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The Effect of COVID-19 on the Cancer Patients Treated with Radiotherapy in Low Risk Area: A Single-Center Descriptive

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Abstract

Objective: To investigate the influence of the new coronavirus epidemic on tumor radiotherapy patients in Zigong City, and provide radiotherapy feasibility and safety in other prefecture-level or low-risk areas. **Methods:** Retrospective Collection of data from January 31, 2020, in our hospital, this time period is an epidemic group. The control group was data from January 31, 2019-May 31, in our hospital. Patient data includes gender, age, tumor type, hospitalization fee, average hospitalization day, radiotherapy completion, treatment destination, and other information. **Results:** The patients with epidemic groups and control groups were 320 and 237, respectively, and the radiotherapy patients increased by 25.9%, increasing patients mainly from other departures outside the tumor department underperformance reform intervention. The epidemic group of brain and breast tumor patients were 39 and 37, respectively, with statistical differences ($P < 0.05$) compared to the control group (25 and 16 respectively). The number of tumor radiotherapy patients in other parts increased, but there was no statistical difference ($P > 0.05$). Inpatient costs, the average hospitalization day, radiotherapy completion, the purpose of treatment, and other data epidemic groups and control groups have no statistical difference ($P > 0.05$). **Conclusion**: The number of COVID-2019 epidemic interventions has increased the number of cancer radiotherapy patients in our hospital, and the epidemic situation has no effect on hospitalization, the average hospitalization day, radiotherapy, and the like. Optimizing the process of clinical treatment, strict prevention and control measures can ensure timely and safe radiotherapy in low-risk areas.

Keywords

COVID-2019, Radiotherapy, Prevention and Control, Low-Risk Areas,

Single Center

1. Introduction

At the beginning of 2020, a new type of coronavirus disease-2019 (COVID-19) spread rapidly in many provinces in China and even in many countries around the world [1]. COVID-19 poses a major threat to national health and the social economy [2]. Because of its strong infectiousness, the disease has been included in the Class B infectious disease stipulated by the Infectious Disease Prevention Law as an acute respiratory infectious disease and is managed as a Class A infectious disease. During the epidemic prevention and control period, personnel were controlled in real-time, and the hospital implemented closed management. Home isolation, traffic control, and other methods have changed residents' work, living habits, and behavior. Cancer patients are a special group of people with low immunity after receiving anti-tumor therapy. Therefore, during the epidemic period, the treatment and protection of tumor patients need to be closely monitored. Surgery, chemotherapy, and radiotherapy are the three main treatments for malignant tumors. Radiation therapy is an important method of treating malignant tumors. About 70% of tumor patients need radiation therapy at different stages of the disease course [3]. It is necessary to analyze the radiotherapy situation of tumor patients during the epidemic period. The severity of the epidemic situation and the number of cancer patients in different provinces are different, and the situation of diagnosis and treatment for cancer patients in different medical institutions are different. There are many relevant reports about the effect of cancer radiotherapy from different centers [4] [5] [6]. There is a lack of relevant reports on the radiotherapy of cancer patients in prefecture-level city hospitals in low-risk areas. Therefore, this paper studies the radiotherapy situation during the epidemic from January 31 to May 31, 2020, through a single-center, and compares it with the radiotherapy situation during the same period in 2019. To analyze the impact of COVID-19 on tumor radiotherapy patients, to provide a reference for tumor radiotherapy in prefecture-level cities in low-risk areas.

2. Materials and Methods

2.1. Patient Selection

The information on tumor radiotherapy patients from the hospital information system (HIS) in the oncology department of a tertiary hospital in Zigong City, Sichuan Province was derived as the research object. Zigong is a city with a population of about 3 million and about 80 - 100 patients received radiotherapy in our hospital using a Varian Trilogy clinical accelerator every day. Inclusion criteria: patients aged ≥ 18 years with tumor radiotherapy. All study subjects gave informed consent. The selected time period for the epidemic group was from

January 31 to May 31, 2020, and the time period for the control group was from January 31 to May 31, 2019. The inclusion data were approved by the hospital ethics committee.

2.2. Investigation Content

The survey included general information such as gender, age, tumor type, hospitalization cost, average length stay, completion of radiotherapy, and purpose of treatment of the radiotherapy patients in the epidemic group and the control group.

