demonstrated a partial response at the time of transplant. The conditioning was tolerated well with no treatment related mortality (TRM) within 100 days and no grade 4 toxicities. All pts developed grade 1-3 mucositis, while 13 reported diarrhea (7 pts grade 3) and 21 developed liver toxicity (transaminitis and/or bilirubin elevation); 2 pts with grade 3. Four pts had grade 3 lung toxicities and 1 pt grade 3 colitis. All pts engrafted: ANC >500 achieved on day 8-17 (median 10); platelets >25,000 on day 11-58 (median 18); platelets >50,000 on day 14-119 (median 23). Overall 1-yr survival is 95% (1 pt died 306 days post transplant); 3 year survival is 72%. All deaths were related to a disease recurrence: two pts with Ewing sarcoma, 2 with rhabdomyosarcoma, and one each with neuroblastoma, Wilms and medullodblastoma.

These data suggest that the B-M-T preparative regimen followed by an ASCT was tolerated well without unexpected or severe toxicities; pts had prompt engraftment and 0% TRM. The survival data are encouraging compared to historical data. This novel conditioning regimen with a favorable toxicity profile can be used in the future as a platform for gene therapy, immunebased cellular therapies or to intensify local control with prompt administration of intensity modulated radiation therapy (IMRT) such as helical-tomotherapy.

I24
RISK FACTORS AND CLINICAL FEATURES OF AUTOLOGOUS GRAFT-VERSUS-HOST DISEASE/ENGRAFTMENT SYNDROME AFTER AUTOLOGOUS HEMATOPOIETIC CELL (HCT) TRANSPLANTATION

Cornell, R.F.[1], Thompson, J.[2], Drobyski, W.R.[1], Fenske, T.S.[1], Horowitz, M.M.[3], Palmer, J.M.[1], Pasquini, M.C.[3], Saad, A.A.[1], Rizzo, J.D.[3], Saber, W.[3], Zhang, M.-J.[2], Zhong, X.[3], Hari, P.[1] [1] Medical College of Wisconsin, Milwaukee, WI; [2] Medical College of Wisconsin, Milwaukee, WI; [3] Medical College of Wisconsin, Milwaukee, WI

Engraftment syndrome (ES) is a complication after HCT. Autologous graft-versus-host disease (AGVHD) a more severe and potentially life-threatening problem that sometimes follows ES. The etiology for these complications remains elusive. We analyzed 315 HCT recipients for multiple myeloma (MM, n = 210), non Hodgkin lymphoma (NHL, n = 53), Hodgkin lymphoma (HL, n = 24) and other diseases (n = 28) to evaluate the clinical features, frequency, risk factors and outcomes of ES/AGVHD. ES was defined by the Spitzer and Maiolino criteria. AGVHD was diagnosed by clinical criteria and all cases confirmed by biopsy. ES occurred in 75 (24%) patients and 24 (7.6%) had AGVHD (site: GI n = 22; skin n = 4; liver n = 1). Diarrhea was the most common manifestation (86%) followed by fever (59%), skin rash (56%) and LFT abnormalities (30%). Median time to onset of ES/AGVHD symptoms was 12 days after HCT. To determine factors which predisposed patients to ES/AGVHD we examined age, sex, ISS stage, conditioning regimen, disease type, prior chemotherapy exposure, growth factor exposure and CD34+ cell count in a multivariate model. Patients with ES/AGVHD had prolonged hospital stays (p<0.0001). Most AGVHD patients required higher dose and exposure to corticosteroids (96%) compared with those with ES (61%) p<0.0001.

By univariate analysis, older age, MM and exposure to bortezomib or lenalidomide were more likely to develop ES or AGVHD (p = 0.0006). See Table 1.

In multivariate models, MM was most strongly associated with development of ES/AGVHD (p<0.0001) compared to lymphoma or other diseases. Higher stage MM (ISS III; p = 0.0177) and the use of thalidomide, lenalidomide or bortezomib prior to HCT (p = 0.0009) were associated with development of ES/AGVHD. At median follow-up of 28 months, there was no difference in overall survival.

