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Research Article

Prognosis Evaluation of the Progression of Diffuse Large B-Cell Lymphoma within 24 Months

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Abstract

Purpose: The progression of disease within 24 months (POD24) has been considered to be a strong prognostic indicator for various types of malignant lymphoma. However, the value of POD24 in Diffuse Large B-Cell Lymphoma (DLBCL) is unclear. We evaluated the value of POD24 in patients with DLBCL.

Methods: A total of 476 newly diagnosed DLBCL patients were analyzed in this study. Overall Survival (OS) was evaluated by Kaplan Meier method. We performed univariate and multivariate analyses to evaluate the potential prognostic value of POD24.

Results: A total of 476 newly diagnosed patients with DLBCL were analyzed in our study. The 5-year OS rates of patients in the POD24 group and non-POD24 group were 22.6% and 82.5%, respectively (HR 7.397; 95% CI 5.403-10.125; p < 0.001). The 5-year OS rates of patients in the POD24 group and non-POD24 group in Complete Release (CR) were 26.5% and 73.7%, respectively (HR 4.374; 95% CI 2.521-7.590; p<0.001). These results were similar in patients with non-CR: the 5-year OS rates were 20.5% and 83.7% (HR 8.697; 95% CI 5.934-12.746; p<0.001). The 5-year OS rates of the POD24 group and the non-POD24 group in the low stage (stage I and II) were 48% and 85.6%, respectively (HR 5.122; 95% CI 2.803-9.363; p<0.001). The results were the same in the high stage (stage III and IV): 10.2% and 79.4% (HR 5.122; 95% CI 2.803-9.363; p<0.001). Only stage was an independent prognostic factor for OS in the POD24 group in the multivariate analysis (P=0.001).

Conclusion: The association between POD24 and OS was confirmed, and POD24 can predict poor OS in patients with DLBCL. These marked differences in outcome suggest that POD24 is useful for patient counseling, study design, and risk stratification in DLBCL.

Introduction

DLBCL is the most common subtype of lymphoma in the United States and Europe [1]. The disease is biologically and clinically heterogeneous and the clinical outcomes are often poor [2,3]. Without treatment, the expected OS rate is less than 1 year [4,5]. However, many patients receive immunochemotherapy treatment that consists of Rituximab plus Cyclophosphamide, Doxorubicin, Vincristine, and Prednisone (R-CHOP) [6-8]. Although most patients receiving standard chemotherapy respond to treatment, 20% to 40% of patients fail to achieve remission or experience relapse [9]. Most relapses occur within the first 12 to 18 months [9-10]. Patients with relapsed or refractory DLBCL experience low survival rates, disease progression within 24 months, and poor prognosis [9]. Therefore, early identification of patients at risk for recurrence or progression is critical for the timely delivery of appropriate treatment.

POD24 is considered a reliable prognostic factor in various types of malignant lymphoma, including follicular lymphoma, mantle cell lymphoma, marginal zone lymphoma, and PTCL (peripheral t-cell lymphoma) [11-14], where there is high evidence to confirm that patients who experience disease progression within 24 months have a poor prognosis [15,16]. Previous studies have explored the event-free survival at 24 months factor of patients with DLBCL, where relapse, repeated therapy and death are commonly used as events [17,18]. POD24 has not been studied in DLBCL. Therefore, POD24 was specifically explored in this study.

We aimed to analyze the value of POD24 in DLBCL to evaluate its clinical significance in clinical practice.

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Materials and Methods

Patients

Patients aged 18-80 who were newly diagnosed with DLBCL in Sichuan Cancer Hospital and Institute and Sun Yat-sen University Cancer Center from February 2012 to November 2019 were included in this study. The inclusion criteria of this study were as follows: patients with a histological confirmation of DLBCL, patients who received first-line therapy with R-CHOP and had complete clinical information. Clinical information included age, sex, clinical stage, hepatitis B surface antigen, Lactate Dehydrogenase (LDH) level, Eastern Cooperative Oncology Group (ECOG) score, and number of extralymphatic lesions, which were used to calculate the patients risk stratification according to the International Prognostic Index (IPI). The study was approved by the ethics committee of Sun Yat-sen University Cancer Center, and a waiver of consent was allowed by the ethics committee because there were no conflicts of interest or risk to patients. We guaranteed confidentiality of patient data according to the requirements of the ethics committee.

