Role of Total Body Irradiation in Hematopoietic Stem Cell Transplantation for Philadelphia Chromosome-Positive Acute Lymphoblastic Leukemia: Implications for Clinical Practice

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Introduction

The Philadelphia chromosome (Ph+) occurs in ~25% of adult ALL cases. Before tyrosine kinase inhibitors (TKIs), long-term survival was <20% with chemotherapy alone and ~40% with allo-HCT. Imatinib integration has significantly improved outcomes.

Method

- Retrospective, observational study at Beneficência Portuguesa de São Paulo, Brazil. Eligible patients were ≥18 years with Ph+ ALL who underwent BMT between October 2017 and July 2025.
- Primary objective: evaluate the impact of conditioning regimen intensity on relapse incidence.
- Secondary objectives: overall survival (OS) and progression-free survival (PFS).

Conclusions

Prior to TKIs, Ph+ ALL carried very high relapse risk. The current combination of chemotherapy, TKIs, and HSCT enables PFS exceeding 80% with sustained molecular responses. Given these advances, investigating TBI dose modulation is clinically relevant. Reduced-intensity conditioning (RIC) with TBI 400 cGy may reduce acute and long-term toxicities without compromising disease control, particularly when transplantation is performed in remission with post-transplant TKI maintenance. Despite the limited sample size, our data show no significant increase in relapse rates across TBI intensity groups, supporting RIC as a viable alternative in this setting.

Results

Characteristic	Ph1 absent N = 50	Ph1 present N = 25
Age	28 (24, 36)	46 (33, 58)
Sex		
Female	24 / 50 (48%)	13 / 25 (52%)
Male	26 / 50 (52%)	12 / 25 (48%)
Performance Status		
100%	45 / 50 (90%)	21 / 25 (84%)
40%	1 / 50 (2.0%)	0 / 25 (0%)
70%	1 / 50 (2.0%)	0 / 25 (0%)
80%	0 / 50 (0%)	1 / 25 (4.0%)
90%	3 / 50 (6.0%)	3 / 25 (12%)
Disease Status at HCT		
CR1	32 / 50 (64%)	22 / 25 (88%)
CR2	15 / 50 (30%)	2 / 25 (8.0%)
CR3+	2 / 50 (4.0%)	1 / 25 (4.0%)
First Relapse	1 / 50 (2.0%)	0 / 25 (0%)
Maintenance TKI		
Dasatinib	0 / 0 (NA%)	11 / 21 (52%)
Imatinib	0 / 0 (NA%)	8 / 21 (38%)
Ponatinib	0 / 0 (NA%)	2 / 21 (9.5%)
Unknown	50	4

Characteristic	Ph1 absent N = 50	Ph1 present N = 25
Donor Type		
Haploidentical Donor	32 / 50 (64%)	15 / 25 (60%)
Matched Related Donor	9 / 50 (18%)	5 / 25 (20%)
Matched Unrelated Donor	9 / 50 (18%)	5 / 25 (20%)
Conditioning Regimen		
cytbi1200	8 / 50 (16%)	1 / 25 (4.0%)
flucytbi400	2 / 50 (4.0%)	12 / 25 (48%)
flutbi1200	15 / 50 (30%)	6 / 25 (24%)
flutbi400	2 / 50 (4.0%)	2 / 25 (8.0%)
flutbi600	1 / 50 (2.0%)	0 / 25 (0%)
flutbi800	22 / 50 (44%)	4 / 25 (16%)

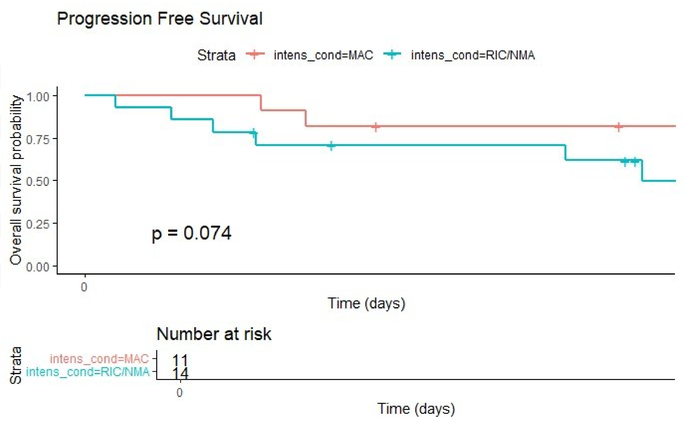

Table1 Progression Free Survival patients ALL ph+ , MAC vs RIC/MNA protocol

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