In conclusion, these data demonstrate that ES and AGVHD are relatively common complications after HCT, occurring in about one-third of patients. Affected patients had diarrhea, non-infectious fevers, longer hospitalization and increased morbidity. Early recognition of these conditions is important to initiate appropriate treatment and avoid unnecessary complications. The vast majority were successfully treated with a short course of corticosteroids. In the era of immunomodulatory drugs and bortezomib for MM, these data suggest that the underlying biology of MM and modern treatments may predispose patients to development of these conditions in the early engraftment period.

Table 1. Characteristics of patients without ES/AGVHD vs. patients with ES/AGVHD

Patient Characteristics	No ES/ AGVHD	ES/ AGVHD	P-value (Univariate)	P-value (Multivariate)
Number of patients	216	99		
Age at transplant, median (range), years	58 (18-79)	61 (26-77)	0.0006	
Gender				
Male	138 (64)	56 (57)	0.2148	
Disease				
Multiple Myeloma	123 (57)	87 (88)	<0.0001	<0.0001
Lymphoma	66 (31)	11 (11)		0.0002
Others	27 (12)	2 (2)		0.0026
International Stage				
Stage III	12 (6)	21 (21)	<0.0001	<0.0047
Chemotherapy				<0.0009
Prior Lenalidomide	36 (17)	30 (30)	0.0058	
Prior Bortezomib	84 (39)	64 (65)	<0.0001	
Prior Thalidomide	19 (9)	15 (15)	0.0915	
Other prior chemotherapy	115 (72)	64 (65)	0.0230	
Conditioning				
Mel	125 (56)	82 (83)	<0.0001	
BEAM	72 (33)	9 (9)	<0.0001	
CyTBI	3 (1)	2 (2)	0.6512	
Growth Factor				
Pegfilgrastim	22 (10)	9 (9)	0.7921	
Filgrastim	192 (89)	88 (89)	0.9999	
Cellularity				
CD34+ cell/kg, median X10^6	5	5	0.4149	
Median days from transplant to discharge (range)	15 (7-94)	17 (6-164)	<0.0001	
Outcomes				
Overall survival (prob 95% CI)				
At 12 months	86 (80-90)	89 (79-94)	0.839	
At 36 months	74 (67-80)	82 (70-90)	0.182	
Death rate (point estimate)				
At 100 days	4 (2-7)	3 (2-7)		

I25
OUTCOMES OF AUTOLOGOUS STEM CELL TRANSPLANTATION IN PHILADELPHIA POSITIVE ACUTE LYMPHOBLASTIC LEUKEMIA

Keyzner, A., Donahue, L.L., Bayer, R.L. Hofstra University School of Medicine - North Shore LIJ Health System, Lake Success, NY

Purpose: Patients with Ph+ALL have very poor outcomes in the absence of allogeneic stem cell transplant. Allogeneic stem cell transplantation, even with reduced intensity preparative regimens, is associated with higher rates of mortality and morbidity as compared to conventional chemotherapy or autologous stem cell transplantation. HLA matched donors are not always available and certain patients may not be good candidates for this procedure. The best treatment alternatives to allogeneic stem cell transplant are not known in the current era of tyrosine kinase inhibitor (TKI) use. Autologous stem cell transplantation has been attempted in the pre-TKI era with very limited success. We report outcomes of eight patients with Ph+ALL treated with autologous stem cell transplantation in combination with TKI use pre and post transplant.

Method/Results: We treated 8 patients with Ph+ ALL, between the years of 2004 to 2010, who did not have an available HLA-compatible donor with autologous stem cell transplantation. All patients underwent standard induction chemotherapy for ALL in combination with Imatinib. One patient who did not achieve complete molecular remission following induction chemotherapy with Imatinib received Dasatinib. Complete molecular remission was documented in all patients prior to peripheral blood stem cell (PBSC) mobilization with VP-16/Ara-C. Seven patients received TBI/Cytoxan/Etoposide as their preparative regimen and one patient received Busulfan/Cytoxan. All but one patient engrafted neutrophils at median 10 days (range 9-56) and platelets at median 21 days (range 9->365). One patient died prior to engraftment. Following recovery of counts

patients were re-started on a tyrosine kinase inhibitor (Imatinib -5, Dasatinib -1). One patient had delayed recovery of blood counts and was not restarted on a TKI. One patient relapsed 4 months post PBSCT and died due to refractory disease. Remaining patients remain alive at median 26 months (range 12-86) in complete molecular remission. Of note the patient that never received post-transplant TKI remains in complete molecular remission 86 months following PBSCT.

