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Clinical characteristics, treatment outcomes, and survival of primary bone diffuse large B-cell lymphoma: a descriptive single-center retrospective study

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ABSTRACT

Aims: Primary bone diffuse large B-cell lymphoma (PB-DLBCL) is a rare extranodal lymphoma with generally favorable outcomes following anthracycline-based immunochemotherapy. Data on the clinical characteristics and outcomes of unifocal (UF) and multifocal (MF) disease remain limited. This study aimed to describe the clinical characteristics, treatment outcomes, survival, and safety of patients with PB-DLBCL and to present descriptive comparisons between UF and MF disease.

Methods: This retrospective single-center study included 13 consecutive adult patients with histologically confirmed PB-DLBCL diagnosed between 2010 and 2025. Patients were classified as UF (n=9) or MF (n=4) according to the number of involved bone sites. Clinical characteristics, treatment response, survival outcomes, and treatment-related adverse events were evaluated.

Results: The median age was 60 years (range, 18–78), and localized bone pain was the most common presenting symptom (92.3%). Patients with MF disease showed a higher frequency of adverse clinical characteristics, including bulky lesions, elevated lactate dehydrogenase levels, larger lesions, and poorer performance status. Complete and partial responses were achieved in 9 patients (69.2%) and 1 patient (7.7%), respectively, yielding an overall response rate of 76.9%. The overall response rate was 100% in the UF group and 25% in the MF group (p=0.014). The median overall survival (OS) was 88.15 months, with a 2-year OS rate of 91.7%. The 2-year OS rates were 100% in the UF group and 66.7% in the MF group. Hematologic toxicities were the most common adverse events, while grade 3–4 toxicities were infrequent and treatment was generally well tolerated.

Conclusion: Anthracycline-based immunochemotherapy was associated with favorable treatment responses and survival outcomes in our cohort. Patients with MF disease showed lower response rates and survival than those with UF disease; however, given the small and imbalanced subgroup sizes, these findings should be interpreted with caution. The outcomes observed in patients with MF disease should be further evaluated in larger cohorts, and prospective studies are needed to identify more effective treatment strategies for this subgroup.

Keywords: Lymphoma; bone neoplasms, diffuse large B-cell lymphoma, treatment outcome

INTRODUCTION

Primary bone lymphoma (PBL) is a neoplasm composed of malignant lymphoid cells that presents with solitary or multiple bone lesions with or without nodal involvement and must be distinguished from the secondary bone involvement of systemic lymphomas.[1] Bone involvement is not uncommon in advanced-stage lymphoma originating in other sites, but PBL is a rare entity. It accounts for approximately 3–7% of malignant bone tumors, nearly 5% of all extranodal lymphomas, and about 1% of non-Hodgkin lymphomas.[2,3] While PBL can present at any age, its peak incidence typically occurs within the fifth and 6th decades with a slight male predilection.[1]

The most common presenting symptoms of PBL are localized bone pain and a palpable mass; it may be complicated by pathological fracture or spinal cord compression at presentation. However, systemic 'B' symptoms, namely fever, night sweats and weight loss are less frequently observed, typically occurring in less than 10% of cases.[2,3] While most patients are presented with localized (limited-stage) disease,

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advanced-stage involvement is also reported in the literature.[4] PBL can develop throughout the entire skeleton; however, it shows a predilection for long bones (specifically the femur, tibia, and humerus), and axial skeletal sites such as the pelvis and spine.[5]

Although various subtypes, including B-cell, T-cell, and Hodgkin lymphoma, can present as PBL, the most common histological subtype is diffuse large B-cell lymphoma (DLBCL)[2,3] and it should be differentiated from other bone tumors including osteosarcoma, Ewing sarcoma, or chronic osteomyelitis. Despite advancements in imaging techniques such as magnetic resonance imaging (MRI) and positron emission tomography/computed tomography (PET/CT), definitive diagnosis remains challenging and depended on histopathological examination and immunohistochemical staining.

