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Comparison of 3D intensity-modulated radiation therapy and 3D conformal radiation therapy concurrently combined with chemotherapy for stage III non-small cell lung cancer.

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Abstract

Objective: To compare and analyse the effect of 3D intensity-modulated radiation therapy and 3D conformal radiation therapy concurrently combined with chemotherapy for stage III (staging of tumor node metastasis) non-small cell lung cancer.

Methods: A total of 100 patients with stage III non-small cell lung cancer who were treated in our hospital from May 2015 to July 2016 were selected as the objects and randomly divided into observation group and control group with 50 cases in each group. The control groups were treated with conformal radiotherapy combined with chemotherapy while the observation groups were given 3D conformal radiation therapy concurrently combined with chemotherapy. Adverse reactions, content of tumor markers and clinical effect were compared between the two groups.

Results: After treatment, the total effective rate of the observation group (62%) was obviously higher than that of the control group (48%) of statistical significance, P<0.05. And the adverse reactions in the observation group were less than those in the control group (P<0.05). The contents of Cyfra21-1, SCC and TSGF decreased in both two groups but the contents in the observation group were significantly lower than those in the control group of statistical significance (P<0.05).

Conclusion: Three dimensional intensity-modulated radiation therapy combined with chemotherapy has a good therapeutic effect. It can lower adverse reactions and reduce serum tumor markers in the patients with very high value in clinical practices.

Keywords: Non-small cell lung cancer, Intensity-modulated radiotherapy, Radiotherapy combined with chemotherapy.

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Introduction

Non-small cell lung cancer is most common in lung cancer. It has increasingly higher incidence in recent years, especially among the youth [1,2]. The patients in stage III have missed the best time of surgical resection and they are mainly treated with chemotherapy and radiotherapy [3,4]. In this study we mainly explored clinical efficacy of three-dimensional intensity-modulated radiation therapy and three-dimensional conformal radiation therapy concurrently combined with chemotherapy for stage III (staging of tumor node metastasis) non-small cell lung cancer reported as follows.

Data and Methods

General data

A total of 100 patients with stage III non-small cell lung cancer who were treated in our hospital from May 2015 to July 2016 were selected as the objects and randomly divided into observation group and control group with 50 cases in each group. In the control group there were 27 males and 23 females aged 46-73 with the average age of (58.49 ± 3.82), 23 cases in stage IIIa and 22 cases in stage IIIb. In the observation group there were 26 males and 24 females aged 45-73 with the average age of (59.07 ± 3.08), 23 cases in stageIIIa and 22 cases in stageIIIb. There was no significant difference between the two groups in the basic data like gender, age and disease condition in the patients of comparability (P>0.05).

Methods

Pemetrexed and cisplatin chemotherapy were conducted in both two groups. Pemetrexed (Nanjing Xianshengdongyuan Pharmaceutical Co Ltd, Zhunzi H20090135) was intravenously injected for treatment at the dosage of 500 mg/m^2 every 21 d. From the first to the third day, cisplatin (Yunnan Biological Valley Pharmaceutical, Limited by Share Ltd, Zhunzi

H20043888) was intravenously injected for the treatment at the dosage of 75 mg/m^2 for treatment. A course of treatment was set as 21 d with 3-4 courses included in chemotherapy.

In addition, the observation groups were treated by three-dimensional conformal radiotherapy combined with chemotherapy. The patients were given localization scan of CT with fixed position and the CT image was transferred to the TPS workstation. The oncologists marked Clinical Target Volume (CTV) and determined the Planning Target Volume (PTV) in the treatment. The dosage of 54 Gy/30 times was performed in PTV and 63 Gy/30 times in Tumor Target Volume (PGTV), 5 times per week for both; when the dosage of radiotherapy reached 2/3, CT examination was conducted and CT location was repeated followed by determination of planning target volume and dose when there was tumor regression.

The control group received three dimensional conformal radiotherapy combined with chemotherapy. The dosage of 60 Gy/30 times was performed in PTV, 5 times per week. When the dosage of radiotherapy reached 2/3, CT examination was conducted and when there was tumor regression CT location was repeated followed by determination of planning target volume and dose with reduced exposure of normal tissues.

Observation index

The adverse reactions and the content of tumor markers like serum cytokeratin 19 fragment antigen (CYFRA21-1), Squamous Cell Carcinoma antigen (SCC) as well as Tumor Specific Growth Factor (TSGF) were compared and the clinical therapeutic effects observed in the two groups. The evaluation standard of curative effect: the patient's disease completely disappeared with no new lesions found and the content of tumor markers was normal for more than 4 w, which was regarded as complete remission; the lesions of patient reduced more than 30% for over 4 w, partial remission; the lesions of patient reduced less than 20%, stable condition and there was the emergence of new lesions, progressive disease. The effective rate=(complete remission+partial remission)/total number of cases × 100% [5].

Statistical processing

Statistical software SPSS20.0 was used for statistical analysis. The measurement data were described as "$\bar{x} \pm s$" and checked by t-test. The count data were expressed as "%" and assessed by χ^2, P<0.05 suggested there was statistically significant difference.

