Supplementary data

Supplementary Methods:

Investigational Mobilization Protocol (continued from Methods)

Only two days of mobilization and apheresis were allowed per protocol. If patients did not meet primary endpoint or at the discretion of the treating physician to collect additional HSCs, they underwent a second mobilization after a washout period with G-CSF and plerixafor. If the minimum goal of 2.0 x 106 CD34+ cells/kg was not met after 2 days of collection, patients proceeded with washout protocol and alternative stem cell mobilization strategy at the discretion of the treating physician. For patients collecting between 2.0 and 4.0 x 106 CD34+ cells/kg, patients could proceed to transplant or collect additional stem cells with alternative strategies to meet the total goal of 4.0 x 106 CD34+ cells/kg per treating physician discretion.

Transplant and Follow-up: Patients who underwent upfront ASCT received myeloablative conditioning with melphalan 140-200 mg/m^2 per standard of care on day -2 followed by HSC infusion on day 0 per standard of care institutional guidelines. Patients were followed for engraftment and event monitoring for 100 days post stem cell infusion. If patients were not planned for upfront ASCT within 60 days of HSC collection, they were monitored for additional 30 days after HSC mobilization for AE monitoring. They could resume anti-myeloma therapy per treating physician discretion.

Contemporaneous control cohort for mobilization:

A contemporaneous prospective control cohort of 15 patients with multiple myeloma was identified. These patients were identified prospectively if were undergoing stem cell mobilization per standard of care protocol and met the following criteria, which were similar to the key eligibility criteria for the phase 2 clinical trial for stem cell mobilization with MGTA-145 + plerixafor. This was defined in the study protocol, but data and samples from the control group were obtained under a separate IRB approved protocol.

1. Diagnosis of multiple myeloma per the International Myeloma Working Group (IMWG) criteria
2. Age: 18 to 70 years
3. Eligible for ASCT per institutional guidelines
4. Within one year of start of myeloma therapy
5. Cardiac and pulmonary status sufficient to undergo apheresis and transplantation per institutional transplant guidelines.
6. No more than 8 cycles of lenalidomide exposure
7. No prior history of stem cell transplant
8. No prior history of failure to collect HSCs

Standard of care HSC mobilization protocol: Patients received G-CSF 10 mcg/kg daily for four consecutive days. On day 4, if CD34$^+$ counts were $\geq$ 20 cells/uL, apheresis was started on day 5.

If day 4 CD34+ cell count was ≤20 cells/uL, plerixafor was administered in the evening on day 4 and started on day 5. Plerixafor could also be administered at physician discretion to patients with day 1 yield <1.5 x 10^6 CD34+ cells/kg or subsequent days with a yield <0.5 x 10^6 CD34+ cells/kg. The primary collection goal per our institutional protocol was ≥ 2 x 10^6 $CD34^+$ cells/kg with an additional 2 x 10^6 $CD34^+$ cells/kg preferred for a backup. In all of the 15 patients, the goal was a total count of ≥ 4 x 10^6 $CD34^+$ cells/kg

Analysis of Primary and Secondary Endpoints: Descriptive statistics were used including proportions and median (range) were to describe primary and secondary endpoints of number of HSCs mobilized and different targets of HSC mobilization, as well as engraftment rate, time to engraftment and adverse events.

Patient Reported Outcome Assessment: Brief Pain Inventory and PRO-CTCAE Items

*A*ssessment of patient reported pain with mobilization was done using the short form of the Brief Pain Inventory (BPI) questionnaire and two items adapted from Patient Reported Outcomes Common Terminology Criteria for Adverse Events (PRO CTCAE). This questionnaire was administered at baseline, each day of mobilization and post within 7 days after mobilization.

Brief Pain Inventory:

This questionnaire consists of 9 items with 2 domains: pain severity and pain interference with a recall of 24 hours. [1] Patients were asked if they have pain and the location of pain, Pain severity is scored on a scale of 0-10 with 0 = no pain and 10 = pain as bad as you can imagine. The BPI pain severity questions assess pain at its "worst," "least," "average," and "now" (current pain). A composite mean severity score of these four items may be calculated. Pain interference is estimated by 7 questions that ask patients how pain has interfered with seven daily activities: walking, work, mood, enjoyment of life, relations with others, and sleep. Pain interference is scored as a mean of the 7 interference items.

We used the Brief Pain Inventory (BPI) to assess two pain domains: severity and interference with daily functions. The severity domain consists of four questions: worst pain during the last 24 hours, least pain during the last 24 hours, pain on the average, and pain right now. The interference domain consists of seven questions concerning how pain has interfered with daily functions during the last 24 hours. Answers for both pain domains are scored using an 11-point Likert scale from 0 signifying No Pain to 10 signifying Pain as bad as you can imagine.

We analyzed this longitudinal data for worst pain during the last 24 hours, arithmetic mean of the severity domain questions, and arithmetic mean of the interference domain questions. We modeled the longitudinal data using a linear mixed effects model where timepoints served as the fixed effects and patients served as the random effect. Point and interval estimates for the fixed effects were compiled.

