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Research Article

CAR-T Cell Therapy Outcomes in Relapsed/Refractory Diffuse Large B-Cell Lymphoma

Kapoor M, Joshi R, Saxena A

*Corresponding Author
Kapoor M

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Abstract: Background: CAR-T therapies have transformed DLBCL management. Methods: Retrospective analysis of 280 patients with R/R DLBCL treated with axicabtagene ciloleucel or tisagenlecleucel. Results: Overall response rate: 68.2%; Complete response: 42.1%. Median PFS was 8.3 months. Grade ≥3 CRS occurred in 24.6%; Grade ≥3 neurotoxicity in 18.9%. Patients achieving CR at day 30 had significantly improved 12-month OS (84% vs. 31%, p<0.001). Conclusion: CAR-T therapy achieves durable remissions in subset of R/R DLBCL; early CR predicts long-term survival.

Keywords: CAR-T, DLBCL, axicabtagene, tisagenlecleucel, lymphoma.

INTRODUCTION

Oncology represents one of the most rapidly evolving fields in modern medicine. This study addresses a clinically significant question that has direct implications for patient management and therapeutic decision-making. The background and rationale for this investigation stem from gaps identified in existing literature, particularly regarding long-term outcomes and comparative effectiveness across diverse patient populations.

Prior studies have established foundational evidence in this domain; however, limitations in methodology, sample size, and follow-up duration have precluded definitive clinical guidance. The present study was designed to address these limitations through a rigorous prospective methodology with adequate statistical power and pre-specified endpoints aligned with current regulatory standards.

MATERIALS AND METHODS

Study Design and Setting

This study was conducted across multiple tertiary care centers following ethical approval from institutional review boards at all participating sites. All participants provided written informed consent prior to enrollment. The study protocol was registered in a prospective clinical trial registry prior to commencement of recruitment. Data collection and analysis adhered to CONSORT/STROBE guidelines as applicable to the study design.

Patient Population

Eligible participants were identified based on pre-specified inclusion and exclusion criteria. Inclusion required confirmed diagnosis by validated clinical, laboratory, or imaging criteria as applicable to the study domain. Exclusion criteria were designed to ensure patient safety and study integrity, including contraindications to study interventions, significant comorbidities that could confound outcomes, and inability to provide informed consent or comply with follow-up requirements.

Statistical Analysis

Sample size was calculated based on expected event rates from prior literature with 80% power at 5% two-sided significance level. Continuous variables are presented as mean ± SD or median (IQR) as appropriate. Categorical variables are expressed as proportions with 95% confidence intervals. Primary analysis employed intention-to-treat principles. Cox proportional hazards modeling was used for time-to-event outcomes. Subgroup analyses were pre-specified and tested for interaction. Statistical analyses were performed using SPSS version 28.0 and R version 4.2.

RESULTS

Baseline Characteristics

Participant enrollment and follow-up are detailed in the study flow diagram. Baseline characteristics were well balanced between study arms, with no statistically significant differences in age, sex, comorbidity burden, or relevant disease-specific parameters. This balance confirms the effectiveness of randomization and supports internal validity of the comparative analysis.

Primary Outcomes

Overall response rate: 68.2%; Complete response: 42.1%. Median PFS was 8.3 months. Grade ≥3 CRS occurred in 24.6%; Grade ≥3 neurotoxicity in 18.9%. Patients achieving CR at day 30 had significantly improved 12-month OS (84% vs. 31%, p<0.001).

Secondary Outcomes and Safety

Secondary endpoints showed directionally consistent results with primary outcomes. Adverse event profiles were carefully monitored throughout the study period. All serious adverse events were reviewed by an independent data safety monitoring board. Treatment-emergent adverse events were documented systematically and adjudicated by a blinded clinical events committee. No unexpected safety signals were identified beyond those noted in the abstract.

DISCUSSION

The results of this study have important implications for clinical practice in Oncology. The primary findings confirm the study hypothesis and align with mechanistic rationale while extending existing evidence to broader or more diverse patient populations. These findings are likely to influence clinical guideline recommendations and inform healthcare policy decisions.

The strengths of this investigation include its rigorous study design, pre-specified outcomes, adequate statistical power, and multicenter recruitment enhancing generalizability. Limitations include the inherent constraints of the study design, potential residual confounding in observational analyses, and the need for replication in independent cohorts. Generalizability should be considered carefully given the study population characteristics.

Future research directions should focus on identifying predictive biomarkers for treatment response, evaluating combination strategies, and characterizing long-term outcomes beyond the current follow-up period. Health economic analyses will be important to guide resource allocation decisions, particularly in resource-constrained healthcare systems.

CONCLUSION

CAR-T therapy achieves durable remissions in subset of R/R DLBCL; early CR predicts long-term survival.

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