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CORRELATION ANALYSIS OF THE SERUM LDH, β2-MG, IL-2R AND IL-10 LEVELS IN LYMPHOMA PATIENTS

ANALIZA KORELACIJE NIVOA SERUMSKOG LDH, β2-MG, IL-2R I IL-10 KOD PACIJENATA SA LIMFOMOM

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Summary

Background: To investigate the variations and clinical relevance of blood levels of β2-microglobulin (β2-MG), interleukin (IL)-2R, IL-10, and lactate dehydrogenase (LDH) in patients with lymphoma who have various circumstances.
Methods: A total of 200 lymphoma patients diagnosed in this hospital from 2021 to 2025 were selected as the lymphoma group. Serum samples and data on age, sex, lymphoma tissue type, immunological type, clinical stage, bone marrow infiltration, and Epstein–Barr virus (EBV) infection were collected. During the same period, serum samples and data from 80 healthy individuals who underwent physical examinations (the control group) were collected. The levels of serum LDH, β2-MG, IL-2R and IL-10. Changes in the levels of each index in lymphoma tissue, tissue immunological type, clinical stage, bone marrow infiltration, and Epstein-Barr virus (EBV) infection and after effective treatment were analysed.
Results: The lymphoma group had greater levels of serum LDH, β2-MG, IL-2R, and IL-10 than the control group ($P<0.05$). Serum LDH, β2-MG, and IL-2R levels were higher in EBV+ patients than in EBV- patients ($P<0.05$). Patients with clinical stage III–IV disease and bone marrow infiltration had higher serum levels of LDH, β2-MG, and IL-2R as the disease progressed compared to those with clinical stage I–II disease without bone marrow infiltration

Kratak sadržaj

Uvod: Cilj je bio da se ispitaju varijacije i klinički značaj nivoa β2-mikroglobulina (β2-MG), interleukina (IL)-2R, IL-10 i laktat dehidrogenaze (LDH) u krvi pacijenata sa limfomom u različitim okolnostima.
Metode: U istraživanje je uključeno ukupno 200 pacijenata sa limfomom dijagnostikovanim u ovoj bolnici u periodu od 2021. do 2025. godine, koji su činili grupu sa limfomom. Prikupljeni su uzorci seruma i podaci o starosti, polu, tipu limfnog tkiva, imunološkom tipu, kliničkom stadijumu, infiltraciji koštane srži i infekciji »Epstein-Barr« virusom (EBV). Tokom istog perioda prikupljeni su i uzorci seruma i podaci od 80 zdravih osoba koje su obavile sistematski pregled (kontrolna grupa). Analizirani su nivoi serumsk LDH, β2-MG, IL-2R i IL-10. Zabeležene su promene nivoa svakog parametra u odnosu na tip limfnog tkiva, imunološki tip, klinički stadijum, infiltraciju koštane srži, infekciju EBV virusom i nakon efikasnog lečenja su i analizirane.
Rezultati: Grupa sa limfomom je imala značajno više nivoe serumskog LDH, β2-MG, IL-2R i IL-10 u poređenju sa kontrolnom grupom ($P<0,05$). Nivoi serumskog LDH, β2-MG i IL-2R su bili viši kod EBV+ pacijenata nego kod EBV- pacijenata ($P<0,05$). Pacijenti u kliničkom stadijumu III–IV i sa infiltracijom koštane srži su imali više serumske nivoe LDH, β2-MG i IL-2R u poređenju sa pacijentima u stadijumu I–II bez infiltracije koštane srži ($P<0,05$). Nakon lečenja, paci-

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(P<0.05). Patients with lymphoma had lower serum levels of β2-MG, IL-2R, IL-10, and LDH after treatment than they had before.

Conclusions: Monitoring changes in serum levels of LDH, β2-MG, IL-2R, and IL-10 has important clinical value for the auxiliary diagnosis of lymphoma patients, EBV infection, clinical staging, therapeutic effects, and prognostic evaluation.

Keywords: lymphoma, lactate dehydrogenase, β2-microglobulin, interleukin-2R, interleukin-10

jenti sa limfomom su imali niže serumske nivoe β2-MG, IL-2R, IL-10 i LDH nego pre terapije.

Zaključak: Praćenje promena nivoa serumske LDH, β2-MG, IL-2R i IL-10 ima značajnu kliničku vrednost u pomoćnoj dijagnostici pacijenata sa limfomom, praćenju infekcije EBV virusom, određivanju kliničkog stadijuma, proceni terapijskog efekta, kao i po pitanju prognoze bolesti.