Due to the rarity of the disease and the lack of large-scale randomized controlled trials, a definitive treatment standard for PBL has not yet been established. While management historically relied on radiotherapy (RT), in the rituximab era, the cornerstone of treatment has shifted to anthracycline-based chemoimmunotherapy, namely R-CHOP. Although RT still maintains its clinical relevance, it is now primarily used as a consolidative therapy for preventing local relapses. surgery is reserved for diagnostic purposes or symptom management in a limited group of patients with specific complications.[6,7]

In this study, we aimed to describe the clinical characteristics, diagnostic findings, treatment responses, and survival outcomes of 13 patients diagnosed with PBL at our tertiary care center. By sharing our institutional experience, we aim to contribute to the literature on this rare entity and discuss our findings in the light of current management strategies.

METHODS

Ethics

This study was approved by the Non-interventional Clinical Researches Ethics Committee of Marmara University Faculty of Medicine (Date: 27.03.2026, Decision No: 09.2026.26-0369). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patients

This retrospective study included patients aged ≥18 years who were diagnosed with PBL between 2010 and 2025 at our institution. PBL was defined as lymphoma involving a single bone site with or without regional lymph node involvement, or lymphoma involving multiple bones without evidence of visceral or bone marrow involvement.[3,6] All the patients had a histopathologically confirmed diagnosis of DLBCL. Diagnostic tissue sampling was obtained by excisional biopsy in 5 patients (38.5%) and by tru-cut biopsy in 8 patients (61.5%). Among the patients, 6 (46.2%) were classified as germinal center B-cell subtype, whereas 5 (38.5%) were classified as non-germinal center subtype. In 2 patients (15.4%), the subtype was not specified. Patients with systemic lymphoma and secondary bone involvement, those younger than 18 years of age, and those with incomplete data were excluded. Patients diagnosed with Hodgkin lymphoma and non–Hodgkin lymphoma subtypes other than DLBCL (including T-cell lymphomas and indolent B-cell lymphomas) were also excluded from the study group. Clinical data, including age, gender, presenting symptoms, involved bone sites, stage at diagnosis, International Prognostic Index (IPI) score, Eastern Cooperative Oncology Group (ECOG) performance status, laboratory parameters (LDH, hemoglobin, etc.), treatment regimens, and outcomes were extracted from medical records. Bulky lesion was defined as a tumor mass measuring ≥7.5 cm in the largest diameter.[8]

The patients were subcategorized as multifocal (MF) or unifocal (UF) disease, according to the number of bone sites involved. The involvement of only one site was defined as unifocal disease (UF), whereas the involvement of two or more sites was defined as multifocal disease (MF).

Staging

All patients underwent staging at diagnosis using PET/CT. Bone marrow biopsy was performed in all patients and none of the patients had bone marrow involvement. Disease staging was assessed according to the Ann Arbor Staging System.[9] Patients with disease confined to a single bone site were categorized as stage IE, while those with regional lymph node involvement were categorized as stage IIE. Stage IV was defined as multiple bone involvement without evidence of distant nodal or visceral disease. Stage IIIE patients, defined as those with distant nodal disease and patients with extranodal involvement other than bone were excluded from the definition of PBL.

Treatment Characteristics and Follow up

All of the patients except one patient were treated with RCHOP regimen for 6 cycles every 21 days (rituximab 375mg/m^2, day 1; cyclophosphamide 750 mg/m^2, day 1; doxorubicin 50 mg/m^2, day1; vincristine 1.4 mg/m^2 (capping the dose at 2 mg) day 1; prednisolone 40 mg/m^2 day 1-5). One patient was treated with R-CEOP therapy (rituximab 375mg/m^2, day 1; cyclophosphamide 750 mg/m^2, day 1; etoposide 50 mg/m^2, day1; vincristine 1.4 mg/m^2 (capping the dose at 2 mg) day 1; prednisolone 40 mg/m^2, day 1-5) for six cycles. R-CEOP was preferred due to low ejection fraction ratio of 35% in that patient. RT was administered in addition to chemotherapy in two patients with a bulky disease and pathological fracture.

BR (Rituximab 375 mg/m^2 day 1; bendamustine 90 mg/m^2 day 1 and 2) and R- ICE (rituximab 375 mg/m^2 day 1; etoposide 100mg/m^2 day 1-3; carboplatin AUC 5× (glomerular filtration rate+25) mg [capping the dose at 800 mg]; ifosfamide 5000mg/m^2) therapy were preferred as salvage therapy and autologous stem cell transplantation (ASCT) was performed in eligible patients.