The following two questions were adapted from the PRO-CTCAE library[2]:

1. Have you noticed any pain, swelling or redness at a site of drug injection or IV today?

2. If yes, what was the severity of the symptoms at worse?
    - o None
    - o Mild
    - o Moderate
    - o Severe
    - o Very Severe

This data was analyzed by descriptive statistics and results were summarized as proportions.

Correlative studies:

1. Assessment of Minimal Residual Disease in Apheresis Graft by Next Generation Flow Cytometry Panel

Graft contamination with malignant plasma cells was evaluated using next generation flow cytometry assay (NGF) minimal residual disease negativity (MRD) testing. MRD NGF was based on the Euro-Flow standardized algorithm as described before in references.[3-5]
This testing was done in the lab of Dr Shaji Kumar at Mayo Clinic.
The sensitivity of the assay is 1 in 1 x 10^5 to 1 x 10^6 cells. It is a 2 tube, 8 color assay and the following panels were used:
Tube #1: CD38/CD56/ CD45/CD19/CD117/ CD81/ CD138/ CD27
Tube #2: CD38/ CD56/ CD45/ CD19/Kappa/Lambda/ CD138/ CD27

2. Graft Composition Immunophenotype and Peripheral Blood Immune Reconstitution Analysis for by Flow Cytometry and CyTOF

Apheresis sample processing: Analysis of apheresis grafts was performed on samples collected from the patients after successful mobilization. Samples from first day of apheresis were used for this analysis. In the case samples from first day of apheresis were not available for any reason, samples from second day of apheresis could be used. Briefly, 1 ml vials were obtained from the actual products after adding 10% DMSO/normosol media and were frozen in the same controlled-rate freezer as the apheresis products. At the day of analysis, the vials were thawed in warm bath for 1-2 min, resuspended in warm RPMI media (containing 10% FBS) and DNAse to avoid clumping, and centrifuged for 10 min at 500xg at room temperature (RT). Cells were counted on a Countess automated cell counter (Invitrogen) and mononuclear cells (MNC) were isolated using Ficoll density gradient separation.

Peripheral blood sample processing: Peripheral blood was collected in 10 ml heparin tube at baseline and at day 28 and 100 after autologous stem cell transplantation. Mononuclear cells (MNC) were isolated using Ficoll density gradient separation. Peripheral blood testing was done on fresh sample.

Immunophenotype analysis (Flow Cytometry)

MNC obtained as described above were stained for surface markers for 30 min at RT in the dark. An extended table describing the monoclonal antibodies used for immunophenotype analysis of HSPC and lymphocyte subsets is provided in the supplementary materials. Propidium iodide or Zombie Aqua viability dye (Biolegend, Cat. # 423101) were used to exclude dead cells. Data were collected on BD FACSAria II and analyzed with FlowJo software (version 9.9.4.). For the peripheral blood samples the absolute count of each cell subset is calculated by multiplying the frequency (in %) of each cell subset from the flow analysis times the absolute lymphocyte count from CBCD and dividing by 100 (= frequency of each cell subset in live cells*absolute lymphocyte count from CBCD/100).

Apheresis products were cryopreserved and analyzed in batches after thawing by flow cytometry and CyTOF. Peripheral blood immune reconstitution by flow cytometry was assessed on fresh peripheral blood samples at baseline, day 28 and day 100 following transplant.

Flow Cytometry and CyTOF Panels: Apheresis products and peripheral blood immune reconstitution.

The following flow cytometry panel was used to characterize immunophenotype of hematopoietic stem cells (HSCs) in apheresis products mobilized by MGTA-145 and plerixafor as well as standard of care mobilization. Flow cytometry was done on cryopreserved and thawed samples in batches and differs from flow cytometry-based analysis of CD34+ cells that was done on fresh apheresis grafts in CLIA certified clinical lab for the purposes of determining CD34+ cell dose of the graft for primary and secondary endpoints.

Table S1: Flow Cytometry Panel with Antibodies for HSC and progenitor cell staining

Fluorochrome	Target	Clone	Dilution
FITC	CD45RA	HI100	1:100
PE	CD90	PR13	1:10
APC-Cy7	CD123	6H6	1:100
APC	CD34	561	1:100
PE-Cy7	CD38	HIT2	1:100
BV510	CD10	HI10a	1:100
Pac Blue	CD117	104D2	1:100
PerCP-Cy5.5	CD19	HIB19	1:100

The following panels was used to characterize immunophenotype of T, B and NK cells in apheresis products mobilized by MGTA-145 and plerixafor as well as standard of care mobilization, and to study peripheral blood immune reconstitution following autologous stem cell transplant. Apheresis products were cryopreserved and analyzed in batches after thawing. Peripheral blood immune reconstitution was assessed on fresh peripheral blood samples at baseline, day 28 and day 100 following transplant.

