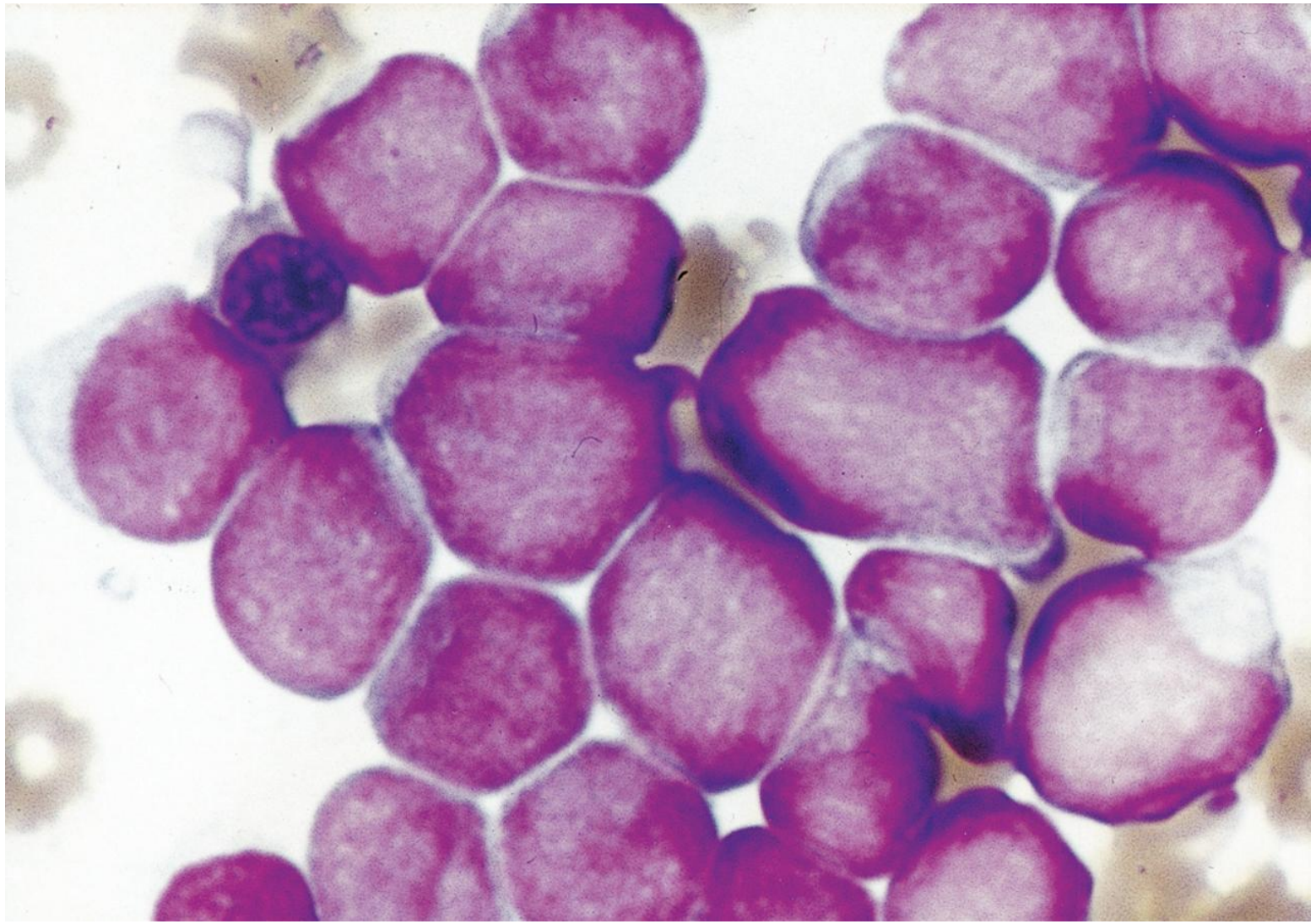
Lymphoid leukemias and multiple myeloma in May-Giemsa smears

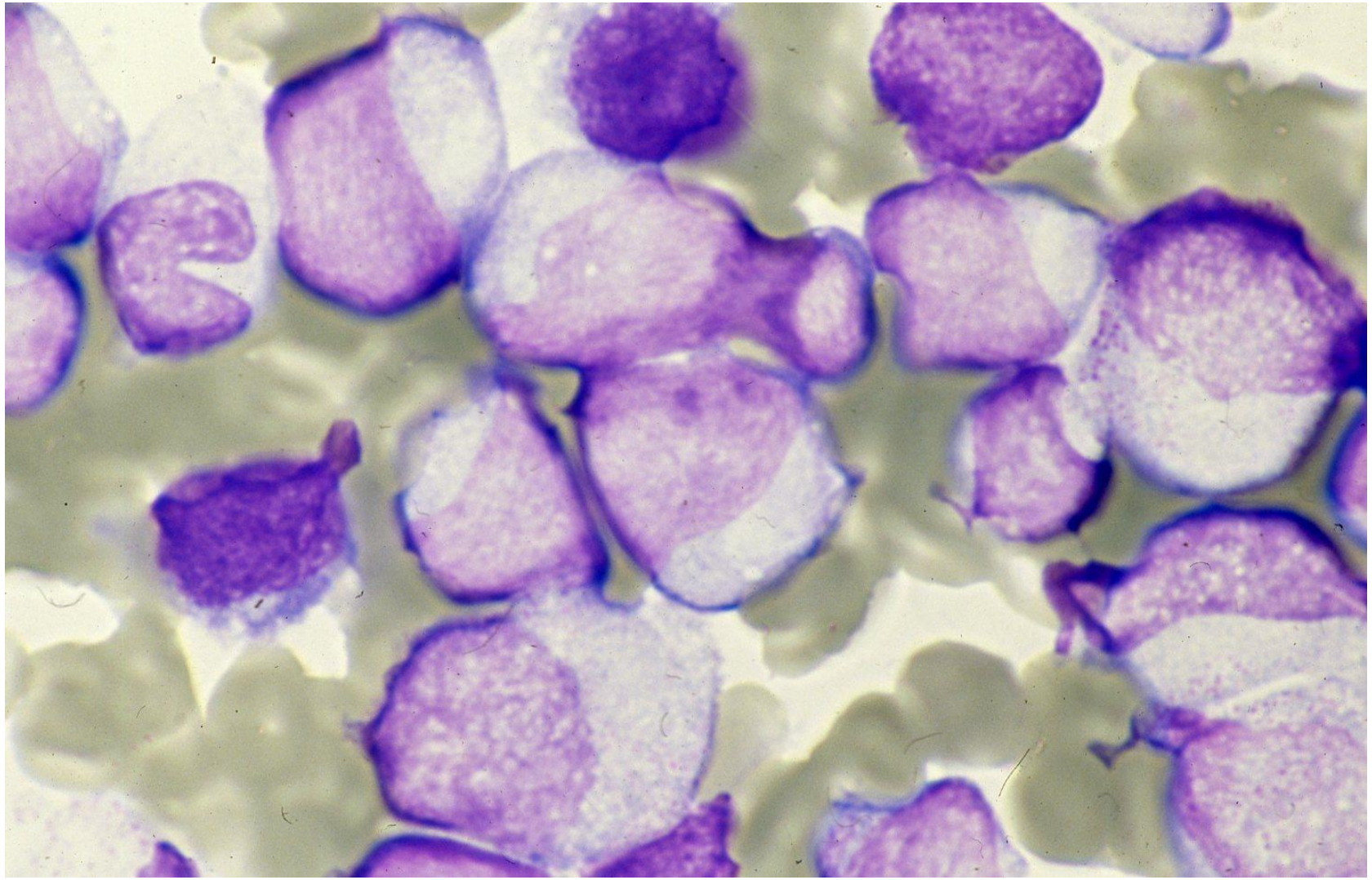
May-Giemsa-stained features of lymphoproliferative disorders involving the bone marrow and peripheral blood are described. These include acute lymphoblastic leukemia, chronic lymphocytic leukemia, hairy cell leukemia, T-cell prolymphocytic leukemia, Sézary syndrome, adult T-cell leukemia, multiple myeloma, Waldenström's macroglobulinemia and lymphomatous involvement of the bone marrow.

