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Original Article

Prognostic value of PD-1, PD-L1 and P53 in patients with non-small cell lung cancer after postoperative adjuvant chemoradiotherapy

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Abstract: Objective: To explore the value of programmed cell death protein 1 (PD-1), programmed cell death ligand 1 (PD-L1) and protein 53 (P53) in estimating the prognosis of patients with non-small cell lung cancer (NSCLC) after postoperative adjuvant chemoradiotherapy. Methods: The clinical data of 100 patients with NSCLC who were treated with adjuvant chemoradiotherapy after pulmonary lobectomy in our hospital were retrospectively analyzed. The expression levels of PD-1, PD-L1 and P53 in tumor tissues were detected by immumohistochemical staining. The efficacy of chemoradiotherapy and survival time between patients with positive and negative expression of PD-1, PD-L1 and P53 were compared respectively to evaluate the correlation of PD-1, PD-L1 and P53 with chemoradiotherapy results in NSCLC. General data of patients were analyzed by single factor analysis. Multivariate logistic regression analysis was used to identify independent risk factors impacting the prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy. Results: A significantly lower chemoradiotherapy effective rate and a remarkably shorter survival time were found in NSCLC patients with positive expression levels of PD-1, PD-L1 and P53 in tumor tissues as compared with those of negative results (all $P<0.05$). Single factor analysis revealed that gender, age, history of smoking, histological type, degree of differentiation, T stage, lymph node metastasis, expression levels of PD-1, PD-L1 and P53 showed significant correlations with the prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy (all $P<0.05$). High T stage (odds ratio (OR)=7.269), history of smoking (OR=5.128), lymph node metastasis (OR=4.647), PD-1 (+) (OR=7.556), PD-L1 (+) (OR=6.674), P53 (+) (OR=9.070), PD-1 (+) PD-L1 (+) (OR=6.095), PD-1 (+) P53 (+) (OR=6.752), PD-L1 (+) P53 (+) (OR=7.363), and PD-1 (+) PD-L1 (+) P53 (+) (OR=8.524) were determined by multiple logistic regression analysis to be independent risk factors influencing the effect of postoperative adjuvant chemoradiotherapy in NSCLC patients. Conclusion: There are numerous risk factors affecting the effect of postoperative adjuvant chemoradiotherapy in NSCLC patients, of which NSCLC patients with positive expression of PD-1, PD-L1 and P53 had a worse prognosis than those with negative results. PD-1, PD-L1 and P53 can serve as effective prognostic indicators for NSCLC after chemoradiotherapy. In clinical practice, monitoring these three indicators contributes to the adjustment of therapeutic regimen and gives some guidance.

Keywords: Programmed cell death protein 1, programmed cell death ligand 1, protein 53, non-small cell lung cancer, chemoradiotherapy

Introduction

Non-small cell lung cancer (NSCLC) is a pulmonary malignant tumor originated from the bronchial mucosa, bronchial glands and alveolar epithelium, which is common in the department of thoracic surgery, and accounts for 85% of all lung cancers with a predilection for males [1]. The incidence of NSCLC involves a long-term interaction among personal factors, environmental factors and genes. Personal factors include age, heredity, immunity, nutrition, etc. Environmental factors cover smoking, career, environmental pollution, and others. The above factors facilitate the formation of carcinogens in the body, inducing gene mutation like protein 53 (P53) and further promoting the occurrence of NSCLC [2]. Early NSCLC shows no clas-

