Am J Transl Res 2021;13(8):9694-9700
www.ajtr.org /ISSN:1943-8141/AJTR0129969

Original Article

Study on the value of nasogastric tube nutrition nursing in critical patients with indwelling nasogastric tube

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Received January 11, 2021; Accepted February 19, 2021; Epub August 15, 2021; Published August 30, 2021

Abstract: Purpose: To explore the application value of nasogastric tube nutrition nursing in critical patients with an indwelling nasogastric tube. Methods: A total of 130 patients who were hospitalized in the ICU of our hospital and retained nasogastric tubes from January 2019 to January 2020 were selected as the research subjects, and they were divided into a control group (n=65, routine nursing) and an observation group (n=65, nasogastric tube nutrition nursing) according to a random number table method. The nutrition index level, gastrointestinal complications, adverse events, Glasgow coma index (GCS) score, acute physiology and chronic health (APACHE II), and quality of life score of the two groups were compared. Results: The serum prealbumin, serum transferrin, and serum albumin after nursing were higher than those before nursing, and the observation group was higher than the control group; the observation group had lower incidence of diarrhea, constipation and gastric retention; the incidence of adverse events in the observation group was lower as well; the GCS score of the observation group after nursing was higher in comparison with the control group, while APACHE II score in the observation group was lower; the observation group had higher quality of life score as compared with the control group. Conclusion: The application of nasogastric tube nutritional nursing in critical patients with an indwelling nasogastric tube has high therapeutic value and is worthy of promotion.

Keywords: Nasogastric tube, nutritional nursing, critically ill patients, value

Introduction

As the preferred nutritional route for critically ill patients, enteral nutrition is a nutritional support method that provides nutrients required by the body's metabolism through the gastrointestinal tract. It is divided into oral and transcatheter infusion, and the nasogastric tube belongs to transcatheter infusion type [1, 2]. Nasogastric tube feeding is a technique that can meet the bodies' nutrition supply and treatment needs. It is conducted by inserting a catheter from the nasal cavity into the gastrointestinal tract, and then infuses water, liquid food, drugs, etc. into the tube [3]. Due to the limitation of the feeding of critically ill patients, nutrition therapy is often performed in the clinic to ensure sufficient nutrition supply, which is conducive to good treatment effect and prognosis. Patients are vulnerable to inadequate nutritional supplements and catheter-related adverse events as a result of the complications occurring during nasogastric tube nutrition therapy, further affecting the treatment of patients [4]. There is a paucity of trials reporting on the nursing of nasogastric tube nutrition, which needs a clinical basis for better nutritional support for critically ill patients to reduce intubation complications. To this end, this study explored the application value of nasogastric tube nutrition nursing in severe patients with an indwelling nasogastric tube, with a hope to provide a reference for clinical improvement of nasogastric tube nutrition therapy.

Materials and methods

General information

Patients who were hospitalized in the ICU of our hospital and retained the nasogastric

tube from January 2019 to January 2020 were selected as the research subjects.

Inclusion criteria: (1) patients who received gastrointestinal nutrition therapy >10 d; (2) patients who had good compliance and could consistently cooperate with this study; (3) patients with APACHE II score >20 points [5]; (4) patients whose family signed informed consent.

Exclusion criteria: (1) patients who received other types of nutritional support during the same period; (2) patients combined with acute abdomen, intestinal obstruction, malabsorption, dyspepsia and other digestive tract diseases; (3) patients complicated with severe organ diseases such as the heart, liver and kidney; (4) patients with inflammation of the digestive tract. Finally, 130 cases were included and divided into a control group (n=65) and an observation group (n=65) according to a random number table method. This study was approved by ethics committee of our hospital.

Methods

The control group

The control group was given routine nursing, namely cleaning the oral cavity and lubricating the gastric tube and other basic nursing.

