than 1000/microlitter following conditioning. Considering platelets, 157 and 12 of patients did not have platelet count less than 20,000 and 100,000/mcrolitter after transplantation respectively. There was no difference for engraftement days between ABO mismatched and matched group. The median RBC transfusion requirement was 7 units prior to 100 days post-HCT and 8 units through one year post-HCT and overall follow-up across all recipients.

Table 1. RBC transfusions in ABO major/bidirectional mismatched and matched donor-recipient pairs.

	All patients	Major/bidirectional missmatch	Match	P-Value
at 100 days	7.5	8	6	0.11
at 1 year	8	10	8	0.071
overall	8	11	8	0.043

A significantly higher total number of RBC transfusions occurred in major and bidirectional ABO mismatches compared to ABO matched transplants (11 units vs 8 units; p = 0.043); however, transfusional requirements were only modestly increased throughout the first year following transplantation in major/bidirectional mismatch group (10 units vs. 8 units; p = 0.061). The increase in overall RBC transfusion was not associated with differences in rates of GVHD, disease relapse, or overall survival.

Conclusion: ABO mismatch may be associated with an increased requirement for RBC transfusion after TLI/ATG conditioining. Management strategies for excessive RBC transfusion after ABO major mismatched HCT require further study but may target persistent recipient plasma cells secreting anti donor ABO antibodies.

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OUTCOME OF SECOND ALLOGENEIC STEM CELL TRANSPLANTATION (SCT) IN PEDIATRIC PATIENTS WITH GRAFT FAILURE OR RECURRENT LEUKEMIA

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Both graft failure or leukemia relapse after an allogeneic SCT are associated with high mortality rate and available treatment options are limited. We report 22 patients (age 3.9-19.7 years) with hematological malignancies who received second allogeneic SCT at COH from 4/2000 – 12/2009 for graft failure (8 patients: AML–3 patients, ALL-3 patients, CML-1 patient, Lymphoma-1 patient) or recurrent leukemia (ALL-5 patients, AML-9 patients). Reduced intensity regimen was used in 18 patients; only 4 received myeloablative conditioning. 9 (41%) patients received transplants from the same donor, and in13 (59%) a different donor was used. Half of the patients (11) received the second SCT within a year of the first SCT (median: 391 days, range: 44-1,715). Overall survival for the whole group at 100 days and 2 years were 77% (60-88%), 45% (35-55%), respectively. The median follow-up for the 8 (36%) surviving patients was 4.5 years (range: 0.5-10.6). Patients with graft failure had superior overall survival (75% at 2 years) compared with recurrent disease (28%, p = 0.04) Less advanced disease status (1CR/2CR vs 3CR/active disease) and diagnosis of non-ALL were associated with higher likelihood of survival (p = 0.02, p = 0.02, respectively). Survival for patients with less than one year between transplants (31% at 2 years) did not differ from those receiving the second SCT later than one year (60%, p = 0.81). Within 100 days post transplant 3 patients were diagnosed with CMV, 3 patients with other viral infection (adeno, VZV, HSV), 12 patients had 23 culture proven episodes of bacterial infections, 5 patients developed Clostridium difficile enterocolitis and 1 patient was diagnosed with Aspergillus fumigatus. In summary, second SCT used for graft failure or leukemia relapse in pediatric patients with hematological malignancies is associated with acceptable transplant related toxicity and infection rates. For patients with graft failure the long term outcome is excellent; for patients with relapsed leukemia second transplant should be offered as a treatment option as it can lead to long term disease free survival.

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ELEVATED PRE TRANSPLANT SERUM FERRITIN IS ASSOCIATED WITH INCREASED RISK OF INVASIVE MOLD INFECTION (IMI) AFTER ALLOGENEIC HEMATOPOIETIC STEM CELL TRANSPLANTATION (HSCT)

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Elevated pre transplant serum ferritin, a measure of iron overload is associated with various adverse outcomes after allogeneic HSCT including increased risk of fungal infections. Invasive mold infections (IMI) are life threatening complications after allogeneic HSCT and are mostly caused by *Aspergillus* species and Zygomycetes. Small case series have shown elevated iron stores in HSCT patients who developed IMI. We examined if elevated serum ferritin prior to HSCT was associated with increased risk of IMI after allogeneic HSCT. Patients who underwent allogeneic HSCT from March 2005 through December 2009, in whom a pretransplant ferritin level was available, are included in this analysis. Serum ferritin was measured upon admission for HSCT prior to initiation of conditioning regimen. Proven or probable IMI was diagnosed according to EORTC Mycosis Study Group criteria. Elevated serum ferritin was defined as values above 1000 ng/ml. Pretransplant ferritin levels were available in 478 patients. 9 patients (1.9%) had developed IMI at day 30 and 21 patients (4.4%) had IMI at day 100. Among the high ferritin group, 8 of 220 patients developed an IMI within 30 days after HSCT compared to 1 of 258 patients in the low ferritin group (P = 0.01). 14 of 220 and 7 of 258 patients in the high and low ferritin groups respectively had developed an IMI by day 100 after HSCT (P = 0.043). The median ferritin level in patents who had IMI at day 30 was 1810 ng/ml compared to 940 ng/ml in those who did not develop IMI (P = 0.006). For patients who developed IMI within 100 days after HSCT, the median ferritin level was 1420 compared to 940 ng/ml for those who were free of IMI. Iron overload as measured by pretransplant serum ferritin is associated with increased risk of IMI after allogeneic HSCT. Fungal prophylactic strategies that cover IMI are particularly important in iron overloaded recipients of allogeneic HSCT.