Conclusion: Autologous stem cell transplantation in combination with tyrosine kinase inhibition can provide long term durable remissions in patients with Ph+ ALL who are unable to undergo allogeneic stem cell transplantation.

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COMPARISON OF AUTOLOGOUS HEMATOPOIETIC STEM CELL TRANSPLANTATION WITH AND WITHOUT METAIODOBENZYLGUANIDINE (MIBG) IN PATIENTS WITH HIGH RISK NEUROBLASTOMA

Hamidieh, A.A.[1], Beigi, D.[2], Fallahi, B.[2], Behfar, M.[1], Jalili, M.[1], Hamdi, A.[1], Hosseini, A.[1], Ghavamzadeh, A.[1] [1] Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran; [2] Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran

Background: Autologous Hematopoietic Stem Cell transplantation (auto-HSCT) has been considered for treatment of patients with high risk neuroblastoma. In this study we compared two main strategies of auto-HSCT for patients with high risk neuroblastoma: auto-HSCT alone in patient with negative diagnostic MIBG and auto-HSCT with therapeutic MIBG before HSCT in patient with positive diagnostic MIBG.

Methods: The results of 14 patients with high risk neuroblastoma who underwent auto-HSCT at our center from 2008 to 2011, were analyzed. Median age at transplantation was 4.5 years (range = 2-7, 50% male). N-Myc amplification was positive in 9 patients (64.3%). Diagnostic MIBG was asked at first visit from all patients who were referred to our center for HSCT. Patients were divided into two groups according to the result of diagnostic MIBG: MIBG-avid (n = 6) and non MIBG-avid (n = 8). MIBG-avid patients received ^{131}I-MIBG (12 mci/kg) on day 21 before transplantation. The conditioning regimen used in all patients consisted of etoposide (1200mg/m^2 total dose divided for 5 days), carboplatin (1500mg/m^2 total dose divided for 5 days), and melphalan (210mg/m^2 total dose divided for 3 days). The source of stem cells was peripheral blood in patients. The median numbers of MNC and CD34 injected were 10.71x10^8/kg /kg, 1.7x10^6/kg, respectively. All patients received 13-cis-retinoic acid (120-160 mg/m^2 2 weeks per month) from day +60 to one year after transplantation.

Results: Engraftment occurred in all patients. The median time to neutrophil and platelet engraftment were 13 (10-18 days) and 17 days (13-21 days), respectively that was not significantly different between two groups. No severe side effects (like neutropenia, thrombocytopenia and mucusitis) were observed in any patients in MIBG-avid group. With a median follow-up time of 13 months (2-35 months), 2 patients (33.3%) relapsed in MIBG-avid group (both died) and 5 patients (62.5%) relapsed in non MIBG-avid group (4 of them died).

Conclusion: Despite nonsignificant difference between two groups, MIBG-avid patients seem to have better survival and lower relapse rate. Therefore, much greater number of cases is needed to clarify the role of MIBG therapy in pre-transplant conditioning regimen for autologous hematopoietic stem cell transplantation in high risk neuroblastoma patients.