Results

Comparison of treatment effect between the two groups

After treatment, the total effective rate of the observation group was 62%, higher than that of the control group- 48% (P<0.05), as shown in Table 1.

Table 1. *Comparison of clinical effect between the two groups (n, %).*

Group	Complete remission	Partial remission	Stable condition	Progressive disease	Effective rate (%)
Observation group (n=50)	9 (18.00)	22 (44.00)	13 (26.00)	6 (12.00)	62.00
Control group (n=50)	6 (12.00)	18 (36.00)	17 (34.00)	9 (18.00)	48.00
χ^2					7.523
p					< 0.05

Comparison of adverse reactions between the two groups

After treatment, the adverse reactions like gastrointestinal reaction, radiation pneumonitis and radiation esophagitis, thrombocytopenia and leukopenia were compared in the patients in stage III between the two groups and it turned out that the adverse reaction rate in the observation group was significantly lower than that in the control group of statistical value (P<0.05), shown in Table 2.

Table 2. *Comparison of adverse reactions between the two groups (n, %).*

Group	Radiation esophagitis	Radiation pneumonitis	Gastrointestinal reaction	Leukopenia	Thrombocytopenia
Observation group (n=50)	7 (14.0)	0 (0.00)	5 (10.00)	2 (4.00)	4 (8.00)
Control group (n=50)	21 (42.00)	7 (14.00)	19 (38.00)	13 (26.00)	15 (30.00)
χ^2	5.005	6.803	7.014	7.668	8.922
p	<0.05	<0.05	<0.05	<0.05	<0.05

Comparison of serum tumor markers content between the two groups

After treatment, the contents of Cyfra21-1, SCC and TSGF in both groups were all lower with the value of the observation group lower than that of the control group with significant difference of statistical significance(P<0.05),shown in Table 3.

Table 3. *Comparison of serum tumor markers content between the two groups.*

Group		Cyfra21-1/(μg/L)	SCC/(μg/L)	TSGF/(μg/L)
Observation group	Before treatment	341.15 ± 34.21	46.95 ± 5.61	242.89 ± 29.11
	After treatment	104.97 ± 12.46	18.97 ± 2.46	80.97 ± 9.46
Control group	Before treatment	341.27 ± 35.18	47.87 ± 5.18	243.27 ± 2.18
	After	179.52 ± 23.23	25.52 ± 3.43	124.52 ± 15.63
t (before treatment in the two groups		0.341	0.262	0.017
P		>0.05	>0.05	>0.05
t (after treatment in the two groups)		6.703	6.942	7.033
P		<0.05	<0.05	<0.05

Discussion

Non-Small Cell Lung Cancer (NSCLC) is the most common lung cancer with moderately high mortality rate. In recent years, its incidence has continued to rise under the influence of factors like environment and heredity, especially among the young [6-8]. For patients with non-small cell lung cancer in stage III, surgical resection is difficult to take effect while chemotherapy alone has limited efficacy with moderately low survival rate in the patients [9-11]. In clinical practices, the patients with stage III NSCLC were mainly treated by three-dimensional conformal radiotherapy and three-dimensional intensity-modulated radiotherapy, which, with precise positioning of radiotherapy target, enable to avoid the damage to surrounding normal tissue while increasing the target dose and thus maximize local control rate [12].

Radiotherapy and chemotherapy can inhibit the proliferation and development of tumor cells. The cancer-killing effect is associated with radiation dose and the increased dose will raise the killing rate but the blind increase of dose will also give rise to more corresponding side effects, making the patients unbearable and affecting the effect of chemotherapy [13,14]. Pemetrexed combined with cisplatin can effectively kill cancer cells in radiotherapy and increase the survival rate of patients [15]. Seen from the study, the total effective rate was 48% in the control group in which the patients were treated by three-dimensional conformal radiotherapy combined with chemotherapy and 62% in the observation group in which the patients were treated by three dimensional intensity-modulated radiation therapy combined with chemotherapy with the value of former significantly lower than that of the latter. After treatment, the adverse reactions like gastrointestinal reaction, radiation pneumonitis and radiation esophagitis, thrombocytopenia and leukopenia were compared in the patients in stage III between the two groups and it turned out that the adverse reaction rate in the observation group was significantly lower than that in the control group. Besides the contents of Cyfra21-1, SCC and TSGF in both groups were all lower but with the value of the observation group lower than that of the control group. Three-dimensional intensity modulated radiotherapy enables to accurately focus the radiation dosage on lesions, increase local radiation dose, maximally kill tumor cells, improve the treatment effect, reduce the damage to surrounding tissue and decrease the probability of side effects as well as adverse reactions.

To sum up, in treatment of the patients with non-small cell lung cancer in TNM stage III, the three-dimensional intensity modulated radiotherapy combined with chemotherapy has a better effect by reducing adverse reactions and effectively controlling the content of serum tumor markers of high value in clinical application.

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