Supportive care measures, including granulocyte colony-stimulating factor (G-CSF) and mesna prophylaxis, were provided in accordance with institutional protocols.

All patients underwent PET-CT at diagnosis, after three cycles of treatment, and one month following completion of therapy. For patients receiving RT, post-treatment response assessment by PET-CT was performed 3 months after the

end of RT. Response to treatment was reported according to revised response criteria.[10] Overall survival (OS) was defined as the period from the date of PBL diagnosis to the date of the last follow-up visit, or the date of death from any cause.

Statistical Analysis

The data analyses were performed using IBM SPSS Statistics v20.0 (IBM Corp., Armonk, NY, USA). Data normality was confirmed via Kolmogorov-Smirnov and Shapiro-Wilk tests. Continuous variables were expressed as medians (range) and compared using the Mann-Whitney U test or Student's t-test as appropriate. Categorical variables were analyzed using Fisher's exact test, whereas the Fisher–Freeman–Halton exact test was applied for categorical variables with more than two categories. Survival outcomes were estimated using the Kaplan-Meier method.

RESULTS

Patients' Characteristics

Thirteen patients with PBL were included in the study. The median age was 60 (range, 18-78). Six patients (46.2%) were male and seven patients were female (53.8%) with a female to male ratio of 1.16. Although this difference did not reach statistical significance, male patients constituted a higher proportion of the MF group than of the UF group (75% vs. 33.3%). The characteristics of each patient were reported in **Supplementary Table 1**.

Patients most frequently presented with pain localized to the involved bone, which was observed in 12 patients (92.3%). Other presenting manifestations included swelling in five patients (38.5%), B symptoms in one patient, pathological fracture in one patient (7.7%), and compression-related neurological manifestations in one patient (7.7%).

Among nine patients with UF, craniofacial bones and long bones were the most frequently involved sites, each accounting for 33.3% of cases. Among the four patients with MF, vertebral involvement was the predominant site of disease, occurring in three patients (75.0%), followed by rib involvement in two patients (50.0%). The sites of involvement for each patient were detailed in **Supplementary Table 1**.

At initial diagnosis, 4 patients (30.8%) had stage IE disease, 5 (38.5%) had stage IIE disease, and 4 (30.8%) had stage IV disease. Among the patients with stage IV disease, only one presented with B symptoms and was therefore classified as stage IVB. Four patients were categorized as MF disease and 9 patients were documented as UF disease. The characteristics of the patients with UF and MF disease at the time of diagnosis were summarized at **Table 1**.

Evaluation of laboratory parameters at diagnosis revealed that the median LDH level, white blood cell count, hemoglobin level, and platelet count were 217 IU/l (range, 136-702), 7×10^9/L (range, 4.5-13×109/l), 12.4 gr/dl (range, 9.9-15.8) and 280×10^9/L (range, 160-480×109/l), respectively. The laboratory tests of the patients at the time of diagnosis were summarized at **Table 1**.

Patients with MF disease also tended to present with more adverse clinical characteristics, including a higher frequency of bulky lesions (50% vs. 11.1%), B symptoms (25% vs. 0%), and elevated LDH levels (75% vs. 33.3%). In addition, the MF group had a larger median index lesion size (80 vs. 25 mm), higher median LDH levels (370 vs. 217 IU/l), and a slightly poorer ECOG performance status (median ECOG score: 1 vs. 0).

Clinical Outcomes and Survival Data of the Patients

CR and PR were achieved in 9 (69.2%) patients and one (7.7%) patient, respectively, resulting in an overall response rate of 76.9%. Three patients (23.1 %) had refractory disease following first-line therapy; all refractory patients had MF disease at diagnosis. Patient with PR was consolidated with RT and achieved CR after RT. No patients with CR or PR had relapsed after median 55 months (range, 20-126). The response rates were summarized in patients with MF and UF diseases in **Table 2** and **Supplementary Table 1**. The overall response rate (CR+PR) was 100% in patients with UF disease, whereas only one patient (25%) with MF disease achieved an overall response (p=0.014).

