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Original Article

Seamless nursing strategy reduces preoperative anxiety and postoperative adverse effects in patients with fiberoptic bronchoscopy under intravenous anesthesia with propofol: a randomized controlled trial

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Abstract: Objective: To evaluate the efficacy of seamless nursing mode on fiberoptic bronchoscopy (FB). Methods: Two hundred patients who underwent FB in the respiratory department from June 1, 2017 to May 31, 2019 were selected as the study subjects, randomly divided into two groups; 100 in the Seamless Nursing (SN) group and 100 in the Routine Nursing (RN) group. The RN group were given routine nursing, while seamless nursing was integrated into SN group in addition to the routine nursing mode. Then anxiety self-rating scale (SAS) score, serum levels of inflammatory factors, postoperative adverse effects, Nottingham health scale (NHP) score and nursing satisfaction were compared between the two groups. Results: According to the SAS scoring system, the results showed that the degree of anxiety degree in patients on admission were similar in two groups (P>0.05); Before operation, the anxiety level of SN the group was significantly lower than on admission (P<0.001) and RN group at the same time (P<0.001). The incidence of bloody sputum, cough, hypoxemia and arrhythmia in the SN group was significantly lower than that in RN group (P=0.027, 0.009, 0.037 and 0.030 respectively). Before FB, the differences of IL-6, IL-17, TNF-α, and IL-10 serum levels between the RN group and SN group were statistically significant (P=0.006, 0.320, 0.410, 0.025 respectively). After seamless nursing, the NHP scores of physical activity, pain, sleep, emotional response and energy in the SN group had statistically significant differences compared with the RN group (P<0.001). The satisfaction degree of patients in the SN group was 91.0%, compared with RN group (71.0%), the difference was statistically significant (P<0.001). Conclusion: Full seamless nursing strategy can lower the level of anxiety before FB, decrease postoperative adverse events, and improve living quality and degree of satisfaction after FB, all of which may have great practical and promotional value.

Keywords: Seamless nursing, fiberoptic bronchoscopy, anxiety, postoperative complications

Introduction

Recently, fiberoptic bronchoscopy (FB), a minimal invasive technique, has been shown to find hidden lung diseases of the trachea and bronchus directly [1]; meanwhile, FB has been extensively applied on clinical diagnosis and treatment because of its high resolution, simple operation and good security compared with traditional thoracotomy [2]. However, as an invasive operation, FB may cause preoperative fear and anxious psychology and trauma during surgery, which will further influence patients' recovery after FB [3, 4]. According to these, a newer and more effective nursing pattern for FB as a perioperative care must be found.

Seamless nursing is a recent management concept of medical care, which was first suggested by the medical center of Florida in the United States [5]; and it refers to one-on-one services for patients including psychosomatic care before, during and after operation (perioperative period) for best physical qualifications, therapeutic effect and recovery quality of the patients [6]. Now seamless nursing has been extensively applied in various kinds of surgical operations [7-9]; nevertheless, there is no rese-

arch about seamless nursing mode on perioperative anxiety of FB, adverse effects, and recovery after FB.

Therefore, this research aims to assess the influence of seamless nursing mode on FB with careful observation on 200 patients who underwent FB in the pneumology department of our hospital.

Material and methods

Sample and setting

Two-hundred patients who were given FB under intravenous anesthesia with propofol in our hospital from June 1, 2017 to May 31, 2019 were recruited in this parallel prospective randomized (by random drawing of sealed envelopes) single-blinded (patients did not know this nursing mode) controlled trial.

The Routine Nursing (RN) group adopted a routine nursing mode, meanwhile, the seamless nursing mode was integrated into the Seamless Nursing (SN) group in addition to the routine nursing mode. General information of patients including gender, age, schooling, etc. was observed. This experiment was approved by the Ethics Committee and patients signed an informed consent. Inclusion Criteria: 1) Patients who were treated with FB; 2) 18-75 years old; 3) ASA I~III; 4) All patients and guardians were informed and consented to this study and signed an informed consent. Exclusion Criteria: 1) Patients who could not cooperatively handle FB; 2) Serious organ dysfunction of heart, liver, kidney and lung; 3) Allergic to anesthetics; 4) Psychiatric disorders; 5) Arterial partial pressure of oxygen (PaO_2) lower than 60 mmHG and partial pressure of carbon dioxide ($PACO_2$) higher than 50 mmHg under standard atmospheric pressure and resting condition; 6) Systemic disease: Anemia, peptic ulcer, Crohns disease, infectious diseases, tumors, autoimmune disease, etc.; 7) Gestation or breast-feeding women; 8) Patients who could not quit smoking or drinking; 9) Any arrhythmia before FB.