sical symptoms. With the progression of disease, patients may experience cough, bloody sputum or hemoptysis, dyspnea, and body weight loss and also may be accompanied by chest pain, hoarseness, and pleural effusion, which seriously threaten patients' life safety and quality of life. Resection has been a conventional therapy for early lung cancer, with a postoperative five-year survival rate up to 40%. Most NSCLC patients are in the middle or advanced stage or metastasis stage when they seek medical treatment consciously, thus losing the best opportunity for surgery. Furthermore, the five-year survival rate after mere surgical treatment is less than 20% [3]. Therefore, adjuvant chemoradiotherapy after surgical treatment for NSCLC patients has been proposed clinically to improve therapeutic effect and lengthen survival time [4]. However, the five-year survival rate after postoperative adjuvant chemoradiotherapy for NSCLC patients has only increased by approximately 2.2% in recent 4 decades and has not remarkably elevated in the last 10 years. Some study has described that postoperative adjuvant chemoradiotherapy has no significant effect in some NSCLC patients, indicating that the effect of postoperative adjuvant chemoradiotherapy in NSCLC patients varies greatly. Some scholars have speculated that the effect difference has a relation to patients' personal factors and environmental factors, and some have speculated a close relation to tumor heterogeneity [5].

With progression on research, reasons for poor prognosis of NSCLC patients after postoperative adjuvant chemoradiotherapy have been proposed to mostly include tumor recurrence and distant metastasis, and tumor immune escape is the key mechanism. Programmed cell death protein 1 (PD-1) and its ligand (PD-L1) pathway as one of the important immune regulatory mechanisms in the body may have a relation to the prognosis of NSCLC patients after postoperative adjuvant chemoradiotherapy, suggesting that improving the prognosis by inhibiting PD-1 expression level in the body is clinically feasible [6]. With the development of the Human Genome Project, some scholars have indicated that P53 gene mutation is closely related to the occurrence, development, metastasis, chemoradiotherapy effect and prognosis of NSCLC, demonstrating that the prognosis can be predicted by measuring the level of P53 gene in patients' body in clinical practice [7]. Currently, few clinical studies about the correlation between the expression levels of PD-1, PD-L1 and P53 and the prognosis of NSCLC patients after postoperative chemoradiotherapy have been reported. Therefore, the study innovatively selected these three genetic serological indicators (PD-1, PD-L1 and P53) and analyzed their correlation with the prognosis of NSCLC patients after postoperative adjuvant chemoradiotherapy, which not only realized the convenient and efficient detection but also provided new ideas for clinical prognosis estimation.

Materials and methods

General data

The study was reviewed and approved by the Ethics Committee of Yidu Central Hospital of Weifang. All patients and their families agreed to participate in the study and signed the informed consent. The study retrospectively analyzed the data of 100 NSCLC patients who were treated with postoperative adjuvant chemoradiotherapy in Yidu Central Hospital of Weifang.

Inclusion criteria: The patients who met the diagnostic criteria for NSCLC of World Health Organization in 1999 [8]; the patients with indications for surgery and postoperative adjuvant chemoradiotherapy; the patients who received surgical treatment and postoperative chemoradiotherapy in our hospital [9]; the patients with a pathological stage of I-IIIA; the patients with an age of 20-65 years old; the patients with no history of anti-tumor therapy; the patient with an expected survival time of 3 months or more; the patients without liver and kidney impairment; the patients without previous treatment related to locally advanced NSCLC; and the patient with complete clinicopathologic data.

Exclusion criteria: The patients who were diagnosed with locally advanced NSCLC; the patients with malignant tumors in other sites; the patients with allergy to chemotherapy drugs or radioactive therapy used in this study; the patients with acute or chronic infection, bleeding tendency, mental disorder, or severe cardio-

vascular and cerebrovascular diseases; the patients with central squamous cell carcinoma with cavitation.

Therapeutic regimen and data collection

Therapeutic regimen: All patients in the study were treated with chemoradiotherapy after pulmonary lobectomy.

Specific procedures were as follows. Firstly, all patients were examined by CT (Neusoft Medical System Co., Ltd., China) to determine the tumor site and excision approach, and the target region for chemoradiotherapy was delineated in the planning system. Secondly, X-ray of intensity modulated radiation therapy (Beijing Wandong Medical Technology Co., Ltd., China) was set with the energy of 6 MV and a dose of 50-60 Gy for 5-6 weeks of radiotherapy. Then pemetrexed (0.2 g, H20060672, Qilu Pharmaceutical Co., Ltd., China) of 500 mg/m^2/d and cisplatin (10 mg, H37021356, Qilu Pharmaceutical Co., Ltd., China) of 75 mg/m^2/d were administrated for chemotherapy, with 3 weeks for a cycle, for 6 cycles. The injection speed of pemetrexed should not exceed 500 mg/m^2h, and cisplatin should be given about 30 min after the end of pemetrexed administration on the first day of each cycle.