2.3. Statistical Analysis

Statistical analysis of the data was performed with SPSS 22.0 software. The data were expressed as x ± s, and count data were expressed as rate or percentage. Continuous variables with normal distribution were compared between two groups using an independent sample t-test. Mann-Whitney U test was used to compare two groups that did not conform to normal distribution. Pearson's Chi-square test or Fisher exact test was used to comparing categorical data, and results were expressed as numbers and percentages (%). $P < 0.05$ was considered statistically significant.

3. Results

3.1. Gender and Age

The total number of radiotherapy patients in the epidemic group was 320, including 198 males and 122 females. The total number of radiotherapy patients in the control group was 237, including 144 males and 93 females. Compared with the control group, the number of radiotherapy patients in the epidemic group increased by 25.9% year on year. There was no significant difference between the epidemic group and the control group ($P > 0.05$) (Table 1).

3.2. Cancer Type

Comparison of the number of patients undergoing radiotherapy at different sites (Table 2). The radiotherapy patients were divided into oncology department admission patients and from other departments other than the oncology department (such as nasopharyngeal carcinoma parents from department of otolaryngology, breast cancer parents from thyroid and breast surgery). The patient was consulted by an oncologist and was suitable for radiotherapy. It can be seen that compared with the control group, the total number of patients undergoing

Table 1. Gender and age comparison of tumor radiotherapy in different parts.

		Control group	Epidemic Group	P
Gender	Male	144 (60.8%)	198 (61.9%)	0.339
	Female	93 (39.2%)	122 (38.1%)	
Age	Mean ± SD	59.43 ± 11.18	60.00 ± 10.91	0.759

Table 2. Comparison of the number of people receiving radiotherapy for different parts of the tumor.

Tumor site	Control group			Epidemic Group			P1	P2	P3
	Department of Oncology	Other departments	Total	Department of Oncology	Other departments	Total			
Brain	20	5	25	20	19	39	0.868	0.001	0.023
Head & neck	28	10	38	29	19	48	0.853	0.008	0.549
Esophagus	23	26	49	18	41	59	0.749	0.011	0.488
Lung	21	13	34	19	24	43	0.765	0.012	0.368
Breast	9	7	16	7	30	37	0.735	0.001	0.011
Cervix	14	1	15	16	7	23	0.715	0.023	0.268
Rectum	3	2	5	9	6	15	0.432	0.034	0.214
Others	42	13	55	30	26	56	0.253	0.025	0.135

Note: P1, P2, and P3 represent the statistical results of the oncology department, other departments, and the total number of patients in the control group and the epidemic group, respectively.

radiotherapy for different parts of the tumor has increased. Among them, there was a statistically significant increase in the total number of patients undergoing radiotherapy for brain tumors and breast tumors ($P < 0.05$). In addition, compared with the control group, the number of patients from the oncology department decreased from 160 to 148, a decrease of 8.1%. The number of patients from other departments increased from 77 to 172, an increase of 55.2%. There was no statistical difference in the number of patients undergoing radiotherapy in each part of the oncology department ($P > 0.05$). There was a statistical difference in the number of patients undergoing radiotherapy in other departments ($P < 0.05$).

3.3. Hospitalization Costs

The hospitalization costs of brain tumors, head and neck tumors, cervical cancer, rectal cancer and other types of tumors increased, but the difference was not statistically significant ($P > 0.05$). The hospitalization costs of esophageal cancer, lung cancer and breast cancer decreased, but the difference was not statistically significant ($P > 0.05$) (Table 3).

3.4. Average Length of Stay

Brain tumor, head and neck tumor, lung cancer, breast cancer, cervical cancer, rectal cancer and other types of tumors increased hospitalization days, but the difference was not statistically significant ($P > 0.05$). The days of hospitalization for esophageal cancer decreased, and the difference was not statistically significant ($P > 0.05$) (Table 4).

3.5. Comparison of Radiotherapy Completion Status, Treatment Methods, and Radiotherapy Purposes

In the control group, 218 people completed radiotherapy (92%), 19 people did

Table 3. Comparison of hospitalization costs for different parts of the tumor.

