Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Clinical Hematology

What About Autologous Stem-Cell Transplantation in Primary Central Nervous System Lymphoma?

W.S. Ouedraogo[1*], M.A. Aznag[1], M. Hamidine[1], K.O. Josias[1], S. Achouch[1], A. Raissi[1]

[1]Department of Clinical Hematology, Avicenne Military Hospital, Marrakech

DOI: https://doi.org/10.36347/sjmcr.2025.v13i10.004 | **Received:** 16.07.2025 | **Accepted:** 24.09.2025 | **Published:** 06.10.2025

***Corresponding author:** W.S. Ouedraogo
Department of Clinical Hematology, Avicenne Military Hospital, Marrakech

Abstract **Case Report**

Autologous hematopoietic stem-cell transplantation (ASCT) as consolidation after high-dose methotrexate (HD-MTX)-based induction chemotherapy has emerged as an effective strategy for achieving durable remissions while reducing the need for whole-brain radiotherapy (WBRT) and its associated neurotoxicity risks, according to meta-analyses, randomized trials, and systematic reviews [1,2,13,3]. In younger, eligible patients, randomized studies report comparable efficacy between WBRT and high-dose chemotherapy followed by ASCT, but with superior neurocognitive tolerance after ASCT supporting its preferential use as consolidation in selected patients [2,13].

Keywords: PCNSL, ASCT, HD-MTX, WBRT, consolidation.

INTRODUCTION

Primary central nervous system lymphoma (PCNSL) is a rare and aggressive form of non-Hodgkin lymphoma initially confined to the central nervous system. Standard induction therapy relies on HD-MTX-based regimens [1,42]. Consolidation is essential for durable disease control, yet WBRT carries a high risk of delayed neurotoxicity, particularly concerning in younger patients [8,18,14]. Alternative strategies to WBRT include non-myeloablative chemotherapy, reduced-dose WBRT (23.4 Gy), and high-dose chemotherapy followed by ASCT. Conditioning regimens incorporating central nervous system–penetrating agents such as thiotepa are favored [1,3,16,18]

CASE REPORT

A 40-year-old man with diffuse large B-cell lymphoma of the CNS received induction with R-MPV (rituximab, methotrexate, procarbazine, vincristine) over five cycles, followed by consolidation with ASCT conditioned with thiotepa and busulfan. He achieved complete remission with full regression of frontal syndrome [40,9,16].

This sequence R-MPV induction followed by thiotepa-based conditioning and ASCT is well documented in the literature as feasible and frequently employed in eligible, responsive, younger patients [40,9,3].

Induction Therapy

HD-MTX–based induction regimens, including R-MPV or MATRix, achieve high response rates (overall response rate ~80–90%), enabling the tumor reduction required before consolidation [10,13,40]. The choice of induction protocol affects ASCT eligibility, as response to induction (complete or partial) is commonly required for transplantation [10,40].

Consolidation:

ASCT Versus WBRT

Two phase II randomized trials comparing WBRT with high-dose chemotherapy followed by ASCT demonstrated similar efficacy for disease control but better cognitive outcomes after ASCT [2,13]. Reviews and meta-analyses conclude that high-dose chemotherapy/ASCT is a credible alternative to WBRT, limiting neurotoxicity while ensuring satisfactory survival [1,3,8,42]. National cohort analyses show decreasing WBRT use and increasing ASCT as consolidation over recent decades, although no universal consensus exists, reflecting patient selection (age, performance status) [5,7].

Conditioning Regimens and Toxicity

Thiotepa-containing regimens (e.g., thiotepa/carmustine or thiotepa/busulfan/cyclophosphamide) are

preferred for their superior CNS penetration, with series reporting good disease-control outcomes [16,34,19,20]. Registry and retrospective studies evaluating conditioning protocols show variations in non-relapse mortality and toxicity profiles, sometimes reporting excess non-relapse mortality for certain regimens in older or frail patients [33,34]. Patient-reported outcome studies indicate that quality of life and neurocognitive recovery after ASCT require ongoing follow-up, with incomplete recovery in some older or fragile patients [15,14].

Efficacy and Survival

Phase II trials and retrospective studies report favorable overall and progression-free survival rates after HD-MTX induction followed by ASCT, with medium-term (2–5 years) outcomes often superior when thiotepa-based conditioning is used [40,19,16,45]. Comparative analyses between reduced-dose WBRT (23.4 Gy) and ASCT show similar survival curves but a more favorable cognitive profile for ASCT consolidation in eligible patients [18,13].

