Ten years of CAR-T cell therapy: real-world experience from the Belgian cohort

Ruben Van Paemel[1,*], Liesbeth Steendam[1,*], Annelore Dehoorne[1], Sofie Moreels[1], Gabriel Levy[2], Anne Uyttebroeck[3], Laure Kornreich[4], Toon Van Genechten[5], Christophe Chantrain[6], Marie-Françoise Dresse[7], Bart Vandekerckhove[8], Victoria Bordon[1], Veerle Mondelaers[1], Barbara De Moerloose[1]

[1]Department of Pediatric Hematology-Oncology and Stem Cell Transplantation, Ghent University Hospital, Ghent, Belgium.[2]Department of Pediatric Hematology-Oncology, Cliniques Universitaires Saint-Luc, Brussels, Belgium. [3]Department of Pediatric Hematology and Oncology, University Hospitals Leuven, Leuven, Belgium. [4]Department of Hemato-Oncology, HUDERF-HUB (ULB), Brussels, Belgium. [5]Division of Pediatric Oncology and Hematology, Antwerp University Hospital (UZA), Edegem, Belgium. [6]Division of Pediatric Hematology-Oncology, Centre Hospitalier Chrétien (CHC), MontLégia, Liege, Belgium. [7]Division of Haematology-Oncology, Department of Paediatrics, University Hospital Liège and University of Liège, Liège, Belgium. [8]GMP Unit CellGenTherapies, Department of Human Body Material, Ghent University Hospital, Ghent, Belgium. *shared first author.

