EFFICACY AND SAFETY OF CAR-T CELL THERAPY IN PLASMA CELL LEUKEMIA: A SYSTEMATIC REVIEW

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Introduction

- Plasma cell leukemia (PCL) is a **rare and aggressive** variant of multiple myeloma with circulating plasma cells.
- Prognosis remains **poor despite modern therapies**.
- Standard treatment approaches are **not well defined**.
- Chimeric antigen receptor T-cell (CAR-T) therapy has shown activity in **relapsed/refractory multiple myeloma**and may offer benefit in PCL.

Aim

· To evaluate the **efficacy and safety** of CAR-T therapy in patients with PCL.

Objectives

- Conduct a systematic review of published studies reporting outcomes of CAR-T therapy in **primary (pPCL)** and **secondary (sPCL)**.

Methods

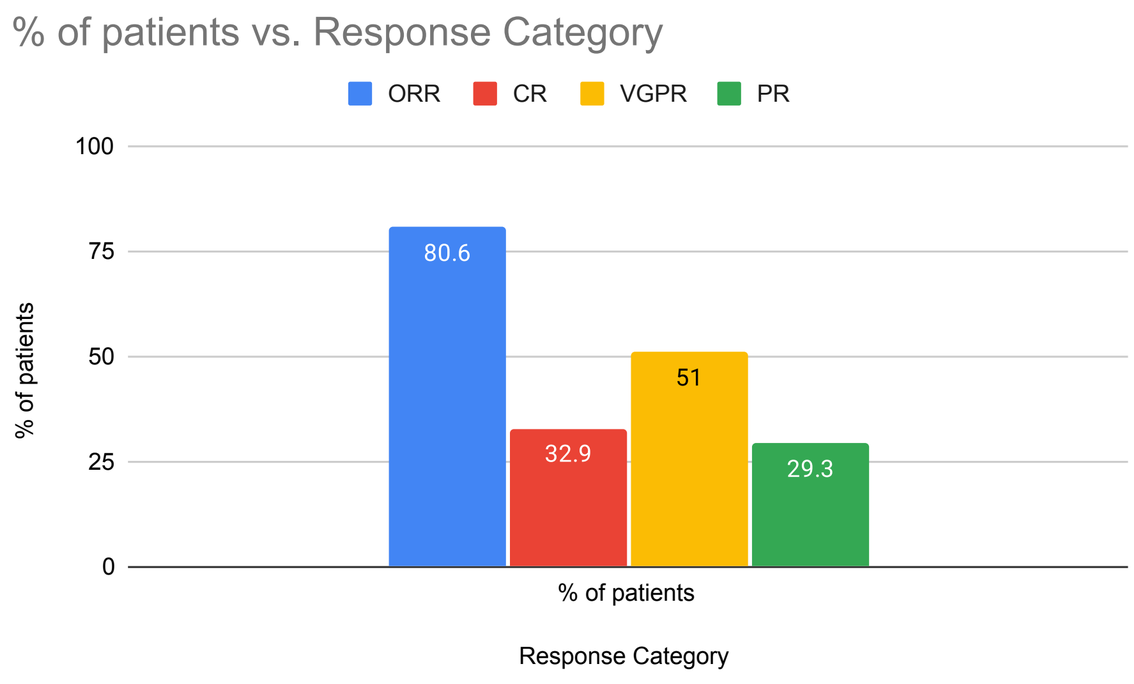
- Literature search: **PubMed, Embase, Cochrane** databases from inception till March 2025
- **64 studies identified → 5 met inclusion criteria.**
- Extracted patient-level and study-level data: demographics, cytogenetics, treatment, efficacy, toxicity.
- Outcomes analyzed: overall response rate (ORR), depth of response, progression-free survival (PFS), overall survival (OS), cytokine release syndrome (CRS), immune effector cell–associated neurotoxicity syndrome (ICANS).

