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ORIGINAL RESEARCH

Risk Factors for Cancer Malnutrition after Radical Tumor Resection

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ABSTRACT

Objective • To investigate the risk factors for cancer malnutrition after radical tumor resection.

Methods • A total of 110 cancer patients who used parenteral nutrition from January 2022 to June 2023 were selected for retrospective analysis and 50 patients who did not need parenteral nutrition support after radical tumor resection were selected as the control group to analyze the general data of the two groups. Univariate and multivariate logistic analyses were used to determine the factors influencing malnutrition in patients supported by parenteral nutrition after radical tumor resection.

Results • The age(P = .032), body mass index(P = .012), education level(P = .025), per capita monthly household income(P = .029), concurrent chemotherapy ratio(P = .035), phobia disease progression(P = .037), and depression(P = .038) of patients who underwent parenteral nutrition after radical tumor resection were all influencing factors, and the differences were statistically significant (P < .034). After undergoing a radical tumor resection, patients with dysphagia grade 2-3, loss of appetite grade 2-3, and nausea and vomiting grade 2-3, as well as diarrhea grade 2-3, require parenteral nutrition support. The risk factors for malnutrition in patients who require such support include age, education, per capita household income, fear of disease progression, depression, pain, and diarrhea.

Conclusion • Patients may suffer from malnutrition after radical tumor resection and need parenteral nutrition support, including age, education level, per capita monthly household income, fear of disease progression, depression, pain, diarrhea, etc., so in clinical nursing, nursing staff should pay more attention to such high-risk factors, so as to carry out personalized nursing programs for patients undergoing radical tumor resection and improve the effectiveness of disease treatment. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Tumor refers to the body under the action of various tumorigenic factors where cells of local tissues lose the normal regulation of their growth at the gene level, resulting in abnormal cell proliferation and the formation of new organisms. Tumors can also be divided into benign and malignant. Benign tumors are less harmful, and generally, there will be compression and obstruction. Malignant tumors are very harmful and can cause serious damage to tissue structure, leading to decreased organ function, low resistance, body pain, fever infection, changes in cachexia, resulting in extreme emaciation, and death due to failure of various systems. Therefore, the timely treatment of patients cannot be ignored. Radical tumor resection is an effective way to treat solid tumors and to achieve the eradication of the disease. This treatment includes the extensive resection of the primary tumor lesion, the resection of directly invaded tissues, and the removal of lymph nodes in the primary tumor area.[1] While radical tumor resection can be effective for treating cancer patients, the postoperative radiotherapy and chemotherapy stage can also have negative consequences. These treatments not only kill cancer cells but also a significant number of normal cells, leading to side effects such as malnutrition and increased susceptibility to infections. The cancer cells carried by the tumor have also been competing with normal cells for nutrients, so that a large number of normal cells will be necrotic due to insufficient supply, unable to work and survive, which indirectly leads to insufficient ability of the human body to absorb nutrients,

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resulting in malnutrition symptoms in the body.[2] if it is not targeted in time, it will continue to consume the energy stored by the body, reduce the patient's immune ability, and seriously affect the prognosis of the disease.

In this study, a retrospective analysis of 110 cancer patients admitted to First Affiliated Hospital of Naval Military Medical University aims to explore the risk factors for cancer malnutrition after radical tumor resection to obtain good tumor treatment results.

INFORMATION AND METHODOLOGY

Basic Information

A retrospective analysis was carried out on 110 tumor patients who used parenteral nutrition from January 2022 to June 2023, including 76 males and 34 females, aged 35~72 years, with an average age of (56.39±5.63) years. There were 19 cases of colon cancer, 33 cases of esophageal tumors, 40 cases of gastric malignancy, 11 cases of hepatobiliary and pancreatic malignant tumors, 2 cases of bladder malignant tumors, 1 case of lung cancer, and 4 other cases In addition, 50 patients who did not need parenteral nutrition support after radical tumor resection were selected as the control group, including 32 males and 18 females, aged 35~72 years, with an average age of (55.43±5.53) years, 9 tumors located in the head and neck, 12 cases of lung and thymus, 10 cases of pelvis, 19 patients with tumors in other areas. All the clinical general data of patients did not affect the development of this study, which was comparative.