Clinical Outcomes

POD24 and OS were the endpoints of this retrospective study. POD24 was defined as the recurrence or progression of the disease within 24 months after diagnosis. OS is defined as the time from diagnosis to the end of follow-up or death. If the patient is censored (lost to follow-up, etc.) or POD24 cannot be assessed if no patient has died from POD within a month.

Statistical Analysis

OS was assessed by the Kaplan–Meier method, and differences between the groups were estimated by the log-rank test. Univariate and multivariate Cox proportional hazards analyses were performed to examine the potential independent influences of clinical variables on POD24. All statistical analyses were performed using GraphPad Prism 7, and P<0.1 was considered statistically significant.

Result

Patient Characteristics

This study included 476 newly diagnosed patients with DLBCL. (Table 1) shows the clinical characteristics of the 476 patients with DLBCL are shown in. The median age at diagnosis was 52 years. There were 277 males (58.2%) and 199 females (41.8%). A total of 182 patients (38.2%) were stage I-II, and 294 patients (61.8%) were stage III-IV. Most patients (92.4%) had a lower ECOG performance status. For cell-of-origin subtypes, 214 (44.9%) were GCB subtypes, and 262 (55.1%) were non-GCB subtypes. Based on IPI scores, 184 patients (38.6%) were low risk, 119 patients (25%) were low-intermediate risk, 106 patients (22.3%) were high-intermediate risk and 67 patients (14.1%) were high risk. We found that in the POD24 group and non-POD24 group, significant differences existed in age (p=0.02), ECOG performance status (p=0.01), B symptoms (p=0.01), extranodal sites (p=0.004), and international prognostic index (IPI) (p=0.001). However, there were no significant differences between the POD24 group and the non-POD24 group in sex, stage, LDH, cell-of-origin subtype, HBsAg status or other clinical characteristics. The details of the clinical characteristics are shown in (Table 1).

Table 1: Clinical characteristics of 476 DLBCL patients.

Variable	All (N=476)	POD24 (N=188)	No POD24 (N=288)	p value
Age (range)	53(10-87)	58(10-87)	51(17-85)	0.02
Gender				
Male	277(58.2%)	117(62.2%)	160(55.6%)	0.15
Female	199(41.8%)	71(37.8%)	128(44.4%)	
Ann Arbor stage				0.50
I-II	186(39%)	70(37.2%)	116(40.3%)	
III-IV	290(61%)	118(62.7%)	172(59.7%)	
Lactate dehydrogenase (LDH)				0.217
Normal	209(43.9%)	76(40.4%)	133(46.2%)	
Abnormal	210(56.1%)	112(59.6)	155(53.8%)	
ECOG performance status				0.01
0-1	440(92.4%)	166(88.3%)	274(95.1%)	
>1	36(7.6%)	22(11.7%)	14(4.9%)	
B symptoms				0.01
Present	150(31.5%)	72(38.3%)	78(27.1%)	
Absent	326(68.5%)	116(61.7%)	210(72.9%)	
Extranodal sites				0.004
0-1	332(69.7%)	117(62.2%)	215(74.7%)	
>1	144(30.3%)	71(37.8%)	73(25.3%)	
International prognostic index (IPI)				0.001
Low risk (0-1 factor)	184(38.6%)	59(31.4%)	125(43.4%)	
Low-intermediate risk (2 factors)	119(25.0%)	41(21.8%)	78(27.1%)	
High-intermediate risk (3 factors)	106(22.3%)	51(27.1%)	55(19.1%)	
High risk (4-5 factors)	67(14.1%)	37(19.7%)	30(10.4%)	
Cell of origin subtypes				0.14
GCB	214(44.9%)	73(38.9%)	116(40.4%)	
Non-GCB	262(55.1%)	115(61.1%)	171(59.6%)	
HBsAg status				0.08
Positive	116(24.4%)	38(20.2%)	78(27.1%)	
Negative	360(75.6%)	150(79.8%)	210(72.9%)	

Abbreviation: ECOG, Eastern Cooperative Oncology Group; GCB, germinal center B-cell; POD 24, progression of disease within 24 months; HBsAg, anti-hepatitis B surface antigen.

