Table 13-6 Summary of Major Types of Lymphoid Leukemias and Non-Hodgkin Lymphomas

Diagnosis	Cell of Origin	Genotype	Salient Clinical Features
Neoplasms of Immature B and T Cells			
B-cell acute lymphoblastic leukemia/lymphoma*	Bone marrow precursor B cell	Diverse chromosomal translocations; t(12;21) involving *RUNX1* and *ETV6* present in 25%	Predominantly children; symptoms relating to marrow replacement and pancytopenia; aggressive
T-cell acute lymphoblastic leukemia/lymphoma	Precursor T cell (often of thymic origin)	Diverse chromosomal translocations, *NOTCH1* mutations (50%-70%)	Predominantly adolescent males; thymic masses and variable bone marrow involvement; aggressive
Neoplasms of Mature B Cells			
Burkitt lymphoma*	Germinal-center B cell	Translocations involving *MYC* and Ig loci, usually t(8;14); subset EBV-associated	Adolescents or young adults with extranodal masses; uncommonly presents as "leukemia"; aggressive
Diffuse large B-cell lymphoma†	Germinal-center or postgerminal center B cell	Diverse chromosomal rearrangements, most often of *BCL6* (30%), *BCL2* (10%), or *MYC* (5%)	All ages, but most common in older adults; often appears as a rapidly growing mass; 30% extranodal; aggressive
Extranodal marginal zone lymphoma	Memory B cell	t(11;18), t(1;14), and t(14;18) creating *MALT1-IAP2, BCL10-IgH*, and *MALT1-IgH* fusion genes, respectively	Arises at extranodal sites in adults with chronic inflammatory diseases; may remain localized; indolent
Follicular lymphoma†	Germinal-center B cell	t(14;18) creating *BCL2-IgH* fusion gene	Older adults with generalized lymphadenopathy and marrow involvement; indolent
Hairy cell leukemia	Memory B cell	Activating *BRAF* mutations	Older males with pancytopenia and splenomegaly; indolent
Mantle cell lymphoma	Naive B cell	t(11;14) creating *CyclinD1-IgH* fusion gene	Older males with disseminated disease; moderately aggressive
Multiple myeloma/solitary plasmacytoma†	Post-germinal-center bone marrow homing plasma cell	Diverse rearrangements involving *IgH*; 13q deletions	Myeloma: older adults with lytic bone lesions, pathologic fractures, hypercalcemia, and renal failure; moderately aggressive Plasmacytoma: isolated plasma cell masses in bone or soft tissue; indolent
Small lymphocytic lymphoma/chronic lymphocytic leukemia	Naive B cell or memory B cell	Trisomy 12, deletions of 11q, 13q, and 17p	Older adults with bone marrow, lymph node, spleen, and liver disease; autoimmune hemolysis and thrombocytopenia in a minority; indolent
Neoplasms of Mature T Cells or NK Cells			
Adult T-cell leukemia/lymphoma	Helper T cell	HTLV-1 provirus present in tumor cells	Adults with cutaneous lesions, marrow involvement, and hypercalcemia; occurs mainly in Japan, West Africa, and the Caribbean; aggressive
Peripheral T-cell lymphoma, unspecified	Helper or cytotoxic T cell	No specific chromosomal abnormality	Mainly older adults; usually presents with lymphadenopathy; aggressive
Anaplastic large-cell lymphoma	Cytotoxic T cell	Rearrangements of *ALK* (anaplastic large cell lymphoma kinase) in a subset	Children and young adults, usually with lymph node and soft-tissue disease; aggressive
Extranodal NK/T-cell lymphoma	NK-cell (common) or cytotoxic T cell (rare)	EBV-associated; no specific chromosomal abnormality	Adults with destructive extranodal masses, most commonly sinonasal; aggressive
Mycosis fungoides/Sézary syndrome	Helper T cell	No specific chromosomal abnormality	Adult patients with cutaneous patches, plaques, nodules, or generalized erythema; indolent
Large granular lymphocytic leukemia	Two types: cytotoxic T cell and NK cell	Point mutations in *STAT3*	Adult patients with splenomegaly, neutropenia, and anemia, sometimes, accompanied by autoimmune disease

*Most common tumors in children
†Most common tumors in adults.
EBV, Epstein-Barr virus; *HIV*, human immunodeficiency virus; *Ig*, immunoglobulin; *NK*, natural killer.

Approximately 90% of ALLs have numerical or structural chromosomal changes. Most common is hyperploidy (>50 chromosomes), but hypoploidy and a variety of balanced chromosomal translocations are also seen. Changes in chromosome numbers are of uncertain pathogenic significance, but are important because they frequently correlate with immunophenotype and sometimes prognosis. For example, hyperdiploidy and hypodiploidy are seen only in B-ALL. In addition, B- and T-ALL are associated with completely different sets of translocations, indicating that they are pathogenetically distinct.

MORPHOLOGY

In leukemic presentations, **the marrow is hypercellular and packed with lymphoblasts,** which replace the normal marrow elements. Mediastinal thymic masses occur in 50% to 70% of T-ALLs, which are also more likely to be associated with lymphadenopathy and splenomegaly. In both B- and T-ALL, the tumor cells have scant basophilic cytoplasm and nuclei somewhat larger than those of small lymphocytes (Fig. 13-6*A*). The nuclear chromatin is delicate and finely stippled, and nucleoli are usually small and often demarcated by a rim of