Inclusion and exclusion criteria

Inclusion Criteria: (1) All patients were diagnosed clinically and diagnosed as tumors by pathological tissue; (2) All patients are treated with preoperative radiotherapy, postoperative adjuvant chemotherapy, and radiotherapy in our hospital; (3) All patients have normal mental, cognitive and other functions, which can effectively cooperate with the development of research.

Exclusion Criteria: (1) those with contraindications to radiotherapy or no indications for chemotherapy; (2) Those with combined heart, liver, lung and other organ function damage; (3) Those with combined or previous digestive tract diseases; (4) Abnormal mental function; (5) Those who cannot effectively implement radiotherapy guidelines or stop radiotherapy without authorization; (6) Meet the supporters of parenteral nutrition.

Research methods

All investigators underwent relevant professional training before the study was launched, and the cases included in this study were screened in strict accordance with the inclusion criteria and exclusion criteria, and the questionnaire was developed for the risk factors related to malnutrition in patients after radical tumor resection. 1 day before the patient's discharge, a questionnaire survey is carried out on the patient, and the patient is instructed to fill in the questionnaire strictly according to his actual situation, and immediately carry out verification after filling it out. After all surveys are completed, carefully check whether there are no omissions, empty items, or incomplete items in the questionnaire to ensure the authenticity and reliability of the questionnaire information. In this study, 110 points were distributed to the questionnaire, and the effective questionnaire collected was 110 points, and the effective rate of the questionnaire was 100%.

The questionnaire survey includes: (1) general information about the patient: including the patient's age, gender, physical body mass index, education level, monthly family income, and whether there was any disease history. (2) Clinical staging of tumors, the effect of surgical treatment, whether concurrent chemotherapy, radiotherapy, etc. are carried out, and whether it is the first disease. (3) Psychological state of patients: Hamilton Depression Scale (HAMD) is used to evaluate the depression of patients, HAHD has a total of 17 scoring items, all items of the scale use a 5-level scoring method, 0 points means that the patient has no such symptoms, 1-point means that the patient's symptoms are mild, 2 points indicate that the patient's symptoms are moderate, 3 points indicate that the patient's symptoms are heavier, and 4 points indicate the patient's symptoms are severe. The total score of HAHD is 0~68 points, and the higher the score, the worse the patient's psychological state. Fears were evaluated using a simplified scale of phobic disease progression, which included the thought that the disease might progress and I become anxious; When I am anxious, there will be some physical discomfort, such as rapid heartbeat, stomach pain, nervousness, and other 12 evaluation items, the Phobic Disease Progression Simplified Scale is used to assess the patient's level of phobic disease progression, each entry answer is divided into "never", "rare", "sometimes", "often" and "always" five dimensions, the total score is 0~60 points, and the score of 34 points and above is the patient's fear of disease progression. (4) Patient's sleep quality: the use of the PSQI score scale to evaluate the patient's sleep quality, the scale has a total of 18 items, composed of 7 components, each component is scored according to 0~3 grade, 0 points indicate the best sleep quality, 3 points represent the worst sleep quality. The cumulative score of each component is the total PSQI score, which ranges from 0 to 21, with 0-5 indicating excellent sleep quality, 6-10 indicating good sleep quality, 11-15 indicating moderate sleep quality, 16-20 indicating poor sleep quality, and 21 indicating worst sleep quality. (5) Adverse reactions of radiotherapy and chemotherapy after radical tumor resection: according to the radiation therapy response symptom measurement table formulated by the American Society of Radiation Oncology, the evaluation content includes dysphagia, loss of appetite, fever, vomiting, diarrhea, nausea, etc., and each symptom adopts a 0~3 grade scoring system. (6) Nutritional status assessment: before the patient is discharged, the nutritional status assessment and dietary survey are carried out, and the subjective overall nutritional status assessment scale is applied, the scale includes the

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patient's self-assessment and medical staff assessment, the former includes clinical symptoms and signs, dietary intake, recent body mass changes, etc., the latter includes physical examination score, metabolic stress state score, and disease age score, the higher the total score, the worse the nutritional status, of which the PG-SGA score <4 is no malnutrition, ≥4 is divided into malnutrition.