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IN VIVO T-CELL DEPLETION (TCD) DOES NOT IMPROVE RATES OF GRAFT-VERSUS-HOST DISEASE (GVHD) AND TRANSPLANTATION OUTCOMES IN PATIENTS UNDERGOING PERIPHERAL BLOOD ALLOGENEIC HEMATOPOIETIC CELL TRANSPLANT (AHCT)

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In vivo TCD is commonly employed to prevent graft rejection and GVHD in patients undergoing AHCT. Published (but controversial) data suggest possible benefit with TCD in the setting of unrelated donor (URD), and HLA-mismatched AHCT. We report here outcomes for patients who received TCD with transplant conditioning (TCD group) and compare them with patients who received T-cell replete allografts (non-TCD group).

The study cohort consists of 150 consecutive patients who underwent AHCT between 2003 and 2009. All patients received peripheral blood allografts. TCD consisted of alemtuzumab (20mg on days -4 and -1; n = 39) or thymoglobulin 6 mg/kg (total dose) for ablative and reduced intensity conditioning transplants and 7.5 mg/kg (total dose) for non myeloablative allografts (n = 51). 4 patients received Atgam at 30mg/kg on days -5 to -3.

Patient characteristics of TCD and non-TCD groups are shown in table 1. Significantly more patients in the TCD group had high risk disease (86.3% v 61.8%, p < 0.05) and received AHCT from URD (62.1% v 29.1%, p < 0.05). Median follow-up of surviving patients is 3yrs. There was no significant difference between engraftment kinetics of two groups. The rates of acute GVHD II-IV in the TCD and non-TCD groups were 42.1% (n = 40) and 50.9% (n = 28) respectively (p0.32).On subgroup analysis rates of acute GVHD II-IV in the TCD and non-TCD groups for matched sibling

Table 1. Baseline patient characterisitcs

Patient Characteristics	TCD group (n=95)	Non-TCD group (n=55)
Sex: n (%)		
Men	60 (63)	34 (62)
Women	35 (37)	21 (38)
Age: median (range)	50 (17-69)	48 (20-63)
Diagnosis: n (%)		
Acute Leukemia/MDS	53 (56)	35 (64)
Non-Hodgkin Lymphoma	23 (24)	4 (7)
Chronic Leukemia	9 (9)	14 (25)
Others	10(11)	2 (4)
Conditioning regimen: n (%)		
Myeloablative	69 (72.6)	45 (81.8)
Reduced intensity / non-myeloablative	26 (27.4)	10 (18.2)
Risk group: n (%)		
Standard risk	13 (14)	21 (38)
High risk	82 (86)	34 (62)
Donor type: n (%)		
Sibling	36 (37.9)	39 (70.9)
Unrelated	59 (62.1)	16 (29.1)
HLA mismatch: n (%)	13 (13.7%)	4 (7.3%)
CD 34+ dose: median (range) x 10*6/Kg body wt.	6.2 (1.9-16)	5.4 (1.2-12.9)

(28.9% v 50%; p = 0.06), URD (48.3% v 64.7%; p = 0.23) and HLA mismatched AHCT (p = 0.59), were not significantly different. The incidence of chronic GVHD in the TCD and non-TCD groups was 41.1% (n = 39) and 45.5% (n = 25) respectively (p0.86). On subgroup analysis of patients undergoing matched sibling, URD and HLA-mismatched AHCT, no significant difference in rates of cGVHD between the two groups was seen (p > 0.05). Relapse rates in the TCD and non-TCD groups were 32.6% and 40% (p = 0.22) respectively. The overall survival at 3years was 39.2% in the TCD group and 39.3% in the non-TCD group; p = 0.93. The 3year progression free survival in similar order were 34.8% and 27.2% respectively (p = 0.85). Non relapse mortality at day 100 respectively were 12.8% and 16% and at 3years were 40% and 41% (p > 0.05).

