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Original Article

Effects of "Timing It Right" nursing on clinical outcome and psychological resilience for lung cancer patients undergoing radical thoracoscopic surgery

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Abstract: Aim: To investigate the effects of "Timing It Right (TIR)" nursing on clinical outcome and psychological resilience in lung cancer patients undergoing radical thoracoscopic surgery. Methods: In this retrospective study, 60 patients from January 2022 to June 2023 were studied. Among them, observation group received TIR intervention (n = 34), while control group received routine nursing intervention (n = 26). The self-care ability, psychological resilience, quality of life (QoL), postoperative recovery, postoperative complications, and postoperative pulmonary function recovery were compared between the two groups. Results: The scores of ESCA (Exercise of Self-Care Agency) and CD-RISC (Connor-Davidson Resilience Scale), lung function, and QoL-C30 in observation group were significantly higher than those in control group after discharge, while the incidence of postoperative complications in observation group was significantly lower than that in the control group (all $P<0.05$). Furthermore, time to first bedtime activity and chest drain removal, and the length of postoperative hospitalization in the observation group were obviously shorter than those in the control group (all $P<0.05$). Conclusion: TIR nursing can effectively enhance the self-care ability of lung cancer patients undergoing radical thoracoscopic surgery, improve their psychological elasticity, enhance their quality of life, shorten the hospitalization time, and reduce the incidence of adverse reactions.

Keywords: Timing It Right, clinical nursing, psychological resilience, radical thoracoscopic lung cancer surgery

Introduction

The incidence and mortality rate of lung cancer are on a rising trend. According to the data of National Cancer Center in 2017, lung cancer still ranks No. 1 in the incidence and mortality rate among males in China [1], and the global incidence of lung cancer in 2018 was 11.6% with a death rate of 18.4%, while its incidence in China accounted for 21% of all the cancers, and the death rate was as high as 25-27% [2, 3]. According to investigation, about 80% of lung cancer patients are in the middle or late stage at their initial diagnosis, and the overall 5-year survival rate in China is only about 10% [4, 5].

Lung cancer treatment modalities include surgery, radiation therapy, chemotherapy, molecular targeted therapy and bio-immunotherapy, etc. The 2017 Clinical Practice Guideline for Non-small Cell Lung Cancer suggests that surgical treatment is the preferred treatment modality for non-small cell lung cancer, and that television-assisted thoracoscopy or minimally invasive surgery is preferred [6]. Traditional open thoracic surgery is highly traumatizing, with longer duration of surgery, significant postoperative pain, and a more pronounced degree of stress on the patients. Thoracoscopic surgery can reduce the surgical trauma, shorten the duration of surgery, reduce the postoperative pain of patients, and reduce the occurrence of postoperative complications [7]. Minimally invasive surgery has been one of the most common surgical procedures in clinical thoracic surgery. The popularization of thoracoscopic surgery has reduced surgical traumatic stress, alleviated patients' postoperative pain, decreased the incidence of postoperative complications, and accelerated patients' recovery. However, the destruction of the tissue integrity and the generation of new trauma during surgery are still unavoidable [8]. Ethun et al. [9]

reported that the incidence of postoperative complications in lung cancer patients was as high as 14.6-18.87%, and the incidence of postoperative complications and adverse reactions in patients with lung cancer combined with coronary artery disease was up to 50%. Current nursing models for radical thoracoscopic surgery of lung cancer include routine care, accelerated rehabilitation care, quality care, and continuity of care, etc. [10], but postoperative complications in lung cancer patients have not been reduced. Therefore, improving the quality of perioperative treatment and nursing care for lung cancer patients, reducing surgical stress, and decreasing the occurrence of complications are directly related to the postoperative recovery of lung cancer patients, and it is also the research focus and pursuit goal in this area.