Ref.-1: Malard F, Mohty M. Acute lymphoblastic leukaemia. Lancet 2020; 395(10230): 1146-1162. doi: 10.1016/S0140-6736(19)33018-1

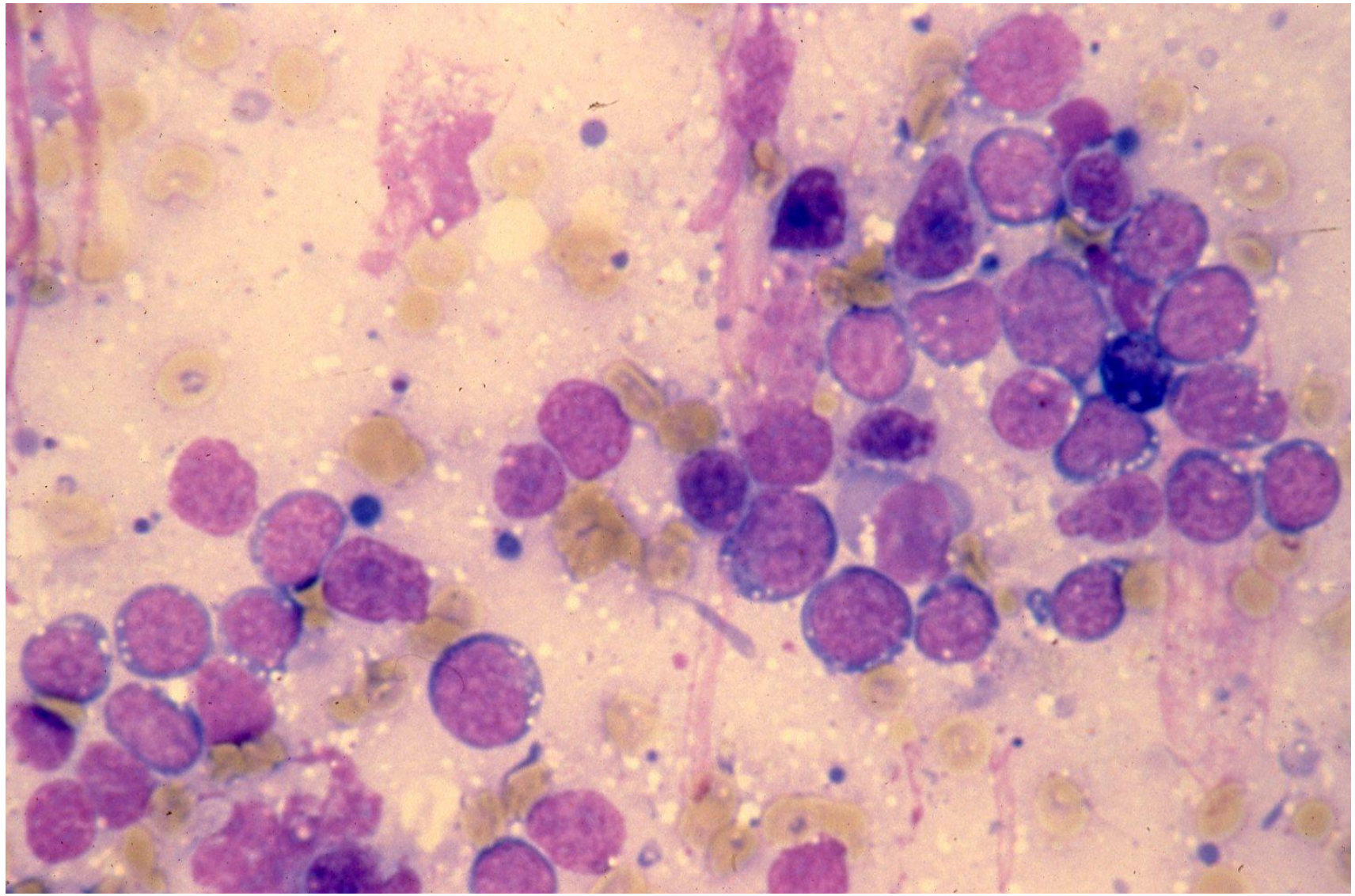
Ref.-2: Justiz Vaillant AA, Stang CM. Lymphoproliferative disorders. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. PMID: 30725847



