

Disease	Immunophenotype	Genetics	Gross morphology	Micro morphology	Clinical manifestations	Other information
ALL – B cell	TdT+, CD19+, CD10+/-, CD20+/-, Ig-	Most common genetic aberration is t(12;21), often hyperdiploidy, occasionally t(9;22) and t(4;11)	Effacement of tissue architecture	Large nuclei, scant cytoplasm, finely stippled chromatin, absent or inconspicuous nucleoli	Abrupt onset, fatigue, fever, bone pain, lymphadenopathy, splenomegaly, hepatomegaly, headache, vomiting, nerve palsies	Accounts for ~85% of all cases of ALL, primarily affects children, more common in white people
ALL – T cell	TdT+, CD1+, CD2+/-, CD3+/-, CD4+/-, CD5+/-, CD8+/-	Many different translocations – most involve the TCR	Same as ALL – B cell	Same as ALL – B cell	Same as ALL – B cell	Often presents with an anterior mediastinal mass, affects adolescent males
CLL/SLL	CD5+, CD10-, CD19+, CD20+, CD22+, CD23+, Ig+(low)	Trisomy 12, deletions of 11q23 and 13q12-14, rarely t(14;19)	Destruction of normal lymph node architecture	Small lymphocytes with round or irregular nuclei, condensed chromatin, and scant cytoplasm; may have larger prolymphocytes with a prominent centrally located nucleolus, smudge cells on peripheral smear	Often asymptomatic; may present with fatigue, weight loss, anorexia, generalized lymphadenopathy*, hepatosplenomegaly*, slight or great lymphocytosis * in 50 – 60% of cases	Primarily affects older patients (>50), differentiated by absolute lymphocyte count (SLL<4000/mm ³ , CLL>4000/mm ³), slow onset, male predominance (2:1 ratio), can transform into a more aggressive lymphoid neoplasm such as prolymphocytic transformation (15 – 30%) or diffuse large B cell lymphoma (10%)
Follicular lymphoma	CD5-, CD10+, CD19+, CD20+	t(14;18) – leads to overexpression of the <i>BCL2</i> protein, preventing apoptosis	Nodular or nodular and diffuse growth pattern in affected lymph nodes	Centrocytes (small lymph with irregular or cleaved nuclear contours and scant cytoplasm) and centroblasts (larger cells with open nuclear chromatin, several nucleoli, and modest cytoplasm)	Generalized, painless lymphadenopathy	Typically affects middle aged patients, indolent waxing and waning course, 30 – 50% of cases undergo malignant transformation most often to diffuse large B cell lymphoma
Diffuse large B cell lymphoma	CD10+/-, CD19+, CD20+	t(14;18), translocations involving <i>BCL6</i> (involved in B cell differentiation) on chromosome 3	Diffuse growth pattern	Large cells with open chromatin and prominent nucleoli	Large, often symptomatic, rapidly growing mass at a nodal or extranodal site	Affects older patients (60s), immunodeficiency associated and body cavity (associated with HHV8) subtypes, genetics and immunophenotype are influenced by the tumor being primary or a transformation

Burkitt lymphoma	CD10+, CD19+, CD20+, IgM+	All forms associated with translocations of the <i>c-myc</i> gene on chromosome 8: t(8;14), t(2;8), or t(8;22)	Depends on subtype	“Starry sky” pattern, high mitotic index, intermediate sized lymphoid cells with round or oval nuclei containing coarse chromatin and several nucleoli with a moderate amount of cytoplasm	Endemic African subtype – mass on the mandible that may also present in the kidneys, ovaries, adrenals, and other abdominal viscera; sporadic and HIV associated subtypes – abdominal mass involving the ileocecum and peritoneum	African and some HIV associated subtypes are infected with EBV
Multiple myeloma	CD5-, CD10-, CD19+, CD20+, CD22+, CD23-	13q deletions, 14q rearrangements, or the balanced translocation t(4;14)(p16.3;q32) involving <i>FGFR3</i> and IgH promoters leading to increased expression of fibroblast growth factor receptor 3	Multifocal destructive bone lesions 1 – 4 cm in diameter filled with a soft, red, gelatinous tumor	Usually >30% plasma cells in the bone marrow resembling normal plasma cells in a diffuse or sheet pattern; some plasmablasts, bizarre multinucleated cells, flame cells (red cytoplasm), and Mott cells (cytoplasmic droplets and various other inclusions)	Bone pain, pathologic fractures, hypercalcemia, renal insufficiency, immunosuppression, hyperviscosity syndrome (visual impairment, neurologic problems, bleeding, cryoglobulinemia)	IL-6 produced by tumor cells causes the proliferation and survival of the cancer and stimulates osteoclastic activity leading to bone destruction
Plasmacytoma	CD5-, CD10-, CD19+, CD20+, CD22+, CD23-		Single osseous or extraosseous lesion	Similar to multiple myeloma	Secondary effects of lesion and hyperviscosity	Osseous lesions typically progresses to multiple myeloma, extraosseous lesions are often cured surgically
Lymphoplasmacytic lymphoma	CD5-, CD10-, CD19+, CD20+, CD22+, CD23-		Masses produce osseous lesions	Diffuse bone marrow infiltration of lymphocytes, plasma cells, and plasmacytoid lymphocytes with PAS positive cytoplasmic Russell and nuclear Dutcher bodies	Weakness, fatigue, weight loss, lymphadenopathy*, hepatomegaly*, splenomegaly*, autoimmune hemolysis (10%), hyperviscosity syndrome	Affects patients in their 60s and 70s, CLL/SLL-like – more differentiated state
Mantle cell lymphoma	CD5+, CD10-, CD23-	t(11;14) involving <i>BCL1 /PRAD1</i> on chromosome 11 and IgH locus on chromosome 14 leading to increased expression of cyclin D1	Diffuse or mantle zone pattern	Centrocytes	Generalized lymphadenopathy, bone marrow, liver involvement, splenomegaly*	Presents in the fourth and fifth decade, male predominance