Timing It Right (TIR), proposed in 2008 by Canadian academia Cameron et al. [11] based on existing research and clinical care pathways for stroke patients, defines the timeframe and content of nursing interventions by identifying changes in the specific needs of the patients and caregivers over the course of the disease onset and progression. Cameron et al. [11] implemented the Right Stroke Timing Family Support Program (TIRSFSP), a family support program for stroke patients and their caregivers based on the theory of timing, which improved the perceived support and emotional well-being of family caregivers who were supported. In Canada, Lee et al. [12] conducted qualitative interviews with 25 survivors of acute respiratory distress syndrome (ARDS) to investigate their needs for educational, emotional, and tangible support at each stage of the TIR framework, and supports needed for secondary prevention of health events, health maintenance, and reintegration were the primary supports identified during the long-term adjustment stage. Currently, the theory has been applied to family members of patients with stroke [13], acute distress respiratory syndrome [14], hip replacement [15], acute coronary syndromes [16], and gastric cancer [17], etc. However, research on the effectiveness of interventions using TIR on clinical nursing and psychological resilience of patients undergoing radical thoracoscopic surgery of lung cancer has not yet been reported.

This study aims to explore the effectiveness of nursing interventions based on TIR in lung cancer patients undergoing radical thoracoscopic surgery, and to provide theoretical and practical bases for the development of nursing care for this population in the future.

Methods

Study subjects

In this retrospective study, totally 60 lung cancer patients undergoing radical thoracoscopic surgery at Yichun People's Hospital from January 2022 to June 2023 were included. The patients were divided into two groups according to the different ways of nursing. The observation group (n = 34 cases) received TIR intervention, and the control group (n = 26 cases) received routine nursing intervention. The Institutional Review Board of Yichun People's Hospital approved this study.

Inclusion criteria: (1) Patients who had been diagnosed with small unilateral lung nodule <3 cm that met the surgical indications in the 2018 edition of the Chinese Primary Lung Cancer Diagnostic and Treatment Guidelines and had undergone radical thoracoscopic surgery for lung cancer [18]; (2) Patients with an age of 18-80 years; (3) Patients without mental disorders or severe visual or auditory impairment; (4) Patients with preoperative ASA scores of I to III; (5) Patients with complete clinical data.

Exclusion criteria: (1) Patients with distant metastases; (2) Patients with severe cardiac, hepatic, or renal diseases, hematologic disorders, or autoimmune system diseases; (3) Patients with a combination of other malignant tumors; (4) Patients who have had lung surgery; (5) Patients with a history of preoperative psychotropic medications; (6) Patients with extensive intraoperative pleural adhesions or uncontrollable bleeding requiring conversion to open surgery; (7) Patients whose surgery lasted more than 240 minutes; (8) Patients transferred to ICU for further observation and treatment after surgery.

Methods

The control group received routine nursing. Routine admission counseling was given after

admission, mainly including explanation of admission precautions, preoperative precautions (preoperative medication and gastrointestinal preparation), and key points of postoperative care, including emphasis on diet. Before discharge, a discharge notification form was given, emphasizing the principles of dietary, review time, and discharge procedures.

The observation group was implemented with TIR nursing based on the routine nursing.

(1) During the diagnosis period: ① Psychological support: assessing the patients' psychological state, guiding them to correctly recognize and deal with the negative emotions, and focusing on communication with the patients to initially establish mutual trust; introducing the hospital layout and environment to reduce the sense of unfamiliarity. ② Health education: emphasizing on explaining the etiology, clinical manifestations, treatment methods, prognosis and survival rate of the disease; promptly informing patients to focus on the next step of the diagnosis and treatment plan to relieve their nervousness and fear.

(2) During the clinical period: ① Surgery-related information support: with the help of manuals and easy-to-understand pictures, introducing the preoperative knowledge (routine surgical procedures, surgical supplies, gastrointestinal preparations) and postoperative knowledge (postoperative position, pain knowledge, prevention of venous thrombosis of the lower limbs, and the significance and key points of early postoperative off-bed activities and back percussion and expectoration, etc.). ② Physical support: encouraging communication between the patients and caregivers to fully satisfy patients' needs.