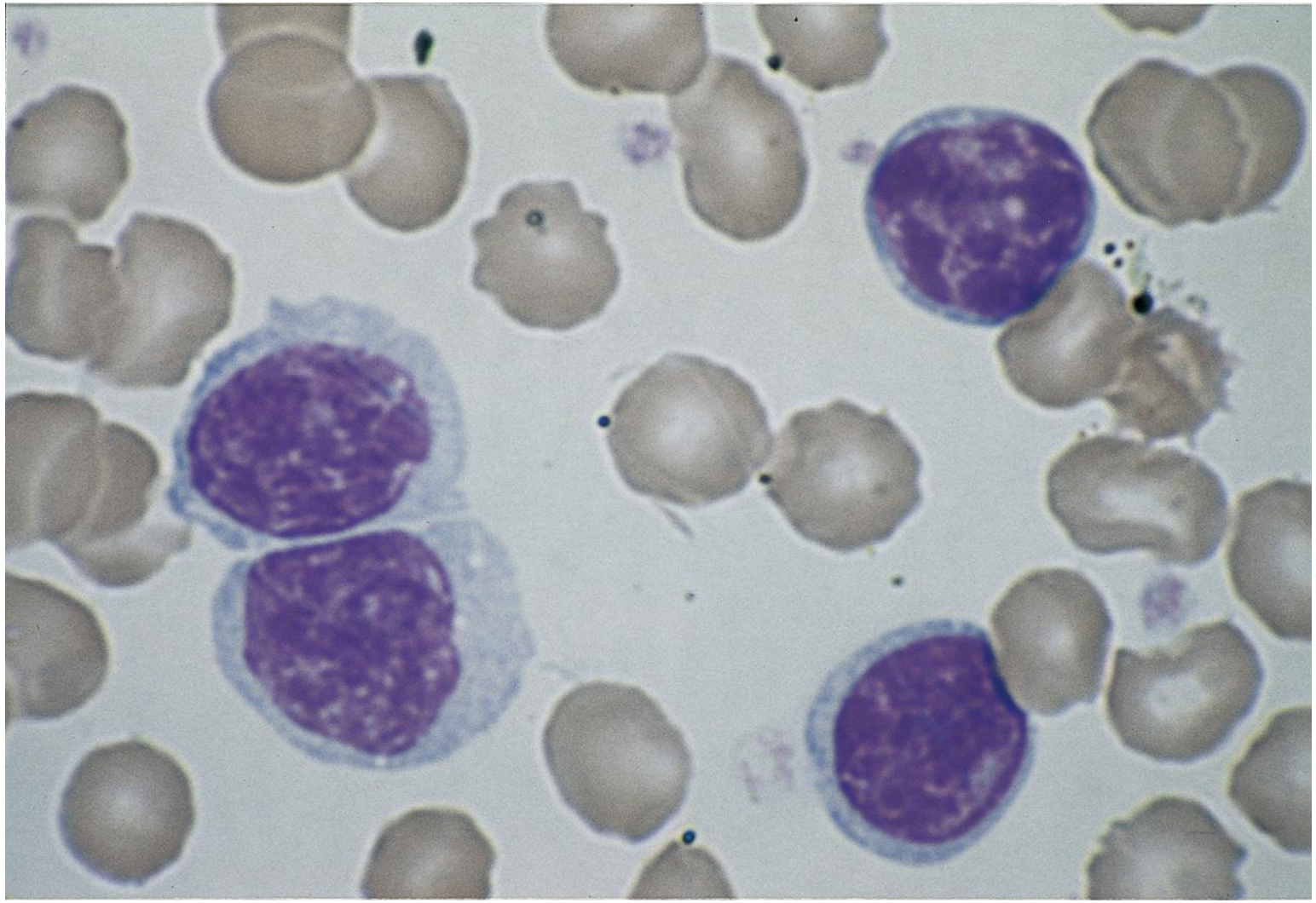
Acute lymphoblastic leukemia, L1. An 18-year-old man complained of malaise and gingival hemorrhage. Pancytopenia was proven (RBC 2,400,000/μL, WBC 35,000/μL (with blasts 95%), and platelets 26,000/μL). Bone marrow aspiration reveals monomorphic blasts with peroxidase-negative scanty cytoplasm. CD10 (common ALL antigen: CALLA), CD19, CD34 and HLA-DR are expressed on the surface, and TdT is localized in the nuclei (immature B-cell origin). May-Giemsa



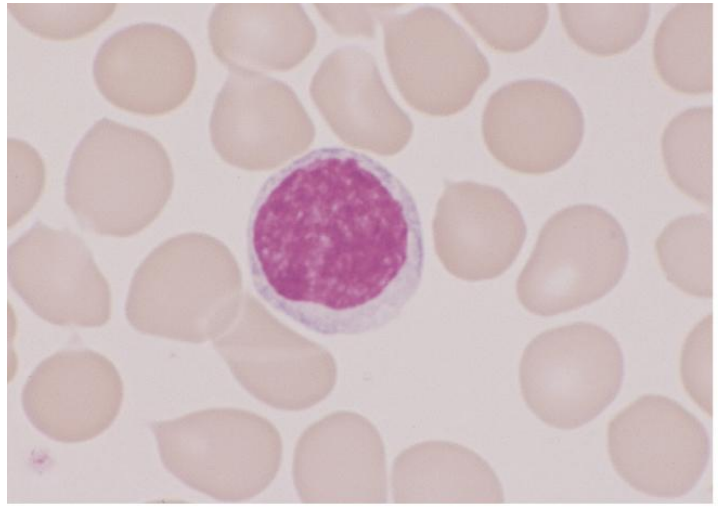
Acute lymphoblastic leukemia, L2. A 10-year-old boy manifested with malaise and nasal hemorrhage. The bone marrow is replaced by monomorphic blasts with relatively plump agranular (peroxidase-negative) cytoplasm. CD10 and TdT are expressed. May-Giemsa

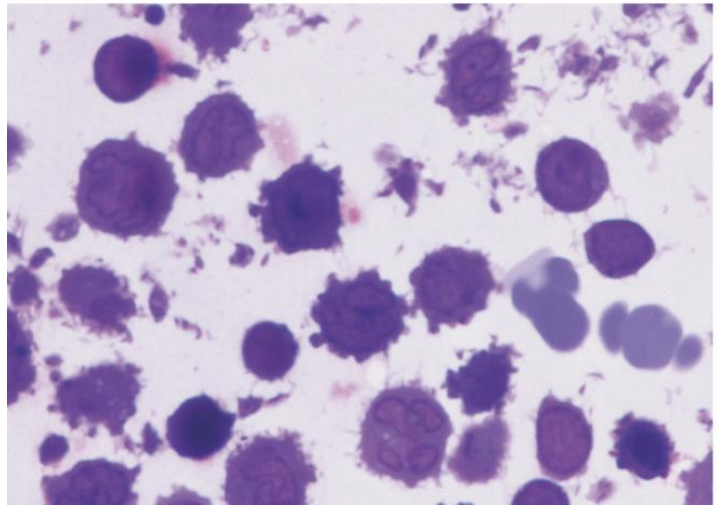


Acute lymphoblastic leukemia, L3. The bone marrow is replaced by monomorphic blasts with basophilic agranular (peroxidase-negative) cytoplasm. The presence of cytoplasmic vacuoles is characteristic of ALL, L3 (Burkitt-like). May-Giemsa

