Outcomes and treatment patterns in primary and secondary plasma cell leukemia: insights from a large US cohort study

Shagun Singh,[1*] Supriya Peshin,[2*] Betsy C. Wertheim,[3] Ashley Larsen,[4] Iloabueke Chineke,[5] Douglas W. Sborov,[6] Damian Green,[7] Michaela Liedtke,[8] Marie Okoniewski,[9] Mohammed Wazir,[10] Omar Nadeem,[11] Levanto G. Schachter,[12] Dominique DeGraaff,[13] Victoria A. Vardell,[14] David G. Coffey[15] and Krisstina Gowin[16]

[1]Internal Medicine, Banner University Medical Center, Tucson, AZ; [2]Norton Community Hospital, Ballad Health, Norton, VA; [3]University of Arizona Cancer Center, Tucson, AZ; [4]Department of Medicine, University of Arizona, Tucson, AZ; [5]Rocky Mountain Oncology, Casper, WY; [6]Huntsman Cancer Institute at the University of Utah, Salt Lake City, UT; [7]University of Miami, Miller School of Medicine, Miami, FL; [8]Standford Medicine, Department of Hematology, Palo Alto, CA; [9]University of Kansas Cancer Center, Kansas City, KS; [10]UMass Memorial Medical Center, Division of Hematology/Oncology, Worcester, MA; [11]Harvard Medical School, Dana-Faber Cancer Institute, Boston, MA; [12]UCLA Health, Hematology Oncology, San Luis Obispo, CA; [13]University of Washington, Department of Oncology and Hematology, Seattle, WA; [14]University of Utah, Huntsman Cancer Institute, Salt Lake City, UT; [15]Divison of Myeloma, Sylvester Comprehensive Cancer Center, University of Miami, Miami, FL and [16]Department of Supportive Care Medicine, Hematology/HCT, City of Hope, CA, USA

*SS and SP contributed equally as first authors.

Supplement Table 1. Patient characteristics, mean ± SD or n (%)

Characteristic	Total n = 153	Primary PCL n = 96	Secondary PCL n = 57	P
Type of transplant(s) at induction				< 0.001
Tandem auto/auto	1 (0.8)	1 (1.1)	0 (0.0)	
Tandem auto/allo	11 (8.3)	10 (11.1)	1 (2.4)	
Single auto	51 (38.6)	45 (50.0)	6 (14.3)	
Single allo	5 (3.8)	4 (4.4)	1 (2.4)	
No transplant at induction	64 (48.5)	30 (33.3)	34 (81.0)	
Type of transplant(s) at relapse				0.613
Tandem auto/auto	1 (0.8)	1 (1.1)	0 (0.0)	
Tandem auto/allo	1 (0.8)	1 (1.1)	0 (0.0)	
Single auto	4 (3.1)	2 (2.2)	2 (5.0)	
Single allo	4 (3.1)	4 (4.4)	0 (0.0)	
No transplant at relapse	120 (92.3)	82 (91.1)	38 (95.0)	
CCND1/IgH t(11;14) at dx				0.323
Absent at diagnosis	39 (49.4)	26 (45.6)	13 (59.1)	
Present at diagnosis	40 (50.6)	31 (54.4)	9 (40.9)	
n missing	74	39	35	
CCND1/IgH t(11;14) ever				1.000
Never present	50 (50.0)	35 (49.3)	15 (51.7)	
Ever present	50 (50.0)	36 (50.7)	14 (48.3)	
n missing	53	25	28	

Missing data for each characteristic (total): Type of transplant(s) at induction (21), Type of transplant(s) at relapse (23), t(11;14) at dx (74), t(11;14) ever (53)

Missing data for each characteristic (primary PCL): Type of transplant(s) at induction (6), Type of transplant(s) at relapse (6), t(11;14) at dx (39), t(11;14) ever (25)

Missing data for each characteristic (secondary PCL): Type of transplant(s) at induction (15), Type of transplant(s) at relapse (17), t(11;14) at dx (35), t(11;14) ever (28)

Supplement Table 2. Associations with survival (Total, n = 153)