Table S2: Flow Cytometry Panel with Antibodies for T and NK cell staining

Fluorochrome	Target	Clone	Dilution
BV421	CD3	SK7	1:100
PerCyP-Cy5.5	CD4	RTA-T4	1:100
APC-H7	CD8	SK1	1:100
APC	CD56	B159	1:50
Pe-Cy7	CD45RA	HI100	1:100
PE	CD62L	DREG-56	1:100
FITC	CD45RO	UCHL1	1:100
APC-R700	CD28	CD28.2	1:100
BV510	CD31	WM59	1:100

Table S3: Flow Cytometry Panel with Antibodies for B cell staining

B cell panel

Fluorochrome	Target	Clone	Dilution
BV421	CD3	SK7	1:100
PerCyP-Cy5.5	CD19	HIB198	1:100
APC-H7	CD20	2H7	1:100
PE	CD24	ML5	1:50
Pe-Cy7	CD27	M-T271	1:100
APC	CD38	HIT2	1:100
FITC	IgM	G20-127	1:100
BV510	IgD	IA6-2	1:100

CyTOF panel

CyTOF analysis was conducted at the Human Immune Monitoring Core at Stanford University. The following CyTOF panel was used to characterize immunophenotype of hematopoietic stem cells (HSCs) and other immune cell subsets in apheresis products mobilized by MGTA-145 and plerixafor as well as standard of care mobilization. This analysis was done on cryopreserved and thawed samples in batches. The panel for the analysis is described below. The methodology is as previously described.[6-9]

Metal label	Specificity	Clone, Vendor	Conjugated by
89Y	CD45	HI30, SBT	SBT
113In	CD57	HCD57, BioLegend	HIMC

115In	live/dead		
141Pr	CCR6	G034E3, SBT	SBT
142Nd	CD19	SJ25C1, Southern BioTech	HIMC
143Nd	CD4	SK3, BioLegend	HIMC
144Nd	CD8	SK1, BioLegend	HIMC
145Nd	CD39B	BioLegend	HIMC
146Nd	IgD	IA6-2, BioLegend	HIMC
147Sm	CXCR2	5E8/CXCR2, SBT	SBT
148Nd	CD11c	Bu15, BioLegend	HIMC
149Sm	CD16	3G8, BioLegend	HIMC
150Nd	CD3	UCHT1, BD	HIMC
151Eu	CD38	HB-7, BD	HIMC
152Sm	CD27	L128, BD	HIMC
153Eu	CD11b	ICRF44, BioLegend	HIMC
154Sm	CD14	M5E2, BioLegend	HIMC
156Gd	CD94	HP-3D9, BD	HIMC
157Gd	CD86	IT2.2, BioLegend	HIMC
158Gd	CXCR5	RF8B2, BD	HIMC
159Tb	CXCR3	G025H7, Biolegend	HIMC
160Gd	CCR7	150503, R&D Systems	HIMC
161Dy	CD90	5E10, SBT	SBT
163Dy	CD34	581, SBT	SBT
164Dy	CD20	2H7, BioLegend	HIMC
165Ho	CD127	A019D5, BioLegend	HIMC
166Er	CD33	P67.8, BD	HIMC
167Er	CD28	L293, BD	HIMC
168Er	CD24	ML5, BioLegend	HIMC
169Tm	CD45RA	H100, SBT	SBT
170Er	CD161	DX12, BD	HIMC
171Yb	TCRgd	B1, BioLegend	HIMC
172Yb	PD-1	EH12.1, BD	HIMC
173Yb	CD123	9F5, BD	HIMC
174Yb	CD56	NCAM16.2, BD	HIMC
175Lu	HLA-DR	G46-6, BD	HIMC
176Yb	CD25	M-A251, BD	HIMC

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Statistical Analysis for Correlative Studies:

Statistical Analysis for Immunophenotype of Apheresis Graft by Flow cytometry

Hematopoietic stem cells and immune cell subsets in the apheresis grafts mobilized with MGTA-145+plerixafor and G-CSF and as needed plerixafor were evaluated using flow cytometry as described above and compared amongst the two groups.

We enumerated CD34+CD90+ CD34+CD90+CD45RA- cells and T cell subsets, B cell subsets, NK cells in the apheresis product. CD90+CD34+ stem cells have been shown to be true self-renewing pluripotent HSCs among the CD34+ cells, whereas CD90(-)CD34+ cells have been shown to be differentiated committed progenitor cells. CD34+CD90+ and CD34+CD90+CD45RA- were reported as a percentage of the total CD34+ cells. T cell subsets, B cell subsets and NK cells were reported as a percentage of total lymphocytes. Immune subsets between grafts mobilized by MGTA-145+plerixafor vs G-CSF and as needed plerixafor were compared using Mann Whitney tests.

Statistical Analysis for Immune Reconstitution by Flow Cytometry:

Immune reconstitution of different immune subsets was evaluated at baseline, day 28 and day 100 post-transplant. Immune reconstitution was evaluated over time in each group as well as compared across the study and control groups.

Methods: For each group and cell subset, absolute immune subset counts were regressed on time since baseline using linear quantile mixed models (Geraci and Bottai 2014), to test for changes from baseline in medians. Within each group and time point, p-values were adjusted (Holm 1979) to control the familywise error rate at 5%. All analyses were conducted in R (R Core Team 2024, v.4.3.3) using packages reshape2 (Wickham 2007), lqmm (Geraci 2014, Geraci and Bottai 2014), and mutoss (Team et al. 2023). Plots are of medians and interquartile ranges.