Tumor site	Control group	Epidemic Group	P
Brain	41693.99 ± 26847.97	65570.65 ± 42803.40	0.065
Head & neck	52037.49 ± 26756.96	59495.40 ± 24509.63	0.369
Esophagus	55179.33 ± 21067.12	45382.96 ± 21477.03	0.193
Lung	57998.94 ± 18010.41	47736.40 ± 20447.85	0.115
Breast	47780.03 ± 9749.29	38464.69 ± 8569.22	0.075
Cervix	47301.15 ± 23568.90	58460.66 ± 15882.69	0.125
Rectum	37357.27 ± 19190.49	56012.12 ± 26647.86	0.235
Others	56877.11 ± 29119.89	57985.73 ± 37831.65	0.965

Table 4. Comparison of hospitalization days for tumors in different parts.

Tumor site	Control group	Epidemic Group	P
Brain	38.04 ± 27.00	48.59 ± 29.34	0.07
Head & neck	46 ± 21.13	54.23 ± 17.91	0.37
Esophagus	40.78 ± 17.74	38.69 ± 16.56	0.81
Lung	43.29 ± 21.47	43.53 ± 17.42	0.85
Breast	27.13 ± 19.72	41.35 ± 7.35	0.18
Cervix	44.87 ± 24.19	52.13 ± 14.44	0.43
Rectum	20.4 ± 16.39	52 ± 23.23	0.28
Others	45.73 ± 25.08	46.5 ± 17.18	0.87

not complete (8%). 288 people in the epidemic group completed radiotherapy (90%), 32 people did not complete (10%), there was no statistical difference between the control group and the epidemic group ($P > 0.05$). In the control group, 90 patients received radiotherapy alone (accounting for 38%), and 147 patients received a combination of radiotherapy and chemotherapy (accounting for 62%). In the epidemic group, 128 patients received radiotherapy alone (accounting for 40%), and 192 patients received a combination of radiotherapy and chemotherapy (accounting for 60%), there was no statistical difference between the control group and the epidemic group ($P > 0.05$). In the control group, 36 patients were treated for palliative radiation therapy (15.2%), and 201 patients were treated with non-palliative radiation therapy (84.8%). In the epidemic group, 54 patients were treated with palliative radiation therapy (16.9%), and 266 patients were treated with non-palliative radiation therapy (83.1%), there was no statistical difference between the control group and the epidemic group ($P > 0.05$) (Table 5).

4. Discussion

The 2020 COVID-19 epidemic has changed people's way of life and caused heavy losses to the global economy [7]. Especially in the first half year of the epidemic,

Table 5. Comparison of radiotherapy completion status, treatment mode, and radiotherapy objectives in patients with different tumor sites.

Project	Tumor site	Control group	Epidemic Group	P
Completion state	Complete	218 (92.0%)	288 (90.0%)	0.876
	Incomplete	19 (8.0%)	32 (10.0%)	
treatment methods	Radiotherapy only	90 (38.0%)	128 (40.0%)	0.435
	Chemoradiotherapy	147 (62.0%)	192 (60.0%)	
radiotherapy purposes	Palliative radiotherapy	36 (15.2%)	54 (16.9%)	0.882
	Nonpalliative radiotherapy	201 (84.8%)	266 (83.1%)	

there is a lack of sufficient experience in epidemic prevention and control. Therefore, this paper takes the situation of tumor radiotherapy patients in the first half of the epidemic as the research object, and takes the tumor radiotherapy situation in the first half year of 2019 as the control group to study the impact of the COVID-2019 epidemic on tumor radiotherapy patients in tertiary hospitals in prefecture-level cities in low-risk areas. Chinese scholars reported that cancer patients had a higher risk of serious events than non-cancer patients (39% vs. 8%, P = 0.000.3), and their symptoms worsened more rapidly [8]. During the COVID-19 pandemic, cancer patients are susceptible and have poor prognosis. During the epidemic, some tumor patients need to receive radiation therapy. At present, conventional fractionated radiotherapy is still the most commonly used treatment mode in clinical practice. However, based on the classic radiobiological theory, prolonging the time of radiotherapy will inevitably lead to a decrease in the effect of tumor radiotherapy and an increase in local recurrence, and even adversely affect the survival of patients [9]. During this epidemic, it is necessary to study the situation of tumor radiotherapy patients in depth to provide reference for other low-risk areas. Therefore, this paper makes statistics on the general data of radiotherapy patients during the epidemic, including gender, age, tumor type, hospitalization expenses, average hospitalization days, completion of radiotherapy, and treatment purposes, which are important for epidemic prevention and control, and timely radiotherapy for tumor patients.