OS of All Patients According to POD24 Results

The OS of patients in the POD24 group and non-POD24 group is shown in (Figure 1). Overall, POD24 was reported in 188 patients (39.5%), and the other 288 patients (61.5%) were analyzed as the non-POD24 group. The 5-year OS rate for patients with POD24 was 22.6% compared with 82.5% for patients without POD24 (HR 7.397; 95% CI 5.403-10.125; p < 0.001) (Figure 1).

OS of Patients with CR and Non-CR According to POD24 Results

A total of 124 patients in the study achieved a CR, POD24 occurred in 66 (53.2%) patients, and non-POD24 occurred in 58 (46.8%) patients. The 5-year OS rate was 73.7% for patients in the non-POD24 group and 26.5% for patients in the POD24 group (HR

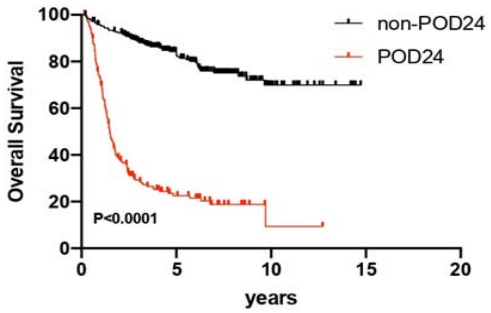

Figure 1: OS of all patients according to POD24 results.

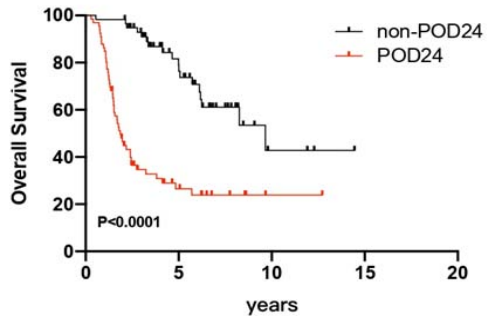

Figure 2A: OS of patients with CR according to POD24 results.

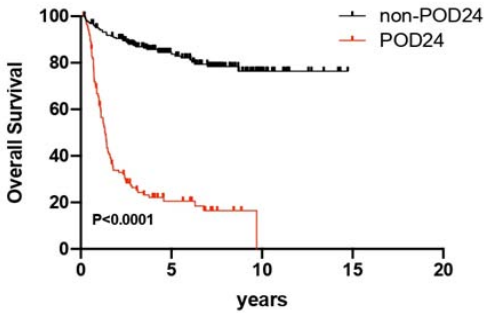

Figure 2B: OS of patients with non-CR according to POD24 results.

4.374; 95% CI 2.521-7.590; p < 0.001). (Figure 2A) For the patients with non-CR, 352 were included in the analysis of OS. POD24 occurred in 218 (62%) patients, and non-POD24 occurred in 134 (38%) patients. The 5-year OS rate was 83.7% for patients in the non-POD24 group and 20.5% for patients in the POD24 group (HR 8.697; 95% CI 5.934-12.746; p < 0.001) (Figure 2B).