Between group comparisons (Trial patients vs control patients) at baseline, day 28 and day 100 were done using the Mann-Whitney-Wilcoxon test

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Statistical Analysis for CyTOF on apheresis grafts

Comparison of immunophenotype of MGTA-145+plerixafor mobilized grafts (N=25) to standard of care mobilized grafts (N=15)

Ratio of cell subset count to count of live intact single cells was regressed on group (control vs. study) and CyTOF batch using quasi-likelihood generalized linear modeling (McCullagh and Nelder 1991, pp. 323-356) with allowance for extra-binomial variance. For four primary cell subsets (CD34+CD45-, CD90+CD34+CD45-, NK cells, lymphocytes), p-values were adjusted to control the familywise error rate using Holm (1979) and for all other subsets p-values were adjusted (Benjamani et al. 2006, Kim and van de Wiel 2008) to control the false discovery rate at 5%. Before plotting, all proportions were range-scaled to interval (0, 1); so, for example, a cell subset with proportions of live intact single cells ranging from 0.1 to 0.3 was re-scaled to 0 to 1. Range scaling was needed because scales on which cell subsets operate differ widely. Data on vertical axis in panel of figures were not adjusted for batch effects

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Supplementary Results

Change in neutrophil count with mobilization: Notably, this G-CSF free regimen resulted in modest increase in neutrophil count with HSC mobilization. Median baseline ANC was 2,860/uL (range: 1,450-7,900),and increased to 13,105/uL (range: 5680-38550) at the end of day 1 of mobilization + apheresis and 12,690/uL (range: 6,690-34,820) at the end of day 2 of mobilization + apheresis. It returned to normal range for all except 2 patients by post-mobilization visit, which occurred within 1 week of mobilization, with median ANC of 4,550/uL (range: 1,770 – 36,900).

Patient Reported Outcomes:

In addition to the Brief Pain Inventory, we also included one question from the PRO-CTCAE in the

PRO questionnaire

1. Have you noticed any pain, swelling or redness at a site of drug injection or IV today? (Adapted from PRO-CTCAE)
o Yes
o No

We have added the result of the PRO-CTCAE question to the supplemental results.

Three of 25 (12%) patients reported pain, redness or swelling at a site of injection or IV.

Contemporaneous Control Cohort

A contemporaneous control cohort of 15 patients undergoing standard of care mobilization was identified as described in Methods. These patients underwent HSC mobilization with G-CSF and as needed plerixafor from 2/8/2021 to 7/19/2021. Baseline characteristics of these 15 patients are shown in **Table S7** and stem cell mobilization and transplant outcomes are shown in **Table S8.**

The median age at mobilization was 62 years (range: 52-70) and 53% were female. Approximately half of the patients (47%) were White and 27% (n=4) were Black. Median duration of induction chemotherapy in this cohort was 6 months (range: 4-10). Lenalidomide was part of treatment in 87% (n=13) of patients with median cycles of exposure being 6 (range:2-8). Twenty-seven percent (n=4) were anti-CD38 antibody exposed and 33% (n=5) had received cyclophosphamide, including 27% (n=4) with more than 2 cycles of cyclophosphamide. Radiation therapy was used for myeloma treatment in 33% (n=5) of patients. Overall, 79% (n=11) of patients were in a VGPR or better response prior to HSC mobilization. Plerixafor was administered to 80% (n=12) of patients in this cohort based on institutional protocol of giving plerixafor if CD34 count on day 4 of GCSF was < 20/μL. Median total HSC collection (in CD34+ cells x 10^6/ kg) was 5.2 (range: 3-13.8), with median day 1 collection being 4.3 (range: 1.3-13.8). Number of apheresis days was 1 in 67% (n=10) of patients, 2 in 20% (n=3) of patients and 3 or more days in 13% (n=2) patients. All patients collected $\geq$ 2 x 10^6 CD34+ cells/kg, while 93% (n=12) collected $\geq$ 4 x 10^6 CD34+ cells/kg.

All patients collected $\geq$ 2 x 10^6 CD34+ cells/kg in 1- 2 days. Fourteen of these 15 patients underwent ASCT. All patients engrafted successfully, with durable engraftment at day 100. Median time to neutrophil engraftment was 12 days (range: 11-14) and median time to platelet engraftment was 17 days (range 13-21).

In the control cohort, the median time from mobilization day 1 to start of conditioning chemotherapy for patients who proceeded to ASCT after G-CSF and plerixafor based mobilization (N=14) was 19 days (range: 13-85).

Table S4: CD34 counts in peripheral blood/uL in patients undergoing mobilization with MGTA-145 and plerixafor

	CD34/uL Median (Range)
Pre-apheresis (Day 1), N=25	24 (3-99)
Post-apheresis (Day 1)	30 (6-452)
Pre-apheresis (Day 2), N=22	15 (5-46)
Post-apheresis (Day 2)	19 (3-49)

Table S5: Alternate hematopoietic stem cell mobilization in 5 patients following mobilization with MGTA-145 and plerixafor

Stem cell yield with MGTA-145+plerixafor CD34+ cells x 10^6/ kg	Alternate Mobilization	Apheresis days with alternate mobilization	Stem cell yield with alternate mobilization: CD34+ cells x 10^6/ kg
4.7 (clotting)*	GCSF + plerixafor	1	4
2.3 (backup)**	GCSF + plerixafor	1	2.2
1.1	GCSF + plerixafor	3	6.3
1.2	GCSF + plerixafor	2	3.3
1.9	GCSF + plerixafor	2	4

Reasons for alternate mobilization: *Primary product clotted during processing for cryopreservation, deemed unrelated to mobilization. ** Treating physician wanted backup stem cells in case of failure to engraft or need for second transplant in future. Remaining three patient underwent alternate mobilization due to failure to collect minimum stem cell dose necessary for stem cell transplant.