Data analysis

SPSS v 22.0 statistical software was used for statistical analysis $\bar{x}$, the measurement data were expressed by (±s), the mean measurement values of the two groups were expressed by *t* value test, the counting data were statistically expressed by percentage %, the counting values of the two groups were evaluated by χ^2 value test, and the risk factors for malnutrition after radical tumor resection were analyzed by multivariate logistic regression. The difference was statistically significant at $P < .05$.

RESULTS

Univariate analysis of malnutrition in patients supported by parenteral nutrition after radical tumor resection

After the data collection, age, body mass index, education level, per capita monthly household income, concurrent chemotherapy ratio, phobia disease progression, and depression of patients who underwent parenteral nutrition after radical tumor resection were all influencing factors, and the differences were statistically significant ($P < .05$), as shown in Table 1.

Comparison of nutritional intake of patients in the two groups

The total energy, carbohydrate and protein intake of the control group was higher than that of the observational group, and the differences were statistically significant ($P < .05$), see Table 2.

Comparison of adverse reactions of the two groups

After data collection, it was found that patients who underwent parenteral nutrition after radical tumor resection had dysphagia grade 2~3, loss of appetite grade 2~3, nausea and vomiting grade 2~3, and diarrhea grade 2~3, all of which were statistically significant ($P < .05$), see Table 3.

Logistic analysis of malnutrition influencing factors in patients supported by parenteral nutrition after radical tumor resection

Multivariate logistic regression analysis was performed by statistically significant indicators as independent variables, nutritional status during parenteral nutrition support after radical tumor resection was included in the model, and the dependent variable was assigned as malnutrition = 1, good nutrition = 0, and the results showed that the patient's age, education level, per capita monthly household income, phobia disease progression, depression, pain, Diarrhea is a risk factor for malnutrition in patients supported by parenteral nutrition, as shown in Tables 4 and 5.

Table 1. Univariate analysis of malnutrition in patients supported by parenteral nutrition after radical tumor resection

Project	Support group (n=110)	Control group (n=50)	χ^2 value	*P* value
age			14.626	.000
Over 60 years old	75	18		
Under 60 years of age	35	32		
gender			0.307	.579
man	58	24		
woman	52	26		
Body mass index			5.752	.016
≤24	57	36		
>24	53	14		
Education			7.885	.004
Primary school and below	13	8		
junior high school	52	9		
high school	24	13		
College degree or above	21	20		
Monthly income per household	27	30		.000
Below 3000	83	20	18.841	
More than 3000				
Past medical history	25	12	0.031	.859
Yes	85	38		
not				
First onset or relapse			0.001	.965
First	59	27		
relapse	51	23		
Concurrent chemotherapy			13.940	.000
Be	42	35		
not	68	15		
Fear progression			9.152	.002
Yes	70	19		
not	40	31		
depression			4.434	.035
Yes	68	22		
not	42	28		
Sleep disturbances			0.651	.419
Yes	69	28		
not	41	22		
pain			15.639	.000
Yes	87	24		
not	23	26		

Table 2. Comparison of nutritional intake ($\bar{x} \pm s$) between the two groups

index	Observational group (n=110)	Control group (n=50)	*t* value	*P* value
Total energy	1533.59±342.59	1756.48±389.58	3.652	.000
carbohydrates	243.58±78.54	268.69±89.03	1.796	.037
protein	59.64±10.49	73.58±11.38	7.585	.000
fat	52.43±12.49	55.66±15.64	1.398	.164

Table 3. Comparison of adverse reactions in the two groups [n(%)].

index	Observational group (n=110)	Control group (n=50)	χ^2 value	*P* value
Difficulty swallowing			7.149	.007
Level 0~1	39	29		
Level 2~3	71	21		
Loss of appetite			9.238	.002
Level 0~1	30	26		
Level 2~3	80	24		
fever			3.237	.071
Level 0~1	92	47		
Level 2~3	18	3		
Nausea and vomiting			6.648	.009
Level 0~1	73	43		
Level 2~3	37	7		
diarrhea			5.063	.024
Level 0~1	79	44		
Level 2~3	31	6		

