TECLISTAMAB IN MULTIPLE MYELOMA: THE RISE OF BISPECIFIC ANTIBODIES AND THE RECONFIGURATION OF CANCER IMMUNOTHERAPY

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Abstract

Multiple myeloma is a hematologic malignancy characterized by the proliferation of malignant plasma cells, and its treatment remains challenging, particularly in patients with relapsed or refractory disease. In this context, teclistamab stands out as an innovative immunotherapeutic alternative based on a bispecific antibody targeting B-cell maturation antigen (BCMA) and the CD3 receptor on T lymphocytes. This study aimed to analyze the scientific evidence concerning the efficacy, safety, and therapeutic prospects of teclistamab in the treatment of multiple myeloma, considering its contribution to the advancement of cancer immunotherapy. This is an integrative literature review based on the analysis of scientific publications related to the topic. The results demonstrate relevant antitumor activity, with favorable clinical responses in patients who have undergone multiple lines of therapy. However, challenges associated with cytokine release syndrome, infections, impaired humoral immunity, and BCMA-related resistance mechanisms were identified. Furthermore, studies on therapeutic combinations and novel antigen targets indicate opportunities for improving treatment. It is concluded that teclistamab represents a significant advance in the management of relapsed or refractory multiple myeloma, although further studies are needed to clarify the durability of responses, optimize safety, and establish individualized therapeutic strategies.

Keywords: Bispecific antibodies, Immunotherapy, Multiple myeloma, Oncology, Teclistamab.

INTRODUCTION

Multiple myeloma is a hematologic malignancy characterized by the clonal proliferation of plasma cells in the bone marrow, whose progression may compromise bone integrity, renal function, blood cell production, and the immune response. Despite the therapeutic advances achieved in recent decades, relapse and the development of treatment resistance remain significant challenges, particularly in patients with relapsed or refractory disease (Holstein; Grant; Wildes, 2023).

In this context, cancer immunotherapy has broadened the possibilities for intervention through strategies targeting interactions between tumor cells and immune-system components. Among these approaches, bispecific antibodies stand out for their ability to recognize two distinct targets simultaneously, bringing T cells into proximity with malignant plasma cells and promoting the activation of cytotoxic mechanisms against the malignancy (Devasia; Chari; Lancman, 2024).

The introduction of teclistamab represents a significant advance in this field, as this bispecific antibody targets B-cell maturation antigen (BCMA) and the CD3 receptor present on T cells. This interaction enables T lymphocytes to be recruited to recognize and destroy myeloma cells, irrespective of the lymphocytes' original antigen specificity, thereby establishing an innovative therapeutic strategy for patients with limited treatment options (Kang, 2022).

The results of the MajesTEC-1 clinical trial established the therapeutic relevance of teclistamab in the treatment of relapsed or refractory multiple myeloma, particularly among individuals previously exposed to different drug classes. The evidence demonstrated clinically relevant antitumor activity in this population, contributing to the incorporation of bispecific antibodies into the range of immunotherapeutic strategies used in advanced stages of the disease (Moreau et al., 2022).

However, the evaluation of this therapeutic modality requires careful attention to safety, tolerability, and the maintenance of response over time. Adverse events requiring specialized monitoring include cytokine release syndrome and manifestations of neurotoxicity, in addition to infectious complications associated with immune dysfunction. In this regard, the long-term follow-up of MajesTEC-1 participants contributes to a broader understanding of the durability of benefits and the clinical challenges associated with treatment (Garfall et al., 2024).

Furthermore, the effectiveness of teclistamab under real-world care conditions is fundamental to assessing the applicability of results obtained in clinical trials. Multicenter studies and real-world analyses have investigated its use in heterogeneous populations, enabling examination of therapeutic response,

adverse events, and clinical characteristics that may influence outcomes outside controlled experimental settings (Dima et al., 2024).

From a biological perspective, the response to teclistamab does not depend exclusively on the expression of the tumor target, but also on the functional state of the patient's immune system. Immune fitness, including the capacity of T lymphocytes to become activated and respond, may affect therapeutic outcomes, highlighting the importance of investigating factors associated with heterogeneous clinical responses and identifying potential predictive markers of benefit (Cortes-Selva et al., 2024).

Another significant challenge is the development of resistance mechanisms, particularly the loss or reduced expression of antigens involved in malignant-cell recognition. BCMA-related antigen escape may compromise the efficacy of therapies directed at this target, reinforcing the need to understand the mechanisms underlying treatment failure and to investigate alternative or complementary strategies, including approaches directed at other antigens, such as GPRC5D (Firestone et al., 2024).