Three patients had refractory disease and received salvage therapy with BR or R-ICE. Following second-line treatment, two patients achieved PR and one patient achieved CR. One

Supplementary Table 1. Characteristics of the patients

Patients no	Age	Gender	ECOG	Bulky lesion	B symptoms	Site of involvement	Staging	UF/MF	Response to first treatment
1	35	F	0	No	No	Maxilla	1	UF	CR
2	56	M	0	No	No	Iliac bone	2	UF	CR
3	59	M	0	No	No	Maxilla	2	UF	CR
4	60	F	0	No	No	Femur	2	UF	CR
5	65	M	1	Yes	No	Mandibula	1	UF	CR
6	66	F	1	No	No	Femur	2	UF	CR
7	68	F	0	No	No	Xiphoid process	2	UF	CR
8	68	F	0	No	No	Humerus	1	UF	CR
9	70	F	1	No	No	Iliac bone	1	UF	PR
10	18	F	0	No	No	Multiple vertebra involvement	4	MF	CR
11	58	M	1	Yes	No	vertebra, rib, femur, acetabulum	4	MF	RD
12	60	M	1	No	No	Multiple vertebra involvement	4	MF	RD
13	78	M	2	Yes	Yes	Scapula, rib, ischium	4	MF	RD

ECOG: Eastern Cooperative Oncology Group, MF: Multifocal disease, F: Female, UF: Unifocal disease, CR: Complete response, M: Male, PR: Partial response, RD: Refractory disease.

Table 1. Characteristics and laboratory results of the patients at diagnosis

	All	Unifocal disease	Multifocal disease	P value
Number	13	9 (69.2)	4 (30.8)	
Age (median, range)	60 (18-78)	65 (35-70)	59 (18-78)	0.64
Gender (number, %) Female Male	 7 (53.8) 6 (46.2)	 6 (66.7) 3 (33.3)	 1 (25) 3 (75)	0.27
ECOG (median, range)	1 (0-2)	0 (0-1)	1 (0-2)	0.14
ECOG (number, %) 0/1 2	 12 (92) 1 (7.8)	 9 (100) -	 3 (75) 1 (25)	0.31
IPI (median, range)	2 (0-4)	2 (0-4)	2 (0-3)	0.3
Size of the index lesion (mm) (median, range)	32 (21-110)	25 (21-84)	80 (35-110)	0.67
Bulky lesion (number, %) Yes No	 3 (23) 10 (77)	 1 (11.1) 8 (88.9)	 2 (50) 2(50)	0.20
B symptoms (number, %) Yes No	 1 (7.8) 12 (92.2)	 - 9 (100)	 1 (25) 3 (75)	0.31
Staging (number, %) Stage 1 Stage 2 Stage 4	 4 (30.8) 5 (38.4) 4 (30.8)	 4 (44.4) 5 (55.6) -	 - - 4 (100)	0.003
LDH (IU/l) (median, range)	217 (136-702)	217 (136-702)	370 (190-690)	0.32
LDH (number, %) High Low	 6 (46.2) 7 (53.8)	 3 (33) 6 (66.7)	 3 (75) 1 (25)	0.27
WBC at the time of diagnosis (median, range) ($\times 10^9$/l)	7 (4.5-13)	6.9 (4.5-13)	9.2 (7.2-9.6)	0.40
Lymphocyte at the time of diagnosis (median, range) ($\times 10^9$/l)	1.5(0.6-2.5)	1.5 (0.6-2.5)	1.6 (1.1-2.5)	0.76
Platelet at the time of diagnosis (median, range) ($\times 10^9$/l)	280 (160-480)	270 (175-420)	354 (160-480)	1
Neutrophil at the time of diagnosis (median, range) ($\times 10^9$/l)	4.2 (2.6-9.2)	4.8 (2.6-9.2)	3.5 (2.7-6.8)	0.71
Hemoglobin at the time of diagnosis (median, range) (gr/dl)	12.4 (9.9-15.8)	12.2 (9.9-15.8)	11.7 (11-12.6)	0.54

ECOG: Eastern Cooperative Oncology Group, IPI: International Prognostic Index, LDH: Lactate dehydrogenase, WBC: White blood cell.