Table. S6: Adverse events during or after mobilization that were deemed to be unrelated or unlikely to be related to investigational mobilization

	Overall	Grade 1	Grade 2	Grade 3
Tingling/paresthesia/oral dysesthesia	9	9		
Hypocalcemia	5	4		1
Nausea	4	4		
Pain (including intermittent pain that was present at baseline and discomfort at IV access site)	4	4		
Hypokalemia	3	2	1	
Anemia	3	1	1	1
Low platelet count	3	1	1	1
Citrate reaction	1	1		
Constipation	1	1		
Diarrhea	1		1	
Vomiting	1			
Dizziness	1	1		
Headache	1	1		
Hot flashes	1	1		
Insomnia	1	1		
Urinary Frequency	1	1		
Chills	1	1		
Fatigue	1		1	

Table S7: Engraftment following high dose melphalan with hematopoietic stem cells collected with alternate mobilization in patients undergoing first mobilization with MGTA-145 and plerixafor

Engraftment data, N=4	**Median (range) or N (%)**
Neutrophil engraftment, ANC $\geq$ 500 x 10^6/L	12 days (11-13)
Platelet engraftment $\geq$ 20,000 x 10^6/L without transfusion in 7 days	20.5 days (17-24)
Platelet engraftment $\geq$ 50,000 x 10^6/L	22 days (17-30)
RBC transfusions needed during transplant	75% (n=3)

All 4 patients received melphalan 200 mg/m2
Median HSCs infused: 3.5 million (3.2 – 4.2)
All 4 patients engrafted, with durable engraftment at day 100

Control cohort: 15 patients were identified and underwent first day of apheresis from 2/8/2021 to 7/19/2021. Baseline characteristics of these 15 patients are shown in **Table S7** and stem cell mobilization and transplant outcomes are shown in **Table S8**

Table S8: Baseline characteristics of 15 patients in prospective contemporaneous control cohort who were mobilized with standard of care mobilization with G-CSF and as needed plerixafor.

Variable	N (%) or median (range) N=15
Age	62 years (52-70)
Sex, female	8 (53%)
Race	
White	7 (47%)
Black or African American	4 (27%)
Asian	3 (20%)
Other or not known	1 (7%)
ISS stage	
1	5 (33%)
2	5 (33%)
3	4 (27%)
Not known	1 (7%)
High-risk cytogenetics*	11 (73%)
Induction chemotherapy before ASCT	
Induction chemotherapy: **	
Bortezomib, lenalidomide, dexamethasone (VRD) or carfilzomib, lenalidomide, dexamethasone	9 (60%)
AntiCD38 antibody*** + VRD or KRD	3 (20%)
Cyclophosphamide, bortezomib, dexamethasone (CyBorD)	2 (13%)
AntiCD38 antibody***, lenalidomide, dexamethasone	1 (7%)
Duration of induction chemotherapy	6 months (4-10)
Lenalidomide exposure	
N	13
Cycles	6 (2-8)
AntiCD38 antibody exposure	4 (27%)
Cyclophosphamide exposure	
N	5 (33%)
More than 2 months of cyclophosphamide exposure	4 (27%)
Lines of therapy before mobilization	
1	10 (67%)
2	4(27%)
3	1 (7%)

Radiation for multiple myeloma N Dose (median, range)	 5 (33%) 2000 cGy (800-3000)
Best response prior to mobilization, VGPR or better	11 (79%)

*4 patients with high-risk FISH based on deletion 17p, t(4;14), t(14;16). Remaining 7 patients with gain1q alone as the high-risk feature.
**Overall, 5 patients received more than one induction regimen. Two patients started on CyBorD and switched to VRD (1) and antiCD38 antibody+KRD and subsequently multi-agent chemotherapy (1). One patient started on VRD and switched to CyBorD. Two patients started on VRD and switched to antiCD38 antibody + VRD.
*** Anti-CD38 antibody includes isatuximab or daratumumab

Table S9: Outcomes with hematopoietic stem cell mobilization and autologous stem cell transplant amongst 15 patients with multiple myeloma in prospective contemporaneous control cohort mobilized with standard of care mobilization (G-CSF and as needed plerixafor).