OS of Patients with Low Stage and High Stage According to POD24 Results

According to the occurrence of POD24, we divided the patients into low stage and high stage to compare the OS. A total of 186 patients in the study were stage I and II. POD24 occurred in 70 (37.6%) patients, and non-POD24 occurred in 116 (62.4%) patients. The 5-year OS rate was 85.6% for patients in the non-POD24 group and 48% for patients in the POD24 group (HR 5.122; 95% CI 2.803-9.363; p<0.001) (Figure 3A). Similar results were found in 290 patients with stages III and IV. POD24 occurred in 118 (40.7%) patients, and non-POD24 occurred in 172 (59.3%) patients. The 5-year OS rate was

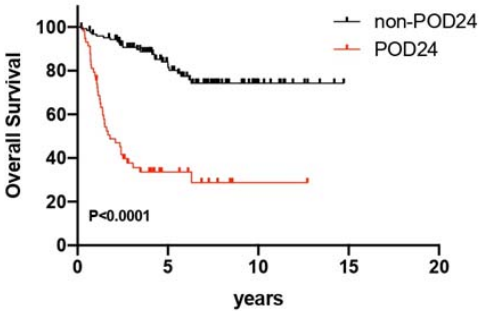

Figure 3A: OS of patients with stage I and II according to POD24 results.

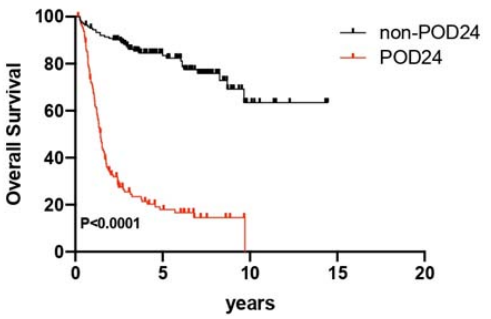

Figure 3B: OS of patients with stage III and IV according to POD24 results.

79.4% for patients in the non-POD24 group and 10.2% for patients in the POD24 group (HR 9.155; 95% CI 6.318-13.265; p < 0.001) (Figure 3B).

Univariate and Multivariate Analyses for Predictors of Survival in Patients with POD24 and Patients with Non-POD24

In the univariate analyses for all patients, we found that age (p<0.001), stage (p<0.001), LDH (abnormal vs. normal) (p=0.066), ECOG (>1 vs. 0-1) (p<0.001), extranodal sites (>1 vs. 0-1) (p<0.001), HBsAg status (positive vs. negative) (p=0.008), and POD24 (with or without) (p<0.001) were independent prognostic factors for OS. In the multivariate analysis of OS, age (p=0.004), stage (p<0.001), and POD24 (with or without) (p<0.001) were determined to be independent predictors. For patients with POD24, in univariate analyses, age (p=0.017), stage (p<0.001), LDH (p=0.016), ECOG (p<0.001), and extranodal sites (p<0.001) significantly affected OS. In multivariate analysis, only stage III-IV vs. I-II was determined to be an independent predictor (p=0.001, (Table 2).

Discussion

DLBCL is highly invasive, with biological and clinical heterogeneity [3]. Some patients with DLBCL cannot be cured with first-line therapy, and the disease is more invasive [9]. Only 30 to 40% of patients with incurable diseases respond to rescue chemotherapy and may subsequently receive exogenous stem cell transplant consolidation [19-21]. In recent studies, POD24 has been considered to be a strong prognostic indicator in various types of malignant lymphoma [11-13]. However, the prognostic significance of POD24 in DLBCL is unclear; thus, we analyzed early disease progression, especially POD24, in a retrospective cohort. This retrospective study

Table 2: Univariate and multivariate prognostic analysis of OS in All patients and the POD24 group.

All patients.

	Hazard ratio (CI)	p value	Hazard ratio (CI)	p value
Age (≥60 vs <60)	2.274(1.675-3.087)	<0.001*	1.636(1.175-2.278)	0.004*
Gender (male vs female)	1.224(0.919-1.630)	0.166	-	-
Stage (III-IV vs I-II)	2.264(1.639-3.128)	<0.001*	1.995(1.381-2.882)	<0.001*
LDH (abnormal vs normal)	1.305(0.983-1.734)	0.066*	1.146(0.826-1.591)	0.415
ECOG (>1 vs 0-1)	1.448(1.214-1.726)	<0.001*	1.105(0.906-1.348)	0.324
B symptoms (present vs absent)	1.235(0.922-1.654)	0.157	-	-
Extranodal sites (>1 vs 0-1)	1.856(1.396-2.468)	<0.001*	1.230(0.871-1.737)	0.239
Cell of origin (non-GCB vs GCB)	1.054(0.881-1.262)	0.564	-	-
HBsAg status (positive vs negative)	1.648(1.139-2.385)	0.008*	1.154(0.767-1.737)	0.492
POD24 (with or without)	7.397(5.403-10.125)	<0.001*	6.500(4.590-9.205)	<0.001*

POD24.