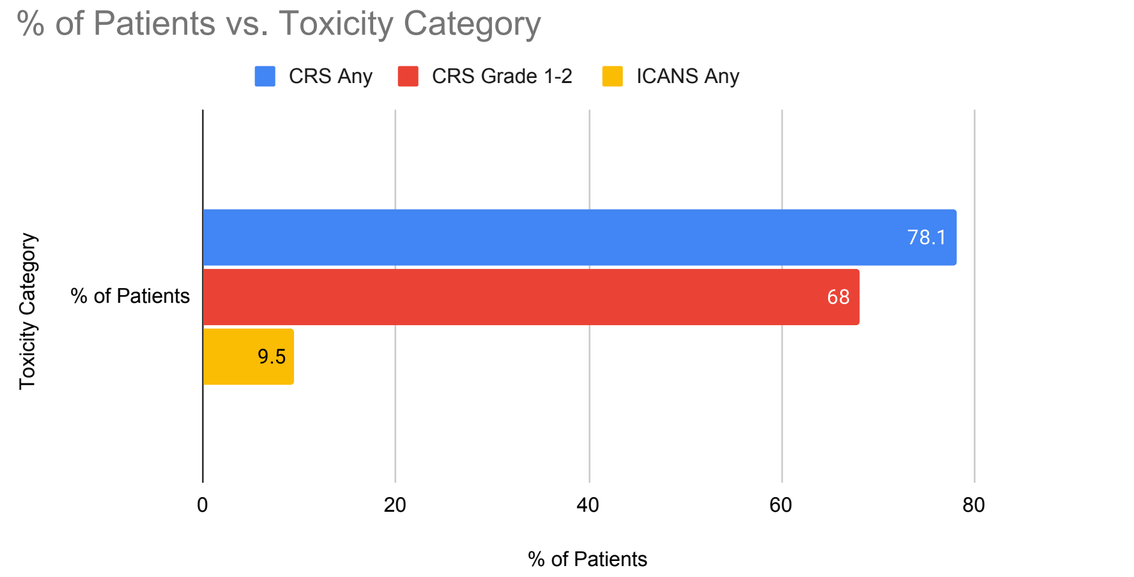
Results

·**Patients: 78 total; 73 evaluable.**

- Median age: 57 (range 28–76).
- Male: 56.5% (35/62).
- Subtypes: 59.3% pPCL, 40.7% sPCL.
- High-risk cytogenetics: 83.6%.
- Triple-class refractory: 62.2%; Penta-refractory: 24.3%.

- **Efficacy:**
  - ORR: 80.6%.
  - CR: 32.9%; sCR: 43.1%; VGPR: 51.0%; PR: 29.3%.
  - Median PFS: 5.2 months; Median OS: 14 months.
- **Safety:**
  - CRS: 78.1% (mostly grade 1–2).
  - Grade 3 CRS: 9.5%; no grade ≥4.
  - ICANS: 9.5% (all grade 1–2).





Summary

- CAR-T therapy in PCL results in **high response rates** despite **heavily pretreated and high-risk** patient population.
- Median survival outcomes remain **modest (PFS ~5 months, OS ~14 months)**.
- Toxicity is **manageable**, with most CRS/ICANS being low grade.

Discussion

- CAR-T therapy is **active** in PCL, but durability of responses is **limited**.
- May serve as a **bridge to transplant** or other consolidative strategies.
- **Future directions:**
  - Prospective clinical trials focused on PCL.
  - Combination strategies to **extend PFS/OS**.
  - Biomarker-driven **patient selection**.

References

1. Li C, Cao W, Que Y, Wang Q, Xiao Y, Gu C, Wang D, Wang J, Jiang L, Xu H, Xu J, Zhou X, Hong Z, Wang N, Huang L, Zhang S, Chen L, Mao X, Xiao M, Zhang W, Meng L, Cao Y, Zhang T, Li J, Zhou J. A phase I study of anti-BCMA CAR T cell therapy in relapsed/refractory multiple myeloma and plasma cell leukemia. Clin Transl Med. 2021 Mar;11(3):e346. doi: 10.1002/ctm2.346. PMID: 33784005; PMCID: PMC7943908.

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