Methods

Routine nursing mode for RN group: ① Fasting and drink-deprivation as required to avoid back flowing of stomach contents, apnea, infection and other adverse effects, hypertension patients take hypotensive drugs before FB, patients wearing removable dentures removed them; ② Advise patients to know about the relative information before operation and check medical record; ③ Prepare bronchoscope, aspirator, cold light source and other instruments and emergent materials and strictly execute aseptic techniques to avoid nosocomial infection; ④ Assist patients to comply with doctor's request during operation, monitor vital signs and general condition; ⑤ Advise to fast without solids and liquids within two hours after examination.

Meanwhile seamless nursing provided one-on-one service to patients in the SN group: Before operation: ① Environmental nursing: keep examination room quiet, clean and bright with indoor temperature 24~26°C and humidity 55%. ② Materials prep: prepare rescue medicine, disinfection instruments and materials, check the integrity of fiber bronchoscope, accessory, catheter and the effectiveness of suction device. ③ Mental nursing: introduce the environment of examination room, operative methods, advantages and complications to ease the tension and fear of patients and no talking, vigorous coughing and waving of heads during the operation. ④ Patient preparation: the past medical history and contraindications are known in detail, such as serious heart disease, stroke, bronchial asthma, drug allergy history, etc., then advise patients to fast with solids 6 hours and liquids for 4 hours before operation and routine examination and vital signs monitoring are performed before the operation; 0.5 mg of atropine and 0.1 g of phenobarbital (luminal) are injected intramuscularly 0.5 h before the operation to reduce tracheal secretions, lower vagus reflex, and remove dentures, and assist coughing up bronchus secretions before surface anesthesia with 2% of lidocaine aerosol inhalation to numb the throat before starting the operation.

During operation: ① Body position preparation: assist patients to a recumbent position with pillow under shoulders to keep a minimum radian of the respiratory tract, so that the bronchoscope can pass through smoothly. ② Patient mental nursing: inform patient that it might cause a cough, nausea or choking when FB enters the glottis, please do not shake or raise head this moment; patients should keep re-

laxed the whole time, if they cannot stand it, gesture language will be allowed, however do not talk or pull out FB forcibly, nurse can comfort them for diverting the attention. ③ Cooperation during the operation: cooperation and teamwork, eliminate oral secretion, keep the upper respiratory tract clear, observe vital signs of the patients, pay attention to the situation of dysphoria and dyspnea, report abnormal situation in real time. Preserve phlegm samples or bronchoalveolar lavage fluid for inspection to instruct clinical medication.

After operation: ① Body position nursing: advise patients to lie on the affected side or lie on their back for 20 min after examination (and it should be 0.5-1 h for outpatients, the patients are to be accompanied by relatives to avoid accidents on the way home). Observe the state of illness frequently with necessary health education after operation, fasting for solids and liquids within 2 h to avoid aspiration. If an irritating cough happens when drinking after 2 h, advise the patients to take a small mild liquid diet, meanwhile avoid irritating food within 48 h. ② Observe the changes of vital signs, if their face looks pale, advise the patients try to talk less and relax more, and not to cough and sneeze vigorously to help vocal cords recover as soon as possible. ③ Blood streak in phlegm might be relative to biopsy of mucous membranes during operation, it will self-cure in 1-3 d generally, emergency treatment should be adopted if hemoptysis happens. ④ Let patients and family know about the results in a timely manner if there are no abnormities; for the patients who are diagnosed with malignant tumors, doctors explain the results appropriately to the patients and their family under protective medical principles for eliminating the ideological burden. All patients in both groups were given FB under intravenous anesthesia with propofol (Fresenius Kabi Deutschland GmbH, Germany) a 2 mg/kg bolus, then continuous propofol 4 mg/kg/h infusion.