DISCUSSION

Tumors not only damage the function of the organs where they are located but also can metastasize far away, impairing the function of other organs. For example, tumors in the lungs not only damage lung function, leading to respiratory failure but also can cause liver and bone, brain, and other organ metastases, impairing the function of the

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Table 4. Logistic analysis of factors influencing malnutrition in patients supported by parenteral nutrition

argument	Assignment description
age	≤ 65 = 0, > 65 = 1
Body mass index	≤ 24 kg/m2 = 0, > 24 kg/m2 = 1
Education	Elementary school and below = 0, junior high school = 1, high school = 2, college and above = 3
Monthly income per household	Below 3000 = 0, above 3000 = 1
Fear of disease progression	None = 0, there is = 1
depression	None = 0, there is = 1
pain	None = 0, there is = 1
Difficulty swallowing	0~1 level = 0, 2 ~ 3 level = 1
Loss of appetite	0~1 level = 0, 2 ~ 3 level = 1
Nausea and vomiting	0~1 level = 0, 2 ~ 3 level = 1
diarrhea	0~1 level = 0, 2 ~ 3 level = 1

Table 5. Logistic analysis of malnutrition influencing factors in patients supported by parenteral nutrition after radical tumor resection

	OR value	SE value	Wald value	*P* value	95% CI
age	2.457	0.601	6.451	.042	1.448 ~ 17.590
Education	2.257	0.123	5.671	.032	1.105 ~ 13.561
Monthly income per household	1.329	0.612	5.552	.021	1.406 ~ 6.994
Fear of disease progression	2.741	0.610	3.276	.013	1.134 ~ 9.411
Depressive conditions	3.612	0.219	4.238	.012	1.231 ~ 8.756
Painful conditions	2.495	0.436	5.734	.045	1.045 ~ 7.458
Diarrheal conditions	1.926	0.119	3.863	.038	1.322 ~ 5.493

target organs. Moreover, the tumor growth rate is rapid, and the oxygen and nutrient supply are relatively insufficient, resulting in tumor necrosis rupture and inducing heavy bleeding. [3] Patients can die due to hemorrhagic shock. At present, tumor is one of the leading causes of death in patients. Therefore, it is important to use a reasonable and effective way to treat patients, radical tumor resection is mainly used in malignant tumors, including tumor resection and lymph node dissection, radical tumor resection is the only way to achieve cure, therefore, if the patient has surgical indications, the patient should be given active surgical treatment in time to protect the patient's health.

