Supplementary Table 1. 검사항목순서

순서	검사 항목
1	Complete blood count, differential count with/without reticulocyte count
2	Blood cell morphology
3	Bone marrow aspirate and biopsy ± clot section
4	Cytochemistry
5	Immunohistochemistry (biopsy or clot section)
6	Immunophenotyping
7	Flow cytometry
8	Coagulation tests
9	Blood chemistry
10	Cytogenetics by standard karyotyping
11	Fusion transcript (FISH or RT-PCR or targeted RNA-seq or WTS)
12	Gene mutation
13	Immunoglobulin gene/T-cell receptor gene rearrangement
14	Multiplex ligation-dependent probe amplification
15	Viral tests

Abbreviations: FISH, fluorescence *in situ* hybridization; RT-PCR, reverse transcription polymerase chain reaction; WTS, whole transcriptome sequencing.

https://doi.org/10.47429/lmo.2025.15.2.105

Supplementary Table 2. 클론성 조혈증에서 발견되는 체세포 돌연변이

순서	검사 항목
Common and/or clinically significant genes[1]	*ASXL1, BCOR, BCORL1, BRCC3, CBL, CTCF, DNMT3A, GNAS, GNB1, IDH1, IDH2, KRAS, JAK2, NRAS, PPM1D, PTPN11, SF3B1, SRSF2, TET2, TP53, U2AF1*
Other genes[1]	*BRAF, CALR, CEBPA, CREBBP, CSF1R, CSF3R, CUX1, ETV6, EZH2, GATA2, JAK3, KDM6A, KIT, KMT2A, MPL, MYD88, NOTCH1, PHF6, PIGA, PRPF40B, PTEN, RAD21, RUNX1, SETBP1, SF1, SF3A1, SMC1A, SMC3, STAG2, STAT3, U2AF2, WT1, ZRSR2*

[1]대립유전자빈도 2% 이상(X 염색체 유전자인 경우 4% 이상)

https://doi.org/10.47429/lmo.2025.15.2.105

Supplementary Table 3. Morphologic approach in mature B cell neoplasms

Differentiation markers				Remark	Diagnosis
Small cells	CD5+	CD23+		Cyclin D1-, del(11q), *IGH::CCND1*-, del(17p), trisomy 12, del(13q)	CLL
Panel: CD5, CD10, CD21, CD23, cyclin D1, BCL2, BCL6, Ki-67, CD11c, (CD25, CD103)[1]		CD23-	Cyclin D1+, IGH::CCND1+		MCL
			Cyclin D1-, IGH::CCND1-		CLL
	CD5-	CD10+	BCL6+, BCL2+, IGH::BCL2+		FL
			BCL6+, BCL2-, IGH::BCL2-	Ki-67 > 30%	PTFL
			BCL6-		HCL, LPL, or other rare B-cell neoplasm
		CD10-	CD103+, CD25+, CD11c+	CD123+, annexin A1+, *BRAF*V600E mutation	HCL
			CD103-, cytoplasmic Ig-		MZL or CD5- CLL or other splenic B-cell lymphomas
			CD103-, cytoplasmic Ig+	del7q, *MYD88* mutation	LPL or MZL
Medium cells	CD5+	Cyclin D1+		Rare MCL may be cyclin D1-. Consider SOX11 IHC.	MCL, blastoid variant
Panel: CD5, CD10, cyclin D1, BCL2, BCL6, IRF4/MUM1, Ki-67		Cyclin D1-	BCL6+/-, IRF4/MUM1+/-		CLL with increased prolymphocytes
			BCL6-, IRF4/MUM1-		Consider cyclin D1- MCL
	CD5-			FISH for *MYC*+, *BCL2*-, *BCL6*+	BL
				FISH for *MYC*-, 11q aberration	HGBCL with 11q aberrations (WHO_5th); LBCL with 11q aberration (ICC)
				Any except 'double hit'	HGBCL, NOS
				FISH for *MYC*, *BCL2*, and *BCL6* to check for 'double hit'	DLBCL/HGBCL-*MYC/BCL2* (WHO_5th); HGBCL-*MYC/BCL2* or HGBCL-*MYC/BCL6* (ICC)