Outcome measures

Then anxiety Self-rating Anxiety Scale (SAS) score, postoperative adverse effects, serum levels of inflammatory cytokines (IL-6, IL-17, TNF-α, IL-10), Nottingham Health Profile (NHP) score and patients' satisfaction degree for nursing service of two groups were compared.

SAS score

The ammount of anxiety was divided into four levels in SAS with the occurrence frequentness of typical symptom as an evaluation criterion: '1' represented this situation never or rarely happened; '2' meant anxiety occurred sometimes; '3' showed anxiety happened most of the time; '4' represented anxiety occurred almost all of the time. Scores of '1', '2', '3' and '4' are the points for 20 different items. No anxiety was indicated when the points were below 50; 50-60 points represented mild anxiety; 61-70 points meant medium anxiety; it represented severe anxiety with points over 70 [10].

Adverse effects

Adverse effects, including bloody phlegm, cough, hypoxemia, tracheal/bronchial spasm, arrhythmia, and fever, were observed during the postoperative 24 hours.

Inflammatory cytokines

Five ml blood samples from patients were taken immediately after operation. The levels of serum inflammatory cytokines IL-6, IL-17, TNF-α, IL-10 were determined by ELISA Kits (Abcam, England).

NHP score

NHP evaluated the patients' quality of life after FB [11], and the scale included physical activity, pain, sleep, emotional reaction and energy. The total points are 100. The higher the points, the worse the quality of life.

Degree of satisfaction

The satisfaction degree of nursing was surveyed using our satisfaction questionnaire 1 d after operation with main contents including hospital environment, service attitude of nurses, methods and contents of nursing, discomfort during the operation, therapeutic effect, side effects and body recovery condition. Total points are 100; 81-100 points showed great satisfaction, 61-80 points showed satisfaction and dissatisfaction was represented with points below 60. The satisfaction degree of patients = (cases with great satisfaction + cases with general satisfaction)/total cases ×100%.