Variable	N (%) or median (range)
Mobilization	
Patients undergoing HSC mobilization	**N=15**
Mobilization regimen (based on risk-adapted protocol)*	
G-CSF alone	3 (20%)
G-CSF and plerixafor	12 (80%)
Plerixafor dose	
0.24 mg/kg	10
0.16 mg/kg	2
Day 4 peripheral blood CD34 count	
Median (range)	12 (5-62)
Day 4 CD34 count < 20/uL	10 (67%)
Stem cell collection	
Total days of apheresis needed	
1	10 (67%)
2	3 (20%)
3 or more	2 (13%)
Total stem cell collection, CD34+ cells x 10^6/ kg	5.2 (3-13.8)
Stem cell collection per day, CD34+ cells x 10^6/ kg	
Day 1, N=15	4.3 (1.3-13.8)
Day 2, N=5	1.6 (0.5-3.5)
Stem cell collection targets	
$\geq$ 2 x 10^6 CD34+ cells/kg	15 (100%)
$\geq$ 2 x 10^6 CD34+ cells/kg on day 1	12 (80%)
$\geq$ 4 x 10^6 CD34+ cells/kg	14 (93%)
Stem cell transplant	
Patients in this cohort undergoing transplant with GCSF+/- plerixafor mobilized HSCs	**N=14**
Conditioning for ASCT	
Melphalan 200 mg/m2	11 (79%)
Melphalan 140 mg/m2	3 (21%)
CD34+ cells (x 10^6 /kg) infused, median (range):	2.7(2-6.9)
Engraftment	
Successful primary engraftment	14 (100%)
Durable engraftment at day 100	14 (100%)
Neutrophil engraftment, ANC $\geq$ 500 x 10^6/L	12 days (11-14)

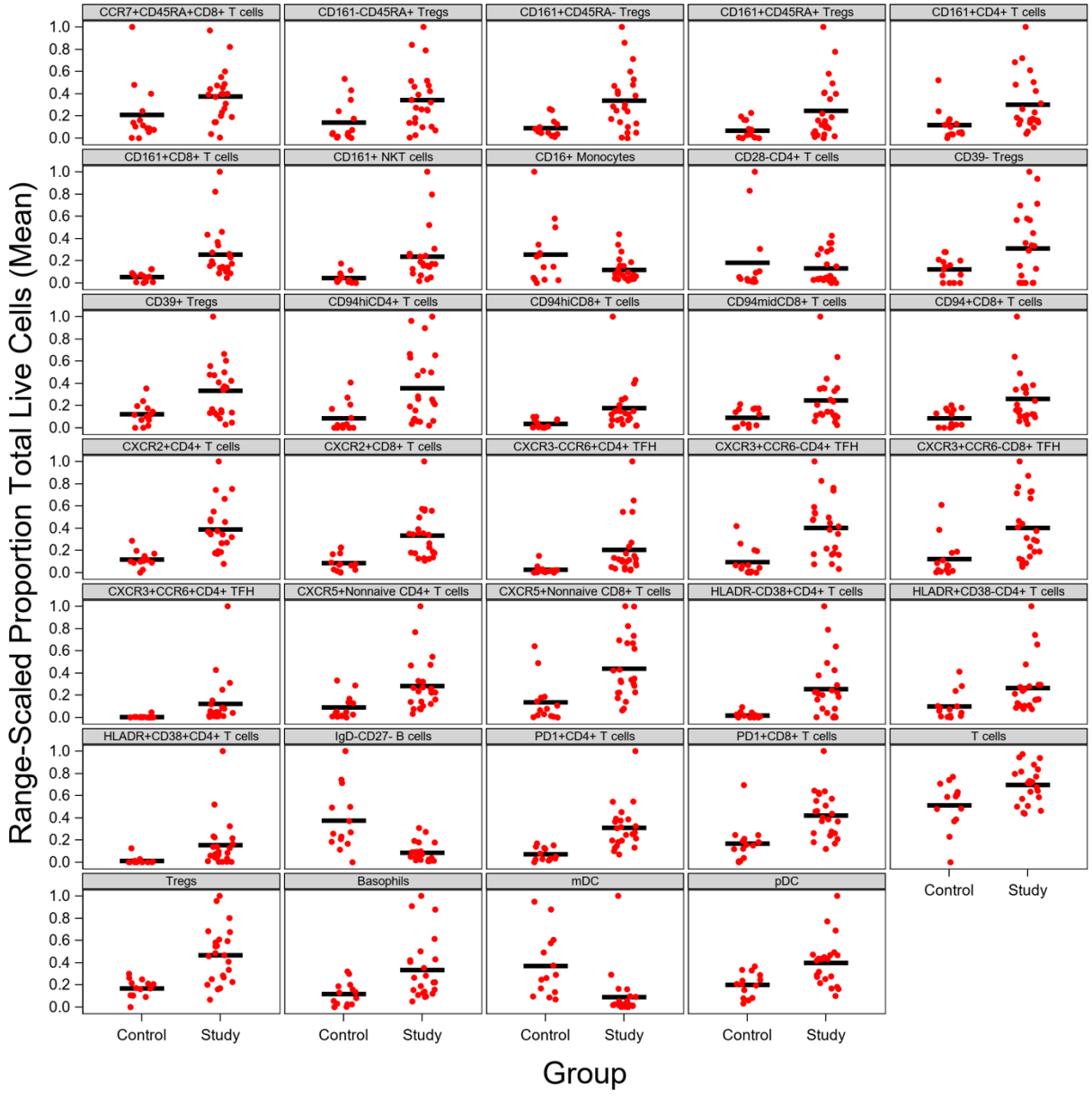
Platelet engraftment $\geq$ 20,000 x 10^6/L without transfusion in 7 days	17 days (13-21)
Platelet engraftment $\geq$ 50,000 x 10^6/L	17.5 days (12-27)
RBC transfusions needed during ASCT	4 (29%)

*Standard of care stem cell mobilization protocol was with G-CSF and risk-adapted plerixafor.