Radiation therapy is one of the main treatments for malignant tumors. Cancer patients who do not receive timely and effective radiotherapy may increase tumor recurrence and mortality [10]. Due to the highly contagious nature of the COVID-19 outbreak, ensuring the safety of patients and medical staff during the outbreak and ensuring that cancer patients receive radiotherapy in a timely manner is a serious issue facing the radiation oncology community. It has been reported [6] [11] that the safety of the radiotherapy center and the smooth progress of the treatment can be effectively guaranteed by organizing personnel training, optimizing the treatment process of radiotherapy patients, and strengthening disinfection and other protective measures. He *et al.* [12] reported a comparison of the radiotherapy situation reported by provincial centers during

the epidemic period and the non-epidemic period of the previous year, and found that the number of people receiving radiotherapy during the epidemic decreased, and the epidemic affected other indicators such as average hospitalization days, hospitalization costs, treatment goals, and treatment completion, and they are not significant. Strengthening prevention and control measures and actively carrying out radiotherapy can ensure that cancer patients receive timely and safe treatment. As the designated hospital for the treatment of COVID-19 in Zigong City, our radiotherapy center has a special isolation ward in a specific hospital area. The research results show that: the total number of radiotherapy patients in the epidemic group was 320, and the total number of radiotherapy patients in the control group was 237. The number of radiotherapy patients during the epidemic increased by 25.9%. The reason is that due to the performance reform of our hospital during the 2020 epidemic, the performance of patients undergoing radiotherapy in other departments has been implemented with a double-count policy, the enthusiasm of medical staff underperformance intervention has increased [13], and the number of patients undergoing radiotherapy has increased, including brain tumors, head, and neck tumors, Esophageal, lung, breast, cervical, rectal, and other types of tumors. Among them, there was a statistically significant difference in the growth of brain tumors and breast cancer ($P < 0.05$), which may be due to the delay in surgical treatment during the epidemic, and some patients with brain tumors or breast cancer chose radiotherapy. There was no significant difference in the changes in hospitalization expenses and average hospitalization days ($P > 0.05$). The completion rate of radiotherapy in the control group was 90%, the completion rate in the epidemic group was 92%, and the completion rate in the epidemic group was slightly lower; the treatment method in the control group was only radiotherapy, accounting for 38%, and the epidemic group was 40%. The purpose of radiotherapy in the control group was palliative radiotherapy. The epidemic group accounted for 15.2% and the epidemic group accounted for 16.9%. The epidemic group both increased, but there was no significant difference ($P > 0.05$). Wang *et al.* [14] found that the number of radiotherapies and palliative care decreased by 58.3% and 100%, respectively. Xie *et al.* [15] suggested that traffic control limited the admission rate of cancer patients who needed palliative radiotherapy during the epidemic, and some tumor patients who needed palliative radiotherapy were afraid to go to the hospital or die at home because they thought the hospital was an infection center. The difference between the results of the increase in the proportion of palliative care in the epidemic group reported in this study and those reported in the literature [14] [15] maybe because this radiotherapy center is a prefecture-level city, and the scale of population flow and the number of hospital patients are not as good as those of provincial capitals or provincial centers. The hospitalization costs, average hospitalization days, completion status, and treatment goals of this study were basically consistent with those reported by He *et al.* [12]. The increase in the number of people undergoing radiotherapy during the epidemic is related to a series of prevention and control

policies in our hospital. First, an emergency infection prevention and control team was established and relevant prevention and control measures were formulated. All medical staff and patients must wear masks and undergo temperature monitoring. Inpatients must undergo nucleic acid testing. The registration areas and temperature measurement areas are set up at the entrance of the hospital, the entrance of the department, and the entrance of the radiotherapy room. Radiotherapy staff are required to receive regular epidemic training, strictly disinfect the radiotherapy area, patient waiting area, physical planning room, mold room, and so on, strengthen medical waste management inwards and other measures, and refer patients with epidemiological history to designated hospitals. A series of prevention and control measures can enable tumor patients to implement radiotherapy in a timely, effective and safe manner. Of course, this study is a single-center study in a tertiary-level hospital in a prefecture-level city in a low-risk area, with limited sample size. The next step is to conduct a larger multi-center controlled study.