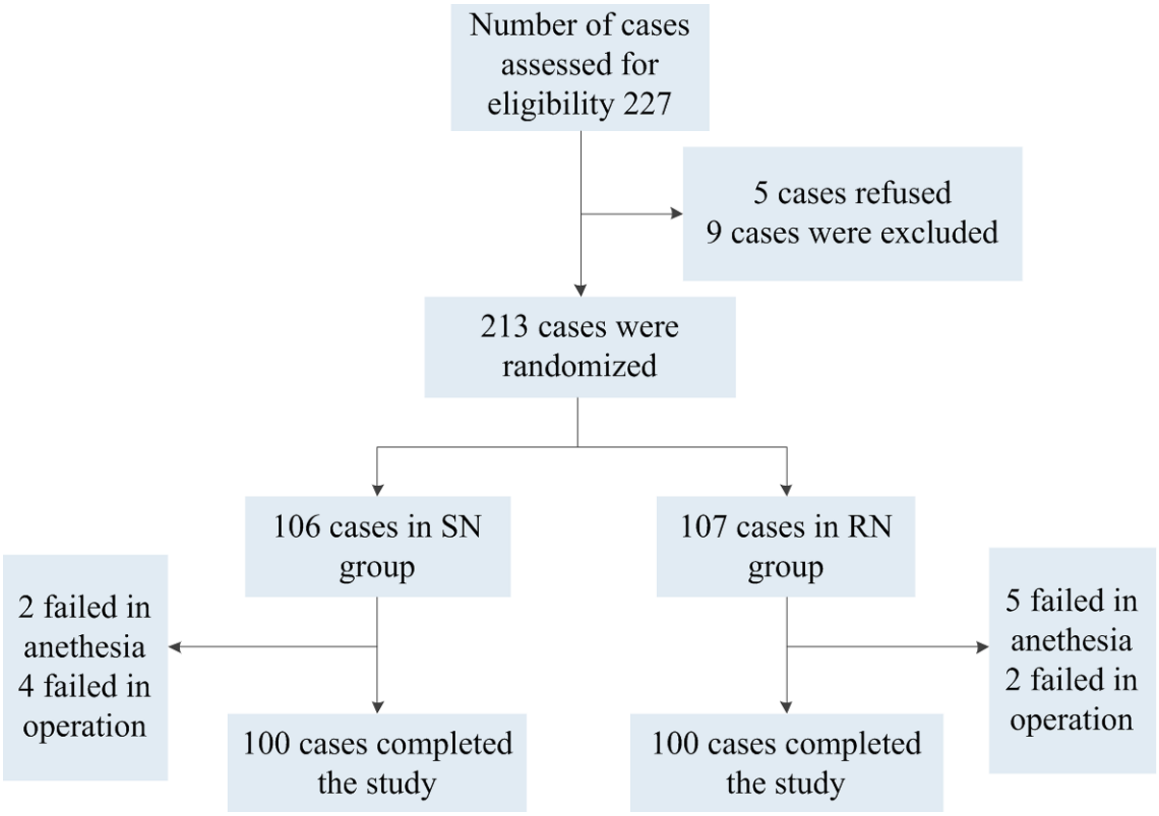

Figure 1. Flow diagram according to Inclusion and Exclusion Criteria.

Statistical methods

Data were analyzed using SPSS 17.0 statistical software. Descriptive statistics were presented as mean ± standard deviation (Mean ± SD). Quantitative data was compared using t test, while percentage (%) was applied for enumeration data using χ^2 test. P<0.05 was considered statistically significant.

Results

General information

Two hundred and twenty seven patients were assessed for eligibility in our hospital from June 1, 2017 to May 31, 2019, and 14 cases were dropped because of refusal or falling under the exclusion criteria (**Figure 1**), 13 were excluded because they failed in either anesthesia or operation; and the remaining 200 patients were randomly divided into SN group (100 cases) and RN group (100 cases). General information including age, gender, time course of the disease and educational level of patients in the two groups were compared, the differences were not statistically significant (P>0.05) (**Table 1**).

Comparison of SAS score

SAS was used to score the anxiety levels of the patients in two groups, and the results showed that the differences of the anxiety SAS scores between two groups were not statistically significant at the time of admission into hospital (P=0.881). There was a difference before the operation between two groups (P<0.001). At the time of admission into hospital, there was no difference of SAS scores in RN group compared with before operation (P=0.075); however, the difference between these two different time points was statistically significant in the SN group (P<0.001) (**Table 2**).

Postoperative adverse effects

Three cases had bloody phlegm, one case coughed, four cases had hyoxemia and one case had arrhythmia in the SN group, and the difference between RN group and SN group regarding the incidence of adverse effects had statistical significance (P=0.027, 0.009, 0.037 and 0.030 respectively). Two cases had tracheal/bronchial spasm, one case had fever in the SN group after operation; moreover there was

Table 1. General information of patients in two groups

		SN group	RN group	χ^2/t	P
Number of cases		100	100	-	-
Age (year)		53.5±9.56	55.8±8.73	-1.777	0.077
Gender (case)	Male	61	65	0.343	0.558
	Female	39	35		
Course time of the disease (years)		1.48±0.75	1.54±0.69	-0.589	0.557
Diseases (case)	Pneumonia	35	41	4.784	0.310
	Tuberculosis	11	6		
	Lung abscess	5	11		
	Lung tumor	28	23		
	Tracheal foreign body	21	19		
Educational level (case)	Junior high school or lower	39	44	0.529	0.768
	Senior high school	32	30		
	Junior college or higher	29	26		

Table 2. Comparison of anxiety level between RN group and SN group at the time of admission into hospital and before operation

		SN group (n=100)	RN group (n=100)	χ^2	P
At the time of admission into hospital	No anxiety	0	0	0.252	0.881
	Mild anxiety	28	25		
	Middle anxiety	53	56		
	Serious anxiety	19	19		
Before operation	No anxiety	32	5	57.031	0.000
	Mild anxiety	45	20		
	Middle anxiety	19	59		
	Serious anxiety	4	16		

Table 3. Postoperative adverse effects between these two groups

	SN group (n=100)	RN group (n=100)	χ^2	P
Bloody phlegm	3	11	4.916	0.027
Cough	1	9	6.737	0.009
Hyoxemia	4	12	4.348	0.037
Tracheal/bronchial spasm	2	1	0.338	0.561
Arrhythmia	1	7	4.688	0.030
Fever	1	4	1.846	0.174

no significant difference between the two groups about tracheal/bronchial spasm and fever (P=0.561 and 0.174 respectively) (**Table 3**).