	Univariate		Multivariate	
	Hazard ratio (CI)	p value	Hazard ratio (CI)	p value
Age (≥60 vs <60)	1.569(1.084-2.272)	0.017*	1.280(0.869-1.886)	0.212
Gender (male vs female)	1.205(0.853-1.702)	0.289	-	-
Stage (III-IV vs I-II)	2.857(1.930-4.229)	<0.001*	2.056(1.323-3.195)	0.001*
LDH (abnormal vs normal)	1.524(1.081-2.148)	0.016*	1.248(0.832-1.871)	0.284
ECOG (>1 vs 0-1)	1.454(1.190-1.775)	<0.001*	1.187(0.952-1.478)	0.127
B symptoms (present vs absent)	1.275(0.906-1.793)	0.163	-	-
Extranodal sites (>1 vs 0-1)	1.895(1.353-2.654)	<0.001*	1.332(0.886-2.002)	0.168
Cell of origin (non-GCB vs GCB)	1.071(0.860-1.332)	0.541	-	-
HBsAg status (positive vs negative)	1.035(0.672-1.596)	0.875	-	-

showed the clinical significance of assessing POD24 in patients with DLBCL and the poor prognosis in patients with early disease progression, including primary refractory disease.

Our study included 476 patients and 188 patients in the POD24 group. Patients with POD24 had a poor prognosis, and the 5-year OS rate for patients with POD24 was 22.6% compared with 82.5% for patients without POD24, which was consistent with the clinical results [15,16]. However, there were no significant differences between the POD24 group and the non-POD24 group in sex, Ann Arbor stage, LDH level, cell-of-origin subtype, HBsAg status or other clinical characteristics. Additionally, for patients with POD24, in a multivariate analysis, only stage III-IV vs. I-II was determined to be an independent predictor.

We also compared POD24 outcomes in patients with CR, non-CR, low stage, and high stage. In the CR and non-CR groups, not all patients with CR had a good prognosis; in contrast, the non-POD24 group in CR had a poor prognosis compared to the POD24 group. Similarly, not all non-CR patients had a poor prognosis, and patients in the non-POD24 group of non-CR patients had a better prognosis. The results were similar in high-stage and low-stage patients and patients in the non-POD24 group of high-stage patients had a better prognosis, and the prognosis was poor in the POD24 group in low-stage patients. Therefore, the OS of the POD24 group was significantly lower than that of the non-POD24 group.

We evaluated several prognostic factors in all patients that might affect survival. In the univariate analyses, we found that age, stage, LDH, ECOG (>1 vs. 0-1), extranodal sites (p<0.001), HBsAg status, and POD24 (with or without) were independent prognostic factors for OS, and only stage was identified as an independent predictor in multivariate analysis. For patients with POD24, in univariate analyses, age, stage, LDH, ECOG, and extranodal sites significantly affected OS. In a multivariate analysis, only stage III-IV vs. I-II was determined to be an independent predictor.

Early assessment of the prognosis of patients with DLBCL is crucial [22]. Although our study has some limitations. This study is a retrospective study with inherent limitations. The study did not include other molecular indicators [23], which are also important prognostic factors [24]. However, our data provide useful information regarding early disease progression, especially POD24, in actual clinical practice.

In conclusion, in this retrospective study, the clinical significance of evaluating POD24 in patients with DLBCL and the poor prognosis of patients with early disease progression were confirmed in clinical practice. However, the clinical characteristics between the POD24 group and non-POD24 group were not significantly different. Our data have important implications for the management of patients with DLBCL and for a better understanding of the disease.