Patient Selection and Clinical Practice

Patient selection for ASCT primarily depends on age, pe rformance status, induction response, and absence of major comorbidities. Registries indicate a preference for patients under 70 years in good general condition [13,3,9]. For young, eligible patients, HD-MTX–based induction (e.g., R-MPV) followed by high-dose chemotherapy and ASCT with thiotepa-containing conditioning maximizes disease control while reducing WBRT use [10,40,16]. Reduced-dose WBRT (23.4 Gy) remains an alternative when ASCT is not feasible but must be weighed against residual neurotoxicity risks [18,8].

Limitations and Contradictions

The evidence base is limited by the absence of large phase III randomized trials. Most comparisons derive from phase II studies, small meta-analyses, and observational cohorts, which are prone to selection bias (younger, fitter patients favored for ASCT) [1,2,13,5]. While overall tumor control appears comparable between WBRT and ASCT, toxicity profiles differ neurocognitive decline with WBRT versus systemic toxicities and variable non-relapse mortality with certain conditioning regimens making individualized decision-making essential [2,13,16,14]. Variability in conditioning protocols and thiotepa dosing across centers further complicates standardization [34,33,16].

CONCLUSION

For younger, fit patients with primary CNS lymphoma, consolidation with high-dose chemotherapy followed by ASCT particularly with thiotepa-based conditioning offers an effective alternative to WBRT while reducing the risk of long-term neurocognitive complications [1,2,13,16]. Treatment decisions should be individualized, considering age, performance status, induction response, and conditioning risks, while informing patients about the balance between disease control and long-term toxicities [3,5,15].

REFERENCES

1. High-dose methotrexate-based regimens and post-remission consolidation for treatment of newly diagnosed primary CNS lymphoma: meta-analysis of clinical trials. (Scientific reports, 2021), PMID: 33483528URL: https://pubmed.ncbi.nlm.nih.gov/33483528/
2. Radiotherapy or Autologous Stem-Cell Transplantation for Primary CNS Lymphoma in Patients Age 60 Years and Younger: Long-Term Results of the Randomized Phase II PRECIS Study. (Journal of clinical oncology: official journal of the American Society of Clinical Oncology, 2022), PMID: 35834762URL: https://pubmed.ncbi.nlm.nih.gov/35834762/
3. Diagnosis and Treatment Using Autologous Stem-Cell Transplantation in Primary Central Nervous System Lymphoma: A Systematic Review. (Cancers, 2023), PMID: 36672475 URL: https://pubmed.ncbi.nlm.nih.gov/36672475/
4. Is Autologous Stem Cell Transplantation a Safe and Effective Alternative to Whole Brain Radiation as Consolidation Therapy in Patients with Primary Central Nervous System Lymphoma? A Critically Appraised Topic. (The neurologist, 2021), PMID: 34190207 URL: https://pubmed.ncbi.nlm.nih.gov/34190207/
5. Consolidative Autologous Stem Cell Transplantation Versus Whole Brain Radiation in PCNSL; a Nationwide Analysis. (Clinical lymphoma, myeloma & leukemia, 2022), PMID: 35705438 URL: https://pubmed.ncbi.nlm.nih.gov/35705438/
6. Clinical characteristics and survival outcomes of patients with primary central nervous system lymphoma treated with high-dose methotrexate-based polychemotherapy and consolidation therapies. (European journal of cancer (Oxford, England: 1990), 2024), PMID: 39427440 URL: https://pubmed.ncbi.nlm.nih.gov/39427440/
7. Evolving consolidation patterns and outcomes for a large cohort of patients with primary CNS lymphoma. (Blood advances, 2024), PMID: 39167801 URL: https://pubmed.ncbi.nlm.nih.gov/39167801/
8. Consolidation Treatment for Primary Central Nervous System Lymphoma: Which Modality for Whom? (Acta haematologica, 2021), PMID: 33242855 URL: https://pubmed.ncbi.nlm.nih.gov/33242855/
9. Role of upfront autologous stem cell transplantation in patients newly diagnosed with primary CNS lymphoma treated with R-MVP: real-world data from a retrospective single-center analysis. (Bone