(3) During adaptation period: ① Symptom assessment and guidance: understanding the patients' postoperative symptom management and giving target instructions accordingly. ② Nutritional support: on the basis of assessing the patients' nutritional status and giving nutritional advice, encouraging the patients to observe their own personal situation in terms of appetite and nutrition and communicate through tools such as telephone follow-up and WeChat to make dietary adjustments in a timely manner. ③ Peer support: encouraging patients to share their experiences with each other to enhance their confidence in overcoming the disease. ④ Economic and financial support: guiding families with financial difficulties to seek social help and donations through various platforms and make full use of relevant resources and policies provided by community and government.

(4) During discharge preparation period: ① Dietary guidance: understanding about the patients' diet and provide personalized guidance. ② Out-of-hospital rehabilitation program: introducing the home exercise system, exercise methods, precautions, the time of follow-up, etc.

Observation indicators

The primary outcome included self-care competencies and psychological resilience assessment. The evaluation of self-care ability was conducted using the Exercise of Self-Care Agency (ESCA) scale [19]. The ESCA measures self-care competencies, including the concept of self-care, sense of responsibility for self-care, self-care skills, and level of health knowledge, with a total of 43 points for each item and a total score of 172 points. The higher the score, the stronger the self-care competence. Psychological resilience was evaluated using the Connor-Davidson Resilience Scale (CD-RISC) [20], which includes three dimensions: resilience (13 items), self-improvement (8 items), and optimism (4 items). The scale covers 25 items, with each item scoring 0-4 points. The higher the score, the higher the level of psychological resilience.

The secondary outcome included quality of life, postoperative recovery, postoperative complications, and postoperative pulmonary function recovery. Quality of life was assessed using the Quality-of-Life Measurement Scale (QoL-C30) [21], which encompasses somatic functioning, emotional functioning, social functioning, and general health, each with a total score of 100, with higher scores indicating a better quality of life. According to the recommendation by European Perioperative Clinical Outcome (EPCO) Taskforce [22], the postoperative complications included pulmonary infection, atelectasis of lung, pulmonary leakage, and hemorrhage. The postoperative recovery was assessed by the time to first bedtime activity, the volume of closed chest drainage on postopera-

Table 1. Comparison of demographic data and clinical characteristics between the two groups

Indicators	Observation group (n = 34)	Control group (n = 26)	χ^2/t	P
Age (years)	56.51±11.34	56.98±9.61	-0.221	0.901
Sex			0.642	0.382
Male	21	11		
Female	13	15		
Marriage			0.713	0.352
Married	29	22		
Single	5	4		
Smoking			1.654	0.122
Yes	14	15		
No	20	11		
Education level			5.323	0.031
Junior high school and below	27	17		
High school or junior college	5	6		
College and above	2	3		
Occupation			2.213	0.342
Farmer	26	18		
Retired persons	1	2		
Professionals and technicians	1	1		
Other	6	5		
Per capita monthly household income			2.872	0.123
<2000	20	19		
2000-5000	6	3		
>5000	8	4		
Form of payment			0.292	0.641
Self-financed	1	1		
Medical insurance	33	25		
Pathologic type			1.561	0.542
Adenocarcinoma	26	20		
Squamous carcinoma	8	6		
Lesion site			2.821	0.553
Upper lobe of left lung	11	10		
Lower lobe of left lung	8	3		
Upper lobe of right lung	9	5		
Right middle lobe	3	2		
Lower right lung	3	6		
Diabetes	3	2	3.871	0.651
Hypertension	7	5	1.664	0.889
Coronary heart disease	2	1	2.784	0.324

tive day 1, the time to chest drain removal, and the length of postoperative hospitalization. Furthermore, postoperative pulmonary function recovery was assessed by lung function.

Statistical analysis

SPSS 22.0 software was used to statistically analyze the obtained data. Measurement data were expressed as mean ± standard deviation. Independent samples t-test was used for intergroup comparisons, and paired t-test for intragroup comparisons. Count data were expressed as n (%), and χ^2 test was used for comparisons. The difference was considered to be statistically significant at P<0.05.