Serum levels of inflammatory factors before FB

The serum levels of IL-6, IL-17, TNF-α, and IL-10 are 30.55±9.78 pg/ml, 15.34±6.01 pg/ml, 3.37±1.55 pg/ml, 3.32±1.20 pg/ml respectively, in SN group after FB. Compared with RN group, the difference is statistically significant (P=0.006, 0.320, 0.410, 0.025 respectively) (**Figure 2**).

Comparison of NHP score

The NHP score points of patients after nursing about physical activity, pain, sleep, emotional reaction and energy in SN group are 92.2±11.3, 89.5±12.4, 90.4±19.8, 92.6±15.3 and 88.1±12.7 respectively. Compared with the RN group, the difference had statistical significance (all P<0.001) (**Table 4**).

Comparison of satisfaction degree

In the SN group, 55 cases had great satisfaction, 36 cases had general satisfaction, nine cases did not feel satisfaction; the degree of satisfaction is 91.0%. Compared with 71.0% of RN group, the difference had statistical significance (P<0.001) (**Table 5**).

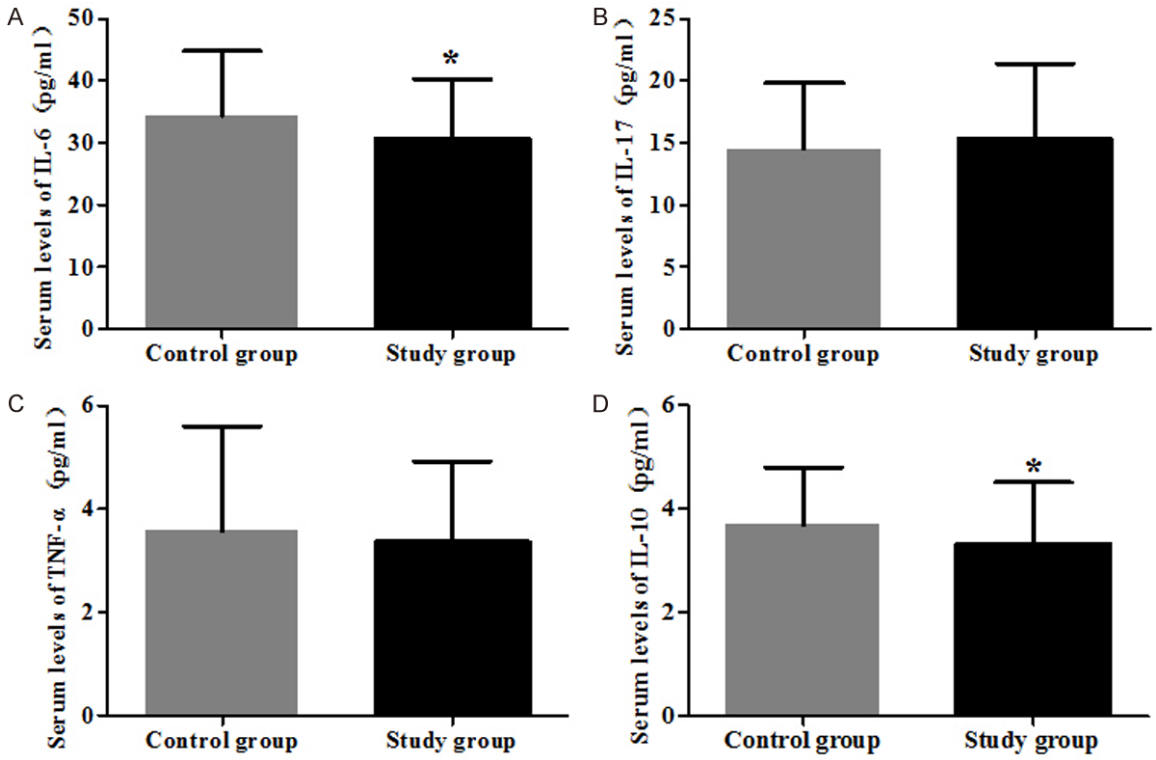

Figure 2. The comparison of serum levels (pg/ml) of inflammatory factors of pneumonia patients in SN group and RN group. A. The comparison of serum IL-6 level (pg/ml) of pneumonia patients in two groups; B. The comparison of serum IL-17 level (pg/ml) of pneumonia patients in two groups; C. The comparison of serum TNF-α level (pg/ml) of pneumonia patients in two groups; D. The comparison of serum IL-10 level (pg/ml) of pneumonia patients in two groups. Study group: SN group, Control group: RN group. *P<0.05, SN group VS. RN group after FB.