At the same time, combinations of bispecific antibodies and the integration of different immunotherapeutic modalities have been reshaping the treatment landscape for multiple myeloma. The combination of teclistamab and talquetamab, the latter targeting GPRC5D, exemplifies the search for strategies capable of enhancing antitumor activity and addressing limitations related to resistance. These investigations reinforce the importance of critically evaluating the benefits, risks, and patient-selection criteria associated with different therapeutic regimens (Cohen et al., 2025).

In light of these developments, a study examining teclistamab as an expression of the advancement of bispecific antibodies and their contribution to the reconfiguration of cancer immunotherapy in multiple myeloma is warranted. Accordingly, this study aims to analyze the scientific evidence concerning the mechanism of action, efficacy, safety, clinical applicability, and resistance mechanisms associated with teclistamab, considering its therapeutic contributions and the challenges that still limit the establishment of this approach in the management of relapsed or refractory multiple myeloma.

METHODOLOGY

TYPE AND DESIGN OF THE STUDY

This study will be conducted as an integrative literature review with a qualitative, descriptive approach, for the purpose of compiling, systematizing, and critically analyzing the scientific evidence related to teclistamab in the treatment of multiple myeloma. This type of review allows findings from different methodological designs to be integrated, facilitating a comprehensive understanding of the therapeutic advances, clinical benefits, adverse events, and resistance mechanisms associated with bispecific antibodies.

The review will comprise systematic stages involving definition of the problem, formulation of the guiding question, establishment of eligibility criteria, database searches, selection of publications, information extraction, critical appraisal of the studies, and synthesis of the results. The organization of these stages will seek to ensure methodological transparency, reproducibility of the search process, and consistency between the proposed objectives and the findings identified.

GUIDING QUESTION

The investigation will be guided by the following question: What scientific evidence is available regarding the efficacy, safety, resistance mechanisms, and therapeutic prospects of teclistamab in the treatment of relapsed or refractory multiple myeloma?

Formulating this question will guide the literature search and delimit the analysis of the studies, considering both clinical outcomes related to use of the drug and the immunologic and molecular factors that may influence therapeutic response. Findings concerning the use of teclistamab in clinical practice and the possibilities of combining it with other immunotherapeutic strategies will also be considered.

INFORMATION SOURCES AND SEARCH STRATEGY

The studies will be searched for in the PubMed/MEDLINE and Scopus databases, as well as in the Directory of Open Access Journals (DOAJ) and SpringerLink portals. These sources were selected because of the breadth of their scientific collections and the availability of publications related to oncology, hematology, immunotherapy, and the development of therapeutic antibodies.

The search strategy will use controlled descriptors, when available, and free-text terms in Portuguese and English, combined using the Boolean operators AND and OR. The principal planned terms include: teclistamab, multiple myeloma, relapsed or refractory multiple myeloma, bispecific antibodies, BCMA, immunotherapy, efficacy, safety, and resistance. In Portuguese, the terms teclistamabe, mieloma múltiplo, anticorpos biespecíficos, imunoterapia, eficácia, segurança, and resistência terapêutica will be used.

The search will be limited to the period from January 2021 to October 2026 and will include publications in Portuguese and English. The final search date must correspond to the day on which the literature search is actually performed, and this information will be recorded to ensure procedural traceability.

INCLUSION AND EXCLUSION CRITERIA

Scientific articles published between January 2021 and October 2026, available in Portuguese or English, and directly addressing teclistamab in the treatment of multiple myeloma, particularly in patients with relapsed or refractory disease, will be included. Clinical trials, observational studies, multicenter studies, real-world analyses, translational studies, and scientific reviews relevant to understanding the efficacy, safety, mechanisms of action, therapeutic resistance, and prospects for the use of bispecific antibodies will be considered.

Publications investigating immunologic factors associated with response to teclistamab, antigen-escape mechanisms, adverse events, response durability, and therapeutic combinations involving this drug may also be included, provided that they present findings relevant to the objectives of the review.

Duplicate studies, publications not directly related to the subject under investigation, articles whose full texts are unavailable for evaluation, studies published in languages other than those established, and documents lacking relevant original or analytical scientific content will be excluded. The latter include editorials, letters without relevant data, commentaries, conference abstracts containing insufficient information, and trial records without usable clinical results. Publications predating 2021 will also be excluded, even if they address general aspects of multiple myeloma or immunotherapy.