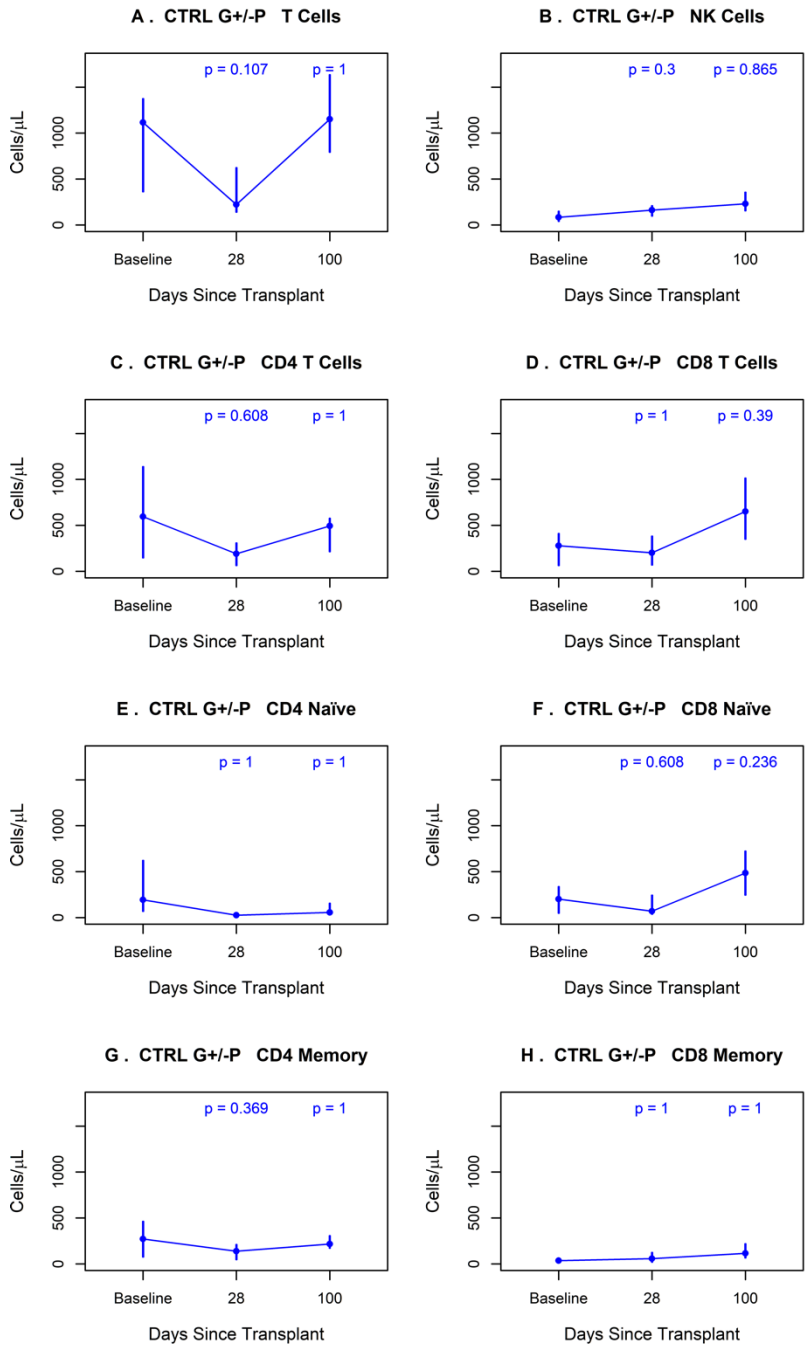
Patients received G-CSF 10 mcg/kg daily for four consecutive days. On day 4, if $CD34^+$ counts were $\geq$ 20 cells/uL, apheresis was started on day 5. If day 4 CD34+ cell count was $\leq$20 cells/uL, plerixafor was administered in the evening on day 4 and started on day 5. Plerixafor could also be administered at physician discretion to patients with day 1 yield <1.5 x 10^6 CD34+ cells/kg or subsequent days with a yield <0.5 x 10^6 CD34+ cells/kg. The primary collection goal per our institutional protocol was $\geq$ 2 x 10^6 $CD34^+$ cells/kg with an additional 2 x 10^6 $CD34^+$ cells/kg preferred for a backup. In all of the 15 patients, the goal was a total count of $\geq$ 4 x 10^6 $CD34^+$ cells/kg

Supplementary Figure 1: Apheresis graft composition by CyTOF: Detailed analysis of immunophenotypic populations in MGTA-145+plerixafor mobilized grafts vs standard of care mobilized grafts with G-CSF and as needed plerixafor with CyTOF.

Shown are immunophenotypic populations that were statistically different amongst patients in the study (MGTA-145+plerixafor mobilization) vs control cohort (G-CSF+/-plerixafor mobilization) after correction for multiple comparisons as described under supplemental methods.