Our limited, single institution experience in a cohort of 150 consecutive patients suggest no significant benefit with routine use of *in vivo* TCD with AHCT. These results highlight the need to develop novel strategies for preventing GVHD and for improving transplantation outcomes.

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OUTCOMES FOLLOWING HEMATOPOIETIC CELL TRANSPLANTATION FOR WISKOTT ALDRICH SYNDROME

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Human leukocyte antigen (HLA) identical sibling donor transplantation remains the treatment of choice for Wiskott Aldrich Syndrome (WAS), however, utilization of alternative donor sources has significantly increased since 1990. We report the hematopoietic cell transplantation (HCT) outcomes of 47 patients with WAS treated at a single center since 1990 with significant improvement in outcomes after 2000 despite the increased use of alternative donors. 5 year overall survival (OS) improved from 62.5% (95% CI: 34.9% to 81.1%) to 90.8% (95% CI: 67.7% to 97.6%) for patients transplanted during 1990-2000 and 2001-2009, respectively. When adjusted for age at HCT, OS was significantly higher in the 2001-2009 era (p = 0.04, Cox proportional hazard analysis). No early transplant related mortality (within the first 100 days) occurred among patients transplanted during 2001-2009 compared to 3/16 during 1990-2000, (p = 0.03, Fisher's exact test). The extent of HLA mismatch did not significantly affect the incidence of acute GVHD, chronic GVHD, or survival. Post-HCT autoimmune cytopenias were frequently diagnosed after 2001: 17/31 (55%) patients. Their occurrence was not associated with transplant donor type (p = 0.53), or occurrence of acute GVHD (p = 0.74), chronic GVHD (p = 0.12), or mixed chimerism (p = 0.50).

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ALLOGENEIC STEM CELL TRANSPLANTATION FOR CHRONIC ACTIVE EBV INFECTION (CAEBV)

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Chronic active Epstein Barr virus infection (CAEBV) encompasses a variety of EBV-associated lymphoproliferative diseases (LPD) in the non-immunocompromised host. In CAEBV either B, T, and/or NK cells are primarily infected with EBV and patients present with a variety of clinical signs and symptoms including fever, hepatosplenomegaly, and lymphadenopathy. While rare in the Western hemisphere, T and NK cell CAEBV is most commonly seen in Japan. In Japan, current treatment protocols rely on chemotherapy and hematopoietic stem cell transplantation (HSCT).

To evaluate the clinical outcome of HSCT in CAEBV patients in the United States, we reviewed our experience with 6 CAEBV patients (4 T-cell, 1 NK-cell, 1 B-cell), who underwent allogeneic HSCT for their disease. Median age at transplant was 11 yrs (range 6 – 25 yrs) and the median time to transplant from diagnosis was 3.7 years (range 4.3 yrs – 8.5 yrs). Four of 6 patients had persistent or refractory disease at the time of HSCT. Four patients received myeloablative conditioning while 2 patients received reduced intensity conditioning (RIC). Median time to neutrophil engraftment was 16 days (range days 11 – 21 days) with no long-term engraftment failure. Five patients received infusions of donor derived EBV-specific cytotoxic T cells (CTLs) at a median of 6 months (range 2.5 months – 12 months) post HSCT. Five patients are alive and in complete remission with a median survival of 2.5 yrs (range 7 months – 10 yrs). One patient developed recurrent T-cell CAEBV immediately post transplant and died of an aggressive T-cell lymphoma 3.7 years post transplant.

Our results support published data from Japan showing good outcomes for CAEBV patients after allogeneic HSCT. Factors that may influence outcome and warrant further study include the timing of transplantation after diagnosis and the use of EBV-directed T-cell therapies.

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HAPLOIDENTICAL STEM CELL TRANSPLANTS IN CHILDREN WITH ACUTE LYMPHOBLASTIC LEUKEMIA IN FIRST OR SECOND REMISSION

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Allogeneic hematopoietic stem cell transplant (SCT) offers curative therapy to children with high-risk or relapsed acute lymphoblastic leukemia (ALL). Here, we report encouraging results using haploidentical related donor CD34+ selected (T-cell depleted) peripheral blood stem cell transplants in children with ALL in first or second remission (CR1 or CR2). From May 2002 to September 2009, we transplanted 17 children (13 male, 4 female) in CR1 (n = 6) and CR2 (n = 11) using primarily a fully myeloablative conditioning regimen consisting of cyclophosphamide 45mg/kg x 2 doses, cytarabine arabinoside 3gm/m^2 x 6 doses and total body irradiation (TBI) 1400cGy (n = 12). Five patients received either a reduced-intensity regimen or busulfan-based regimen for clinical purposes (such as to avoid TBI exposure). All patients received alemtuzumab (3, 5 or 10mg/dose depending on body weight) during conditioning for *in vivo* T-cell depletion to promote engraftment and provide additional GvHD protection. If the infused T-cell dose was less than