[1]형태학적으로 hairy cell leukemia 의심될 경우

Abbreviations: BL, Burkitt lymphoma; CLL, chronic lymphocytic leukemia/small lymphocytic lymphoma; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; HCL, hairy cell leukemia; HGBCL, high-grade B-cell lymphoma; IHC, immunohistochemistry; LBCL, large B-cell lymphoma; LPL, lymphoplasmacytic lymphoma; MCL, mantle cell lymphoma; MZL, marginal zone lymphoma; PTFL, pediatric-type follicular lymphoma; ICC, International Consensus Classification; WHO 5th, the 5th edition of World Health Organization classification of tumors of hematopoietic and lymphoid tissues.

Differentiation markers				Remark	Diagnosis
Large cells	CD5+	Cyclin D1+			Pleomorphic MCL
Panel: CD5, CD10, BCL6, IRF4/MUM1, Ki-67		Cyclin D1-		Consider SOX11 IHC to exclude cyclin D1-negative pleomorphic MCL	DLBCL, NOS CD5+
	CD5-	CD10+	IRF4/MUM1+	FISH for IRF4 rearrangement	LBCL with *IRF4* rearrangements
	DLBCL		IRF4/MUM1-		DLBCL, NOS GCB type (BCL6+)
		CD10-	BCL6+, IRF4/MUM1-		DLBCL, NOS GCB type
			BCL6+, IRF4/MUM1+ → Non-GCB BCL6-, IRF4/MUM1- → Non-GCB BCL6-, IRF4/MUM1+ → Post-GCB 추가 markers: CD20, PAX5, CD138, ALK, CD30, CD15, EBV-EBER, HHV8, Ig light and heavy chains	CD20+ (PAX5+), EBER-, CD30-	T-cell-rich → THRLBCL (May be BCL6+, IRF4/MUM1-) DLBCL, non-GCB
				CD20+ (PAX5+), EBER-, CD30+	Mediastinal → PMBL (May be BCL6+, IRF4/MUM1-)
				CD20+ (PAX5+), EBER-, CD30+, morphologically borderline with CHL	CD15- → PMBL CD15+ → HGBCL, NOS
				CD20+ (PAX5+), EBER+	Elderly and immunosuppressed → EBV+ DLBCL

(Continued to the next page)

Supplementary Table 3. Continued

Differentiation markers			Remark	Diagnosis
				Extranodal, T-cell rich, angiocentric → Lymphomatoid granulomatosis
				Chronic inflammation → DLBCL associated with chronic inflammation
			CD20+ (PAX5+), EBER-, HHV8+	HHV8-positive DLBCL, NOS [ICC]; KSHV/HHV8-positive DLBCL [WHO_5th] (IgM lambda +) confirm by morphology
			CD20- (PAX5-), CD79a+, IRF4/MUM1+, CD138+/-, EBV+/-, HHV8-	Plasmablastic lymphoma → MYC FISH+
			CD20- (PAX5-), CD79a+, IRF4/MUM1+, CD138+/-, EBV+/-, HHV8+	PEL (CD30+)
			CD20- (PAX5-), CD79a+, IRF4/MUM1+, CD138+/-, EBV-, ALK+	ALK+ LBCL → IgA lambda+, EMA+
			CD20- (PAX5-), CD79a+, IRF4/MUM1+, CD138+/-, EBV-, ALK-, HHV8-	Anaplastic/Plasmablastic myeloma/plasmacytoma → CD56+/-, Cyclin D1+/-, IgG, IgA, kappa/lambda
Cutaneous localization	CD10+			PCFCL
Panel: CD3, CD5, CD10, BCL2, BCL6, IRF4/MUM1, CD21/23 (FDC markers)	CD10-	BCL2-	BCL6+, IRF4/MUM1- (FDC+/-) Small/medium/large cells, many CD3+ cells	PCFCL
			BCL6- (GC+), IRF4/MUM1+/- (FDC+ follicular, disrupted), Small/medium cells (Larger cells in GC)	PCMZL
		BCL2+	BCL2 strongly+, BCL6+/-, IRF4/MUM1+ (FDC-) Large round cells, Few CD3+ T-cells	PC-DLBCL, leg type
			BCL6- (GC+), IRF4/MUM1+/- (FDC+ follicular, disrupted), Small/medium cells	PCMZL
			BCL2 +/-, BCL6+, IRF4/MUM1- (FDC+/-, follicular), Small/medium/large cells, Many CD3+ T-cells	PCFCL