STUDY-SELECTION PROCEDURES

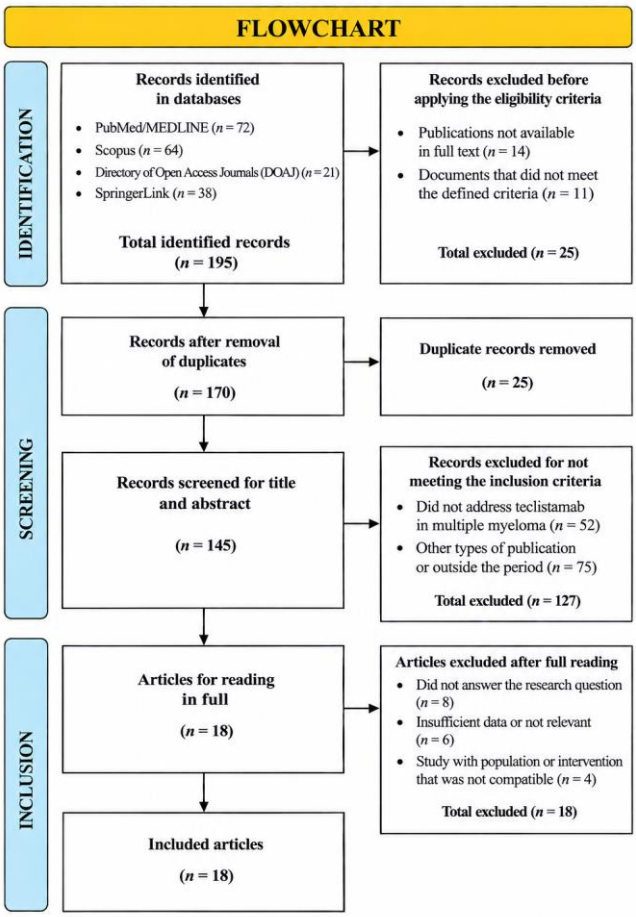
The publications will be selected in successive stages. First, the records retrieved from the selected information sources will be identified, after which duplicates will be removed. Titles and abstracts will then be reviewed to assess thematic relevance and compatibility with the eligibility criteria. Potentially relevant articles will undergo full-text review to confirm their inclusion in the final sample.

To ensure transparency, the number of studies identified in each source, duplicates removed, publications excluded during screening, full texts assessed, and studies ultimately included will be recorded. Reasons for exclusion at the full-text review stage will be documented, allowing presentation of a selection flow based on the PRISMA 2020 recommendations, which guide transparent reporting of study identification, screening, eligibility, and inclusion processes, adapted for an integrative review.

The selection process will be presented in Figure 1, which summarizes the identification, duplicate-removal, screening, eligibility-assessment, and study-inclusion stages of the integrative review.

Figure 1

Study-selection flowchart



Source: Prepared by the authors (2026).

DATA EXTRACTION, CRITICAL APPRAISAL, AND SYNTHESIS

The included studies will be organized using a data-extraction instrument developed by the researchers, covering authorship, year of publication, country in which the study was conducted, objective, methodological design, population characteristics, therapeutic context, principal results, and identified limitations. Priority will be given to extracting information concerning response rate, response duration, progression-free survival, overall survival, adverse events, and factors associated with treatment resistance, according to the information available in each publication.

The critical appraisal will consider the suitability of the design for the objectives of each study, the clarity of the methods, the consistency of the results, and limitations that may compromise interpretation

of the evidence. When appropriate, specific methodological appraisal instruments compatible with the type of study analyzed may be used.

The synthesis will be predominantly qualitative and organized into the following thematic categories: mechanism of action of teclistamab; efficacy and response durability; safety and management of adverse events; effectiveness in clinical practice; resistance mechanisms; and prospects for therapeutic combinations.

The results will be presented descriptively and comparatively, with the aim of identifying convergences, divergences, knowledge gaps, and clinical implications. Studies derived from the same population or clinical trial will be examined for possible participant overlap, preventing related publications from being incorrectly interpreted as independent evidence.

ETHICAL CONSIDERATIONS

As this is a review conducted exclusively with secondary data from previously published studies, this research did not involve the direct participation of human beings and therefore did not require review by a Research Ethics Committee, in accordance with Resolution No. 510 of April 7, 2016, issued by the National Health Council (Conselho Nacional de Saúde).

The principles of scientific integrity, appropriate attribution of authorship, and fidelity to the information presented in the publications consulted will be respected. The analysis and presentation of the results will seek to avoid distorted interpretations, relevant omissions, or conclusions exceeding the limits of the available evidence.

RESULTS AND DISCUSSION

The analysis of the selected publications demonstrates that teclistamab represents a significant advance in the treatment of relapsed or refractory multiple myeloma, particularly among patients who

have previously undergone multiple lines of therapy. To systematize the authors' contributions and facilitate comparison of the findings, Table 1 presents the principal characteristics and focuses of the selected studies.