marrow transplantation, 2022), PMID: 35173287 URL: https://pubmed.ncbi.nlm.nih.gov/35173287/
10. Consolidation Therapy in Primary Central Nervous System Lymphoma. (Current treatment options in oncology, 2020), PMID: 32725379URL: https://pubmed.ncbi.nlm.nih.gov/32725379/
11. First line treatments in primary central nervous system lymphomas in young patients. (Current opinion in oncology, 2023), PMID: 37498049 URL: https://pubmed.ncbi.nlm.nih.gov/37498049/
12. [Primary central nervous system lymphoma: advances in treatment strategies]. ([Rinsho ketsueki] The Japanese journal of clinical hematology, 2020), PMID: 32507817 URL: https://pubmed.ncbi.nlm.nih.gov/32507817/
13. Long-term efficacy, safety and neurotolerability of MATRix regimen followed by autologous transplant in primary CNS lymphoma: 7-year results of the IELSG32 randomized trial. (Leukemia, 2022), PMID: 35562406 URL: https://pubmed.ncbi.nlm.nih.gov/35562406/
14. Consolidation Regimen and Cerebral Atrophy in Patients with Primary Central Nervous System Lymphoma. (International journal of radiation oncology, biology, physics, 2024), PMID: 39615656 URL: https://pubmed.ncbi.nlm.nih.gov/39615656/
15. Patient Reported and Clinical Outcomes after High-Dose Chemotherapy and Autologous Stem Cell Transplantation in Primary Central Nervous System Lymphoma. (Cancers, 2023), PMID: 36765625 URL: https://pubmed.ncbi.nlm.nih.gov/36765625/
16. Outcomes Associated With Thiotepa-Based Conditioning in Patients With Primary Central Nervous System Lymphoma After Autologous Hematopoietic Cell Transplant. (JAMA oncology, 2021), PMID: 33956047 URL: https://pubmed.ncbi.nlm.nih.gov/33956047/
17. Impact of Thiotepa-Based Autologous Hematopoietic Cell Transplantation in Primary Central Nervous System Lymphoma in First Complete Remission: A University of California Hematologic Malignancies Consortium Retrospective Analysis. (Clinical lymphoma, myeloma & leukemia, 2023), PMID: 37336714 URL: https://pubmed.ncbi.nlm.nih.gov/37336714/
18. Reduced-dose WBRT as consolidation treatment for patients with primary CNS lymphoma: an LOC network study. (Blood advances, 2022), PMID: 35772168URL: https://pubmed.ncbi.nlm.nih.gov/35772168/
19. Intensive chemotherapy followed by autologous stem cell transplantation in primary central nervous system lymphomas (PCNSLs). Therapeutic outcomes in real life-experience of the French Network. (Bone marrow transplantation, 2022), PMID: 35422077 URL: https://pubmed.ncbi.nlm.nih.gov/35422077/
20. Outcomes of Autologous Stem Cell Transplant Consolidation in Primary Central Nervous System Lymphoma: A Mayo Clinic Experience. (Biology of blood and marrow transplantation: journal of the American Society for Blood and Marrow Transplantation, 2020), PMID: 32818553 URL: https://pubmed.ncbi.nlm.nih.gov/32818553/
21. Phase IB part of LOC-R01, a LOC network non-comparative randomized phase IB/II study testing R-MPV in combination with escalating doses of lenalidomide or ibrutinib for newly diagnosed primary central nervous system lymphoma (PCNSL) patients. (Journal of hematology & oncology, 2024), PMID: 39300447 URL: https://pubmed.ncbi.nlm.nih.gov/39300447/
22. Outcomes from hematopoietic stem cell transplantation following treosulfan-based conditioning: A clinical and pharmacokinetic analysis. (Pediatric transplantation, 2024), PMID: 38766999 URL: https://pubmed.ncbi.nlm.nih.gov/38766999/
23. Early Toxicity and Efficacy of Four Different Conditioning Regimens for Autologous Hematopoietic Cell Transplantation in Patients With Lymphoma: Impact of Drug Shortages in a Resource-Constrained Country. (Transplantation and cellular therapy, 2024), PMID: 39097096 URL: https://pubmed.ncbi.nlm.nih.gov/39097096/
24. Comparison of Mitoxantrone-Melphalan and BEAM Conditioning Regimens in Patients with Lymphoma. (Hematology/oncology and stem cell therapy, 2022), PMID: 33933474 URL: https://pubmed.ncbi.nlm.nih.gov/33933474/
25. Cisplatin as a Viable and Secure Alternative to Carmustine in BEAM-Based Conditioning for Autologous Hematopoietic Stem Cell Transplantation in Patients with Lymphoma. (Transplantation proceedings, 2024), PMID: 39069458 URL: https://pubmed.ncbi.nlm.nih.gov/39069458/
26. Sequential intensive chemotherapy followed by autologous or allogeneic transplantation for refractory lymphoma. (Leukemia & lymphoma, 2021), PMID: 33586581 URL: https://pubmed.ncbi.nlm.nih.gov/33586581/
27. Post-transplant-cyclophosphamide and short-term Everolimus as graft-versus-host-prophylaxis in patients with relapsed/refractory lymphoma and myeloma-Final results of the phase II OCTET-EVER trial. (European journal of haematology, 2024), PMID: 38616351 URL: https://pubmed.ncbi.nlm.nih.gov/38616351/
28. Treosulfan is a safe and effective alternative to busulfan for conditioning in adult allogeneic HSCT patients: Data from a single center. (Cancer medicine, 2024), PMID: 38752476 URL: https://pubmed.ncbi.nlm.nih.gov/38752476/
29. Feasibility and Efficacy of a Pharmacokinetics-Guided Busulfan Conditioning Regimen for Allogeneic Stem Cell Transplantation with Post-Transplantation Cyclophosphamide as Graft-versus-Host Disease Prophylaxis in Adult Patients with