Follow-up: Patients in the study were followed up for 5-year survival by telephone and clinical reexamination at the 1st, 3rd, 6th, 9th and 12th months of each year.

Data collection: Face to face interview of patients' basic state of nature, past medical history, life history and specialized information was performed by uniformly trained investigators with a self-design questionnaire, specifically including age, gender, waist circumference, body mass index, educational background, history of smoking, drinking, hypertension and diabetes, histological type, degree of differentiation, T stage, lymph node metastasis, PD-1, PD-L1, and P53 [10].

Cancer tissues (4 μm) were prepared from the paraffin-embedded tissue specimens in the pathology department. The expression levels of PD-1, PD-L1 and P53 in the specimens were detected by inmmunohistochemical streptavidin-peroxidase (S-P) method (Abcam, USA) according to the instruction. The detection results were evaluated by 2 professional pathologists. The criteria of PD-1 and PD-L1 expression levels were as follows: the staining intensity was scored as 0 for no color, 1 for faint yellow, 2 for pale brown, and 3 for brown [11]. Percentage of positive cells (%) refers to the average proportion of positive cells in tumor-infiltrating lymphocytes (TILs) or tumor cells in 5 visual fields. The staining intensity of TILs greater than 2 scores or more than 5% tumor cells was considered as positive PD-1 and PD-L1 expression. The criteria of P53 expression: no staining particles in the cell nucleus indicates a negative expression, and diffuse pale brown particles in the cell nucleus indicate a positive expression [12].

Outcome measures and evaluation criteria

Main outcome measures: The effect of PD-1, PD-L1 and P53 expression levels on efficacy of chemoradiotherapy and survival time was analyzed. The predictive value of PD-1, PD-L1 and P53 expression levels for chemoradiotherapy efficacy was analyzed by receiver operating characteristic (ROC) curves. Clinical data of patients were collected for single factor analysis, and independent prognostic factors were observed. Three-month after the treatment, clinical efficacy was evaluated according to the solid tumor volume established by World Health Organization [13]. Complete remission (CR) refers to the complete disappearance of target lesions for more than 4 weeks. Partial remission (PR) refers to a reduction of the sum of the maximum diameters of the limit lesions by >30% and lasted for more than 4 weeks. Stable disease (SD) refers to a reduction of the sum of the maximum diameter of the baseline lesions by <30%. Progression of disease (PD) refers to an increase of the sum of the maximum diameter of the baseline lesions by more than 20% or the appearance of new lesions. The effective rate was counted as CR + PR, while ineffective rate was counted as and SD + PD. The survival time was from the beginning of chemotherapy after the diagnosis of lung cancer to death [14].

Secondary outcome measures: Patients were divided into favorable prognosis group (CR + PR) and unfavorable prognosis group (SD + PD) based on the clinical efficacy of neoadjuvant

Table 1. General data of patients ($\bar{x}$ ± sd, n/%)

Item	Details
Gender (n)	
Male	68
Female	32
Average age (years)	56.4±10.2
Average waist circumference (cm)	92.12±5.34
Average BMI (kg/m^2)	23.87±2.37
Educational background (n)	
Primary school or below	30
Junior middle school	49
Senior middle school or above	21
History of smoking (n)	
Yes	70
No	30
History of drinking (n)	
Yes	54
No	46
History of hypertension (n)	
Yes	49
No	51
History of diabetes (n)	
Yes	45
No	55
Histological type (n)	
Squamous carcinoma	44
Adenocarcinoma	56
Degree of differentiation (n)	
Low	30
Middle	39
High	31
T stage (n)	
<T2	44
≥T2	56
Lymph node metastasis (n)	
Yes	41
No	59
PD-1 (n)	
+	38
-	62
PD-L1 (n)	
+	52
-	48
P53 (n)	
+	60
-	40

Note: BMI: body mass index; PD-1: programmed cell death protein 1; PD-L1: programmed cell death ligand 1; P53: protein 53; +: positive; -: negative.

chemotherapy to observe the association of expression levels of PD-1, PD-L1 and P53 with patients' prognosis outcome.