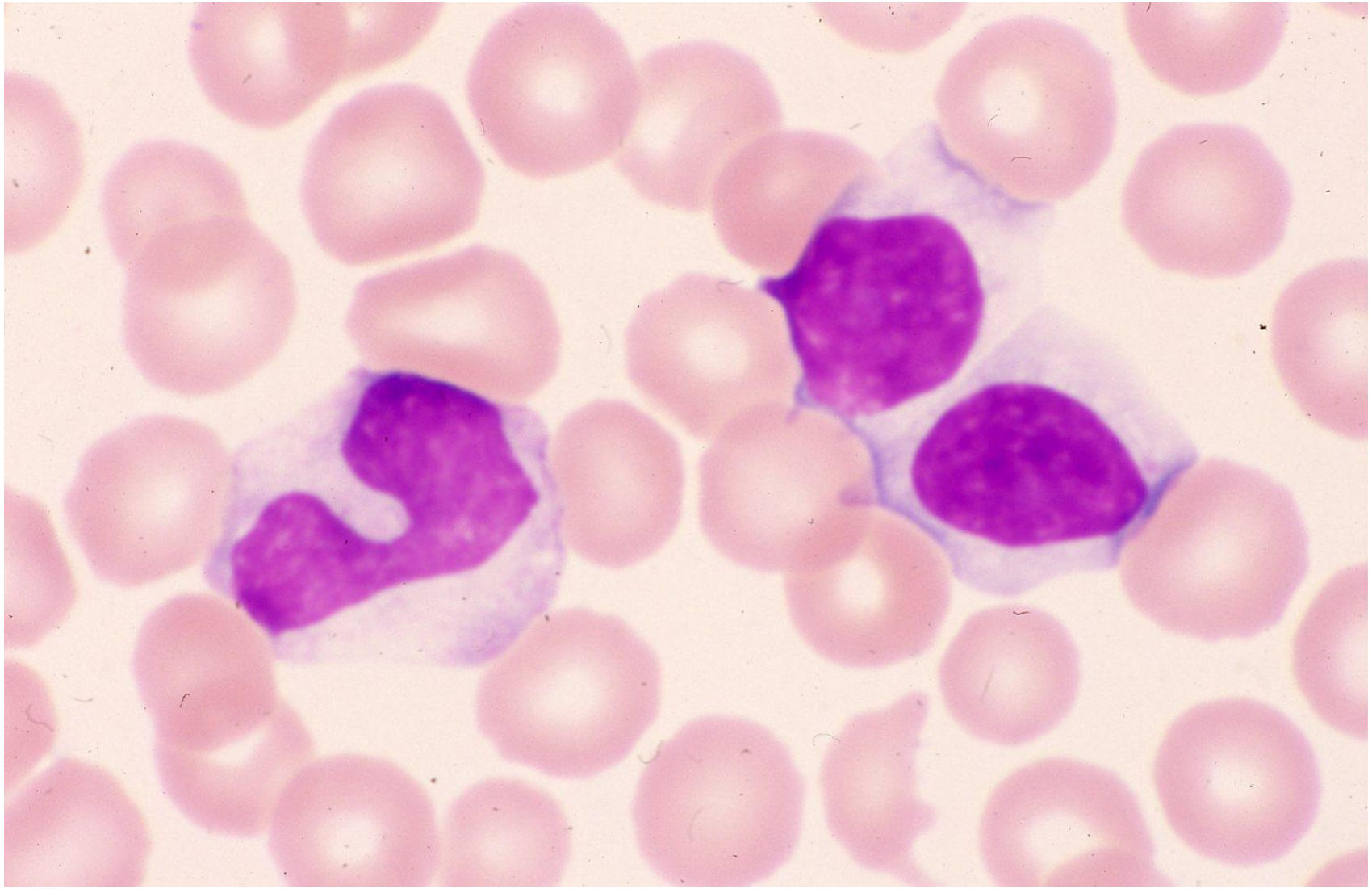


Chronic lymphocytic leukemia (peripheral blood, May-Giemsa). WBC 36,000/μL (lymphocytes 90%). In this indolent leukemia of the aged, both small and large lymphocytes are increased in the peripheral blood. The leukemia cells express mantle zone B-cells (CD5, CD19, CD20, CD23-positive). Kappa-type light chain restriction was proven.