Table 1

Characterization of studies on teclistamab and bispecific antibodies in multiple myeloma

Author/Year	Study objective	Main scientific contributions	Conclusion
Cohen et al. (2025)	To investigate the combined use of talquetamab and teclistamab in patients with relapsed or refractory multiple myeloma.	Combining bispecific antibodies directed at distinct targets broadens the possibilities for immune activation against tumor cells. This strategy seeks to enhance antineoplastic activity through complementary mechanisms and constitutes a relevant investigational alternative for patients who have undergone multiple lines of therapy and have limited conventional treatment options.	The combination represents a promising prospect for intensifying the antitumor response and broadening the possibilities for intervention in advanced multiple myeloma. However, its use requires careful evaluation of efficacy, cumulative toxicity, and immunologic safety, considering the risks of infection and adverse events related to immune-cell activation.
Cortes-Selva et al. (2024)	To evaluate the relationship between patients' immune fitness and response to teclistamab in the MajesTEC-1 study.	The investigation contributes to understanding how the functional competence of the immune system may influence therapeutic response to teclistamab. The interaction among T lymphocytes, malignant plasma cells, and the immune microenvironment is an important component of the antibody's activity, allowing the influence of individual immunologic conditions on the heterogeneity of clinical outcomes to be examined.	Characterizing immune fitness may contribute to understanding the factors associated with treatment response and variability in clinical outcomes. Further studies are needed to clarify the usefulness of these parameters as potential predictive biomarkers, thereby supporting patient stratification and the development of more individualized therapeutic strategies.

Devasia, Chari, and Lancman (2024)	To analyze the role of bispecific antibodies in the treatment of multiple myeloma, considering their mechanisms of action, efficacy, and safety.	The authors discuss the evolution of bispecific antibodies as an immunotherapeutic modality capable of bringing T cells into proximity with malignant cells, thereby promoting tumor recognition and destruction. The analysis addresses the clinical benefits of this approach, immune-mediated adverse events, and challenges related to resistance, infection prevention, and the incorporation of these therapies into oncohematologic practice.	Bispecific antibodies significantly expand the therapeutic arsenal against multiple myeloma, particularly in cases of relapsed or refractory disease. Their use, however, requires structured care protocols, continuous monitoring, and strategies for preventing and managing complications so as to support the achievement of sustained clinical benefits.
Dima et al. (2024)	To evaluate the safety and efficacy of teclistamab in clinical practice among patients with relapsed or refractory multiple myeloma.	The analysis of real-world data permits the use of the drug to be examined in heterogeneous populations, including patients whose clinical characteristics may differ from those observed in controlled trials. This perspective contributes to understanding therapeutic outcomes, the occurrence of adverse events, and the difficulties involved in implementing treatment in different care settings.	Observational evidence complements clinical-trial results and broadens understanding of the effectiveness of teclistamab under routine conditions. Integrating these data may improve patient selection, follow-up planning, and the identification of care needs, although the limitations inherent in observational designs must be considered.
Firestone et al. (2024)	To investigate antigen escape as a shared mechanism of resistance to BCMA-directed therapies in multiple myeloma.	Loss or reduced expression of the BCMA antigen may compromise the recognition of malignant cells and limit the efficacy of different therapeutic modalities that use this target. This mechanism highlights the complexity of tumor resistance and demonstrates that disease persistence may involve biological changes capable of reducing the vulnerability of neoplastic cells to immunologic intervention.	Antigen escape constitutes a significant challenge to the maintenance of durable therapeutic responses and the selection of subsequent treatments. Understanding this mechanism reinforces the importance of investigating alternative targets, developing sequential strategies, and identifying resistance markers to support individualized clinical decision-making.

Frerichs et al. (2024)	To investigate the effects of teclistamab on humoral immunity and the importance of immunoglobulin supplementation in heavily treated patients with multiple myeloma.	Treatment-associated impairment of humoral immunity underscores patients' vulnerability to infection, particularly in the context of advanced hematologic disease and prior exposure to multiple therapies. The analysis highlights the relevance of assessing immunoglobulin levels and considering preventive measures intended to reduce infectious complications during clinical follow-up.	Periodic assessment of humoral immunity and immunoglobulin replacement, when clinically indicated, are important components of supportive care. Adopting individualized preventive measures may help reduce infectious morbidity, preserve treatment continuity, and improve the safety of patients undergoing bispecific immunotherapy.
Garfall et al. (2024)	To present the long-term follow-up findings from the MajesTEC-1 study of teclistamab in patients with relapsed or refractory multiple myeloma.	Extended follow-up contributes to evaluating the persistence of responses, duration of therapeutic benefit, and safety profile over the course of treatment. Longitudinal analysis is particularly relevant to understanding the maintenance of antitumor activity, disease progression, and the occurrence of complications during continued exposure to the drug.	Long-term follow-up is essential to establish the durability of clinical benefits and characterize the risks associated with prolonged teclistamab use. Interpretation of the results must consider follow-up duration and the characteristics of the population investigated, thereby allowing therapeutic decisions and monitoring strategies to be improved.
Holstein, Grant, and Wildes (2023)	To examine the prospects of chimeric antigen receptor T-cell (CAR-T) therapies and bispecific antibodies in the treatment of multiple myeloma.	The analysis addresses two immunotherapeutic modalities with distinct immune-targeting mechanisms, considering their operational characteristics, clinical limitations, and potential applications. The comparison contributes to understanding factors such as treatment availability, patients' clinical status, monitoring requirements, and challenges related to resistance and treatment sequencing.	The incorporation of CAR-T therapies and bispecific antibodies broadens the possibilities for individualizing multiple myeloma treatment. The choice between these modalities should consider treatment history, clinical status, resource availability, and associated risks, emphasizing decisions grounded in the evidence and each patient's specific needs.

