens. Diagn. Cytopathol. 2013;00:000–000. © 2013 Wiley Periodicals, Inc.

Key Words: rhabdomyosarcoma; sarcoma; effusion; cytology; myogenin

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Rhabdomyosarcoma (RMS) is an aggressive sarcoma with skeletal-muscle differentiation that primarily affects children and young adults and involves the head/neck, extremities, and soft tissues. Rarely, RMS can exfoliate into body fluids resulting in malignant effusions.^{1–4} Histologic subtypes of RMS include embryonal, alveolar, and pleomorphic RMS. Diagnosis of RMS is based on a combination of histologic findings in surgical biopsies or resections along with ancillary studies including immunohistochemistry and cytogenetics. With respect to the former, the clinical utilization of muscle markers such as desmin and myogenin has emerged as valuable adjuncts in the diagnostic confirmation of RMS. As desmin expression is not specific for RMS, myogenin has emerged as a sensitive and specific marker of skeletal muscle differentiation.^{5–7}

Myogenin is one of several basic helix-loop-helix myogenic transcription factors, including MyoD, Myf5, and MRF4 that play critical roles in skeletal muscle differentiation and development during embryogenesis.⁸ Previous studies of myogenin expression in RMS have cited a sensitivity of 71–100% and high specificity with regards to spindle cell neoplasms.^{5,7} The extent of nuclear immunoreactivity in RMS varies depending on the subtype of RMS being examined. For instance, Morgenstern et al. demonstrated that the percentage of myogenin-positive cells is greater in alveolar RMS when compared to embryonal RMS.⁷

Effusions that are positive for metastatic sarcoma are uncommon and account for up to 5% of malignant effusions.⁹ The utility of myogenin immunocytochemistry is therefore of particular interest for the diagnosis of RMS in effusion specimens as the cytomorphologic distinction between RMS and its mimics including reactive mesothelium, metastatic carcinoma, and other sarcomas can be