Table 2. Response rates of the patients to the first line therapy

Response to first line therapy	All patients (n=13) (n, %)	UF (n=9) (n, %)	MF (n=4) (n, %)	P value
CR PR RD	9 (69.2) 1 (7.8) 3 (23)	8(88.9) 1 (11.1) -	1 (25) - 3 (75)	p=0.0121

UF: Unifocal disease, MF: Multifocal disease, CR: Complete response, PR: Partial response, RD: Refractory disease

patient who achieved PR was not eligible for ASCT because of advanced age and poor ECOG performance status. This patient relapsed 6 months after completing six cycles of BR. The second patient, who achieved PR, proceeded to ASCT and the patient relapsed after 24 months.

The third patient achieved CR with salvage therapy and subsequently underwent ASCT while in CR. This patient has remained in remission following transplantation.

The median OS for the entire cohort was 88.15 months, with a 2-year OS rate of 91.67%. The 2-year OS rate was 100% in patients with UF disease and 66.67% in those with MF disease (**Figures 1 and 2**).

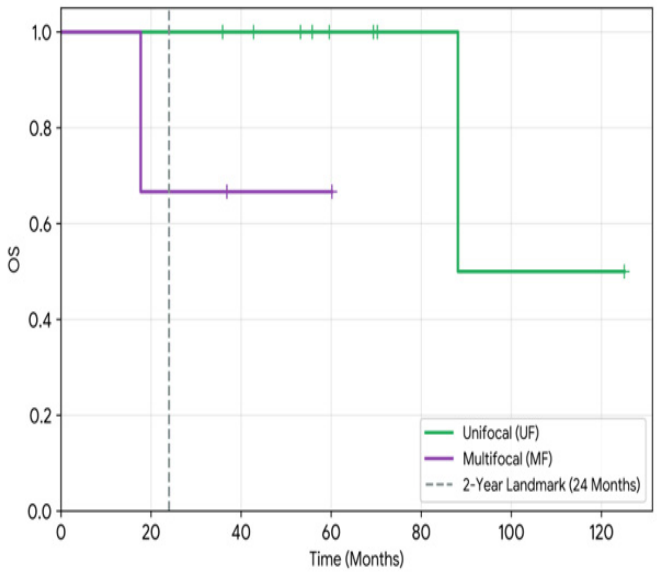


Figure 1. The overall survival of patients with unifocal and multifocal disease.
OS: Overall survival, UF: Unifocal, MF : Multifocal

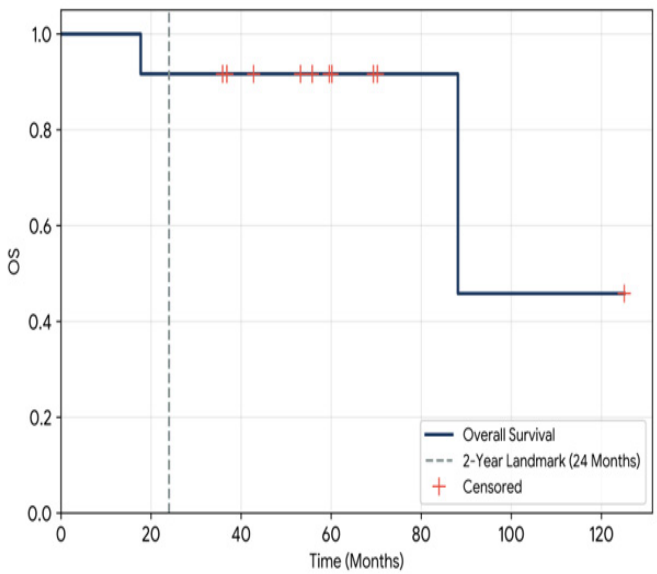


Figure 2. The overall survival of all cohort.
OS: Overall survival

During the follow-up period, two patients died. One patient in the MF group died due to refractory disease and subsequent infectious complications. One patient in the UF group died while in remission; however, the cause of death could not be determined.

Safety Data

Overall, 11 of 13 patients (84.6%) experienced at least one adverse event of any grade, while grade 3–4 adverse events were observed in 3 patients (23.1%). The most common adverse events were anemia and neutropenia, each occurring in 11 patients. All cases of anemia were grade 1–2, whereas neutropenia was grade 1–2 in 8 patients and grade 3–4 in 3 patients. Thrombocytopenia was observed in 3 patients and was limited to grade 1–2. Febrile neutropenia occurred in 3 patients. Non-hematologic adverse events included mucositis in 4 patients and peripheral neuropathy in 2 patients; all cases of neuropathy were grade 1.