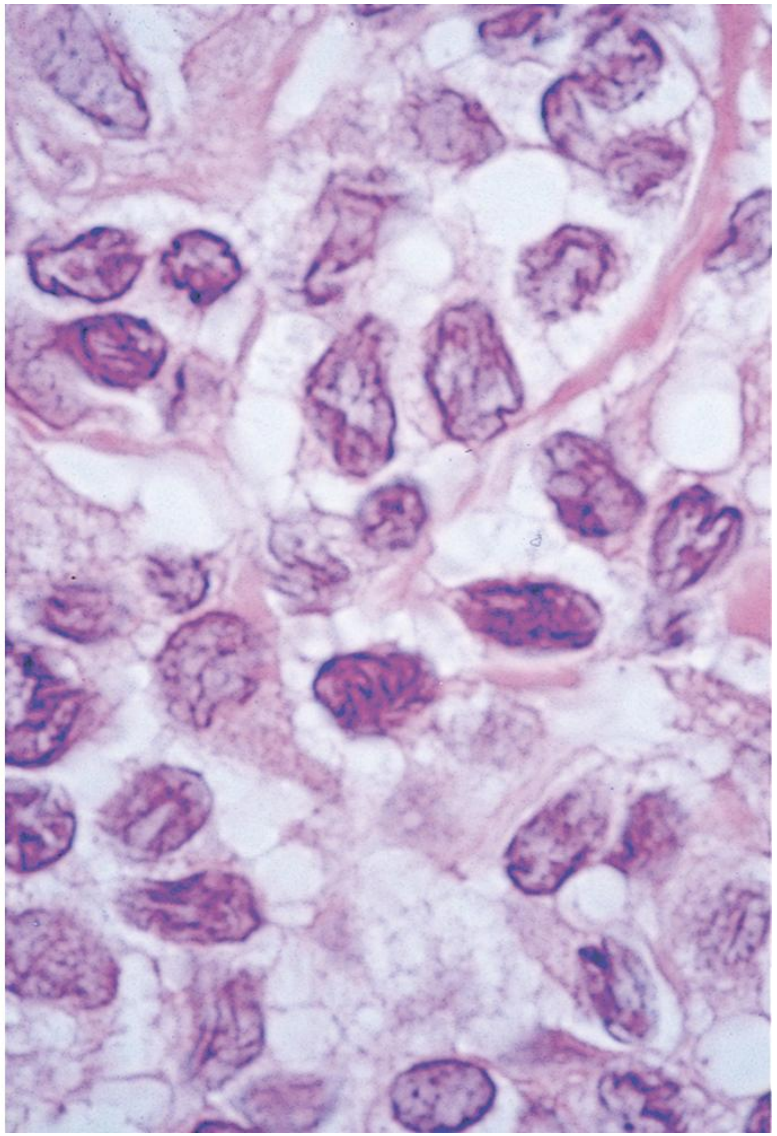




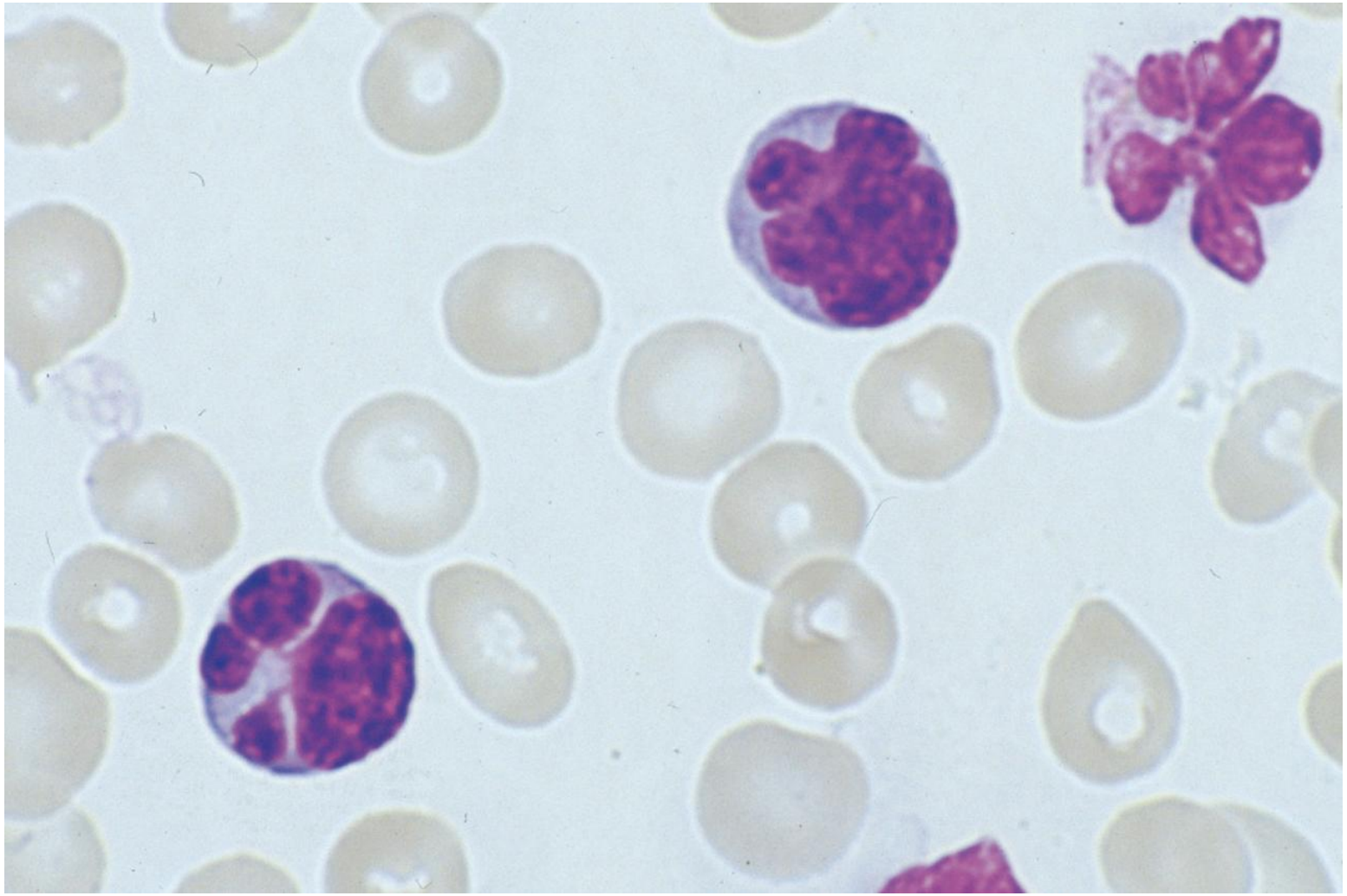
Hairy cell leukemia (left top: May-Giemsa, left bottom: thick section of the buffy coat, methylene blue stain, right: scanning electron microscopy). Hairy processes are not recognized in the large lymphocytes in the peripheral blood in May-Giemsa preparation. Hairy processes are seen in thick sections and by SEM observation. The hairy cells belong to B-cells (CD19/CD20/CD25-positive). Splenomegaly may be prominent.



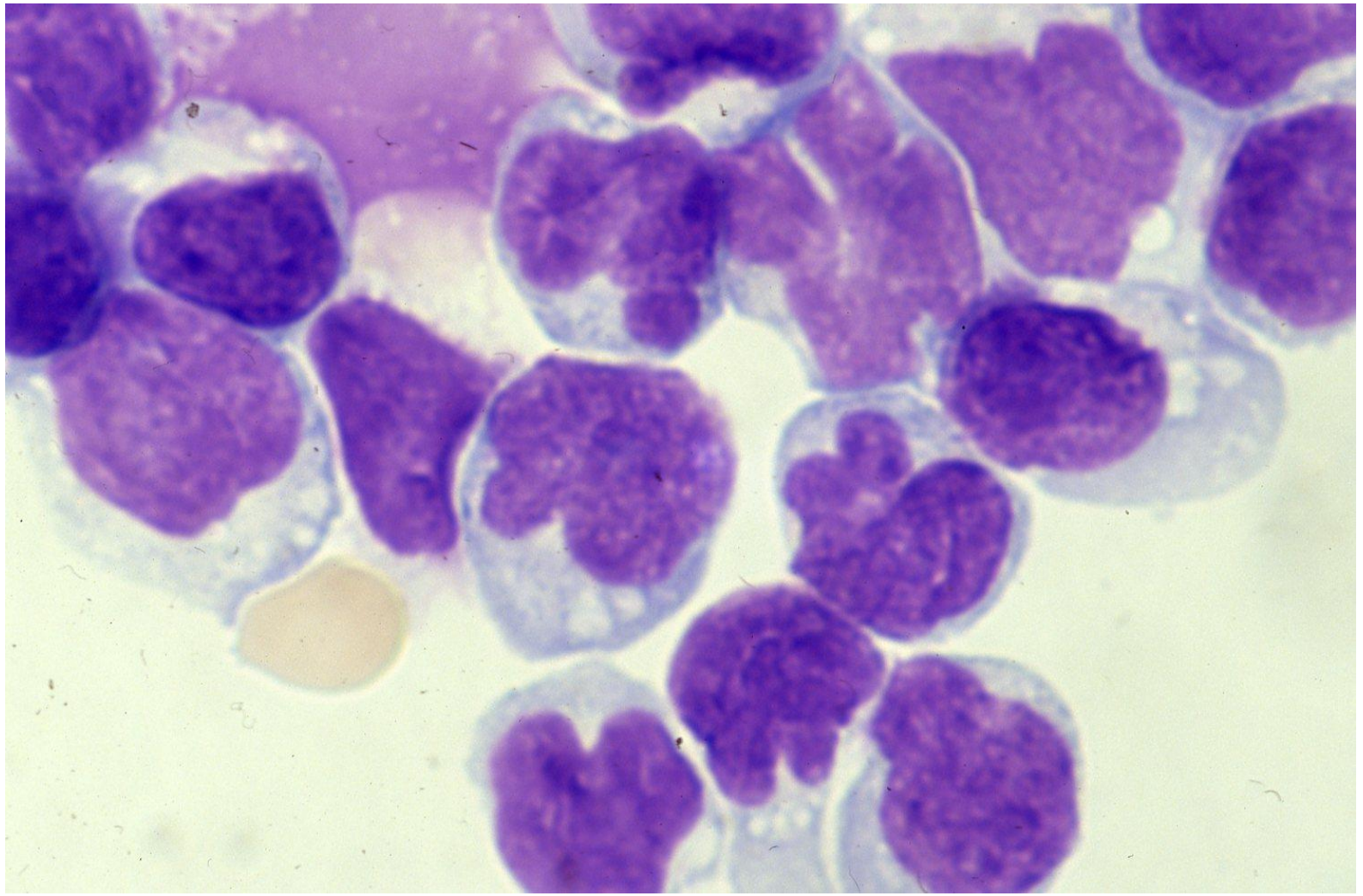
T-cell prolymphocytic leukemia, a mature but aggressive T-cell leukemia with proliferation of small to medium-sized prolymphocytes with post-thymic T cell phenotype (CD2/CD3/CD5/CD7/CD52-positive). CD4-positive cases are common (CD4/CD8-double positive or CD8-positive cases may also be seen). Peripheral blood smear (May-Giemsa)