Table 4. Quality of life compared between these two groups after nursing

	SN group (n=100)	RN group (n=100)	t	P
Physical activity	92.2±11.3	80.2±10.4	-7.814	0.000
pain	89.5±12.4	71.3±11.9	-10.590	0.000
sleep	90.4±19.8	71.2±18.9	-7.014	0.000
Emotional reaction	92.6±15.3	71.9±12.3	-8.881	0.000
Energy	88.1±12.7	63.4±14.1	-13.016	0.000

Table 5. Comparison of postoperative satisfaction degree between these two groups

	RN group (n=100)	SN group (n=100)	χ^2	P
Great satisfaction	34	55		
General satisfaction	29	36		
Dissatisfaction	37	9		
Satisfaction degree	71.0%	91.0%	22.752	0.000

Discussion

With significant advantages (simple operation, distinct image and broader view), FB has been applied clinically to diagnose and treat respiratory system diseases [12]. However, like gastroscopy, colposcopy and other endoscopies, bronchoscopy can make patient feel negative emotions, such as fear, contradictions, and anxiety, etc. [4]. Therefore nurses can help by explaining relevant knowledge and matters that need attention to the patient using a one-on-one nursing approach during the perioperative period; so seamless nursing strategy is especially important for FB.

Seamless nursing refers to the cooperation of basic, secondary and third level health departments, welfare housing, family, community and other health-care workers, from which this nursing mode can provide the highest quality patient-centered care [13, 14]. Service concepts of seamless nursing have become the developmental trends of modern operating room nursing gradually over time. It has changed the past commanding form of nursing which only pays attention to diseases not the

working attitude, it converts service concepts of nurses and improves initiative service awareness which improves the responsibility of operating room nurses to realize the 'people first and patient-centered' aims [15, 16].

Research has found that seamless nursing could lower anxious emotions of patients clearly before surgery because of the influences of reducing environmental factors according to seamless nursing strategy on patients' psychology [17]. Psychological nursing further reduces fear and anxiety of patients by necessary education and psychological guidance before operation [18]. At the same time, the incidence of bloody phlegm, cough and hyoxemia of patients who underwent seamless nursing decreased, the reason possibly being that the sufficient preparation of materials according to seamless nursing strategy decreased the adverse events during the operation, and this could help to avoid any forgotten details which might result in additional trauma [19]. Also understanding the information of the operation fully could help to avoid the disadvantages of FB [20]; as well as preparing suitable positions, enhancing compatibility of patients with psychological care, creating more professional skills of nurses during FB realized better cooperation [21], and the above contents could create a sufficient condition for decreasing postoperative adverse effects. The numbers of postoperative arrhythmia patients in the RN group are more than in the SN group; this might be because any anxious emotions resulted in autonomic nerves system dysfunction, parasympathetic nervous system hypofunction and sympathetic nervous system hyperfunction which can raise catecholamine levels, and then heighten the heart rate, elevate blood pressure, improve myocardial contraction and increase myocardial oxygen consumption, thus lead ingto ventricular tachycardia [22, 23]. While the seamless nursing strategy might decrease arrhythmia rate by relieving the anxious emotion of patients.

Meanwhile, improving quality of living might be relevant to the reduction of postoperative complications, and the rising of nursing satisfaction might be based on the reduction of side events after FB and improvement of living quality. However a small sample size and short follow-up time may result in errors, so the prospective experiments with larger sample size should be conducted to verify the results above.

In conclusion, seamless nursing strategy can lower the level of anxiety before FB, decrease postoperative adverse events, and improve living quality and degree of satisfaction after FB; all of which may have great practical and promotional value.

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Disclosure of conflict of interest

None.

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