Ključne reči: limfom, laktat dehidrogenaza, β2-mikroglobulin, interleukin-2R, interleukin-10

Introduction

Lymphoma originates in lymph nodes or other lymphoid tissues, and its incidence is increasing (1). It is a malignant tumour that poses a serious threat to human health. Hodgkin's lymphoma (HL), T-cell non-Hodgkin's lymphoma (T-NHL), and B-cell non-Hodgkin's lymphoma (B-NHL) are the three different forms of lymphoma (2). Studies (3–5) have shown that when the latent membrane protein nuclear antigen 1 and the encoded small RNA protein of Epstein–Barr virus (EBV) are activated, they affect the prognosis of lymphoma patients and are intimately linked to the onset and progression of the disease. With increasing research in recent years, a growing number of serum markers have been identified as closely associated with tumour onset, and some, with high sensitivity and specificity, are crucial for clinical diagnosis, therapeutic effects, and prognostic evaluation (6–8). The importance of β2-microglobulin (β2-MG) and lactate dehydrogenase (LDH) in the diagnosis of lymphoma has received increasing attention. Previous studies (9–11) have shown that cytokines are involved in cell signalling, inflammation, and immune regulation. Among these factors, abnormal expression of interleukin-2 receptor (IL-2R) is associated with the development and progression of lymphoma.

Lymphoma is a highly heterogeneous hematopoietic malignancy, and its occurrence and development are closely related to tumour burden, metabolic status, and the imbalance of the immune microenvironment (12). β2-microglobulin (β2-MG), interleukin-2 receptor (IL-2R), serum lactate dehydrogenase (LDH), and interleukin-10 (IL-10) all reflect tumour cell destruction and glycolytic activity, tumour burden and cell turnover, T-cell/tumour microenvironment activation, and an improvement in the immunosuppressive axis. As a convenient, minimally invasive and repeatable biomarker, it has been used for clinical risk stratification and efficacy monitoring (13). However, most existing studies focus on a single indicator or specific subtype (14). There is still insufficient evidence regarding the intrinsic correlation among the above four indicators and their integration with clinical stage, IPI score, treatment response and prognosis, which limits their combined application in precise assessment. This research is expected to reveal changes in biomarker coupling across multiple pathways and dimensions, to construct a serological prognostic model with greater explanatory power and operational utility, to promote the early identification of high-risk populations, and to provide a basis for individualised treatment strategies (15). However, there is a lack of unified standards for detection platforms and thresholds. β2-MG is affected by renal function; LDH is easily disturbed by hemolysis and tissue damage; and infection or concomitant inflammation can increase IL-2R and IL-10 levels. Different subtypes of lymphoma and treatment modalities (Immunochemotherapy, targeted therapy and cell therapy) can alter the profile of indicators (16–18).

Therefore, as EBV is a malignant tumour of the human immune system, the relationships between the levels of serum markers LDH, β2-MG, IL-2R, and IL-10 and the occurrence and development of EBV-infector-related lymphoma, as well as its tissue immunological types, are worthy of investigation.

Materials and Methods

General information

Two hundred lymphoma patients, including 128 males and 72 females, diagnosed at our hospital between 2021 and 2025, were included in the lymphoma group. A total of 12 HL patients were classified into the HL group. There were 52 T-NHL patients in the T-NHL group and 136 B-NHL patients in the B-NHL group. There were 60 patients in clinical stages I–II and 140 patients in clinical stages III–IV. A total of 35 EBV-infected patients were categorised as EBV+. One hundred forty patients with EBV infection were classified into the EBV+ group, and 60 patients without EBV infection were classified into the EBV- group. There were 136 patients with bone marrow infiltration and 64 without.

Eighty healthy individuals, including 48 males and 32 females, underwent physical examinations. Age: 32 to 70 years. The age and sex differences between the lymphoma and control groups were similar and did not reach statistical significance (P>0.05).

Each participant provided informed consent, and the Medical Ethics Committee at our hospital approved the study [No. HKYS-2025-A0210].

Inclusion criteria for lymphoma

(1) Confirmed by pathological tissue or cytology; (2) The patient's age was 18 years; (3) Other malignant tumours, hemolysis, severe damage to heart, liver and kidney functions, liver cirrhosis, and immune diseases were excluded.

Instruments and reagents

(1) The determination of lactate dehydrogenase (LDH) was carried out using the LDH kit (catalogue number: KLDH-100) from Thermo Fisher Scientific, USA.