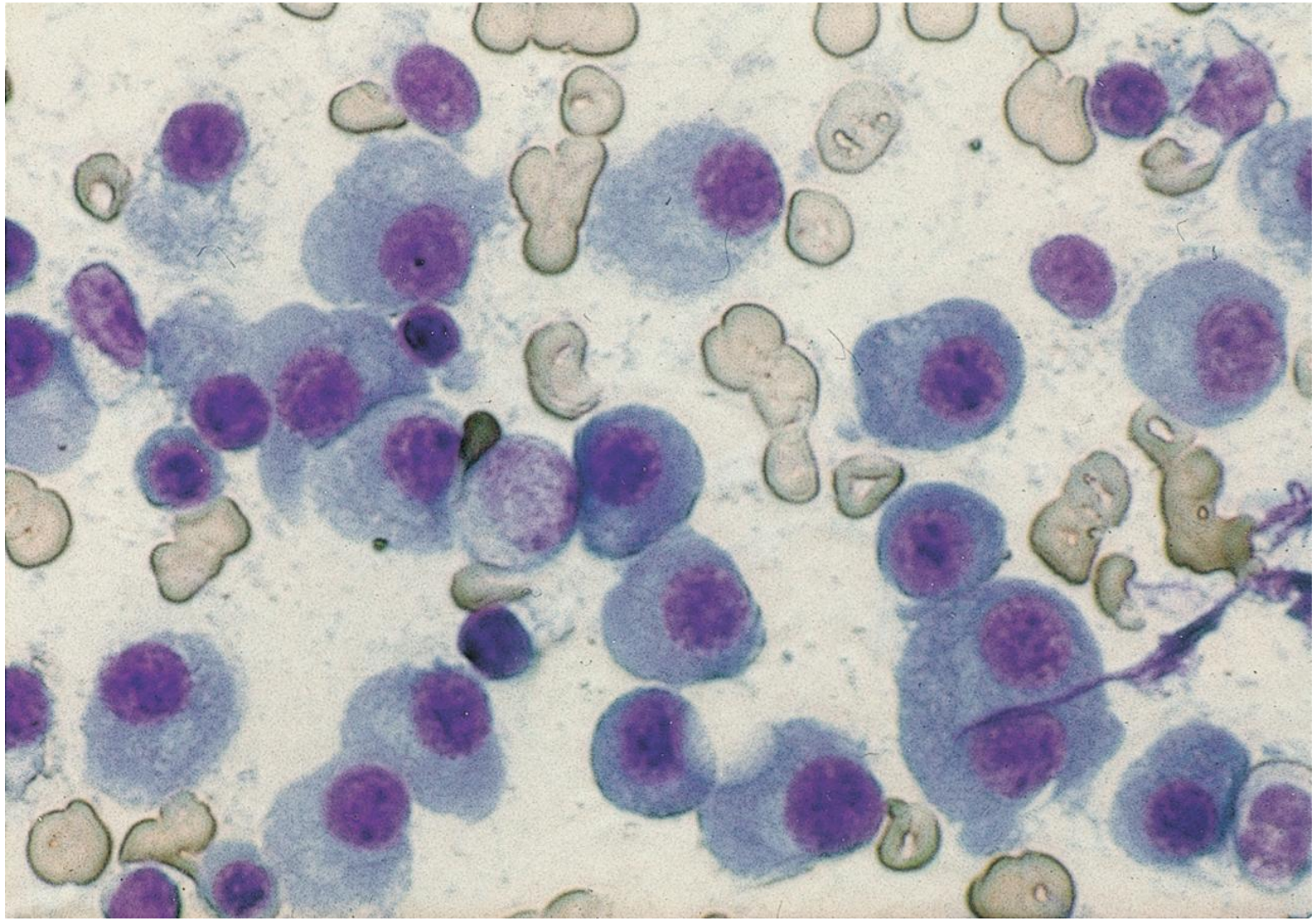
Sézary syndrome, an indolent cutaneous T-cell lymphoma (left: electron microscopy, right: skin biopsy, H&E). A 54-year-old man manifested with systemic erythroderma. The peripheral blood contains 12% of atypical convoluted CD4-positive T-lymphocytes, but the bone marrow is devoid of neoplastic cells. Serum ATLA is negative. Cerebriform (pedal-shaped) nuclei are characteristic of Sézary cells.



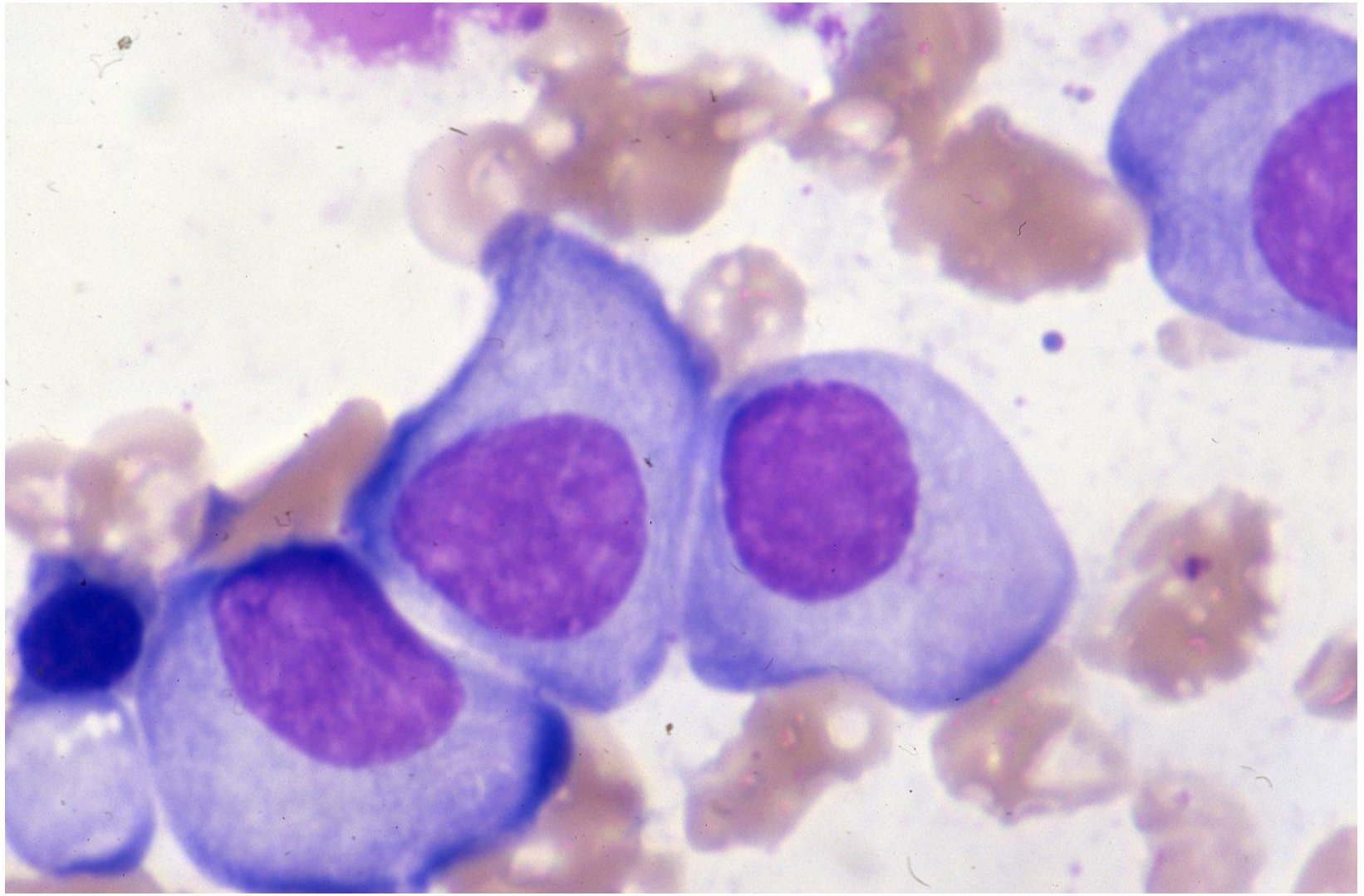
Adult T-cell leukemia. A 75-year-old man, born in Kagoshima, Kyushu island, Japan, complained of thirsty and headache caused by hypercalcemia (7.0 mEq/L). Peripheral blood: WBC 14,200/mL with 37% abnormal lymphocytes. The bone marrow contained only 10% abnormal cells. HTLV-1 antibody was positive. Surface markers positive on the convoluted T-cells include CD3/CD4/CD25/HLA-DR. Hypercalcemia is due to production of parathyroid hormone-related protein by the leukemia cells.