Statistical analysis

All statistical data were analyzed using the SPSS 21.0 professional statistical software. The measurement data that conformed to a normal distribution were described as mean ± standard deviation ($\bar{x}$ ± sd) and analyzed by an independent-samples t test. The enumeration data were expressed as number of patients/percentage (n/%) and analyzed by chi-square test. Single factor analysis and multivariate logistic regression analysis were used to identify the independent risk factors for the prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy. ROC curves were plotted to determine the predictive value of PD-1, PD-L1 and P53 expression levels for the chemoradiotherapy efficacy of NSCLC patients. $P<0.05$ denoted a statistically significant difference.

Results

General data

General data of 100 NSCLC patients are shown in **Table 1**, including gender, average age, average waist circumference, average body mass index, educational background, and history of diseases.

Effect of PD-1, PD-L1 and P53 expression levels on chemoradiotherapy efficacy of NSCLC patients

NSCLC patients with positive PD-1 (+), PD-L1 (+) and P53 (+) expression in tumor tissues had a significantly lower effective rate after chemoradiotherapy and a significantly shorter survival time compared with those with negative PD-1 (-), PD-L1 (-) and P53 (-) expression (all $P<0.05$, **Figures 1**-**3**).

Predictive value of PD-1, PD-L1 and P53 expression levels for chemoradiotherapy results of NSCLC patients

Analysis through ROC curves found that the area under the curve was 0.640 for PD-1, 0.680 for PD-L1, 0.660 for P53, and 0.730 for

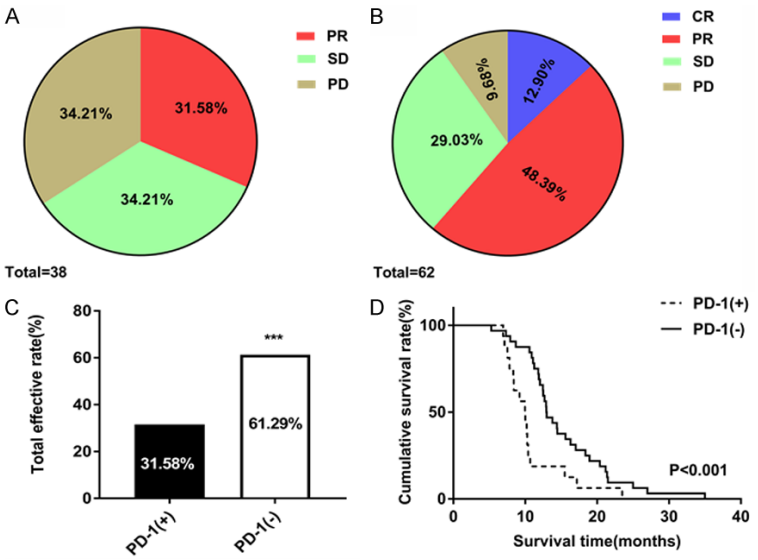

Figure 1. Effect of PD-1 expression on chemoradiotherapy efficacy. A: Effective rate of chemoradiotherapy of patients with PD-1 (+); B: Effective rate of chemoradiotherapy of patients with PD-1 (-); C: Effective rate of chemoradiotherapy of patients with PD-1 (+) or PD-1 (-); D: Survival time of patients with PD-1 (+) or PD-1 (-). Compared with PD-1 (+), ***P<0.001. CR: complete remission; PR: partial remission; SD: stable disease; PD: progression of disease; PD-1 (+): positive PD-1 expression; PD-1 (-): negative PD-1 expression.