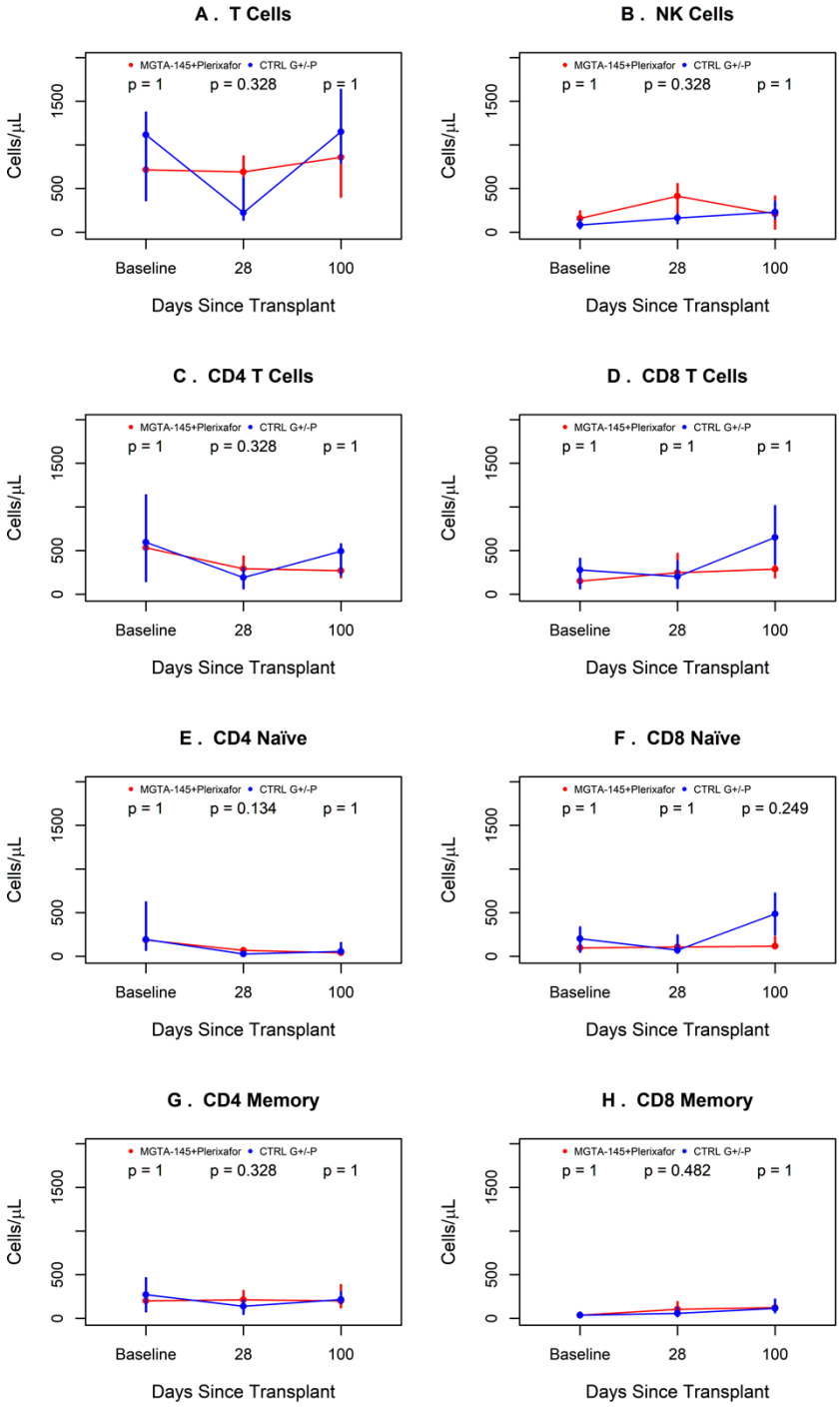


Supplementary Figure 2: Peripheral blood immune reconstitution by flow cytometry in cohort undergoing ASCT with G-CSF and as needed plerixafor mobilized cells



The graph represents absolute cell counts/µl shown as median and interquartile range of A. T cells (CD3+), B. NK cells (CD3-CD56+), C. CD4 T cells (CD3+CD4+), D. CD8T cells (CD3+CD8+), E. CD4 naïve T cells (CD45RA+), F. CD8 naïve T cells (CD45RA+), G. CD4 memory T cells (CD45RO+), and H. CD8 memory T cells (CD45RO+) as assessed by flow cytometry at baseline and at day 28 and 100 after autologous stem cell transplantation with GCSF+/- plerixafor (CTRL G+/-P) mobilized HSCs P values at each timepoint represent comparison vs. baseline. Each panel shows median and interquartile range.

Supplementary Figure 3: Peripheral blood immune reconstitution by flow cytometry in cohort undergoing ASCT with G-CSF and as needed plerixafor mobilized cells



The graph represents absolute cell counts/µl shown as median and interquartile range of A. T cells (CD3+), B. NK cells (CD3-CD56+), C. CD4 T cells (CD3+CD4+), D. CD8T cells (CD3+CD8+), E. CD4 naïve T cells (CD45RA+), F. CD8 naïve T cells (CD45RA+), G. CD4 memory T cells (CD45RO+), and H. CD8 memory T cells (CD45RO+) as assessed by flow cytometry at baseline and at day 28 and 100 after autologous stem cell transplantation with MGTA-145 and

plerixafor mobilized HSCs vs. G-CSF +/- plerixafor (CTRL G+/-P) mobilized HSCs. P values at each timepoint represent comparison between the two groups at that timepoint. Each panel shows median and interquartile range.