Sample size data from a previous retrospective study by Wang et al. [23] were used to calculate the sample size. For the exploratory effect anal-

Table 2. Comparison of ESCA scores between the two groups

	Time point	Observation group (n = 34)	Control group (n = 26)	t	*P*
Self-care concepts (points)	Before intervention	20.51±5.92	28.51±2.16	5.992	0.189
	After intervention	43.22+5.37	31.06±5.33	8.235	0.001
	t	4.218	3.216	-	-
	P	0.001	0.042	-	-
Self-care responsibility (points)	Before intervention	20.12±8.95	23.53±6.22	7.639	0.427
	After intervention	40.12±5.24	28.54±6.05	9.424	0.002
	t	3.128	2.416	-	-
	P	0.001	0.043	-	-
Self-care skills (points)	Before intervention	26.23±7.22	28.45±5.24	8.940	0.616
	After intervention	45.47±7.21	31.45±3.24	7.349	0.003
	t	8.618	7.216	-	-
	P	0.001	0.040	-	-
Health knowledge (points)	Before intervention	28.58±4.55	25.36±5.52	6.377	0.750
	After intervention	46.28±3.57	31.22±4.06	9.458	0.004
	t	10.892	6.135	-	-
	P	0.029	0.043	-	-

Note: ESCA, Exercise of Self-Care Agency.

Table 3. Comparison of CD-RISC scores between the two groups

	Time	Observation group (n = 34)	Control group (n = 26)	t	P
Resilience	Before intervention	30.12±3.88	29.68±4.40	0.991	0.318
	After intervention	38.14±6.63	32.58±4.98	8.559	0.001
	t	4.218	3.216	-	-
	P	0.002	0.011	-	-
Self-improvement	Before intervention	17.64±3.08	17.61±3.22	0.308	0.749
	After intervention	23.85±4.08	19.50±3.39	10.321	0.002
	t	3.128	2.416	-	-
	P	0.020	0.034	-	-
Optimism	Before intervention	8.54±1.66	8.36±1.48	0.924	0.352
	After intervention	12.22±2.08	9.84±2.64	8.335	0.001
	t	8.618	7.216	-	-
	P	0.012	0.045	-	-
Total score	Before intervention	56.41±8.39	55.19±8.74	1.284	0.202
	After intervention	74.38±8.55	62.81±6.98	13.071	0.003
	t	6.91	7.15	-	-
	P	0.021	0.032	-	-

Note: CD-RISC, Connor-Davidson Resilience Scale.

ysis of TIR nursing in lung cancer patients undergoing radical thoracoscopic surgery, more than 15 patients are necessary to obtain sufficient degrees of freedom. The ratio of the two groups was set to 5:5 (control group:observation group). The actual sample size was adjusted according to the situation.

Results

Clinical characteristics

There were no significant differences between the two groups in terms of age, gender, residence, education level, marital status, occupa-