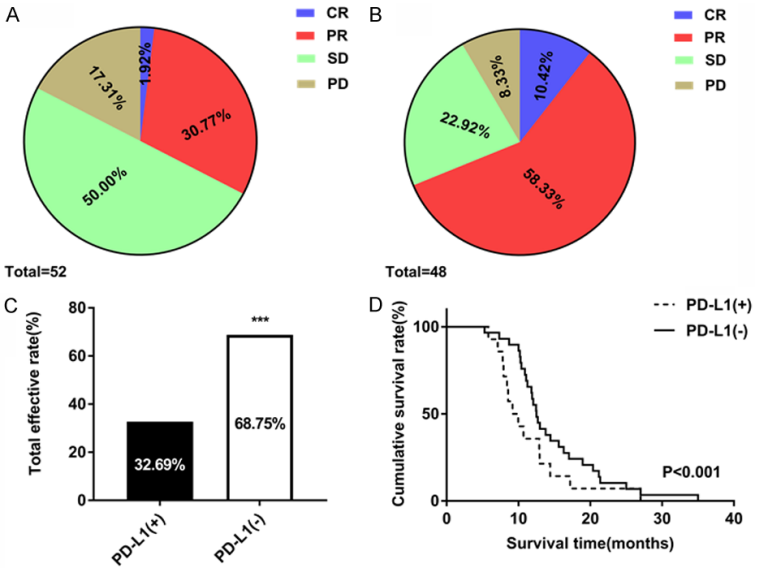

Figure 2. Effect of PD-L1 expression on chemoradiotherapy efficacy. A: Effective rate of chemoradiotherapy of patients with PD-L1 (+); B: Effective rate of chemoradiotherapy of patients with PD-L1 (-); C: Effective rate of chemoradiotherapy of patients with PD-L1 (+) or PD-L1 (-); D: Survival time of patients with PD-L1 (+) or PD-L1 (-). Compared with PD-L1 (+), ***P<0.001. CR: complete remission; PR: partial remission; SD: stable disease; PD: progression of disease; PD-L1 (+): positive PD-L1 expression; PD-L1 (-): negative PD-L1 expression.

the combination of PD-1, PD-L1 and P53 (all P<0.05, **Figure 4**).

Single factor analysis of prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy

Single factor analysis proved significant correlations of gender, age, smoking history, histological type, degree of differentiation, T stage, lymph node metastasis, and expression levels of PD-1, PD-L1 and P53 with the prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy (all P<0.05, **Table 2**).

Multiple logistic regression analysis of prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy

Multiple logistic regression analysis showed that high T stage (odds ratio (OR)=7.269), history of smoking (OR=5.128), lymph node metastasis (OR=4.647), PD-1 (+) (OR=7.556), PD-L1 (+) (OR=6.674), P53 (+) (OR=9.070), PD-1 (+) PD-L1 (+) (OR=6.095), PD-1 (+) P53 (+) (OR=6.752), PD-L1 (+) P53 (+) (OR=7.363), and PD-1 (+) PD-L1 (+) P53 (+) (OR=8.524) were independent risk factors impacting the results of postoperative adjuvant chemoradiotherapy for NSCLC patients (all P<0.05, **Table 3**).