Author Contributions

Tongyu Lin, Mengdi Wan, Huangming Hong, Xiaoqian Li contributed to the conception of the study and wrote the manuscript.

He Huang, Xiaojie Fang, Yungchang Chen, Wei Zhang contributed significantly to analysis and manuscript preparation.

Ying Tian, Yuyi Yao, Fei Pan, Huawei Weng, Zegeng Chen performed the data analyses and wrote the manuscript.

Le Yu, Yuanyuan Shen, Xudong Li helped perform the analysis with constructive discussions.

Authors may have contributed in multiple roles.

Data-Sharing Statement

The data set used and/or analyzed during the current study is available from the corresponding author on reasonable request.

Ethical Approval

The study was approved by the ethics committee of Sun Yat-sen University Cancer Center, and a waiver of consent was allowed by the ethics committee because there were no conflicts of interest or risk to patients. Confidentiality of patient data was guaranteed according to the requirements of the ethics committee.

Disclosure

The authors declare that there are no conflicts of interest.

References

1. Li S, Young KH, Medeiros LJ. Diffuse large B-cell lymphoma. Pathology. 2018; 50: 74-87.
2. Wright GW, Wilson WH, Staudt LM. Genetics of Diffuse Large B-Cell Lymphoma. The New England journal of medicine. 2018; 379: 493-494.
3. Chapuy B, Stewart C, Dunford AJ, Kim J, Kamburov A, Redd RA, et al. Molecular subtypes of diffuse large B cell lymphoma are associated with distinct pathogenic mechanisms and outcomes. Nature Medicine. 2018; 24: 679-690.
4. Morton LM, Wang SS, Devesa SS, Hartge P, Weisenburger DD, Linet MS. Lymphoma incidence patterns by WHO subtype in the United States, 1992-2001. Blood. 2006; 107:265-276.
5. Tilly H, Vitolo U, Walewski J, Silva MGD, Shpilberg O, André M, et al. Diffuse large B-cell lymphoma (DLBCL): ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Annals of oncology : official journal of the European Society for Medical Oncology. 2012; 23: vii78-vii82.
6. Coiffier B, Lepage E, Briere J, Herbrecht R, Tilly H, Bouabdallah R, et al. CHOP chemotherapy plus rituximab compared with CHOP alone in elderly patients with diffuse large-B-cell lymphoma. The New England journal of medicine. 2002; 346: 235-242.
7. Habermann TM, Weller EA, Morrison VA, Gascoyne RD, Cassileth PA, Cohn JB, et al. Rituximab-CHOP versus CHOP alone or with maintenance rituximab in older patients with diffuse large B-cell lymphoma. Journal of clinical oncology: official journal of the American Society of Clinical Oncology. 2006; 24: 3121-3127.
8. Pfreundschuh M, Trümper L, Osterborg A, Pettengell R, Trneny M, Imrie K, et al. CHOP-like chemotherapy plus rituximab versus CHOP-like chemotherapy alone in young patients with good-prognosis diffuse large-B-cell lymphoma: a randomised controlled trial by the MabThera International Trial (MInT) Group. The Lancet. Oncology. 2006; 7: 379-391.
9. Coiffier B, Thieblemont C, Neste EVD, Lepeu G, Plantier I, Castaigne S, et al. Long-term outcome of patients in the LNH-98.5 trial, the first randomized study comparing rituximab-CHOP to standard CHOP chemotherapy in DLBCL patients: a study by the Groupe d'Etudes des Lymphomes de l'Adulte. Blood. 2010; 116: 2040-2045.
10. Larouche J, Berger F, Chassagne-Clément C, Ffrench M, Callet-Bauchu E, Sebban C, et al. Lymphoma recurrence 5 years or later following diffuse large B-cell lymphoma: clinical characteristics and outcome. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2010; 28: 2094-2100.