Kang (2022)	To describe the first approval of teclistamab, its pharmacologic mechanisms, and its clinical applications in multiple myeloma.	The study systematizes the pharmacologic characteristics of the BCMA × CD3 bispecific antibody and its relevance to patients with relapsed or refractory multiple myeloma. The approach highlights its ability to direct T lymphocytes toward malignant BCMA-expressing cells, establishing an immunotherapeutic strategy distinct from conventional antineoplastic interventions.	The approval of teclistamab represents an important advance in the evolution of immunotherapy for multiple myeloma, particularly for patients with limited therapeutic alternatives. Its use strengthens the role of bispecific antibodies in the treatment of advanced disease while requiring clinical vigilance to identify and manage immunologic toxicities and infectious complications.
Lee, Neri, and Bahlis (2024)	To compare BCMA- and GPRC5D-targeting bispecific antibodies in terms of efficacy, safety, and resistance mechanisms.	The analysis demonstrates the diversity of immunologic targets explored in the treatment of multiple myeloma and the importance of understanding differences among response, toxicity, and resistance profiles. Investigating these targets also contributes to the discussion of therapeutic options following disease progression after previous treatments, particularly when the efficacy of BCMA-directed strategies has been compromised.	Targeting distinct antigens broadens treatment possibilities and may support sequential strategies in patients with treatment resistance. However, target selection should consider the biological characteristics of the disease, previous exposure to immunotherapies, and specific toxicity profiles. Comparative studies are needed to establish the optimal sequence for using these modalities.
Mohan et al. (2024)	To evaluate teclistamab outcomes among patients with relapsed or refractory multiple myeloma treated at different institutions.	The multicenter experience contributes to examining the effectiveness and safety of the drug under diverse care conditions, complementing evidence from clinical trials. Including patients treated at different centers broadens understanding of implementation challenges, clinical heterogeneity, and monitoring needs during treatment.	Multicenter real-world studies support an understanding of the applicability of teclistamab in different care settings and help identify clinical-support needs. Interpreting these results together with experimental evidence may guide improvements in institutional protocols and individualized patient follow-up.

Riedhammer et al. (2024)	To analyze clinical outcomes with teclistamab among 123 patients with relapsed or refractory multiple myeloma in Germany.	The investigation provides observational evidence regarding use of the drug in a real-world clinical population, enabling its effectiveness and safety challenges to be examined outside the experimental setting. The analysis contributes to contextualizing the use of teclistamab in previously treated patients with different clinical conditions, broadening knowledge of its use in oncohematologic practice.	Real-world findings complement clinical-trial data and help clarify the response to and tolerability of teclistamab in diverse populations. Integrating this evidence may support better-informed therapeutic decisions, provided that the methodological limitations, sample composition, and particular features of the care setting studied are considered.
Scott et al. (2023)	To investigate the prophylactic use of tocilizumab to prevent teclistamab-associated cytokine release syndrome.	The study explores a preventive strategy for controlling an inflammatory complication associated with T-cell activation. This approach contributes to discussion of safety protocols intended to reduce the severity of adverse events and improve clinical management during initiation and administration of the bispecific antibody.	Tocilizumab prophylaxis constitutes a strategy of interest for managing cytokine release syndrome, but its use should be guided by the available evidence and applicable clinical protocols. Individualized assessment of risks, benefits, and potential immunologic repercussions is essential to ensuring a safe therapeutic approach.
Searle et al. (2022)	To evaluate the combination of teclistamab, subcutaneous daratumumab, and lenalidomide in patients with multiple myeloma in the phase 1b MajesTEC-2 study.	The investigation explores the combination of bispecific immunotherapy, a monoclonal antibody, and an immunomodulatory agent, with the aim of enhancing antitumor activity through complementary mechanisms. The strategy also contributes to investigating the feasibility of combination regimens and the challenges related to tolerability, the intensity of immunomodulation, and clinical safety.	The combination constitutes a relevant approach to the development of integrated therapeutic regimens for multiple myeloma. Its establishment depends on demonstrating consistent clinical benefits, assessing adverse events, and defining appropriate patient-selection criteria, taking into account the balance between treatment intensification and safety.