Marginal zone lymphoma (MALToma)	CD5-, CD10-, CD19+, CD20+, CD22+, CD23-		Follicle appears inverted	Cells in varying stages of B cell differentiation, some of which are plasma cells	Indolent course	Presents in middle aged adults, “abnormal 3” – tend to arise in tissues involved in chronic autoimmune inflammatory disorders, remain localized for long periods of time, composed of cells at different stages of differentiation
Hairy cell leukemia	CD11c+, CD19+, CD20+, CD25+, PCA-1+		Leukemia	Cells with round, oblong, or reniform nuclei and modest amounts of pale blue cytoplasm with threadlike or bleblike extensions imparting the hairy appearance	Splenomegaly, hepatomegaly, pancytopenia, increased risk of infection	“disease of middle aged white men”, male:female ratio 4:1
Peripheral T cell lymphoma, unspecified	CD2+, CD3+, CD5+, CD7+, TCR+		No pathognomonic features	No pathognomonic features	Generalized lymphadenopathy	“Wastebasket” diagnosis
Adult T cell leukemia/lymphoma	CD2+, CD3+, CD4+, CD7+		Skin lesions	Varies – frequently cells with multilobated nuclei (cloverleaf or flower cell), occasional multinucleated giant cells resembling Reed-Sternberg cells	Generalized lymphadenopathy, hepatosplenomegaly, peripheral lymphocytosis, hypercalcemia	Associated with HTLV-1 infection
Mycosis fungoides	CD2+, CD3+, CD4+, CD7+		Cutaneous lesions in the premycotic, plaque, or tumor phase	Cells with cerebriform nuclei	Cutaneous manifestations	
Sézary syndrome	CD2+, CD3+, CD4+, CD7+		Generalized exfoliative erythroderma	Cells with cerebriform nuclei	Cutaneous manifestations, occasionally leukemia of Sézary cells	Generally does not progress to tumefaction
Angioimmunoblastic T cell lymphoma	CD4 > CD8 cells		Skin rash	Larger lymphocytes with a central prominent nucleolus	Fever, night sweats, weight loss, skin rash, generalized lymphadenopathy, hepatosplenomegaly	Proliferation of high endothelial venules and follicular dendritic cells, EBV associated
Anaplastic large T cell lymphoma	CD30+, EMA+	t(2;5)	Diffuse lymph node involvement	Large lymphocytes with round to irregular nuclei containing prominent nucleoli	Systemic symptoms	Male:female ratio 6:1, ALK – and lower M:F ratio in older patients, less aggressive cutaneous subtypes exist

C-Anaplastic large cell lymphoma	CD2+/-, CD3+/-, CD4+, CD5+/-, CD30+, EMA -, ALK -		Diffuse skin involvement	Reed-Sternberg like cells	Localized skin papules, nodules, or tumors	Affects adults and elderly, male predominance, becomes increasingly aggressive but may regress – will relapse
Lymphatoid papulosis	CD4+, CD30+, ALK-		Skin manifestations	Reed-Sternberg like cells	Skin lesions (papules)	Affects adults and elderly, male predominance, may regress and relapse
Blastic NK cell lymphoma	CD2-, CD3-, CD4+, CD7-, CD56+		Cutaneous lesions	Light staining lymphocytes with several nucleoli	Cutaneous lesions	Usually presents with skin involvement and lymphadenopathy
Subcutaneous panniculitis-like T cell lymphoma	75% CD8+; 25% __ TCR+, CD4-, CD8-		Infiltration of the subcutaneous tissue, dermal and epidermal involvement in the __ TCR subtype	Small to large cells with hyperchromic nuclei	Multiple subcutaneous nodules ranging in size from 0.5 to several cm present on the trunk and extremities, NO lymphadenopathy, hemphagocytic syndrome (pancytopenia, fever, hepatosplenomegaly) in some patients	Affects children and young adults of both sexes equally
Extranodal NK/T lymphoma, nasal type	CD2+, CD3+, CD56+S3-		Nasal mass	Large lymphocytes with loose chromatin and multiple nucleoli	Mass in the nasal cavity, possibly with extranasal presentation and systemic symptoms	Occurs in immunosuppressed patients, EBV associated
Enteropathy-type T cell lymphoma	CD3+, CD4-, CD5-, CD7+, CD8+/-, TCR+		Ulcerated, raised lesions in the jejunum or ileum, possibly polypoid	Monomorphic infiltrate of medium-large cells with intestinal epithelial invasion	Severe abdominal pain	Associated with celiac disease, may be linked with EBV in some regions
Hepatosplenic T cell lymphoma	CD3+, CD4-, CD5-, CD8-, TCR+		Diffuse sinusoidal infiltrate	Small lymphocytes with round to oval nuclei containing loose chromatin and several nucleoli	Hepatosplenomegaly, NO lymphadenopathy, thrombocytopenia, anemia	Occurs in adolescents and young adults more often in males than females