11. Casulo C, Byrtek M, Dawson KL, Zhou X, Farber CM, Flowers CR, et al. Early Relapse of Follicular Lymphoma After Rituximab Plus Cyclophosphamide, Doxorubicin, Vincristine, and Prednisone Defines Patients at High Risk for Death: An Analysis From the National LymphoCare Study. Journal of clinical oncology: official journal of the American Society of Clinical Oncology. 2015; 33: 2516-2522.
12. Maurer MJ, Ghesquières H, Jais J, Witzig TE, Haioun C, Thompson CA, et al. Event-free survival at 24 months is a robust end point for disease-related outcome in diffuse large B-cell lymphoma treated with immunochemotherapy. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2014; 32: 1066-1073.
13. Yamaguchi, M., et al., Early disease progression in patients with localized natural killer/T-cell lymphoma treated with concurrent chemoradiotherapy. Cancer science. 2018; 109: 2056-2062.
14. Sortais, C., et al., Progression of disease within 2 years (POD24) is a clinically relevant endpoint to identify high-risk follicular lymphoma patients in real life. Ann Hematol, 2020; 99: 1595-1604.
15. Casulo C, Dixon JG, Le-Rademacher J, Hoster E, Hochster H, Hiddemann W, et al. Validation of POD24 As a Robust Early Clinical Endpoint of Poor Survival in FL from 5,225 Patients on 13 Clinical Trials. Blood. 2021; 139: 1684-1693.
16. Lyu R, Yan YT, Yi SH, Wang TY, Deng SH, Liu W, et al. [The prognostic significance of POD24 in 106 cases with splenic marginal lymphoma with bone marrow invasion]. Zhonghua xue ye xue za zhi = Zhonghua xueyexue zazhi. 2020; 41: 228-233.
17. Maurer MJ, Ghesquières H, Jais J, Witzig TE, Haioun C, Thompson CA, et al. Event-free survival at 24 months is a robust end point for disease-related outcome in diffuse large B-cell lymphoma treated with immunochemotherapy. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2014; 32: 1066-1073.
18. Wang Y, Farooq U, Link BK, Larson MC, King RL, Maurer MJ, et al. Late Relapses in Patients With Diffuse Large B-Cell Lymphoma Treated With Immunochemotherapy. Journal of clinical oncology: official journal of the American Society of Clinical Oncology. 2019; 37: 1819-1827.
19. Crump M, Kuruvilla J, Couban S, MacDonald DA, Kukreti V, Kouroukis CT, et al. Randomized comparison of gemcitabine, dexamethasone, and cisplatin versus dexamethasone, cytarabine, and cisplatin chemotherapy before autologous stem-cell transplantation for relapsed and refractory aggressive lymphomas: NCIC-CTG LY.12. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2014; 32: 3490-3496.
20. Gisselbrecht C, Glass B, Mounier N, Gill DS, Linch DC, Trneny M, et al. Salvage regimens with autologous transplantation for relapsed large B-cell lymphoma in the rituximab era. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2010; 28: 4184-4190.
21. Neste EVD, Schmitz N, Mounier N, Gill D, Linch D, Trneny M, et al. Outcome of patients with relapsed diffuse large B-cell lymphoma who fail second-line salvage regimens in the International CORAL study. Bone Marrow Transplantation. 2016; 51: 51-57.
22. Lin J, Zheng Y, He H, Wang J, Yang Y, Chen D, et al. [Clinicopathological Features and Prognostic Factors of DLBCL]. Zhongguo shi yan xue ye xue za zhi. 2018; 26: 779-783.
23. Chapuy B, Stewart C, Dunford AJ, Kim J, Kamburov A, Redd RA, et al. Author Correction: Molecular subtypes of diffuse large B cell lymphoma are associated with distinct pathogenic mechanisms and outcomes. Nature Medicine. 2018; 24: 1290-1291.
24. Kang HJ, Lee HH, Jung S, Park K, O J, Jeon Y, et al. Pattern of failure and optimal treatment strategy for primary gastric diffuse large B-cell lymphoma treated with R-CHOP chemotherapy. PLoS ONE. 2020; 15: e0238807.