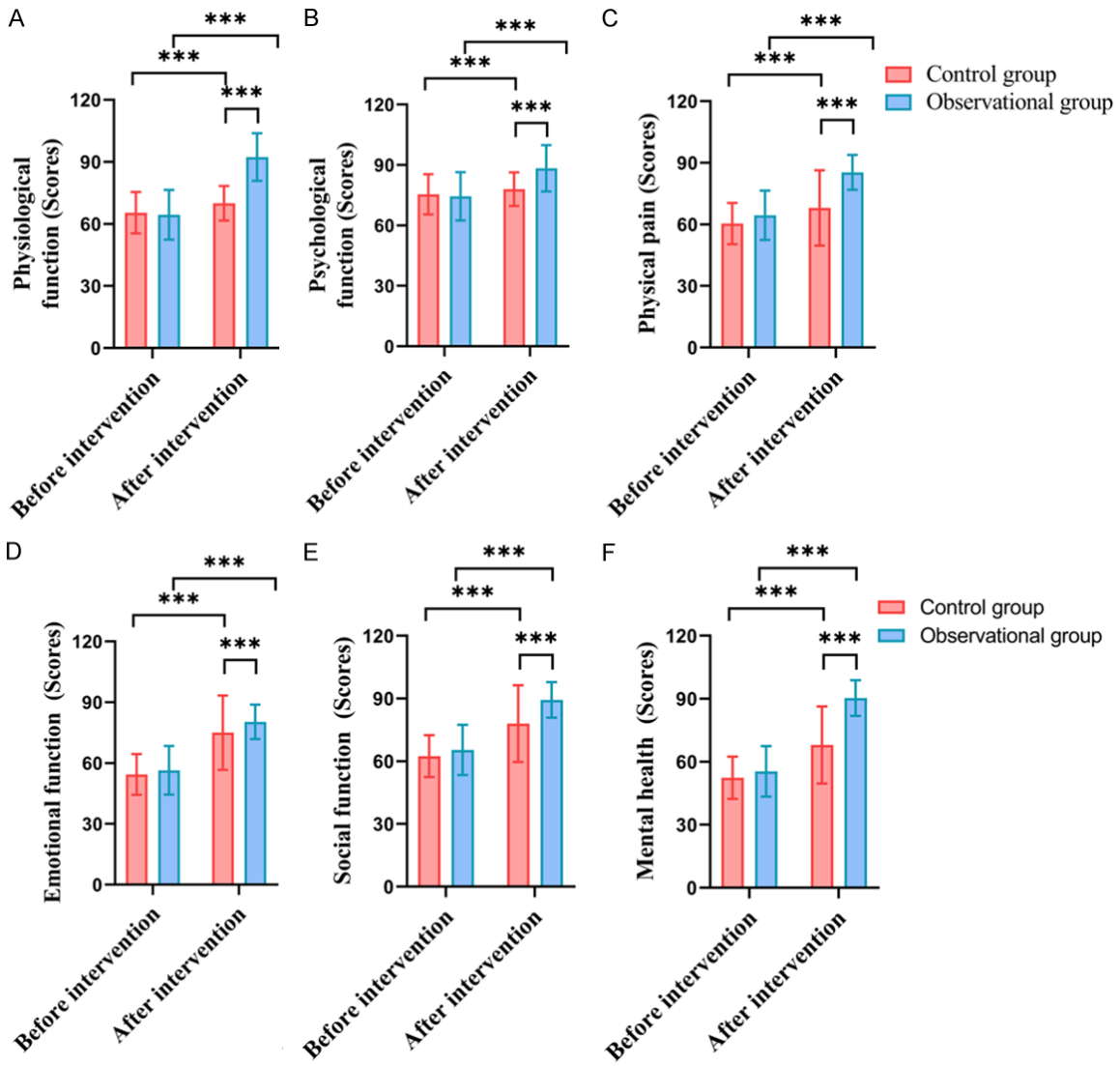

Figure 1. Comparison of QoL-C30 scores between the two groups. A: Physiological function; B: Psychological function; C: Physical pain; D: Emotional function; E: Social function; F: Mental health. ***$P<0.001$, compare with control group. QoL-C30, Quality-of-Life Measurement Scale.

tion, per capita monthly family income, medical payment method, lesion location, pathologic type, and underlying disease (all P>0.05), indicating that the two groups were comparable (**Table 1**).

Self-care competencies

We evaluated patients' self-care capabilities using the ESCA scores. As shown in **Table 2**, there were no significant differences in all the domains of ESCA scale between the two groups before the intervention (all P>0.05), and the scores of self-care concepts, self-care responsibility, self-care skills, and health knowledge in the observation group were higher than those of the control group after the intervention (all P<0.05).

Psychological resilience

After the intervention, the resilience, self-improvement, optimism and total scores of both groups were all improved, and the scores in the observation group were statistically higher than those in the control group (all P<0.05) (**Table 3**).