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COMPARISON OF BUSULFAN + MELPHALAN TO MELPHALAN 200 MG/M2 AS PREPARATIVE REGIMEN FOR AUTOLOGOUS TRANSPLANTATION IN MULTIPLE MYELOMA

Ahmed, S., Dinh, Y., Rondon, G., Andersson, B., Jones, R., Bashir, Q., Shah, N., Popat, U., Champlin, R.E., Qazilbash, M.H., Kebriaei, P. The University of Texas, M.D. Anderson Cancer Center, Houston, TX

Background: High-dose chemotherapy with melphalan 200 mg/m2 (Mel 200) followed by autologous hematopoietic stem cell transplan-

tation (auto-HCT) is the standard treatment for transplant-eligible patients (pts) with multiple myeloma (MM). Most patients eventually relapse after auto-HCT and in efforts to improve the efficacy of the preparative regimen, several groups have evaluated the combination of busulfan (Bu) and melphalan (Mel). We studied the safety and efficacy of a combination of Bu and Mel (Bu-Mel) in patients with advanced lymphoid malignancies, including MM. (Kebriaei P, et al., Biol Blood Marrow Transplant 2011; 17: 412-420). In this study we compared outcomes of patients with MM who received Bu-Mel with a control group of patients who received Mel 200 for auto-HCT for MM.

Methods: We identified 30 patients with MM in first remission who received Bu-Mel followed by auto-HCT between 1/2005 and 10/2010. They were compared to a control group (4:1) of 120 patients with MM who received Mel 200 as conditioning regimen for auto-HCT. The groups were matched for year of auto-HCT, age at auto-HCT (+/- 4 yrs), cytogenetic abnormalities, and disease status at auto-HCT. The primary objective was to study impact of conditioning regimens on complete (CR) and overall response rate (ORR), progression-free (PFS) and overall survival (OS).

Results: Patient characteristics and major outcomes are summarized in the attached Table. Bu-Mel and Mel 200 groups were similar in median age, renal function and chemosensitivity at auto-HCT, and time from diagnosis to auto-HCT (Table). Median time to neutrophil engraftment in both groups was 10 days (p = 0.8). There was no significant difference in 100-day transplant-related mortality (0% vs. 0.8%, p = 0.2) or grade 2-4 non-hematologic toxicity between Bu-Mel and Mel 200 (80% vs. 66%, p = 0.18) or veno-occlusive disease (none in either group). CR rates in Bu-Mel and Mel 200 were 30% vs. 34% (p = 0.82, Table). Median follow up was 27.3 months. Median PFS for Bu-Mel and Mel 200 were 24.1 and 26.2 months, respectively (p = 0.43, Figure 1). Median OS for Bu-Mel and Mel 200 has not yet been reached (p = 0.24, Figure 2).

Conclusions: In this large single center study with long follow up, we demonstrated that a preparative regimen of Bu-Mel is comparable to Mel 200 in safety and efficacy. The two regimens will be compared in a prospective, randomized trial.

Table. Patient Characteristics/Outcomes

	Bu-Mel (n = 30)	Mel200 (n = 120)	p
Males	17	68	1.00
Median Age	52.5	52	0.19
Abn Cytogenetics	12	48	1.00
High Risk CG	2	8	1.00
Serum Creat > 1.5 at TP	1	8	0.68
Median Interval Dx to TP	6.8 mo	6.7 mo	0.44
Median CD34	4.63	4.76	0.31
Chemosensitive (>/ = atTP)	13%	9%	0.50
Median days to engraftment ANC ./ = 500	10	10	0.81
CR	9, 30%	41, 34%	0.82
CR + VGPR	20, 66%	72, 60%	0.53
ORR	27, 90%	110, 83%	0.57
100-day TRM	0	1, 0.8%	0.20
Grade 2-4 AE	24, 80%	79, 66%	0.18
Median PFS	24.1 mo	26.2 mo	0.43
Median OS	not reached	not reached	0.24

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QUALIFICATION OF CORD BLOOD UNITS FOR AN AUTOLOGOUS INFUSION PROGRAM FOR PEDIATRIC PATIENTS WITH ACQUIRED BRAIN INJURIES

Allison-Thacker, J., Fitzgerald, A., Sun, J., McLaughlin, C., Waters-Pick, B., Vinesett, R., Kurtzberg, J. Duke University Medical Center, Durham, NC

Autologous umbilical cord blood (CB) infusion for the treatment of brain injuries in young children has been studied by the Pediatric Blood and Marrow Transplant (PBMT) Program at Duke University Medical Center since 2004. The majority of infusions have been used to treat children with Hypoxic Ischemic Encephalopathy