Tanenbaum, Miett, and Patel (2023)	To examine the emerging treatment landscape for relapsed or refractory multiple myeloma.	The discussion contextualizes the expansion of therapeutic alternatives, including targeted immunotherapies and novel antitumor interventions. The authors address challenges related to resistance, treatment sequencing, and the biological heterogeneity of the disease, all of which influence the selection of strategies for patients who experience progression after multiple lines of therapy.	The growing diversity of therapeutic options reinforces the need to individualize clinical decisions based on disease profile, functional status, and prior drug exposure. Integrating novel immunotherapies into care planning may expand the possibilities for disease control, provided that it is accompanied by careful assessment of benefits and risks.
Tapia-Galisteo, Álvarez-Vallina, and Sanz (2023)	To analyze the development of bispecific and trispecific immunologic agents capable of bringing immune cells into proximity with malignant cells.	The authors discuss the biological foundations of immune-cell engagers and their potential applications in hematologic malignancies. The analysis contributes to understanding how antibody engineering may increase the specificity of immune targeting and promote the activation of cytotoxic mechanisms against tumor cells, while also addressing challenges associated with the development of these platforms.	Multispecific agents represent a significant frontier in cancer immunotherapy, with the potential to broaden the possibilities for recognizing and eliminating malignant cells. Advances in this technology depend on clinical validation of its efficacy, characterization of its safety, and development of strategies capable of reducing resistance and immune-mediated complications.
Touzeau et al. (2024)	To evaluate the efficacy and safety of teclistamab in patients with relapsed or refractory multiple myeloma previously exposed to BCMA-targeting therapies.	The investigation addresses a complex clinical context in which previous exposure to treatments against the same antigen may influence subsequent response. The analysis contributes to understanding the challenges associated with reusing anti-BCMA strategies, considering potential resistance, disease characteristics, and the need for alternatives for patients whose disease progresses after previous interventions.	Use of teclistamab after other anti-BCMA therapies requires individualized evaluation of treatment history, previous response, and the patient's clinical condition. Understanding resistance mechanisms and response-associated factors may help establish more appropriate therapeutic sequences and optimize patient selection for subsequent treatments.

Usmani et al. (2021)	To investigate the clinical activity and safety of teclistamab, a BCMA × CD3 bispecific antibody, in patients with relapsed or refractory multiple myeloma in the MajesTEC-1 study.	The phase 1 study provided initial clinical evidence of the drug's ability to bring T lymphocytes into proximity with BCMA-expressing tumor cells and promote their cytotoxic activity. The investigation helped characterize the feasibility of this immunotherapeutic approach and laid the foundation for the subsequent clinical development of teclistamab in patients with advanced disease.	The investigation established an important clinical basis for the development of teclistamab and the expansion of BCMA-directed immunotherapeutic strategies. Its results helped establish bispecific antibodies as a therapeutic alternative for relapsed or refractory multiple myeloma, although clinical use depends on rigorous monitoring and appropriate management of adverse events.
Whittemore and Knafl (2005)	To update the methodological foundations of the integrative literature review.	The authors systematize the stages involved in organizing, critically appraising, and synthesizing evidence from studies with different methodological designs. This approach supports the integration of heterogeneous findings and enables the identification of convergences, divergences, scientific gaps, and clinical implications in fields characterized by rapid developments in therapeutic interventions.	The integrative review provides methodological support for compiling, critically analyzing, and synthesizing evidence on the efficacy, safety, and clinical challenges of teclistamab. Its application makes it possible to construct a comprehensive overview of the available knowledge, identify limitations in the literature, and provide a basis for future research recommendations while respecting the methodological quality and characteristics of the studies included.

Source: Prepared on the basis of the references provided (2021–2025).

The studies address different dimensions of its use, including antitumor activity, response durability, safety, effectiveness under real-world conditions, impairment of humoral immunity, and the development of resistance.

CLINICAL EFFICACY AND ESTABLISHMENT OF TECLISTAMAB IN MULTIPLE MYELOMA

The results of the MajesTEC-1 study constitute an important reference for understanding the clinical development of teclistamab. Usmani et al. (2021) investigated its use in patients with relapsed or refractory multiple myeloma, establishing initial evidence concerning the feasibility of the T-lymphocyte

redirection strategy. Moreau et al. (2022) subsequently broadened understanding of the drug's antitumor activity, helping establish its relevance in a population characterized by prior treatment exposure and an unfavorable prognosis.