R-CHOP therapy was delayed in four patients (33.3%). The delay occurred once in two patients and twice in two patients, with a median duration of 12 days (range, 7–15 days). The causes for therapy delay were urinary tract infection and pneumonia in two patients and neutropenia in two patients. R-CEOP treatment was delayed during the first two cycles because of neutropenia. After prophylactic granulocyte stimulating agent (G-CSF) was incorporated into the treatment regimen, all subsequent cycles were delivered on time without further delays or interruptions. No dose reductions or other dose modifications were necessary.

DISCUSSION

PBL is a rare extranodal lymphoma, and the limited number of reported cases continues to challenge the establishment of standardized management strategies. In the present study, we evaluated the clinical characteristics, treatment outcomes, and survival of 13 patients with DLBCL-type PBL treated at a single tertiary center.

The median age of our cohort was 60 years (range, 18–78), which is consistent with previous retrospective studies reporting a median age between 45 and 65 years.[3,7,11] Similar to earlier reports, our patients showed a broad age distribution at diagnosis. In the literature, PBL has been reported in adults ranging from 18 to 87 years of age. Therefore, while the disease is most frequently diagnosed in middle-aged and older adults, it may present at almost any adult age. The age distribution and median age in our cohort were similar not only to those reported in previous PBL series but also to those observed in DLBCL patients.[12]

Although females accounted for 53.8% of patients in our cohort, previous studies have generally reported a slight male predominance in PBL.[3,5] This discrepancy is likely related to the small sample size. Males represented 75% of patients with MF disease, whereas females were more common in the UF group. However, given the small number of patients with MF disease, this difference should be interpreted with caution.

Most patients in our cohort presented with localized symptoms, such as pain and swelling, while B symptoms were uncommon at presentation. Similarly, previous studies have shown that local bone pain is the most common presenting symptom, occurring in approximately 80–95% of patients, whereas B symptoms are reported in only 4–12% of cases.[7,11,13-15] In our study, none of the patients with UF PBL had B symptoms, whereas only one patient (25%) with MF disease presented with constitutional symptoms. This finding was partly consistent with the study by Ayesh Haj Yousef et al.,[11] who also reported no B symptoms among patients with UF disease, although B symptoms were present in 75% of patients with MF disease. The discrepancy in the frequency of B symptoms among patients with MF disease may be explained by the small sample sizes and retrospective design of both studies. In a large population-based cohort of patients with DLBCL, the incidence of B symptoms increased from 16.4% in Ann Arbor stage I to 40.9% in stage IV disease.[12] In contrast, B symptoms remained uncommon in our cohort, even among patients with stage IV disease. Although sample sizes were limited in both studies, these findings might suggest that constitutional symptoms in primary bone DLBCL are highly variable, even in advanced-stage disease. Therefore, the presence or absence of B symptoms alone has limited diagnostic value and should not be relied upon to establish or exclude the diagnosis of primary bone DLBCL.

Our analysis demonstrated distinct patterns of skeletal involvement according to disease extent, with craniofacial and long bones being the most commonly affected sites in UF disease and vertebral lesions predominating in MF disease. These findings are in line with previous studies reporting the femur as one of the most frequently involved bones in PBL and highlighting the axial skeleton, particularly the vertebrae and pelvis, as preferential sites of MF disease.[11,16-18]

In our study, the median IPI score was 2 in both the UF and MF groups, and the distribution of IPI scores was similar between the two subgroups. ECOG performance status was generally favorable, with only one patient in the MF group having an ECOG score of 2. In contrast, Sharma et al.[16] reported ECOG scores ≥2 in nearly one-third of patients. This difference may be explained by the higher tumor burden in their cohort, which included a greater proportion of patients with stage IV disease, B symptoms, elevated LDH levels, and higher IPI scores.

Patients with MF disease showed a higher frequency of adverse clinical characteristics, including bulky lesions, B symptoms, elevated LDH levels, larger bone lesions, and poorer performance status. Similar clinical patterns have been reported in previous studies.[3,11,19]

The results in our study revealed that hematological laboratory parameters were generally within normal ranges at diagnosis. This observation highlights that complete blood count findings may be non-specific and insufficient to prompt the diagnosis of PBL. Consequently, normal hematological parameters should not exclude further investigation in patients with clinically or radiologically suspicious bone lesions.