After radical tumor resection, the surgical trauma is relatively large, and patients may have many complications. In addition, surgical removal of the tumor may have unclean resection, which is also a relatively common cause of tumor recurrence. Colon cancer patients often experience obstruction due to the tumor's growth, which absorbs the body's nutrients and reduces normal cell's nutrient intake. This results in stomach swelling after eating, and restrictions in defecation and farting. These symptoms cause abdominal distention, which negatively impacts the patient's nutritional status and increases the gastrointestinal tract's burden, leading to malnutrition. The results of this study show that the patient's age, education level, per capita monthly household income, fear of disease progression, depression, pain, and diarrhea are all risk factors for malnutrition in patients supported by parenteral nutrition. Reasons for such conclusion are clarified as follows: (1) Age factor: Elder people will shrink all organs of the body year by year, gastrointestinal digestive function will also weaken, digestion and absorption become difficult, and food cannot be completely absorbed regardless of the quality or quantity. As people age, their teeth tend to loosen and fall out, making it difficult to chew certain foods. This can result in the rejection of more than half of the food, which can lead to gastrointestinal problems such as constipation and affect nutrient absorption. Additionally, the body's sensory organs, such as the sense of taste, smell, and vision, tend to weaken with age, leading to a decreased appetite and affecting food intake. In patients undergoing radical tumor resection, the tumor itself will consume the body's nutrients, so that the body's demand for nutrients increases. Chemotherapy and radiotherapy after radical tumor resection will cause damage to normal cells, affect the function of digestive organs such as the intestine and mouth, cause vomiting, diarrhea, poor feeding, and other symptoms, affecting the patient's appetite and nutrient absorption. [4] Combined, patients are more susceptible to malnutrition. (2) Education level: Compared with people with a lower education level, having a higher education level can help patients understand the knowledge of the disease in more ways, obtain care during and after the treatment of the disease, and help them choose healthier food options to support the progress of their treatment and avoid malnutrition. (3) Income level: People with low-income levels incur greater costs due to disease treatment, or even in debt, backward medical care capabilities, poor living conditions, and living environment, and insufficient sanitary conditions, so for such people, they cannot obtain sufficient nutritional support after radical tumor resection, and the required nutrient is insufficient, which is easy to lead to malnutrition risk. Such people have less daily exercise time, but exercise and nutrition have a close relationship with each other promotion and mutual influence, reasonable nutrition arrangements should be with each individual's growth and development, physical skill needs, and mutual assistance and adaptation. (4) Fear of disease progression: patients may have fear of disease treatment due to previous understanding of the various dangers of tumors and the death of patients with the same diseases around them, which will also lead to greater psychological pressure on patients, long-term anxiety, worry, so it is easy to lead to hormone disorders in the body, and then cause endocrine disorders, and it will be easy to lose appetite, the body absorbs insufficient nutrients, and there will be low immunity. [5] Especially in the elderly, long-term worry, boredom and anxiety will accelerate their aging and death, and cast a discordant shadow on the whole family, affecting the life of the family, and the recovery of their diseases. (5) Depressive conditions: Lack of some important nutrients, such as vitamin B, vitamin D, omega-3 fatty acids, and folic acid, may lead to neurotransmitter disorders, thereby increasing the risk of depression. [6] For oncology patients, radical tumor resection may lead to anxiety, fear, apprehension, nervousness, weakness, and even negative expectations about their future. These psychological reactions can lead to insomnia, loss of appetite, inferiority, self-blame, social disorders, and other discomforts, affecting the patient's recovery process and treatment effect, thereby constantly affecting the patient's mentality of eating food, resulting in malnutrition. [7] (6) Pain: If the patient is in a state of pain for a long time, it may put the nerves of the brain in a state of excitement, to a certain extent, it may also affect the quality of sleep, and the more severe pain situation will also cause the hormone secretion in the body to be disordered, to a

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certain extent, there may also be irritability, energy consumption increases, can increase daily intake.[8] If the pain is chronic, it may lead to negative emotions such as anxiety and depression in the treatment of the patient's disease, and even affect the diet, resulting in a decrease in the patient's basal intake and affecting the patient's disease treatment process. In patients with tumors, tumor factors may affect the function of the digestive tract, resulting in reduced food intake. (7) Diarrhea: diarrhea usually increases gastrointestinal peristalsis, food has not been absorbed and utilized, usually excreted, long-term diarrhea, may lead to malnutrition in the body, and is also accompanied by dizziness and dry mouth symptoms.[9-10] Diarrhea can cause damage to the intestinal mucosa, in addition, diarrhea may also lead to dehydration and electrolyte imbalance, further affecting nutrient absorption, so diarrhea is also one of the risk factors affecting nutrient absorption in patients.

In summary, in the tumor patients undergoing radical tumor resection, the patient's age, education level, per capita monthly household income, fear of disease progression, depression, pain, diarrhea, etc. may become risk factors for malnutrition patients, resulting in backward treatment process and affecting the final effect of disease treatment, so after radical tumor resection of tumor patients, attention to the above factors should be deepened, to help patients reduce the impact of malnutrition, obtain better disease treatment effects, and promote faster recovery of diseases. The clinical application effect is good, and it can be promoted and applied.

CONFLICT INTERESTS

The authors declare no conflict of interest.

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None

AUTHOR CONTRIBUTIONS

Yang Ting conceived this study and should be considered as a first author. Jing Zhao, and Zhou Jinhua analyzed the data. Yang Ting and Zhou Jinhua wrote the manuscript. All authors read and approved the final manuscript.

AVAILABILITY OF DATA AND MATERIALS

The data referred to in this study are available from the corresponding author upon reasonable request.

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