Abbreviations: DLBCL, diffuse large B-cell lymphoma; FDC, follicular dendritic cell; GCB, germinal center B-cell–like; HGBCL, high-grade B-cell lymphoma; HHV8, human herpesvirus 8; IHC, immunohistochemistry; KSHV, Kaposi sarcoma herpesvirus; LBCL, large B-cell lymphoma; MCL, mantle cell lymphoma; PC-DLBCL, primary cutaneous DLBCL; PCFCL, primary cutaneous follicle center lymphoma; PCMZL, primary cutaneous marginal zone lymphoma; PEL, primary effusion lymphoma; PMBL, primary mediastinal (thymic) large B-cell lymphoma; THRLBCL, T-cell/histiocyte-rich large B-cell lymphoma; ICC, International Consensus Classification; WHO 5th, the 5th edition of World Health Organization classification of tumors of hematopoietic and lymphoid tissues.

https://doi.org/10.47429/lmo.2025.15.2.105

https://doi.org/10.47429/lmo.2025.15.2.105

Supplementary Table 4. Morphologic approach in mature T cell neoplasms

	Differentiation markers			Remark	Diagnosis
Anaplastic morphology	CD30+	ALK+			ALCL, ALK+
Panel:	strong,	ALK-	PAX5+		If only one T-cell antigen is expressed, it could be DLBCL
CD30, CD15, PAX5, ALK	all cells		PAX5 dim+, CD15+, EBER+/-		Consider CHL (T-cell antigen expression may rarely occur in CHL)
EBV-EBER, cytotoxic granule proteins (granzyme B, perforin, TIA1)			PAX5-	Cutaneous	Primary cutaneous CD30+ T-cell LPD
CD25, IRF4/MUM1					Polymorphous, regressing = LyP
					Monomorphous, progressing = PC-ALCL
					MF in transformation (if there is history of MF)
				Non-cutaneous	ALCL, ALK- (caveat: r/o nodal involvement by CTCL, CD15 may be+in CTCL)
				Intestinal	EATL (eosinophils: clinical history of celiac disease or antibodies)
				HTLV1+	ATLL, anaplastic large cell type (CD25+)
	CD30- or focal				PTCL, NOS
Cutaneous localization	CD30+ strong, all cells				CD30+ Cutaneous LPD
(non-anaplastic morphology)	CD30- or focal	Epidermotropic	CD4+	CD2+, CD5+, CD7-, CD8-, ßF1+, CGP-	MF, SS
Panel:				HTLV1+	ATLL
CD2, CD5, CD7, CD4, CD8, CD30,			CD4-	CD8+, CD2-, CD5-, CD7+/-, CD56-, ßF1+, CGP+	CD8+ AECTCL
CD56, ßF1, TCRγ, cytotoxic granule				CD8+, CD2+, CD5+, CD56-, TIA1+ other cytotoxic granules-, Ki-67 < 10%	Primary cutaneous acral TCL (confirmed by localization to ear, nose, and foot)
proteins, EBV-EBER;				CD8+/-, CD2+, CD5-, CD7+/-, CD56+/-, ßF1-, CGP+	Cutaneous γδTCL (dermis and subcutis often involved)
Optional: CD25, CD279		Dermis and subcutis	CD4+	CD56+ (maybe CD2+, CD7+, CD56+)	Consider myeloid sarcoma
				CD56+, CD3-, CD5-, CD123+, CD68+, TCL1+	BPDC
				CD56- (small/medium cells)	CD4+ small/medium CTCL/T-cell pseudolymphoma (CD279+)
				CD56- (medium/large cells)	PTCL, NOS
			CD4-	CD8+, ßF1+, CD2+, CD5-, CD7+, CD56-, CGP+	SCPTCL
				CD8+, ßF1-, CD2+, CD5-, CD7+/-, CD56+/-, CGP+	Cutaneous γδTCL
				CD8-, ßF1+	PTCL, NOS
				CD8-, ßF1-, EBV+, CD2+, CD7-, CD56+, CGP+, TCRγ-	ENKTCL nasal type
				CD8-, ßF1-, EBV-, CD2+, CD5-, CD7+/-, CD56+/-, CGP+, TCRγ+	Cutaneous γδTCL