5. Conclusion

To sum up, while strengthening epidemic prevention and control measures, actively carrying out tumor radiotherapy can ensure that patients with malignant tumors receive timely and safe treatment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] The Central People's Government of the People's Republic of China (2020) The World Health Organization Named the Novel Coronavirus Pneumonia as "COVID-19".

[2] Zhu, N., Zhang, D., Wang, W., *et al.* (2020) A Novel Coronavirus from Patients with Pneumonia in China, 2019. *The New England Journal of Medicine*, **382**, 727-733. https://doi.org/10.1056/NEJMoa2001017

[3] Barton, M.B., Frommer, M. and Shafiq, J. (2006) Role of Radiotherapy in Cancer Control in Low-Income and Middle-Income Countries. *The Lancet Oncology*, **7**, 584-595. https://doi.org/10.1016/S1470-2045(06)70759-8

[4] Ots, P., Ortuo, J.Z., Fernández, S.P., *et al.* (2021) Impact of Covid-19 on Patients in Radiotherapy Oncology Departaments in Spain. *Radiotherapy and Oncology*, **161**, 148-151. https://doi.org/10.1016/j.radonc.2021.06.001

[5] Dai, M., Liu, D., Liu, M., *et al.* (2020) Patients with Cancer Appear More Vulnerable to SARS-CoV-2: A Multicenter Study during the COVID-19 Outbreak. *Cancer Discovery*, **10**, 783-791. https://doi.org/10.1158/2159-8290.CD-20-0422

[6] Wei, W., Zheng, D., Lei, Y., *et al.* (2020) Radiotherapy Workflow and Protection Procedures during the Coronavirus Disease 2019 (COVID-19) Outbreak: Experience of the Hubei Cancer Hospital in Wuhan, China. *Radiotherapy and Oncology*, **148**, 203-210. https://doi.org/10.1016/j.radonc.2020.03.029

[7] Yin, C. (2020) Genotyping Coronavirus SARS-CoV-2: Methods and Implications.

Genomics, **112**, 3588-3596. https://doi.org/10.1016/j.ygeno.2020.04.016

[8] Liang, W., Guan, W., Chen, R., *et al.* (2020) Cancer Patients in SARS-CoV-2 Infection: A Nationwide Analysis in China. *The Lancet Oncology*, **21**, 335-337. https://doi.org/10.1016/S1470-2045(20)30096-6

[9] Halperin, E.C., Brady, L.W., Perez, C.A., *et al.* (2013) Perez and Brady's Principles and Practice of Radiation Oncology. 6th Edition, Lippincott Williams & Wilkins Press, Philadelphia.

[10] McMillan, M.T., Ojerholmm, E., Verma, V., *et al.* (2017) Radiation Treatment Time and Overall Survival in Locally Advanced Non-Small Cell Lung Cancer. *International Journal of Radiation Oncology, Biology, Physics*, **98**, 1142-1152. https://doi.org/10.1016/j.ijrobp.2017.04.004

[11] Li, D., Liu, R., Wei, S., *et al.* (2020) Infection Prevention and Control Measures during COVID-19 from Medical Physics Perspective: A Single Institution Experience from China. *Journal of Applied Clinical Medical Physics*, **21**, 221-222. https://doi.org/10.1002/acm2.12889

[12] He, J., Yang, L., Tao, Z., *et al.* (2021) Impact of the 2019 Novel Coronavirus Disease (COVID-19) Epidemic on Radiotherapy-Treated Patients with Cancer: A Single-Center Descriptive Study. *Cancer Management and Research*, **13**, 37-43. https://doi.org/10.2147/CMAR.S281323

[13] Wu, J., Wang, C., Gao, Y., *et al.* (2021) Relationship between High Performance Work Systems and Job Satisfaction of Medical Staff Based on Latent Profiles Analysis. *Chinese Hospital Management*, **41**, 40-43. (in Chinese)

[14] Wang, X.S. and Zeng, M. (2020) Challenges for a Cancer Center in the Novel Coronavirus Pneumonia Epidemic. *Technology in Cancer Research & Treatment*, **19**, 1-4. https://doi.org/10.1177/1533033820945774

[15] Xie, C., Wang, X., Liu, H., *et al.* (2020) Outcomes in Radiotherapy-Treated Patients with Cancer during the COVID-19 Outbreak in Wuhan, China. *JAMA Oncology*, **6**, 1457-1459. https://doi.org/10.1001/jamaoncol.2020.2783