Characteristic	Age-adjusted HR (95% CI)	Multivariate[1] HR (95% CI)	p-value
Secondary PCL	4.54 (3.01–6.83)	2.37 (1.47–3.84)	< 0.001
Any transplant	0.12 (0.06–0.21)	0.16 (0.08–0.29)	< 0.001
High-risk genetic feature	1.28 (0.76–2.14)	1.10 (0.63–1.92)	0.749
DEL17p	1.56 (0.90–2.71)	1.31 (0.72–2.40)	0.376
t(4;14)	1.21 (0.64–2.30)	0.92 (0.45–1.88)	0.818
t(14;16)	0.63 (0.28–1.39)	0.89 (0.38–2.08)	0.790
Extramedullary disease	1.57 (0.99–2.48)	0.97 (0.57–1.66)	0.919
CCND1/IgH t(11;14) at dx	0.63 (0.35–1.11)	0.65 (0.34–1.26)	0.203
CCND1/IgH t(11;14) ever	0.80 (0.49–1.32)	0.79 (0.46–1.36)	0.393

[1] Further adjusted for PCL type and any transplant

Supplement Table 3. Patient characteristics, by transplant status, mean ± SD or n (%)

Characteristic	Never transplant n = 96	Ever transplant n = 57	P
Age at diagnosis	64.8 ± 10.0	56.4 ± 9.0	< 0.001
Lab measures at diagnosis			
LDH (U/L)	501.5 ± 675.6	347.4 ± 238.9	0.509
Albumin (g/dL)	3.2 ± 0.7	3.4 ± 0.8	0.224
Creatinine (mg/dL)	1.8 ± 1.7	5.1 ± 19.8	0.733
Beta-2 microglobulin (?)	11.5 ± 14.8	10.1 ± 10.2	0.837
Secondary PCL			< 0.001
Primary	28 (46.7)	65 (86.7)	
Secondary	32 (53.3)	10 (13.3)	

Supplement Table 3. Patient characteristics, by transplant status, mean ± SD or n (%)

Characteristic	Never transplant n = 96	Ever transplant n = 57	P
High-risk genetic feature			0.500
No	12 (36.4)	24 (46.2)	
Yes	21 (63.6)	28 (53.8)	
Extramedullary disease			0.505
No	32 (71.1)	54 (78.3)	
Yes	13 (28.9)	15 (21.7)	
First line of chemotherapy			0.111
Proteosome inhibitor triplet	16 (45.7)	31 (70.5)	
VTD PACE–like regimen	10 (28.6)	8 (18.2)	
Daratumamab quadruplet	1 (2.9)	1 (2.3)	
Other	8 (22.9)	4 (9.1)	
Best response to first line of chemo			0.041
Less than CR	19 (61.3)	10 (32.3)	
CR or better	12 (38.7)	21 (67.7)	
MRD Negative (10^{-6}) (ever)			< 0.001
Yes	1 (2.5)	9 (16.1)	
No	18 (45.0)	3 (5.4)	
Unknown	21 (52.5)	44 (78.6)	
CCND1/IgH t(11;14) at dx			1.000
Absent at diagnosis	13 (50.0)	22 (48.9)	
Present at diagnosis	13 (50.0)	23 (51.1)	
CCND1/IgH t(11;14) ever			1.000
Never present	16 (51.6)	30 (51.7)	
Ever present	15 (48.4)	28 (48.3)	

Note: P-value for comparing never versus ever transplant from Wilcoxon rank-sum test (continuous variables) or Fisher's exact test (categorical variables).

High-risk genetic features, as defined by the revised 2016 IMWG consensus, include the presence of t(4;14), t(14;16), Del17p13, a non-hyper diploid karyotype and gain (1q)

Missing data for never transplant: LDH (26), Albumin (15), Creatinine (18), beta-2 microglobulin (19), High-risk genetic feature (27), Extra medullary disease (15), First line chemotherapy (25), Best response to first line of chemo (29), MRD response (20), t(11;14) at dx (34), t(11;14) ever (29)

Missing data for ever transplant: LDH (43), Albumin (32), Creatinine (36), beta-2 microglobulin (34), High-risk genetic feature (23), Extra medullary disease (06), First line chemotherapy (31), Best response to first line of chemo (44), MRD response (19), t(11;14) at dx (30), t(11;14) ever (17)