Hematologic Malignancies. (Transplantation and cellular therapy, 2021), PMID: 34403790 URL: https://pubmed.ncbi.nlm.nih.gov/34403790/

30. First-Line Use of Daratumumab in Patients with Multiple Myeloma Shows Delayed Neutrophil and Platelet Engraftment after Autologous Stem Cell Transplantation: Results from a Real-Life Single-Center Study. (Cancers, 2024), PMID: 39409927 URL: https://pubmed.ncbi.nlm.nih.gov/39409927/
31. Efficacy and safety of stem cell mobilization following gemcitabine, dexamethasone, cisplatin (GDP) salvage chemotherapy in patients with relapsed or refractory lymphoma. (Leukemia & lymphoma, 2020), PMID: 32482114 URL: https://pubmed.ncbi.nlm.nih.gov/32482114/
32. Carfilzomib combined with cyclosporine and methotrexate for the prevention of graft-versus-host disease after allogeneic stem-cell transplantation from unrelated donors. (Bone marrow transplantation, 2021), PMID: 32873915 URL: https://pubmed.ncbi.nlm.nih.gov/32873915/
33. [33] Comparison of Thiotepa-based Conditioning Regimens for Older Adults with Primary Diffuse Large B-cell Lymphoma of the Central Nervous System Undergoing Autologous Hematopoietic Cell Transplantation. (Transplantation and cellular therapy, 2024), PMID: 39303985 URL: https://pubmed.ncbi.nlm.nih.gov/39303985/
34. [34] Impact of thiotepa dose-intensity in primary diffuse large B-cell lymphoma of the central nervous system undergoing autologous hematopoietic cell transplant with thiotepa/carmustine conditioning. (Bone marrow transplantation, 2023), PMID: 37563283 URL: https://pubmed.ncbi.nlm.nih.gov/37563283/
35. [35] Identification of clinical factors impacting outcome in patients undergoing autologous hematopoietic cell transplantation after BEAM and TEAM conditioning. (European journal of haematology, 2024), PMID: 37823328 URL: https://pubmed.ncbi.nlm.nih.gov/37823328/
36. Comparison of reduced-toxicity conditioning protocols using fludarabine, melphalan combined with thiotepa or carmustine in allogeneic hematopoietic cell transplantation. (Bone marrow transplantation, 2021), PMID: 32591641 URL: https://pubmed.ncbi.nlm.nih.gov/32591641/
37. Thiotepa and antithymocyte globulin-based conditioning prior to haploidentical transplantation with posttransplant cyclophosphamide in high-risk hematological malignancies. (Bone marrow transplantation, 2020), PMID: 31673080 URL: https://pubmed.ncbi.nlm.nih.gov/31673080/
38. Feasibility of thiotepa addition to the fludarabine-busulfan conditioning with tacrolimus/sirolimus as graft vs host disease prophylaxis. (Leukemia & lymphoma, 2020), PMID: 32654570 URL: https://pubmed.ncbi.nlm.nih.gov/32654570/
39. BuCyE can safely replace BEAM as a conditioning regimen for autologous stem cell transplantation in the treatment of refractory and relapsed lymphomas. (Leukemia research, 2021), PMID: 34592699 URL: https://pubmed.ncbi.nlm.nih.gov/34592699/
40. Long-term Outcomes in Primary CNS Lymphoma After R-MVP and High-Dose Chemotherapy With Autologous Hematopoietic Stem Cell Transplant. (Neurology, 2023), PMID: 37344228 URL: https://pubmed.ncbi.nlm.nih.gov/37344228/
41. First-line high-dose therapy and autologous blood s