(2) The determination of β2-microglobulin (β 2-mg) was carried out using the β2-mg detection reagent from Roche, Switzerland (catalogue number: 11573408122).

(3) The detection of interleukin-2 receptor (IL-2R) was carried out using the IL-2R ELISA kit from BioLegend Company of the United States (Item No.: 430501).

(4) The determination of interleukin-10 (IL-10) also utilized the IL-10 ELISA kit (catalogue No. : DY217-05) from R&D Systems of the United States.

(5) All the instruments and equipment are calibrated and verified as standard laboratory equipment, including microplate readers (model: Multiskan Go, Thermo Fisher Scientific) and centrifuges (model: Eppendorf 5415 R, Eppendorf AG), to ensure the reliability of data during the experiment.

Detection methods

All subjects had 5 mL of peripheral venous blood collected on an empty stomach in the early morning. The coagulation tubes were left at room temperature for 30 minutes to coagulate. Then, the serum was separated by centrifugation at 3000 r/min for 10 minutes and tested immediately. Those that cannot be tested on the same day should be aliquoted and stored in a dark place at -80 °C. Freezing and thawing should not be repeated. Samples with hemolysis, chylous disease or severe jaundice should be excluded. LDH was determined by the rate method (lactate-pyruvate, NADH consumption) on a fully automatic biochemical analyser at 37 °C, expressed as U/L. β2-MG was measured by immunoturbidimetry on ×× immunoanalyser, expressed in mg/L. sIL-2R and IL-10 were measured in U/mL and pg/mL, respectively, by sandwich chemiluminescence or ELISA. Four/five-parameter standard curves were plotted using the matching standards. The testing personnel blinded the clinical data, released the results according to the Westgard rule, and participated in the inter-laboratory quality assessment to ensure the accuracy and comparability of the data.

Treatment plan

Patients with NHL received the CHOP regimen (intravenous injection of cyclophosphamide 750 mg/m^2 on day 1; intravenous injection of vincristine 1.4 mg/m^2 on day 1; intravenous infusion of doxorubicin 50 mg/m^2 on day 1); oral prednisone acetate 100 mg/m^2 was administered from day 1 to day 5, with 21 days as one cycle and a treatment interval of 3 weeks. HL patients received the ABVD regimen (intravenous injection of doxorubicin 25 mg/m^2 on days 1 and 15; intravenous injection of bleomycin at a dose of 10 mg/m^2, vincristine at a dose of 6 mg/m^2, and dacarbazine at a dose of 375 mg/m^2 (with a course interval of 2 weeks)) combined with radiotherapy. Changes in the patients' serum levels of LDH, β2-MG, IL-2R, and IL-10 were noted after two cycles.

Analysis of statistical methods

Data processing and analysis were conducted using SPSS 19.0. Normally distributed data are expressed as x±s. Analysis of variance was used for comparisons among several groups, and a t-test was used for comparisons between two groups. A P value below 0.05 was regarded as an indicator of statistical significance.

Results

Comparison of the serum LDH, β2-MG, IL-2R and IL-10 levels between the lymphoma group and the control group

The lymphoma group's serum had higher levels of LDH, β2-MG, IL-2R, and IL-10 than those in the control group (P<0.05) (*Table I*).

The levels of peripheral serum LDH, β2-microglobulin, IL-2R, and IL-10 in the two groups were compared. The results showed that the levels of the above four indicators in the lymphoma group were significantly higher than those in the control group,

Table I Comparison of serum LDH, b 2-MG, IL-2R, IL-10 levels between lymphoma group and control group ($\bar{x}$±s).

Group	n	LDH (IU/L)	β2-MG (ng/mL)	IL-2R (U/mL)	IL-10 (pg/mL)
Control group	40	175.00±18.26	1787.50±766.13	579.00±70.89	1.61±0.58
Lymphoma group	200	425.64±175.66	3356.04±836.04	3038.39±1101.37	75.62±10.36

Table II Comparison of serum LDH, β 2-MG, IL-2R, and IL-10 levels in lymphoma patients with different EBV states ($\bar{x}\pm s$).

Group	n	LDH (IU/L)	β2-MG (ng/mL)	IL-2R (U/mL)	IL-10 (pg/mL)
EBV+group	140	462.80±140.79	3823.25±674.39	3692.92±981.39	81.85±14.39
EBV-group	60	252.42±88.23	2586.35±578.09	2068.45±617.11	74.25±4.71

Table III Serum LDH, β 2-MG, IL-2R, and IL-10 levels in lymphoma patients of different tissue immunological types.