Discussion

By 2013, the incidence and mortality rate of lung cancer in China ranked first among malignant tumors, and 85% of lung cancers were NSCLC [15]. Postoperative adjuvant chemoradiotherapy has become the conventional treatment for NSCLC. However, the efficacy of chemoradiotherapy is affected by many factors, of which high T stage, lymph node metastasis and history of smoking have

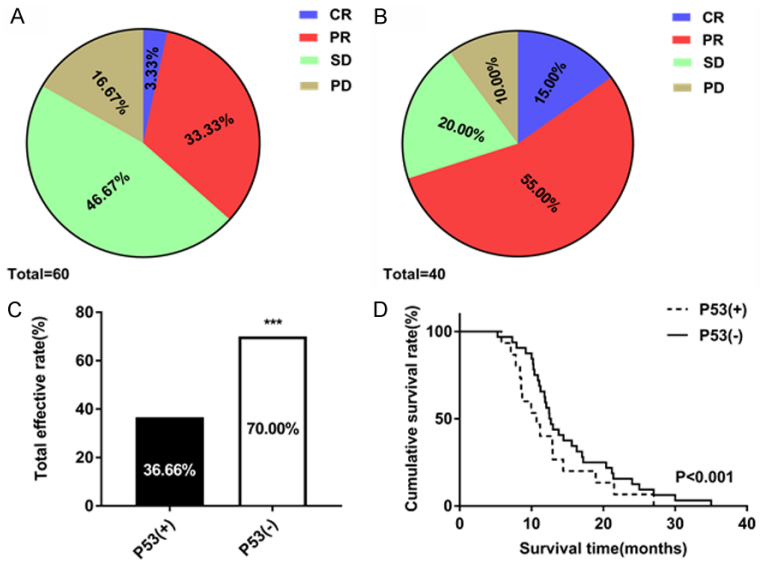

Figure 3. Effect of P53 expression level on chemoradiotherapy results. A: Effective rate of chemoradiotherapy of patients with P53 (+); B: Effective rate of chemoradiotherapy of patients with P53 (-); C: Effective rate of chemoradiotherapy of patients with P53 (+) or P53 (-); D: Survival time of patients with P53 (+) or P53 (-). Compared with P53 (+), ***P<0.001. CR: complete remission; PR: partial remission; SD: stable disease; PD: progression of disease; P53 (+): positive P53 expression; P53 (-): negative P53 expression.

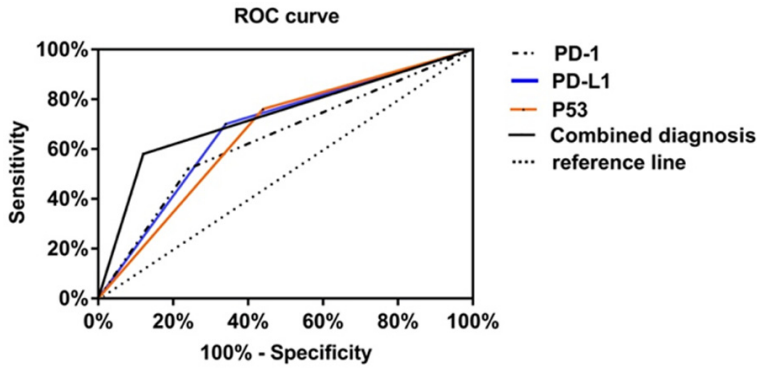

Figure 4. Predictive value of PD-1, PD-L1 and P53 expression for chemoradiotherapy efficacy of NSCLC patients. PD-1: programmed cell death protein 1; PD-L1: programmed cell death ligand 1; P53: protein 53; NSCLC: non-small cell lung cancer; ROC: receiver operating characteristic; combined diagnosis: combined diagnosis of PD-1, PD-L1 and P53.

been recognized [16-18]. Some scholars proposed that gene mutation and tumor immune escape involving factors like PD-1 and PDL1 could influence the effect of postoperative chemoradiotherapy for NSCLC and had an obvious correlation with the prognosis of patients [19, 20]. Therefore, analysis of factors influencing the prognosis of NSCLC patients in clinical practice was of great significance for prediction of postoperative chemotherapy effect.