Quality of life

The QoL-C30 results demonstrated that the physiological function, psychological function,

Table 4. Comparison of postoperative recovery between the two groups

	Observation group (n = 34)	Control group (n = 26)	t	*P*
Time to first bedtime activity (h)	22.14±4.29	29.20±11.11	6.286	0.022
Volume of closed chest drainage on postoperative day 1 (ml)	224.78±122.15	228.66±112.96	2.587	0.089
Time to closed chest drain removal (h)	33.52±21.44	56.73±22.14	7.505	0.011
Length of postoperative hospitalization (h)	183.52±41.44	246.73±42.14	5.505	0.041

Table 5. Comparison of lung function indexes between the two groups

Index	Time	Observation group (n = 34)	Control group (n = 26)	t	*P*
FEV1 (L)	Before treatment	1.31±0.48	1.37±0.52	1.028	0.320
	Three months after treatment	2.96±0.38	1.91±0.51	8.113	0.002
	t	11.228	8.226	-	-
	P	0.001	0.002	-	-
FVC (L)	Before treatment	1.57±0.69	1.55±0.67	1.301	0.871
	Three months after treatment	4.91±0.53	3.75±0.48	11.939	0.001
	t	13.128	12.416	-	-
	P	0.003	0.002	-	-
FEV1/FVC (%)	Before treatment	52.84±5.61	54.08±5.82	2.143	0.918
	Three months after treatment	67.43±5.32	59.57±6.21	9.138	0.006
	t	8.618	7.216	-	-
	P	0.012	0.040	-	-

Note: FEV1, forced expiratory volume in one second; FVC, forced vital capacity.

physical pain, emotional function, social function, and mental health in the patients of observation group improved more significantly as compared with those of the control group (P<0.05) (**Figure 1**).

Postoperative recovery

As shown in **Table 4**, the time to first bedtime activity, the time to chest drain removal, and the length of postoperative hospitalization in the observation group were all significantly shorter than those in the control group (all P<0.05).

Lung function

There was no statistical difference in lung function between the two groups before the intervention (P>0.05). Three months after the intervention, the lung function of patients in the two groups were statistically improved (all P<0.05), and the function of the observation group was significantly better than that in the control group (**Table 5**).

Postoperative complications

The total complication rate of the observation group was 5.9%, which was much lower than 7.7% of the control group (P = 0.043) (**Table 6**).

Univariate and multivariate regression analysis

As shown in **Table 7**, univariate analysis showed that smoking, adenocarcinoma, TIR nursing, length of postoperative hospitalization, lung function, and postoperative complication were correlated with the prognosis in patients undergoing radical thoracoscopic surgery (all P<0.05). The Cox proportional hazards regression model showed that smoking, TIR nursing, lung function, and postoperative complication were independent factors affecting the prognosis in lung cancer patients undergoing radical thoracoscopic surgery.

Discussion

In our study, the observation group had higher ESCA, CD-RISC and QoL-C30 scores, but lower

Table 6. Comparison of the incidence of postoperative complications between the two groups

	Pulmonary infection	Lung atelectasis	Pulmonary leakage	Hemorrhage	Total	Rate
Observation group (n = 34)	2	0	0	0	2	5.9%
Control group (n = 26)	1	1	0	0	2	7.7%
P	0.052	-	-	-	-	0.043

Table 7. Univariate and multivariate regression analysis

Variable	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P	OR (95% CI)	P
Age				
≥65	1.751 (0.487-2.648)	0.794		
<65	1.000			
Gender				
Female	1.364 (0.678-2.384)	0.524		
Male	1.000			
Smoking				
No	1.000			
Yes	1.024 (0.988-1.248)	0.009	3.927 (1.647-9.678)	0.007
Pathologic type				
Adenocarcinoma	3.507 (0.824-2.259)	0.019	3.568 (0.607-9.608)	0.113
Squamous carcinoma	1.000		-	
Hypertension	0.814 (0.354-1.821)	0.451		
Diabetes	2.013 (1.712-4.925)	0.334		
Coronary heart disease	1.563 (0.748-3.488)	0.172		
TIR nursing	3.927 (1.647-9.678)	0.007	4.568 (1.647-9.678)	0.023
ESCA score	0.984 (0.324-1.249)	0.827	-	
CD-RISC scale	16.437 (6.829-29.279)	0.942		
Time to first bedtime activity	1.227 (0.677-2.358)	0.342		
Volume of closed chest drainage on postoperative day 1	4.224 (0.298-12.791)	0.234		
Time to closed chest drain removal	2.632 (0.174-6.768)	0.328	1.548 (0.643-5.688)	0.641
Length of postoperative hospitalization	6.267 (4.636-15.526)	<0.001	2.568 (1.647-9.678)	0.084
Lung function	3.037 (2.385-6.788)	<0.001	2.108 (1.674-3.728)	0.001
Postoperative complication	0.572 (0.437-1.782)	<0.001	0.668 (0.575-1.878)	0.028