Group	n	LDH (IU/L)	β2-MG (ng/mL)	IL-2R (U/mL)	IL-10 (pg/mL)
control group	80	175.00±18.26	1787.50±766.13	579.00±70.89	1.61±0.58
T-NHL group	52	317.33±56.71	2927.67±497.88	2964.33±851.45	75.51±12.12
B-NHL group	136	379.60±107.83	3385.23±879.69	2562.31±1160.5	78.31±12.93
HL group	12	337.34±64.31	3571.31±841.26	2969.31±858.65	65.39±9.48

and the differences were statistically significant (all $P<0.05$). Among them, LDH and β-2 microglobulin showed a significant increase overall in the lymphoma group, suggesting enhanced tumour-related metabolic activity and increased tumour burden. IL-2r and IL-10 also increased simultaneously, reflecting changes in immune activation and regulation.

Comparison of serum LDH, β2-MG, IL-2R and IL-10 levels in lymphoma patients with different EBV states

Compared with those in the EBV-group, the levels of serum LDH, IL-2R and β2-MG in the EBV+ group were greater ($P<0.05$), but there was no statistically significant difference in the level of IL-10 ($P>0.05$).

In the stratified comparison by EBV infection status, the levels of serum LDH, β2-MG, and IL-2R in EBV-positive lymphoma patients were significantly higher than those in EBV-negative patients (all $P<0.05$). IL-10 showed a trend toward increased levels in the EBV-positive group, but the difference was not statistically significant compared with the negative group. The results suggest that EBV infection is closely associated with increased tumour metabolic activity and immune activation, reflecting a higher tumour burden and disease activity. Among them, LDH, β2-MG, and IL-2R have good discriminative value for distinguishing EBV states (*Table II*).

Comparison of serum LDH, β2-MG, IL-2R and IL-10 levels in patients with lymphoma of different tissue immunological types

Compared with those in the control group, the levels of serum LDH, β2-MG, IL-2R, and IL-10 in the T-NHL, B-NHL, and HL groups were higher ($P<0.05$). Serum LDH, β2-MG, IL-2R, and IL-10 levels, however, did not differ statistically significantly between the T-NHL, B-NHL, and HL groups ($P>0.05$).

Comparisons were made among lymphoma patients with different tissue immune types, and significant differences were found in serum LDH, β2-MG, IL-2R, and IL-10 levels (overall comparison, $P<0.05$). With increasing tumour biological invasiveness and tumour burden, LDH and β2-MG show an upward trend, and IL-2R also increases significantly, suggesting that immune activation and microenvironmental disorder are more pronounced. IL-10 also increased among different types, but the range of variation was relatively large. The four serological indicators can reflect the biological heterogeneity of different tissue immune types across both metabolic and immune dimensions. They can provide references for clinical subtype identification, risk stratification, and the evaluation of efficacy and prognosis (*Table III*).

Comparison of serum LDH, β2-MG, IL-2R and IL-10 levels in lymphoma patients with different clinical stages

Serum LDH, β2-MG, and IL-2R levels were higher ($P<0.05$) in patients with stages III–IV disease than in those with clinical stages I–II disease, but there was no statistically significant difference in the level of IL-10 ($P>0.05$), as shown in *Table IV*.

Stratified by clinical stage, serum LDH, β2-MG, and IL-2R levels increased stepwise with progression. The levels in stages III-IV were significantly higher than those in stages I-II, and the difference was sta-

Table IV Comparison of serum LDH, β 2-MG, IL-2R, IL-10 levels in lymphoma patients of different clinical stages ($\bar{x}\pm s$).

Item	n	LDH (IU/L)	β2-MG (ng/mL)	IL-2R (U/mL)	IL-10 (pg/mL)
I~IIperiod	60	230.62±74.97	2685.75±609.94	2199.16±653.65	69.02±9.03
III~IV period	140	454.95±103.1	3668.11±773.69	3721.16±955.06	81.50±12.95

Table V Comparison of serum LDH, b 2-MG, IL-2R, and IL-10 levels in lymphoma patients with different bone marrow infiltration conditions.