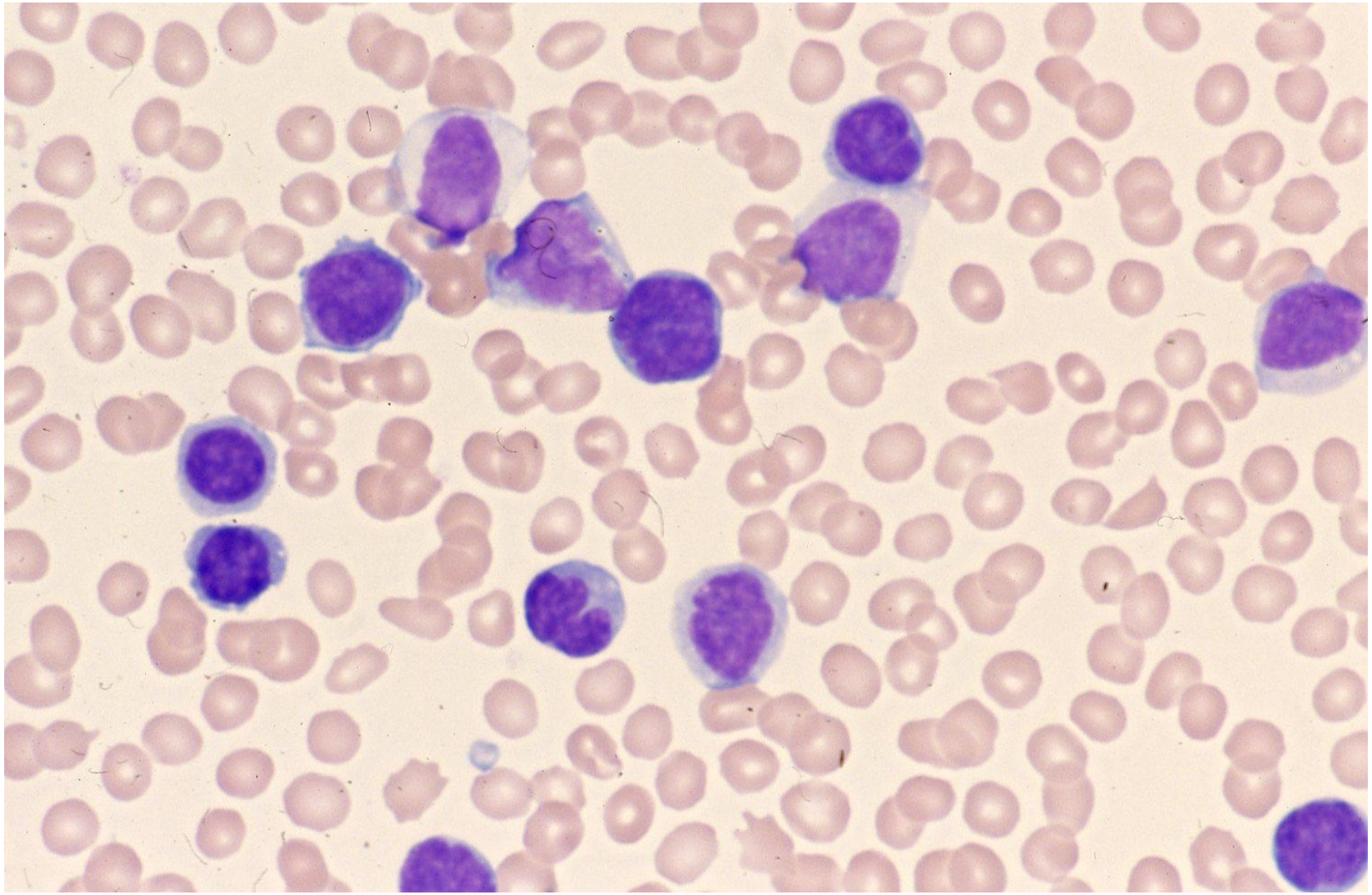
Adult T-cell leukemia with meningeal involvement (cerebrospinal fluid, May-Giemsa). Atypical lymphocytes with convoluted or cerebriform nuclei densely infiltrate the meningeal space. A 72-year-old man complained of severe headache and died of systemic spread with hypercalcemia.