In this study, general data of NSCLC patients with postoperative adjuvant chemoradiotherapy were analyzed, such as basic state of nature and past medical history, to investigate the risk factors affecting the prognosis. Gender, age, smoking history, histological type, degree of differentiation, T stage, and lymph node metastasis were demonstrated to have significant correlations with the prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy, which was consistent with the results obtained by Check et al. [21]. It further confirmed that gender, age, smoking history, T stage, and other conventional risk factors were correlated with the prognosis of NSCLC, suggesting that close attention should be paid to patients with the above high-risk factors. Reasons were that NSCLC mainly occurred in elderly males, and the majority of NSCLC patients had a history of smoking and a high T stage, inducing poor therapeutic effect. PD-1 (+) and PD-L1 (+) were found to be independent risk factors affecting the efficacy of postoperative adjuvant chemoradiotherapy for NSCLC patients, indicating that the prognosis could be evaluated by clinically detecting the expression levels of PD-1 and PD-L1 in tumor tissues of NSCLC patients. The mechanisms were as follows. The PD-1/PD-L1 pathway was the main pathway of immune escape. PD-1 and PD-L1 were important factors in body immunoregulation and expressed in activated B cells, T cells and natural killer cells (NK cells). They functioned as recognizing antigen and regulating the role of immune cells in peripheral tissues. PD-L1, the ligand of PD-1, plays a negative regulation effect in immune response. NSCLC cells could up-regulate the

Table 2. Single factor analysis of risk factors for prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy

Factors	Favorable prognosis group (n=50)	Unfavorable prognosis group (n=50)	χ^2	P
Age (years)			19.869	0.000
>20 and ≤55	32	10		
>55 and ≤65	18	40		
Gender (n)			36.029	0.000
Male	20	48		
Female	30	2		
Waist circumference (n)			0.040	0.841
<92 cm	26	25		
≥92 cm	24	25		
BMI			0.360	0.548
<24 kg/m^2	27	24		
≥24 kg/m^2	23	26		
Educational background (n)			0.201	0.904
Primary school or below	14	16		
Junior middle school	25	24		
Senior middle school or above	11	10		
History of smoking (n)			37.333	0.000
Yes	21	49		
No	29	1		
History of drinking (n)			1.449	0.229
Yes	24	30		
No	26	20		
History of hypertension (n)			0.360	0.548
Yes	23	26		
No	27	24		
History of diabetes (n)			1.980	0.159
Yes	24	21		
No	26	29		
Histological type (n)			52.597	0.000
Squamous carcinoma	40	4		
Adenocarcinoma	10	46		
Degree of differentiation (n)			57.155	0.000
Low	0	30		
Middle	20	19		
High	30	1		
T stage (n)			52.597	0.000
<T2	40	4		
≥T2	10	46		
Lymph node metastasis (n)			56.594	0.000
Yes	2	39		
No	48	11		
PD-1 (n)			8.319	0.004
+	12	26		
-	38	24		
PD-L1 (n)			12.981	0.000
+	17	35		
-	33	15		

P53 (n)			10.667	0.001
+	22	38		
-	28	12		
PD-1 (+) PD-L1 (+) (n)			5.319	0.021
Yes	12	23		
No	38	27		
PD-1 (+) P53 (+) (n)			4.596	0.032
Yes	11	21		
No	39	29		
PD-L1 (+) P53 (+) (n)			10.176	0.001
Yes	9	24		
No	41	26		
PD-1 (+) PD-L1 (+) P53 (+) (n)			6.453	0.011
Yes	7	18		
No	43	32		

Note: NSCLC: non-small cell lung cancer; BMI: body mass index; PD-1: programmed cell death protein 1; PD-L1: programmed cell death ligand 1; P53: protein 53; +: positive; -: negative.