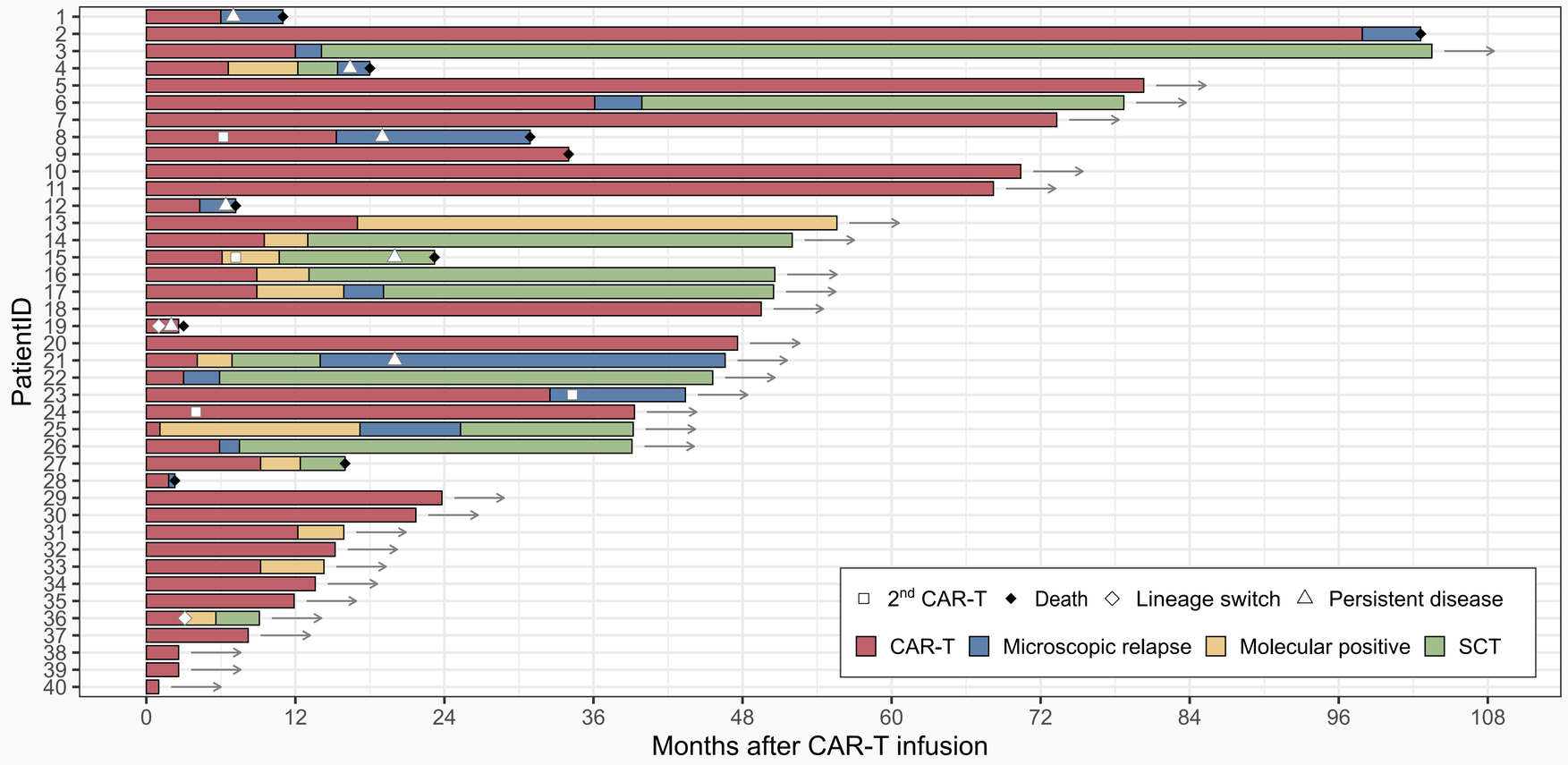
Introduction

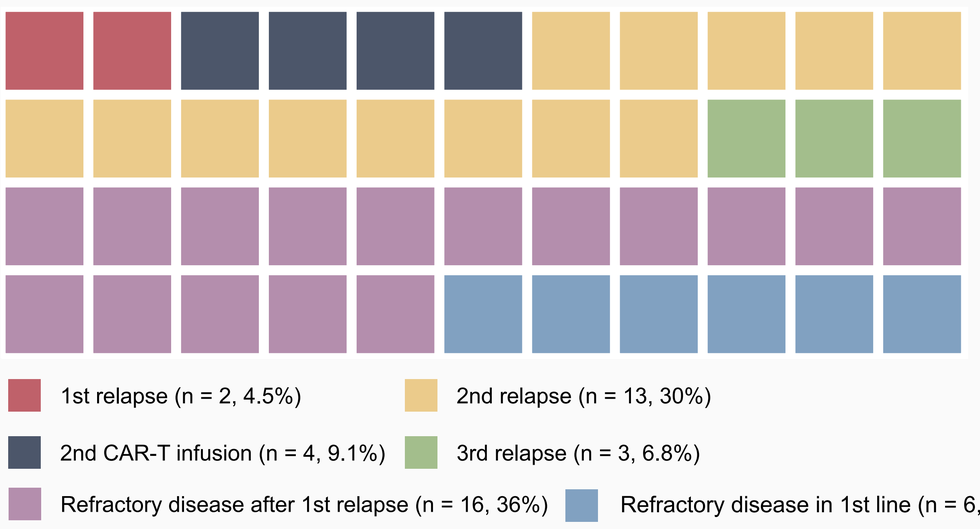
Chimeric antigen receptor (CAR) T-cell therapy has revolutionized the treatment landscape for pediatric relapsed/refractory B-cell acute lymphoblastic leukemia (BCP-ALL). We report the comprehensive 10-year experience with CAR-T cell therapy in pediatric BCP-ALL patients from Belgium, encompassing both clinical trials and commercial product use

Methods

We conducted a retrospective analysis of all pediatric BCP-ALL patients treated with CAR-T cell therapy in Belgium between 2015 and 2025 (n = 40). The cohort included patients treated in the ELIANA trial (n=3), CCTL019B2001X trial (n=6), Cassiopeia trial (n=1), and with commercial Kymriah (tisagenlecleucel) (n=30 patients). Overall survival (OS), event-free survival (EFS), and individual patient outcomes were analyzed using Kaplan-Meier methodology and swimmer plot visualization.

