

Morphologic and immunophenotypic characterization of lymphocytosis following BCMA-targeted CAR-T cell therapy in relapsed/refractory multiple myeloma

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<https://doi.org/10.3324/haematol.2025.289079>

Received: September 2, 2025.
Accepted: January 16, 2026.
Early view: January 29, 2026.

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Supplementary Table 1. Summary of patient characteristics, complete blood count (CBC), and flow cytometric findings post-BCMA CAR-T infusion in the retrospective cohort.

ID	Age	Gender	ISS stage	Days Post CAR-T	WBC ×10 ⁹ /L	ALC ×10 ⁹ /L	Atypical Lymphocytes (%)	Flow Cytometry Findings						
								% CD3+ of lymphocytes	% CD3+ CD7- of T cells	% CD3+ CD5- of T cells	CD4: CD8 ratio	% T cells in blast gate of total cells	Plasma Cells	% CAR-T of CD3 cells
1	56	M	II	D10	3.6	2.2	62	99	24.1	10.5	0.4	33.6	Absent	NA
				D14	3.0	1.7	57	97	17.7	11.2	0.5	7.4	Absent	59.9 (D14)
2	65	F	II	D11	32.5	26.0	82	99	54.4	7.0	0.73		Absent	59.2 (D10)
3	63	F	I	D11	4.0	2.7	53	98	10.2	9.2	0.2		Absent	NA
4	59	F	I	D13	15.4	13.7	52	99	44.4	8.4	1		Absent	56.9 (D14)
5	69	M	III	D14	7.1	5.6	45	94	23.2	17.2	0.1		Absent	NA
6	75	F	I	D28	6.1	1.7	6	16	29.8	4.0	0.8		Absent	60 (D14)

Note: All patients in this cohort received cilta-cel.

Supplementary Table 2. Baseline characteristics and association of expansion features with neurotoxicity in the prospective cohort (n = 21).

Top: Baseline demographic and clinical characteristics of patients receiving BCMA-directed CAR-T therapy.

Variable	All patients n=21
Gender, n (%)	
Female	9 (42.9)
Male	12 (57.1)
Age at diagnosis, median (range)	58 (42-72)
Year Car-T infusion, n (%)	
2023	9 (42.9)
2024	8 (38.1)
2025	4 (19.0)
CAR-T product, n (%)	
Cilta-cel	19 (90.5)
Ide-cel	2 (9.5)
ISS stage, n (%)	
Stage I	11 (52.4)
Stage II	4 (19.0)
Stage III	3 (14.3)
Unknown	3 (14.3)
Presence of cytokine release syndrome, n (%)	19 (90.5)
Grade I	10 (47.6)
Grade II	7 (33.3)
Grade III	2 (9.5)
Presence of immune effector cell-associated neurotoxicity syndrome	4 (19.0)
Presence of delayed neurotoxicity	4 (19.0)

Bottom: Association of CAR-T expansion features with neurotoxicity.

Group	Total (n)	ICANS, n (%)	Delayed neurotoxicity, n (%)
ALCmax $\geq 3 \times 10^9$ /L	12	3 (25.0)	4 (33.3)
ALCmax $< 3 \times 10^9$ /L	9	1 (11.1)	0 (0)
%BCMA of T cells $\geq 60\%$	9	4 (44.4)	4 (44.4)
%BCMA of T cells $< 60\%$	12	0 (0)	0 (0)
CD4-predominant CAR-T expansion	10	3 (30.0)	3 (30.0)
CD8-predominant CAR-T expansion	11	1 (9.1)	1 (9.1)

Supplementary Table 3. Summary of absolute lymphocyte count (ALC) kinetics, BCMA⁺ CAR-T cell expansion, and associated toxicities in patients receiving BCMA-directed CAR-T therapy (n = 21).

ID	Gender	Age at diagnosis	Date CAR-T infusion	Car-T product	ISS stage	ALC_d minus5	ALC_d0	ALC_d1	ALC_d2	ALC_d3	ALC_d4	ALC_d5	ALC_d6	ALC_d7	ALC_d8
p1	Female	62	6/12/2023	Cilta-cel	II	1.83	0.02	0.03	0.04	0.04	0.06	0.12	0.3	0.33	0.36
p2	Female	72	7/17/2023	Cilta-cel	I	2	0.07	0.1	0.17	0.19	0.15	0.23	0.24	0.12	0.13
p3	Female	42	9/12/2023	Cilta-cel	I	0.4	0.01	0.09	0.06	0.1	0.19	0.13	0.13		
p4	Male	47	9/12/2023	Cilta-cel	II	1.1	0.07	0.03		0.15	0.19	0.39	0.33	0.08	0.34
p5	Male	61	9/11/2023	Cilta-cel	III	1.13	0.02	0.02	0.02	0.03	0.07	0.05	0.13	0.2	0.27
p6	Male	54	9/20/2023	Cilta-cel	III	0.88	0.04	0.07	0.14	0.16	0.26	0.26	0.42	0.5	0.37
p7	Female	67	11/6/2023	Cilta-cel	I	0.87	0.25	0.05	0.04	0.06	0.06	0.07	0.06	0.07	0.02
p8	Male	50	12/14/2023	Ide-cel	I	1.5	0.03	0	0.05		0.11	0.25	0.99	1.51	2.42
p9	Male	56	1/24/2024	Cilta-cel	I	2.25	0.15	0.18	0.26	0.3	0.32	0.17	0.28	0.23	0.14
p10	Female	60	1/24/2024	Cilta-cel	I	2.99	0.15	0.15	0.18	0.28	0.31	0.38	0.29	0.36	0.26
p11	Female	56	2/26/2024	Cilta-cel	II	0.99	0.25	0.2	0.25	0.26	0.27	0.29	0.25	0.19	0.15
p12	Male	55	3/13/2024	Cilta-cel	I	2.3	0.04	0.08	0.08	0.19	0.03	0.06	0.51	0.51	0.73
p13	Male	57	3/29/2024	Cilta-cel	Unknown	2.15	0.28	0.16	0.26	0.44	0.46	0.45	0.38	0.57	0.59
p14	Female	44	10/16/2024	Cilta-cel	III	1.6	0.01	0.01	0.01		0.15	0.33			
p15	Male	42	3/3/2025	Cilta-cel	I	0.26	0.06	0.04	0.09	0.21	0.47	0.58	0.62	0.69	2.15
p16	Male	65	6/10/2024	Cilta-cel	I	0.57	0.04	0.02	0.01	0.08	0.03	0.06	0.05	0.07	1.09
p17	Male	67	3/4/2025	Cilta-cel	I	0.5	0.04	0.03	0.02	0.09	0.02	0.02	0.02		0.34
p18	Male	65	8/28/2023	Cilta-cel	II	0.28	0.02	0.03	0.05	0.08	0.02	0.08	0.06	0.02	0.56
p19	Female	58	8/19/2024	Cilta-cel	I	0.01									
p20	Male	66	2/3/2025	Ide-cel	Unknown	0.18									
p21	Female	71	3/11/2025	Cilta-cel	Unknown	1.22		0.02	0.09	0.19	0.25	0.32	0.18	0.06	0.11