Note: ESCA, Exercise of Self-Care Agency; CD-RISC, Connor-Davidson Resilience Scale.

postoperative complications than the control group. It indicates that the TIR nursing can effectively enhance the self-care ability of lung cancer patients undergoing radical thoracoscopic surgery, improve their psychological elasticity, enhance their quality of life, shorten the hospitalization time, and reduce the incidence of adverse reactions.

Relevant studies have pointed out that the higher the level of self-efficacy of patients, the more positive of the patients to cope with the disease, resulting in better prognosis and quality of life [24]. The results of this study showed that the total self-efficacy score of patients in the observation group was significantly higher than that of the control group, indicating that TIR nursing can enhance the sense of self-efficacy of patients after radical surgery. This is because TIR nursing intervention provides coping skill training for the psychological changes in patients of different stages, by which the patients can master more anti-cancer information and self-care skills, thus enhancing their self-management abilities [25].

Quality of life is one of the important indicators for evaluating the treatment effect of tumor patients in current clinical practice [26]. The results of some studies have shown that the

lower the level of social support received by lung cancer patients after radical thoracoscopic surgery in terms of their own health status, disease knowledge and disease management efficacy, the greater the negative impact on their quality of life [27-29]. The results of this study showed that after the intervention, the total QoL score and the scores of each dimension (physiological condition, emotional condition, somatic functioning condition, social/family condition) of the observation group were all significantly higher than those of the control group, indicating that TIR nursing was effective in improving the quality of life of the patients. This is due to the fact that the health education provided by TIR nursing can better help patients understand their own health status and grasp relevant nursing knowledge, thus improving their ability to cope with the disease [30]. Emotional support can build a platform for patients to communicate with the outside world and improve their ability to utilize social resources, which is conducive to their physical and mental health and improves their quality of life [31].

Lung infection and pulmonary atelectasis are some of the most common postoperative complications of lung cancer, which are important factors affecting patients' prognosis and regression [32]. The results of many literature show that lung atelectasis and lung infection can be improved through preoperative health education, respiratory management, and postoperative pain management [33-35]. As seen in the results of this study, the incidence of pulmonary infection and complications in the observation group was significantly lower than that in the control group. Preoperative health education for patients can, on the one hand, urge patients to quit smoking and take nebulization therapy early to reduce the production of respiratory secretions, which is conducive to preoperative respiratory tract cleaning and preparation, and on the other hand, it can help patients to learn about the importance of preoperative respiratory exercise and effective postoperative expectoration in advance, which is conducive to the exercise of respiratory muscles, lung capacity, and pulmonary function of the patients. At the same time, patients can better cooperate with postoperative care and treatment by mastering the method of effective coughing in advance, effectively cleaning the respiratory tract and reducing the occurrence of pulmonary atelectasis and lung infection [36]. Therefore, perioperative respiratory management and effective postoperative analgesia are the key to improving patients' respiratory function, promoting lung re-expansion, and reducing postoperative complications.

However, there are some limitations in this study. First, this study is a single-center, small sample, retrospective analysis with certain selective bias. Second, as TIR nursing has not yet formed a unified nursing consensus and guidelines, and there is no fixed standard or protocol for its application in the clinic, it is not conducive to the dissemination of the concluding results to a certain extent. Third, due to time constraints, we only evaluated the short-term application effect of TIR nursing in postoperative lung cancer patients, and the long-term effect is not yet clear.

In conclusion, TIR nursing can effectively enhance the self-care ability of lung cancer patients undergoing radical thoracoscopic surgery, improve their psychological elasticity, enhance their quality of life, shorten the hospitalization time, and reduce the incidence of adverse reactions.

Disclosure of conflict of interest

None.

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