Results

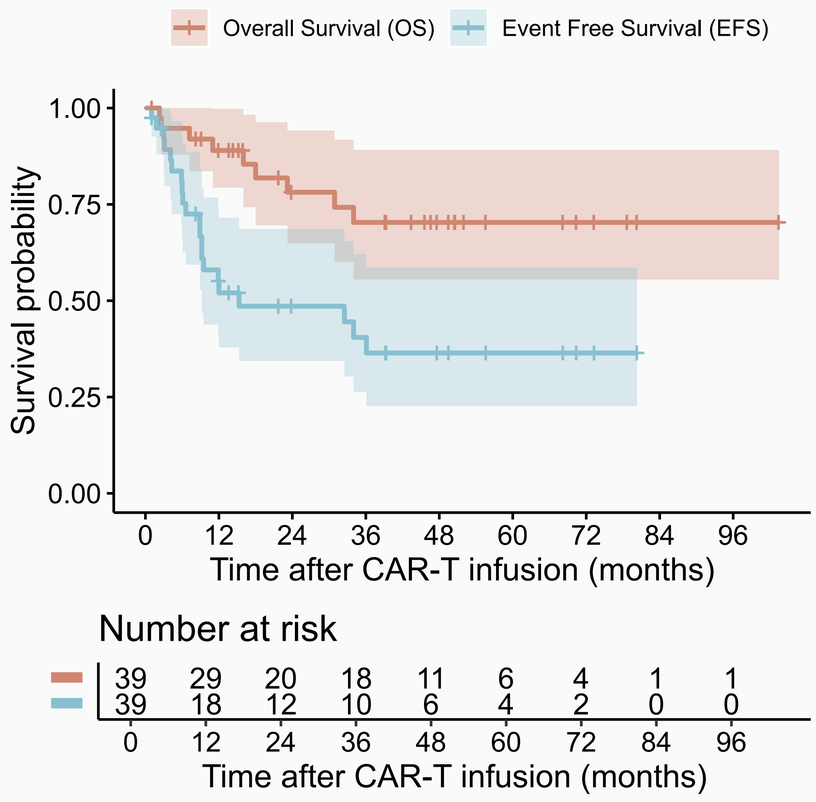


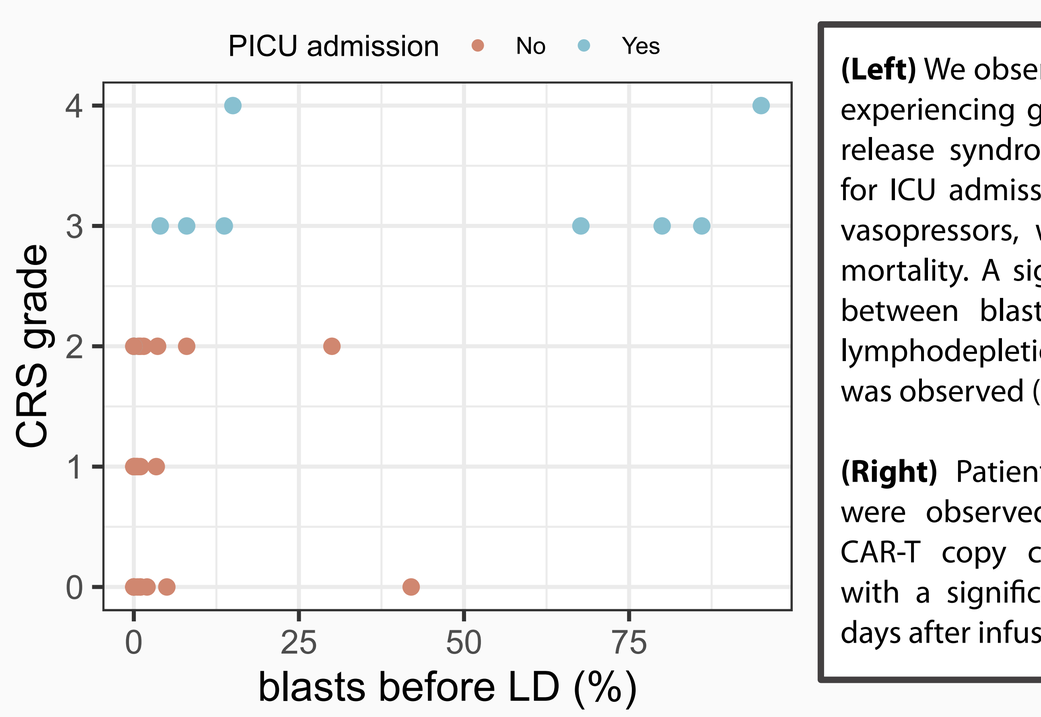


The majority received CAR-T therapy after one or more relapses (n = 34), or refractory disease at diagnosis (n = 6). Twelve patients received an allogenic SCT before CAR-T infusion. Four patients received a second dose of CAR-T for CD19 positive relapse (n = 2) or loss of B-cell aplasia (n = 2).