											% CD4	% CD8					Delayed neurotoxi
								%BCMA of T cells at	BCMA of T cells at	BCNA of T cells at							
ALC_d9	ALC_d10	ALC_d11	ALC_d12	ALC_d13	ALC_d14	ALC_d15	ALCmax	ALCmax	ALCmax	ALCmax	CRS	CRS grade	CRS date	ICANS	ICANS grade		
	0.34	0.84	3.53	4.27	2.83	1.62	4.27	54	35.5776	39.6494	Yes	Grade I	6/20/2023	No	NA	No	
0.39	1.42	5.59	5.13	3.37	2.75	1.78	5.59	60	43.6433	12.2112	Yes	Grade I	7/24/2023	No	NA	No	
		0.58	4.31	13.72	13.11	8.62	13.72	45.7	2.4684	0.9516	Yes	Grade II	9/19/2023	No	NA	No	
0.91	1.43	1.69	1.31	0.82	0.59	0.84	1.69	11.7	0.645	0.5166	Yes	Grade II	9/18/2023	No	NA	No	
0.22	0.15	0.35	0.58	1.25	1.22	0.65	1.25	31.3	14.5017	9.9588	Yes	Grade I	9/20/2023	No	NA	No	
0.37	0.3	0.83	2.02	2.16	1.48	0.97	2.16	56.8	11.1154	34.4114	Yes	Grade I	9/29/2023	No	NA	No	
0.1	0.22	0.4	0.42	0.57	0.63	0.29	0.63	25.1	4.3524	9.88	Yes	Grade II	11/10/2023	No	NA	No	
1.41	1.26	0.95	0.71	0.68	0.8	0.7	2.42	6.6	1.092	2.6159	Yes	Grade I	12/14/2023	No	NA	No	
0.31	1.27	4.51	3.76	2.48			4.51	24.7	4.212	21.7	Yes	Grade II	1/31/2024	No	NA	No	
0.43	0.74	2.11	2.41	1.78			2.41	7.8	2.1667	5.029	No	NA		No	NA	No	
1.33	10.04	25.98	23.03	14.09	6.12		25.98	74.3	30.7997	23.6145	Yes	Grade II	3/5/2024	No	NA	No	
0.76					0.84		0.84	8.9	0.8575	7.116	Yes	Grade I	3/14/2024	No	NA	No	
0.33	1.81	4.93	3.99	2.21	1.22	0.87	4.93	53.6	9.6141	35.9307	Yes	Grade III	4/5/2024	No	NA	No	
0.57	0.47	1.19	1.33	1.48	1.35		1.48	56.6	12.2958	42.0644	Yes	Grade I	10/17/2024	No	NA	No	
5.17	5.94					1.1	5.94	72.9	18.0256	52.371	No	NA		NA	NA	No	
4.77	7.6	7.19	3.28	1.62	1.09		7.6	74.7	41.5548	32.6784	Yes	Grade I	6/14/2024	No	NA	Yes	
4.5	11.13	10.41	5.37	3.39		2.27	11.13	86.5	57.9026	26.2235	Yes	Grade I	3/11/2025	No	NA	Yes	
3.21	9.55	11.13	5.27	3.73	2.31	1.7	11.13	84.6	83.1548	3.34	Yes	Grade III	8/31/2023	Yes	Grade II	Yes	
0.14	1.4	2.81	4.05	4.85	4.14	3.83	4.85	84.7	11.6178	80.1855	Yes	Grade I	8/23/2024	Yes	Grade III	Yes	
0.05	0.05	0.16	0.08	0.03	0.02		0.16	66.5	64.8636	3.358	Yes	Grade II	2/4/2025	Yes	Grade II	No	
0.11	1.66	3.46	9.1	7.03	3.3	2.05	9.1	64.3	43.416	18.9164	Yes	Grade II	3/18/2025	Yes	Grade I	No	