The biological basis of this approach is related to its capacity to promote functional proximity between T cells and malignant plasma cells. Devasia, Chari, and Lancman (2024) explain the relevance of bispecific antibodies as agents capable of establishing a connection between a tumor antigen and a T-lymphocyte-activating component. Consistent with this perspective, Tapia-Galisteo, Álvarez-Vallina, and Sanz (2023) place immune-cell engagers within the context of technological advances aimed at increasing the specificity and efficiency of antitumor immune responses.

In the field of clinical efficacy, interpreting the results requires consideration not only of the achievement of an initial response but also of its depth, duration, and association with control of disease progression. Garfall et al. (2024) address extended follow-up of patients participating in MajesTEC-1, contributing to analysis of the persistence of therapeutic benefits. In parallel, Kang (2022) contextualizes the evidence underpinning approval of the drug, emphasizing its importance as an alternative for patients with advanced multiple myeloma and limited therapeutic options.

Translating experimental findings into routine care constitutes another important area of the literature. Dima et al. (2024) analyze the safety and efficacy of teclistamab under real-world conditions, while Mohan et al. (2024) broaden this perspective through a multicenter investigation. In addition, Riedhammer et al. (2024) describe the treatment experience of 123 patients in Germany, contributing to understanding how clinical characteristics, care conditions, and population-specific features may influence outcomes observed outside clinical trials.

Evaluation of therapeutic response must also incorporate individual immunologic conditions, since the function of effector cells may affect the activity of bispecific antibodies. Cortes-Selva et al. (2024) investigate the correlation between immune fitness and response to teclistamab in the MajesTEC-1

study, emphasizing the relevance of factors related to patients' immune status. This perspective broadens the interpretation of clinical variability by indicating that expression of the tumor target, although important, does not alone account for all determinants of therapeutic benefit.

SAFETY, THERAPEUTIC RESISTANCE, AND PROSPECTS FOR IMMUNOTHERAPEUTIC INNOVATION

Cytokine release syndrome represents one of the principal complications associated with the immune activation promoted by teclistamab. Scott et al. (2023) investigated prophylactic use of tocilizumab as a strategy to prevent this manifestation, contributing to discussion of measures intended to improve treatment tolerability. These findings reinforce the need for care protocols integrating early identification of clinical signs, systematic monitoring, and timely interventions during administration of the drug.

Frerichs et al. (2024) analyzed the effects of teclistamab on the humoral immunity of heavily pretreated patients, emphasizing the importance of immunoglobulin supplementation when clinically indicated. This evidence broadens understanding of therapeutic safety by demonstrating that control of the malignancy must be accompanied by strategies intended to reduce infectious complications and preserve patients' general health.

Regarding therapeutic combinations, Searle et al. (2022) investigated teclistamab combined with subcutaneous daratumumab and lenalidomide in the MajesTEC-2 study. This approach represents an attempt to integrate complementary immunologic mechanisms and enhance antitumor activity. However, interpretation of the results must consider the possibility of increased toxicity, the need for more comprehensive monitoring, and the importance of establishing clinical criteria for selecting patients eligible for combination regimens.

The evolution of immunotherapeutic strategies also involves comparisons between bispecific antibodies and advanced cellular therapies. Holstein, Grant, and Wildes (2023) discuss the expansion of

chimeric antigen receptor T-cell (CAR-T) therapies and bispecific antibodies in multiple myeloma, highlighting the diversification of available alternatives. Although both modalities harness T-lymphocyte activity, they differ in their method of administration, treatment organization, and care requirements, all of which influence their applicability and individualized therapeutic selection.

Firestone et al. (2024) investigated antigen escape as a shared mechanism of resistance to interventions using this target, indicating that changes in antigen availability or expression may compromise malignant-cell recognition. This limitation demonstrates that therapeutic activity depends not only on the ability to activate T lymphocytes, but also on maintaining the molecular conditions required for tumor recognition.

Use of teclistamab after previous BCMA-directed treatments is a particularly relevant issue for patients whose disease is difficult to control. Touzeau et al. (2024) evaluated its efficacy and safety in this context, contributing to discussion of the possibility of sequentially using therapies that share the same target. Interpretation of these results requires consideration of previously established resistance mechanisms, treatment history, and the biological characteristics of the disease, without assuming that previous exposure to BCMA-directed therapy will produce uniform outcomes in all patients.

Consistent with this issue, Lee, Neri, and Bahlis (2024) examine bispecific antibodies directed at BCMA and GPRC5D, highlighting differences related to efficacy, safety, and resistance mechanisms. The diversity of molecular targets offers the possibility of overcoming certain limitations of therapies directed exclusively at BCMA. Nevertheless, the choice between these alternatives should consider the patient's clinical profile, previous treatment exposure, specific toxicities, and the availability of sufficiently robust comparative evidence.