Item	n	LDH (IU/L)	β2-MG (ng/mL)	IL-2R (U/mL)	IL-10 (pg/mL)
No bone marrow infiltration	64	240.89±76.53	2685.75±609.94	2317.62±705.58	69.02±8.98
There is bone marrow infiltration	136	461.89±115.48	3725.58±756.85	3763.45±989.81	81.68±13.27

Table VI Changes in serum LDH, b 2-MG, IL-2R, and IL-10 levels before and after treatment in lymphoma patients.

Group	n	LDH (IU/L)		β2-MG (ng/mL)	
		Before treatment	After treatment	Before treatment	After treatment
Lymphoma group	200	390.85±108.91	199.12±71.19	3365.84±851.47	1821.37±395.42
EBV+group	140	462.80±140.79	206.00±38.16	3823.25±674.39	2356.32±893.69
EBV-group	60	252.42±88.23	160.23±26.22	2586.35±578.09	1810.00±456.53
group	n	IL-2R (U/mL)		L-10 (pg/mL)	
		Before treatment	after treatment	Before treatment	after treatment
Lymphoma group	200	3112.56±1127.09	825.5±130.21	77.33±13.08	25.37±11.76
EBV+group	140	3692.92±981.39	1677.56±526.36	81.85±14.39	34.12±14.56
EBV-group	60	2068.45±617.11	607.25±113.36	74.25±4.71	16.75±9.63

tistically significant ($P<0.05$). The continuous increase in LDH and β2-MG indicates increased tumour glycolytic metabolism and cellular burden, while the increase in IL-2R reflects enhanced immune activation and elevated disease activity. IL-10 also showed a high trend in the advanced population, suggesting changes in the immunomodulatory microenvironment.

Comparison of the serum LDH, β2-MG, IL-2R and IL-10 levels in lymphoma patients with different bone marrow infiltration conditions

Compared with those in patients without bone marrow infiltration, the levels of serum LDH, β2-MG and IL-2R in patients with bone marrow infiltration were significantly greater ($P<0.05$). However, *Table V* indicates that there was no statistically significant difference in IL-10 levels ($P>0.05$).

Serum markers in lymphoma patients were compared according to bone marrow infiltration. The results showed that the levels of LDH, β2-MG, and IL-2R in the bone marrow infiltration-positive group were significantly higher than those in the infiltration-negative group, and the difference was statistically significant ($P<0.05$), suggesting that tumour burden and systemic immune activation were aggravated with bone marrow involvement. In contrast, although IL-10 was generally higher in the control group than in the other groups, the difference in bone marrow infiltration stratification between the groups was not as significant as the former three. Further analysis indicated that in patients with bone marrow infiltration and clinical stage III-IV, the increases in LDH, β2-

MG, and IL-2R were more pronounced and consistent with disease progression.

Comparison of the serum LDH, β2-MG, IL-2R and IL-10 levels in lymphoma patients before and after treatment

Compared with those before treatment, the levels of serum LDH, β2-MG, IL-2R and IL-10 decreased after treatment ($P<0.05$), as shown in *Table VI*.

The levels of serum lactate dehydrogenase (LDH), β2-microglobulin (β2-MG), interleukin-2 receptor (IL-2R), and interleukin-10 (IL-10) in 200 lymphoma patients before and after treatment were compared and analysed. The results showed that, before treatment, the levels of serum LDH, β2-MG, IL-2R, and IL-10 in lymphoma patients were significantly higher than those in the healthy control group ($P<0.05$), indicating that these indicators are highly significant for the diagnosis and disease monitoring of lymphoma. After treatment, the levels of serum LDH, β2-MG, IL-2R, and IL-10 in patients decreased significantly, and the differences were significant compared with pre-treatment levels ($P<0.05$). This change reflects the treatment's effectiveness and indicates that the patient's condition has been controlled. In addition, reductions in serum LDH and β2-MG levels are closely associated with the clinical stage and the improvement of bone marrow infiltration, especially in patients with stage III–IV disease and bone marrow infiltration.

Discussion

Lymphoma is a malignant tumour that seriously endangers human health. It often manifests as painless, progressive enlargement of superficial lymph nodes or is accompanied by fever, weight loss, and hepatosplenomegaly (19). Research (20–22) has shown that the relatively high copy number of the EBV genome and persistent latent infection with EBV are both important factors in tumour development. People who previously suffered from infectious mononucleosis had a fourfold greater risk of developing HL than healthy people did. The titer of the EBV envelope antigen-antibody complex has increased. Monoclonal EBV appendages have been confirmed to exist in lymphoma cells (23). Clonal-free EBV is present in most lymphoma cells (24). At present, laboratory tests of patients with EBV-associated lymphoma have revealed elevated serum C-reactive protein levels and decreased white blood cell, platelet, and haemoglobin levels, among other findings, but the results lack specificity. With increasing research, specific indicators with high sensitivity and specificity are crucial for the diagnosis, therapeutic effectiveness and prognostic assessment of diseases (25).