In our cohort, all patients with UF disease achieved an overall response (100%), whereas one patient (25%) with MF disease responded to first-line treatment. The 2-year OS rates were 100% in the UF group and 66.67% in the MF group. Given the small number of patients, particularly in the MF group, these differences between MF and UF groups should be interpreted with caution. Previous studies have reported excellent overall response rates of approximately 85–90% in patients with primary bone DLBCL treated with anthracycline-based immunochemotherapy, with or without

consolidative RT.[3,6,16] However, data comparing outcomes according to disease distribution remain limited. Consistent with our findings, Ayesh et al.[11] reported that no patient with MF achieved a complete response, whereas only one patient with UF failed to achieve CR, corresponding to a CR rate of 87.5% in the UF group. Similarly, Wu et al.[19] demonstrated significantly superior survival among patients with localized disease, reporting a 5-year OS of 83.4% in the UF group compared with 36.7% in the MF group. Likewise, Rezazadeh et al.[7] reported excellent long-term outcomes in patients with limited-stage primary bone DLBCL, with a 10-year OS approaching 80–90%. Overall, while PB-DLBCL is generally associated with favorable treatment responses and survival outcomes, the inferior outcomes observed in patients with MF disease should be further evaluated in larger cohorts. Prospective studies are needed to identify more effective treatment strategies for patients with MF disease to increase response rates and survival.

The safety profile observed in our cohort was comparable to that reported in previous studies of R-CHOP–based therapy, in which hematologic toxicities, particularly neutropenia and febrile neutropenia, are among the most common treatment-related adverse events.[20-22] In our cohort, grade 3–4 adverse events were infrequent, and treatment delays were limited, occurring mainly because of neutropenia or infection. The introduction of prophylactic G-CSF in patients who developed neutropenia prevented further treatment delays, allowing all subsequent treatment cycles to be administered on schedule. Overall, R-CHOP–based immunochemotherapy was generally well tolerated, and no patient required dose reduction or treatment discontinuation because of treatment-related toxicity.

Limitations

This study had several limitations. First, its retrospective design may have resulted in information bias. Second, the study included a relatively small number of patients from a single tertiary center, reflecting the rarity of PBL and limiting the statistical power and generalizability of our findings. Given the small and imbalanced subgroup sizes, the statistical comparisons and associated p-values between UF and MF disease should be interpreted with caution. In addition, the small sample size precluded multivariable analyses to identify independent prognostic factors. Nevertheless, despite these limitations, our study provides detailed clinical, treatment, and survival data on this rare disease and adds to the limited real-world evidence on PB-DLBCL with UF and MF involvement. Larger multicenter studies are needed to validate these observed differences and more reliably assess their clinical and prognostic significance.

CONCLUSION

As a result, PB-DLBCL treated with anthracycline-based immunochemotherapy demonstrated favorable treatment responses and survival outcomes in our cohort. Patients with MF disease showed lower response rates and survival than those with UF disease; however, given the small and imbalanced subgroup sizes, these findings should be interpreted with caution. The inclusion of only PBL cases with DLBCL histology resulted in a clinically homogeneous study population. The outcomes observed in patients with MF disease should be further evaluated in larger cohorts. Prospective studies are needed to identify more effective treatment strategies for patients with MF disease.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Non-interventional Clinical Researches Ethics Committee of Marmara University Faculty of Medicine (Date: 27.03.2026, Decision No: 09.2026.26-0369).

Informed Consent

This retrospective study used pre-existing anonymized patient data. No additional intervention was performed, and there was no direct patient contact. The study was approved by the Ethics Committee, and the requirement for written informed consent was waived by the ethics committee.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

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Author Contributions

Concept: AFY, IA; Design: MUM, TT; Control: ES, SÖ, FA; Resources: TE, AB; Materials: RBÖ, CG; Data Collection and/or Processing: FT, AFY; Analysis and/or Interpretation: AFY, IA; Literature Review: TT, FA; Writing the Article: AFY; Critical Review: AFY, MUM, TE, AB, RBÖ, CG, SÖ, FT, FA, ES, TT, IA.

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