(Right) In our cohort, a 5 years EFS of 36.5% (25.45 - 48.82% 95% CI) and 5 years OS of 70.0% (63.89 - 92.22% 95% CI) was observed. Events were mainly relapse followed by SCT, in 11 patients (27%).

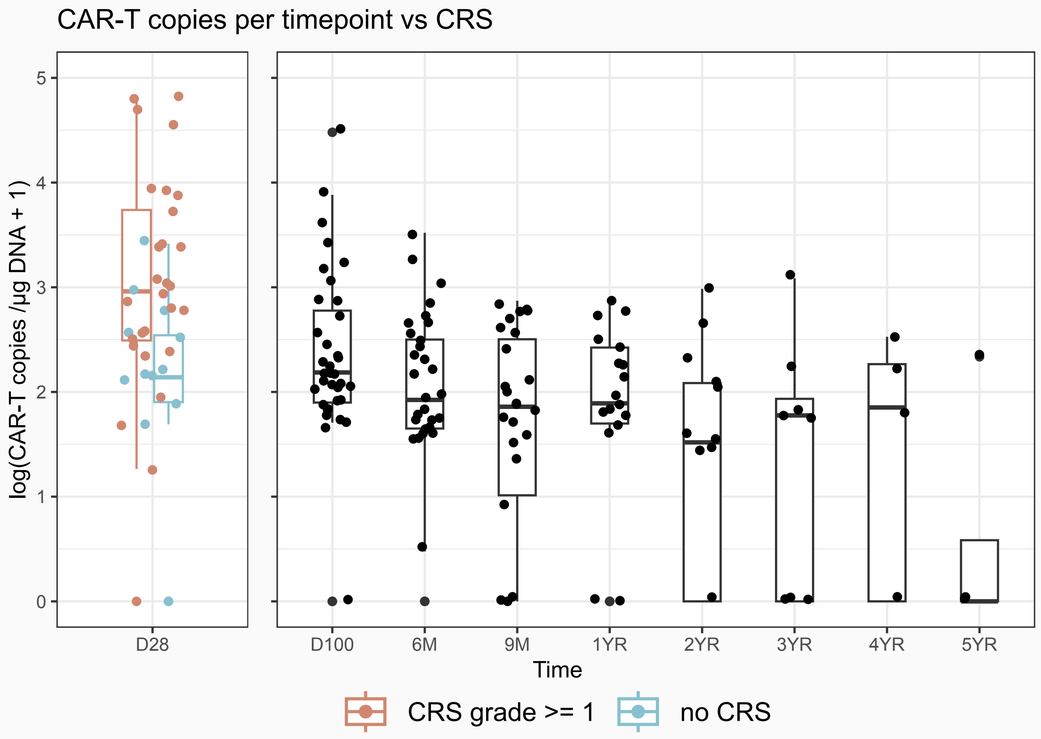
In a Cox proportional hazards model, patients with higher blast percentage in bone marrow before lymphodepletion had a significantly worse EFS (p = 0.021). However, this significant association was not observed for OS.





(Left) We observed 8 patients (16%) experiencing grade 3 or 4 cytokine release syndrome (CRS) with need for ICU admission, tocilizumab and vasopressors, with 0% CRS-related mortality. A significant association between blast percentage before lymphodepletion and CRS grade was observed (p = 0.013).

(Right) Patients experiencing CRS were observed to have a higher CAR-T copy count after infusion, with a significant difference at 28 days after infusion (p < 0.001).



Conclusions

This decade-long, nationwide experience demonstrates the successful implementation and integration of CAR-T cell therapy for pediatric BCP-ALL in Belgium, from initial trial participation to routine clinical practice. Our results support the efficacy and safety profile, while providing valuable insights into real-world outcomes. These findings contribute to the growing body of evidence supporting CAR-T cell therapy as a standard of care for pediatric BCP-ALL patients with refractory or relapsed disease.

Contact
Ruben Van Paemel
Pediatric Hematology and Oncology
+32 (0)9 332 12 77
Ruben.VanPaemel@uzgent.be
www.uzgent.be

Abbreviations
OS = overall survival
EFS = event free survival
CRS = cytokine release syndrome
BCP = B-cell precursor
SCT = stem cell transplantation
LD = lymphodepletion