Table 3. Multivariate logistic regression analysis of independent risk factors for prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy

Factors	β	SE	Wald χ^2	P	OR	95% CI
PD-1 expression (positive vs. negative)	0.365	0.741	4.981	0.000	7.556	7.657-9.964
PD-L1 expression (positive vs. negative)	0.291	0.638	3.371	0.000	6.674	3.763-7.221
P53 expression (positive vs. negative)	0.546	0.264	6.288	0.000	9.070	8.916-9.665
T stage (<T2 vs. ≥T2)	0.564	0.584	4.241	0.000	7.269	6.287-9.653
History of smoking (yes vs. no)	0.431	0.471	5.601	0.003	5.128	4.366-6.447
Lymph node metastasis (yes vs. no)	0.752	0.523	3.635	0.018	4.647	3.687-7.850
PD-1 (+) PD-L1 (+) (yes vs. no)	0.379	0.458	4.722	0.000	6.095	43.793-8.424
PD-1 (+) P53 (+) (yes vs. no)	0.544	0.682	5.206	0.000	6.752	3.842-8.361
PD-L1 (+) P53 (+) (yes vs. no)	0.428	0.582	5.774	0.000	7.363	5.625-9.825
PD-1 (+) PD-L1 (+) P53 (+) (yes vs. no)	0.582	0.492	4.902	0.000	8.524	7.319-10.533

Note: NSCLC: non-small cell lung cancer; SE: standard error; OR: odds ratio; CI: confidence interval; PD-1: programmed cell death protein 1; PD-L1: programmed cell death ligand 1; P53: protein 53; +: positive.

expression level of PD-L1, which increase the probability of binding to PD-1 on TIL surface and inhibit the killing effect of TILs on tumor cells, causing tumor immune escape and impacting chemoradiotherapy effect [22, 23]. P53 (+) was proved to be an independent risk factor affecting the results of postoperative adjuvant chemoradiotherapy for NSCLC patients, manifesting that the prognosis could be evaluated by clinically detecting P53 expression level in tumor tissues of NSCLC patients. The reason lays in the primary function of P53, which is the earliest discovered tumor suppressor protein coded by P53 gene, in regulating cell cycle and inhibition process of cell carcinogenesis. When P53 gene mutation and allelic loss occurred, the expression level of P53 protein might be abnormal, which not only resulted in the loss of function of tumor suppressor gene originally possessed, but also had the oncogenic function to promote malignant transformation of cells, leading to the occurrence and development of lung cancer, especially NSCLC [24, 25]. Moreover, PD-1 (+) PD-L1 (+), PD-1 (+) P53 (+), PD-L1 (+) P53 (+), and PD-1 (+) PD-L1 (+) P53 (+) were identified as independent risk factors impacting the results of postoperative adjuvant chemoradiotherapy for NSCLC patients. Therefore, it proved that the expression levels of PD-1, PD-L1 and P53 in

tumor tissues were closely related to the prognosis of NSCLC patients with postoperative chemoradiotherapy. The study results also demonstrated that NSCLC patients with positive PD-1, PD-L1 and P53 expression levels showed a significantly lower effective rate of chemoradiotherapy and a shorter survival time compared with those with negative expression. It further confirmed a significantly negative correlation of PD-1, PD-L1 and P53 with chemoradiotherapy efficacy and survival time. A further analysis through ROC curves showed that PD-1, PD-L1 and P53 all can serve as potential indicators of efficacy evaluation of adjuvant postoperative chemotherapy, and the combination of the three indicators had the highest predictive value for efficacy.

The innovation of this study laid in the selection of serological indicators for the predictive indicators of prognosis of NSCLC patients with postoperative adjuvant chemoradiotherapy, which further popularized the application of serological indicators. In addition, the study focused on analyzing three serological indicators in genetics, PD-1, PD-L1 and P53 and broke the application limitation of serological indicators, bringing good prospects. The shortcoming was that the sample size was small, which might cause some errors. The results need to be further investigated by enlarging the sample size.

In conclusion, risk factors that affect the effect of postoperative adjuvant chemoradiotherapy in NSCLC patients are numerous, of which NSCLC patients with positive PD-1, PD-L1 and P53 expression had a worse prognosis than those with negative expression. PD-1, PD-L1 and P53 can serve as effective indicators for predicting the effect of postoperative chemoradiotherapy for NSCLC. In clinical practice, monitoring these three indicators contributes to the adjustment of therapeutic regimen and gives some guidance.

Disclosure of conflict of interest

None.

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