LDH is a glycolytic enzyme that plays a significant role in anaerobic glycolysis and gluconeogenesis. Some studies (26–28) suggest that elevated LDH levels in patients with malignant tumours result from a higher glycolysis rate in tumour cells compared with healthy individuals, and that this can alter the activities of various enzymes. The activity of LDH, an important enzyme in glycolysis, also increases (29). Owing to the accelerated metabolism of malignant tumour cells and changes in cell membrane permeability, enzymes from cancer tissues are released into the bloodstream. This disrupts the normal balance of enzymes in the blood, leading to an increase in the patient's serum LDH level. The serum LDH level in patients with clinical stage III-IV disease was greater than that in patients with stage I-II disease ($P<0.05$), and the serum LDH level in patients with bone marrow infiltration was greater than that in patients without bone marrow infiltration (30). These findings may be related to the active enzymatic systems of lymphoma cells, especially EBV, which affect the metabolic system and increase LDH activity. However, the specific mechanism remains unclear. As the disease progresses, lymphoma cells proliferate and infiltrate in large numbers, affecting the metabolism of other normal tissues and causing tissue cell lysis and destruction (31). When effective treatment is carried out, many lymphoma cells are killed, and enzyme activity decreases, indicating that the condition is stable.

Therefore, the serum LDH level in lymphoma patients is associated with lymphoma burden, stage, bone marrow infiltration, and Epstein–Barr virus (EBV) infection, and is also an important indicator for assessing therapeutic response and prognosis. Still, it cannot reflect the immunological type of the lymphoma tissue. Studies have shown that LDH levels correlate with tumour malignancy; the greater the malignancy, the higher the LDH level. LDH levels are related to tumour stage. The later the stage is, the higher the serum LDH level. LDH levels are associated with extranodal metastasis. The serum LDH level is elevated in patients with liver, spleen and bone marrow invasion. LDH levels are associated with tumour burden in NHL.

β2-MG is produced mainly by lymphocytes and is part of the complete histocompatibility antigen on the cell membrane. It can pass through the glomerular filtration membrane and be reabsorbed by the proximal convoluted tubules. Recent studies have shown that both tumour cells and lymphocytes can produce large amounts of β2-MG, and that phytohemagglutinin can accelerate this synthesis. The reason for this finding is that β2-MG is a soluble component of the nucleated cell membrane, and lymphoma cells themselves can synthesise and secrete large amounts of β2-MG. However, the specific mechanism is not yet apparent and may be related to increased cell turnover and EBV infection (32).

Cytokines, including ILs, interferons, tumour necrosis factors, and various hematopoietic cytokines,

are produced by tumour cells and surrounding immune cells. They play a significant role in regulating key immune pathways. In various haematological malignancies, including lymphoma, cytokine expression is dysregulated, leading to a continuous inflammatory environment that affects the survival and proliferation of tumour and stromal cells. Studies have shown that elevated levels of some cytokines can serve as markers of aggressive lymphoma.

IL-2R is an immunosuppressant. Studies (33–35) have shown that in diseases associated with immune dysfunction, such as malignant tumours, IL-2R can persist in cells or be expressed in a disordered manner and may play an essential role in the malignant tumour environment. IL-10 exerts a potent immunosuppressive effect by inhibiting the secretion of proinflammatory cytokines, and it can also exert an immunostimulatory effect by inducing B cell proliferation and differentiation.

Conclusion

A tumour may contain multiple tumour markers. Selecting specific tumour markers or the optimal combination for detection facilitates early screening for malignant tumours, disease monitoring, and assessment of tumour treatment efficacy, recurrence, metastasis, and prognosis. However, LDH, β2-MG, and IL-2R all reflect tumour burden, stage, bone marrow infiltration, EBV infection severity, and therapeutic prognosis. IL-2R and IL-10 reflect the status of immune function. Therefore, monitoring changes in serum LDH, β2-MG, and IL-2R levels has significant clinical value for the auxiliary diagnosis, clinical staging, assessment of therapeutic effect and prognosis, and assessment of EBV infection in lymphoma patients.

Conflict of interest statement

All the authors declare that they have no conflict of interest in this work.

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