The investigation of combinations of bispecific antibodies constitutes another promising avenue of clinical development. Cohen et al. (2025) evaluated the combination of talquetamab and teclistamab in patients with relapsed or refractory multiple myeloma, exploring simultaneous targeting of different

antigens. This strategy is based on the possibility of increasing tumor-cell recognition and reducing limitations associated with dependence on a single target. However, its incorporation into clinical practice requires careful evaluation of the relationship among therapeutic benefit, toxicity, infection prevention, and treatment sustainability.

Tanenbaum, Miett, and Patel (2023) discuss the expansion of options for relapsed or refractory multiple myeloma, highlighting the growing complexity of clinical decision-making. In this setting, definition of the therapeutic sequence should consider not only efficacy demonstrated in individual studies, but also the patient's clinical condition, previously used therapies, resistance mechanisms, and the ability of healthcare services to provide specialized follow-up.

Taken together, the evidence examined indicates that teclistamab has changed the treatment landscape for relapsed or refractory multiple myeloma by expanding the possibilities for immunologically targeting malignant cells. Clinical studies, real-world investigations, and research into resistance contribute to a more comprehensive understanding of its benefits and limitations. Nevertheless, challenges remain regarding response duration, immunosuppression, infectious complications, patient selection, and the identification of strategies capable of preserving efficacy in the face of the disease's biological evolution.

In light of this body of evidence, the establishment of teclistamab as a component of cancer immunotherapy depends on integrating antitumor efficacy, safety, therapeutic individualization, and longitudinal follow-up. Future research should prioritize the identification of predictive biomarkers, improvement of preventive measures for immunologic complications, comparison of different therapeutic sequences, and evaluation of combinations directed at multiple antigens. These prospects may contribute to better-informed clinical decisions and broaden the therapeutic benefits available to patients with relapsed or refractory multiple myeloma.

CONCLUSION

The analysis undertaken makes it possible to understand the role of teclistamab in the treatment of relapsed or refractory multiple myeloma, demonstrating its relevance to the evolution of cancer-immunotherapy strategies. In response to the guiding question, the findings indicate that this bispecific antibody represents an important therapeutic alternative because it redirects T lymphocytes against tumor cells expressing B-cell maturation antigen (BCMA), thereby expanding the possibilities for disease control in patients who have undergone multiple lines of treatment.

The scientific evidence concerning the clinical efficacy of teclistamab was examined, with an emphasis on favorable outcomes among patients with relapsed or refractory multiple myeloma. The studies analyzed demonstrate relevant antitumor activity and clinical responses supporting its use in this context, including among individuals with limited therapeutic options. In addition, real-world experiences reinforce the importance of evaluating the drug's effectiveness in more heterogeneous populations, complementing findings obtained from clinical trials.

However, incorporating teclistamab into oncology practice requires attention to adverse events associated with its administration. The principal challenges identified include cytokine release syndrome, alterations in the humoral immune response, and the consequent risk of infection. Accordingly, systematic clinical follow-up, early identification of complications, and adoption of preventive measures, including immunoglobulin supplementation when indicated, are fundamental components in promoting therapeutic safety and treatment continuity.

Another relevant aspect concerns resistance mechanisms, particularly those related to loss or altered expression of BCMA, which may compromise treatment response. The evidence also points to the need to investigate combined strategies and alternatives directed at other antigen targets, such as GPRC5D. Thus, combining teclistamab with other immunotherapeutic agents and integrating it into

different treatment sequences represent promising prospects, although these approaches depend on careful evaluation of efficacy, toxicity, and patient selection.

From the perspective of therapeutic innovation, it is concluded that bispecific antibodies contribute to the reconfiguration of immunotherapy in multiple myeloma, particularly by providing a modality distinct from cellular therapies such as CAR-T cells. Despite these advances, challenges remain with regard to response duration, infection prevention, tumor resistance, access to the drug, and definition of the optimal time for its use. Individualization of clinical management and joint assessment of benefits and risks are therefore indispensable to improving therapeutic outcomes and the quality of oncology care.

Finally, prospective, multicenter studies with extended follow-up are recommended to compare teclistamab with other therapies directed at BCMA and different antigen targets, considering efficacy, survival, quality of life, toxicity, costs, and resistance mechanisms. Studies identifying biomarkers capable of predicting therapeutic response and the risk of complications are also needed. These investigations may contribute to establishing more precise patient-selection criteria and guiding evidence-based clinical decisions, thereby consolidating the role of teclistamab in the contemporary management of multiple myeloma.

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