Abbreviations: ALCL, anaplastic large-cell lymphoma; ATLL, adult T-cell leukemia/lymphoma; BPDC, blastic plasmacytoid dendritic cell; CTCL, primary cutaneous T-cell lymphoid proliferations and lymphomas; DLBCL, diffuse large B-cell lymphoma; EATL, enteropathy-associated T-cell lymphoma; ENKTCL, extranodal NK/T-cell lymphoma; LPD, lymphoproliferative disorders; LyP, lymphomatoid papulosis; MF, mycosis fungoides; SS, Sézary syndrome; PTCL, peripheral T-cell lymphoma; SCPTCL, subcutaneous panniculitis-like T-cell lymphoma; γδTCL: primary cutaneous gamma-delta T-cell lymphoma.

	Differentiation markers			Remark	Diagnosis
Extranodal, non-cutaneous	EBER+		CD5-, CD4-, CD8-, CD30-, CD56+, CGP+		ENKTCL (midline face, upper aerodigestive tract, testis, GI tract; may have T-cell phenotype)
(non-anaplastic morphology)	EBER-	CD30+	ALK+		ALCL, ALK+ small cell, or histiocyte-rich variants

(Continued to the next page)

Supplementary Table 4. Continued

Differentiation markers				Remark	Diagnosis
Panel:			ALK-	Intestinal, other abdominal/visceral sites, celiac disease or markers +	EATL (CD5-, CD7- CD4-, CD8+/-, CD56+/-, TIA1+, GRB+, Perf+)
CD2, CD3, CD4, CD5, CD7, CD8,				Other sites, celiac disease markers negative	PTCL, NOS (usually less strongly CD30+)
CD30, CD56, ALK, ßF1, TCRγ,		CD30-		Intestine, epidermorphic	MEITL
IRF4/MUM1, cytotoxic granule				Liver, spleen, bone marrow sinuses, immune suppression	HSTCL (CD5-, CD7-, CD4-, CD8-, CD56+, TIA1+, GRB-, Perf-)
proteins, EBV-EBER				Other sites	PTCL, NOS
Nodal localization	CD30+	ALK+			ALCL, ALK+ small cell, or histiocyte-rich variants
(non-anaplastic morphology)	CD30+/-	ALK-	CD10+, BCL6+, PD1+, CD4+/-, CXCL13+	Vascular proliferation, expanded CD21+ CD23+ FDC	AITL
Panel:				Nodular CD21+ CD23+ FDC	Follicular PTCL
CD2, CD3, CD4, CD5, CD7, CD8,			CD10-, BCL6-	HTLV1+	ATLL (CD2+, CD5+, CD7-, CD25+, CD56-)
CD30, ALK, CD10, BCL6, PD1/CD279,				HTLV1-	PTCL, NOS
CXCL13, CD21, CD23, EBV-EBER					

Abbreviations: AITL, angioimmunoblastic T-cell lymphoma; ALCL, anaplastic large-cell lymphoma; ATLL, adult T-cell leukemia/lymphoma; EATL, enteropathy-associated T-cell lymphoma; ENKTCL, extranodal NK/T-cell lymphoma; FDC, follicular dendritic cell; HSTCL, hepatosplenic T-cell lymphoma; MEITL, monomorphic epitheliotropic intestinal T-cell lymphoma; PTCL, peripheral T-cell lymphoma.

https://doi.org/10.47429/lmo.2025.15.2.105