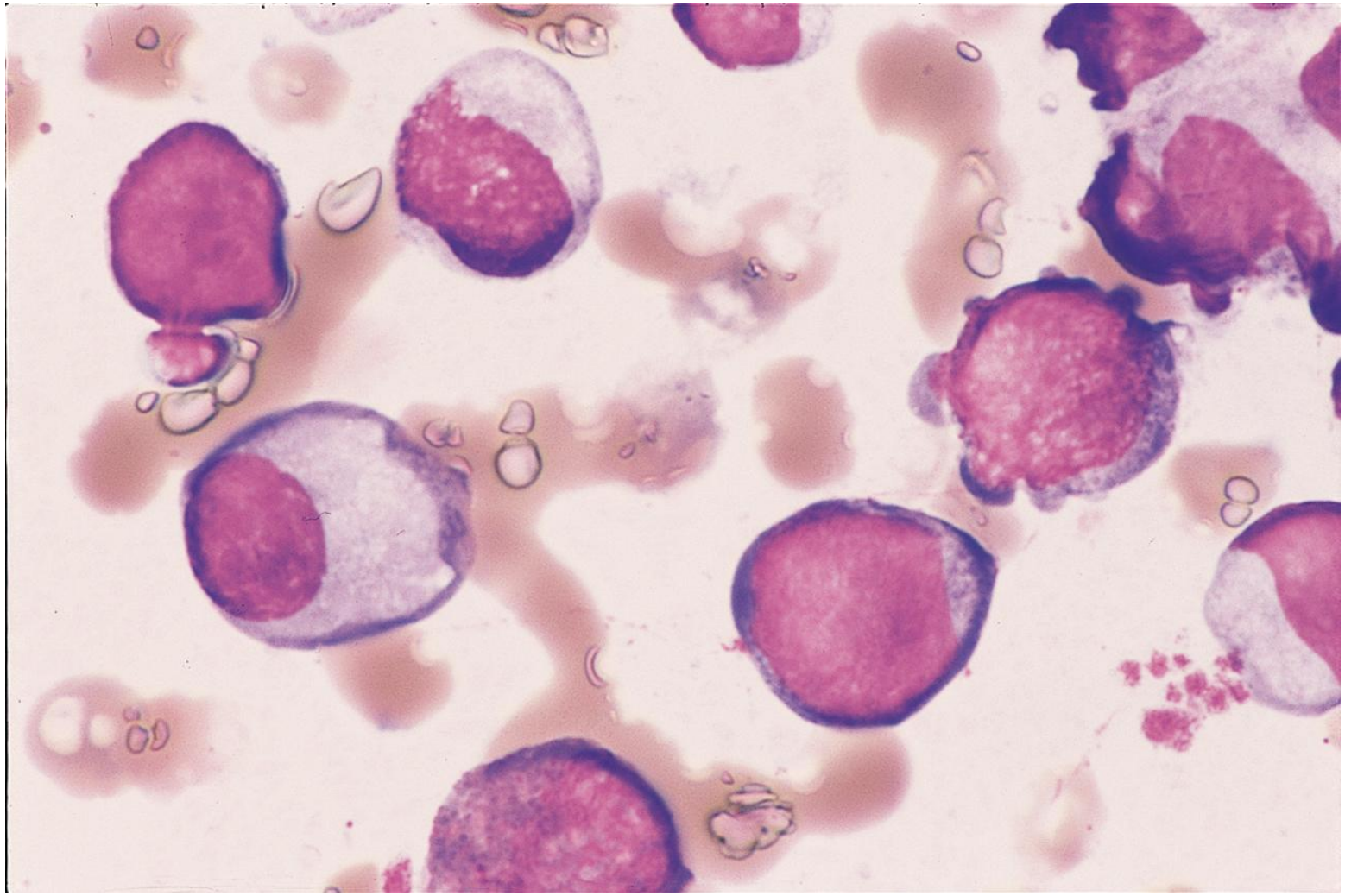
Multiple myeloma (plasmacytoma). Bone marrow aspiration (May-Giemsa). Mature-looking plasma cells grow in the marrow space. Eccentric round nuclei with chromatin aggregation, plump basophilic cytoplasm with perinuclear halo (Golgi area) are characteristic.



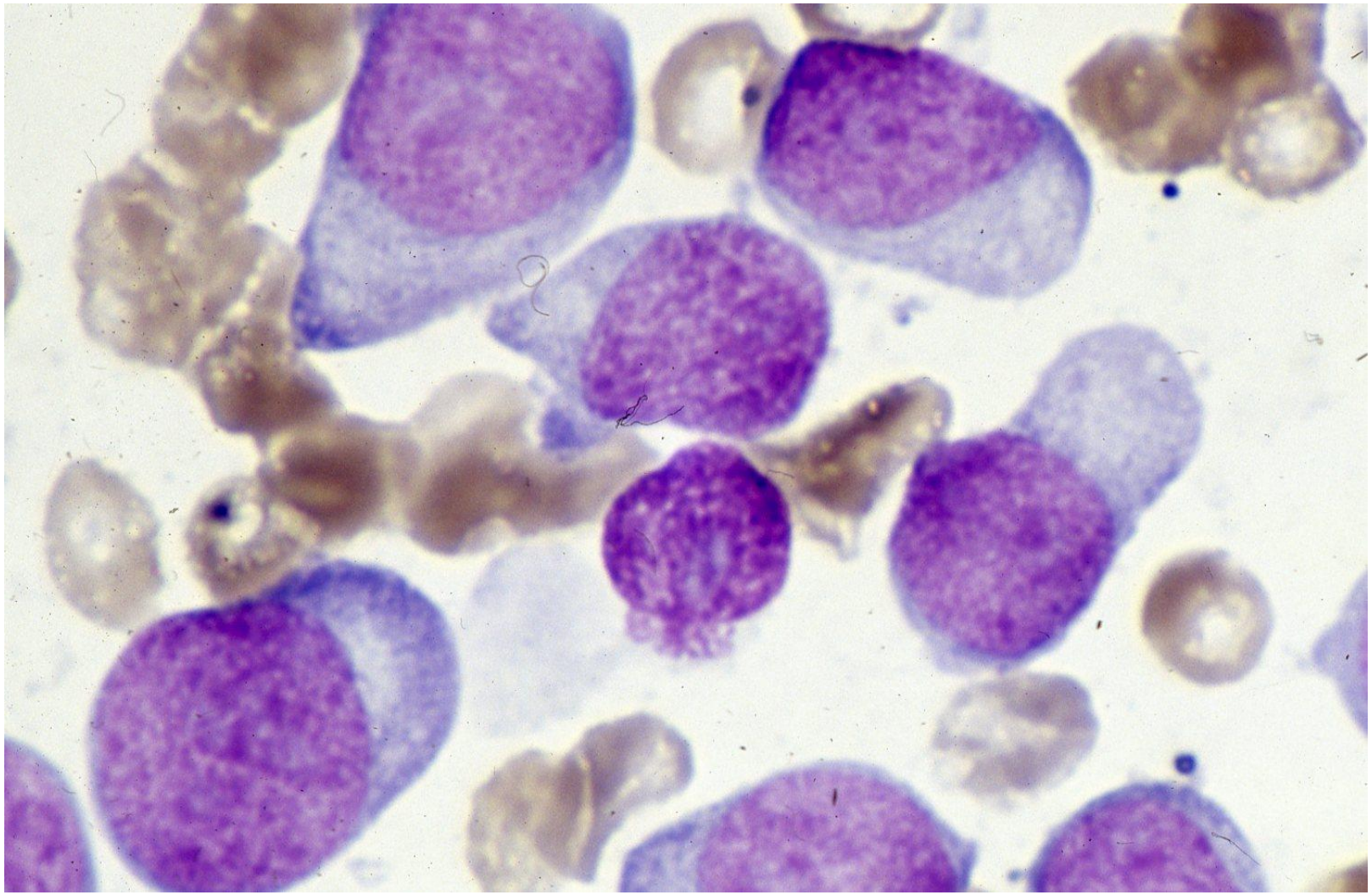
Multiple myeloma, IgA-type. The peripheral cytoplasm shows deeply stained with increased basophilia. The “flame cells” are characteristic of IgA-secreting plasmacytoma. The “flaming” phenomenon is uncommonly in other myeloma types. May-Giemsa



Plasma cell leukemia (peripheral blood smear, May-Giemsa). Plasma cell leukemia is an aggressive form of multiple myeloma. Leukemic transformation is a rare phenomenon (<1%) in multiple myeloma.



Waldenström's macroglobulinemia. A 58-year-old woman manifested with elevated serum IgM (4,500 mg/dL) and hyperviscosity syndrome. Leukemic change is associated (WBC 27,300/μL with 78% lymphoid cells). The bone marrow aspiration reveals monomorphic growth of lymphoplasmacytoid cells.



Infiltration of malignant lymphoma of B-cell type. Medium-sized plasmacytoid lymphoma cells occupy the marrow space. A 73-year-old woman manifested with systemic lymphadenopathy and leukemic change. May-Giemsa