COMPARATIVE ANALYSIS OF T-CELL DEPLETION STRATEGIES IN PEDIATRIC HEMATOPOIETIC STEM CELL TRANSPLANTATION

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Introduction

Haploidentical HSCT is increasingly used in children. Two main GVHD prevention strategies — TCRαβ⁺/CD19⁺ depletion and post-transplant cyclophosphamide (PTCY) — show promising results, but comparative pediatric data on immune recovery and viral reactivation are scarce.

Aim

To evaluate and compare strategies of **GVHD prophylaxis** in pediatric HSCT

Objectives

To analyze **transplant outcomes, immune reconstitution, and viral reactivation** in children receiving HSCT with either TCRαβ⁺/CD19⁺ depletion or PTCY

Methods

Design: Single-center non-randomized, retrospective study

Patients: 118 pediatric HSCT (107 patients with AL)

Study groups:
1. Ex vivo depletion of TCRαβ+/CD19+ cells (TCR) using Clinimacs Plus (Miltenyi Biotec, Germany)
2. In vivo depletion using post-transplant cyclophosphamide (PTCY) 50 mg/kg

Parameter	PTCy group (n = 43)	TCRab+/CD19+ depletion group (n = 75)	p
Number of patients	33	74	
The median age (range), years	8 (1–17)	5 (1–17)	< 0,003
Gender (male/female), n (%)	1 (63,6)/12 (36,4)	43 (58,1)/31 (41,9)	< 0,003
Disease status			
First remission, n	22	24	< 0,005
Second remission, n	17	39	
Refractory disease, n	4	12	
Donor type			
Haploidentical donor, n	37	60	< 0,001
Fully matched unrelated donor, n	5	14	
Fully matched related donor, n	1	-	
Stem cell source			
Peripheral blood stem cells, n	24	74	< 0,03
Bone marrow, n	9	1	
Conditioning regimen			
Reduced-intensity regimen, n	2	7	< 0,007
Myeloablative regimen, n	41	68	

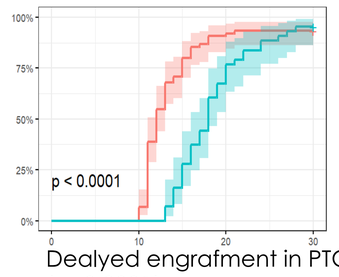
Endpoints:

- Engraftment (neutrophils)
- GVHD (acute, chronic)
- Viral reactivation (CMV, EBV, HHV6)
- Immune reconstitution (CD3, CD4, CD8, CD19, NK at D+100)
- Survival (EFS, OS)

Analysis: Non-parametric tests; Kaplan–Meier survival

Results

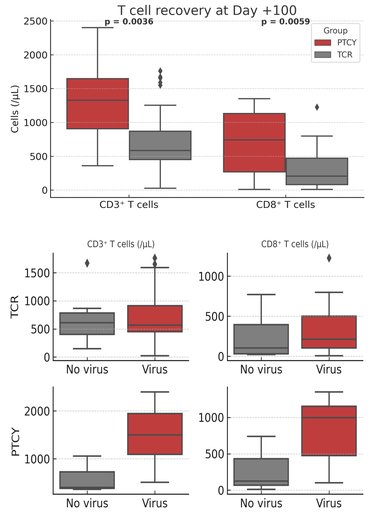
Engraftment Rates



Median time to engraftment:
+12 days in Group TCR
+18 days in Group PTCY

Dealyed engrafment in PTCY group was observed (p<0.0001)

Immune reconstitution (Day +100)



•TCR group — significantly higher CD3⁺ and CD8⁺ rec overy

•Better early B (CD19⁺) and NK recovery with TCR (trend, not all significant)

•In PTCY, lower CD3⁺ linked to viral reactivation

Cumulative incidence of acute GVHD

Cumulative incidence of aGVHD were almost equal in both groups (0,29 in TCR group vs 0,41 in PTCY group, p=0.23)

Probability of CMV reactivation

Lack of statistically significant differences in CMV reactiviation between two groups (p=0.89)

Event-free survival

We did not note statistically significant differences in EFS between observed group (0.53 in TCR group vs 0.45 in PTCY group p=0.30)

Overall survival

There were no differences in OS either (0.61 in TCR group vs 0.75 in PTCY group p=0.31)

Discussion

- Both depletion strategies for unwanted T-lymphocyte populations demonstrated comparable efficacy.
- The best engraftment rate was observed in the ex-vivo depletion (PTCY) group; however, no significant differences were found in relapse rates, graft rejection rates, or overall survival (OS).
- The choice of method should be guided by the biological characteristics of the disease and the clinical condition of the patient.

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