Observation group

The observation group was given the nasogastric tube nutritional nursing on the basis of the control group [6]. (1) Mastery of the patient's medical history, mouth and nose patency, blood coagulation function, swallowing function, vital signs and other information before tube placement, establish a risk emergency plan, and prepare rescue items. (2) Select a soft, small-caliber gastric tube and place it according to the "*Guideline for Clinical Practice of Adult Nasogastric Tube Feeding*". If the resistance of suctioning gastric juice is excessive, the gastric tube can be rotated to adjust it; expectorant nursing should be done before placing a gastric tube if there is more sputum; if there is gas accumulation in the stomach, then the patient was instructed to hold their breath and take a deep breath for 0.5 min. (3) Completion of tube placement and record the depth of the gastric tube. If the position of the gastric tube is incorrect, it should be adjusted in time; 1 mL of liquid paraffin is injected from the nostril to the outer wall of the gastric tube during the patient's gastric tube indwelling, so that the liquid paraffin flows along the wall of the gastric tube to the pharynx; avoiding the original part when changing the tape; observe the length of the gastric tube exposure every 4 h. (4) Operational norms are in strict accordance with the *Clinical Nutrition Nursing Guidelines-Enteral Nutrition Section* issued by the Nursing Section of the Parenteral Enteral Nutrition Branch of the Chinese Medical Association, strictly following the "six du principle", namely angle, speed, temperature, cleanliness degree, concentration and adaptability. The angle of raising the head of the bed should be appropriate if the patient is in bed; maintain a semi-recumbent position within 0.5 h after the nasogastric tube feeding. The feeding speed should be from slow to fast. The cleanliness of the nasal feeding solution should be ensured so that it will not be contaminated and will not deteriorate. The speed, temperature and concentration of nasogastric tube feeding should be adjusted at any time according to the actual situation of the patient. (5) The "three links, three rinses" principle should be adhered to, three links refer to before and after administration, before and after nasogastric tube feeding, and 4 to 6 hours after continuous infusion; three rinses are taking about 5 ml of warm boiled water used for pulse-type flushing, long-term gasogastric tube feeding should be rinsed once every 4 h, and it should be rinsed with warm water first when blockages happen or with $NaHCO_3$ or pancreatin if the effect is unsatisfactory. (6) The nursing department uniformly produces the enteral nutrition infusion signs, gastric tube line signs and special treatment card signs, in which all the gastric tube lines signs are purple, the enteral nutrition infusion logo hangs on the patient's bedside, gastric tube line signs are attached to the end of the nasogastric tube, and the special treatment signs are hung on the special infusion rack for enteral nutrition; and, a reserved use infusion rack, infusion pump tube, enteral nutrition pump, and perfusion device are utilized if needed. All patients in the two groups were treated for 14 days.

Detection of nutritional indicators

Before and after nursing, serum prealbumin, serum transferrin, serum albumin and other nutritional indicators were detected for all

Table 1. Comparison of general data

Groups	Sex [n (%)]		Age ($\bar{x}$ ± s, year)	Height ($\bar{x}$ ± s, cm)	weight ($\bar{x}$ ± s, kg)
	Male	Female			
Control group (n=65)	30 (46.15)	35 (53.85)	45.95±6.76	166.05±6.54	64.13±7.04
Observation group (n=65)	34 (52.31)	31 (47.69)	48.22±6.05	166.47±6.38	63.55±7.61
χ^2/t	0.492		2.017	0.371	0.371
P	0.483		0.046	0.046	0.653

patients. Fasting venous blood 5 mL was extracted before intubation and 14 d after nasogastric tube, centrifuged for separation, the upper layer of serum was retained, and stored at -80°C for future inspection. An automatic biochemical analyzer [CX-5, Beckman (USA)] was applied for detection, and the detection methods for the three nutritional indicators were turbidimetry, turbidimetry and bromocresol green colorimetry.

Outcome measures

(1) Nutritional indicators: serum prealbumin, serum transferrin, serum albumin. Normal range of serum prealbumin was 213.0~441.9 mg/L, lower than normal range was considered malnutrition, and higher than normal range was considered overeating protein diet, normal range of adult serum transferrin was 2.20~4.0 g/L. The normal range serum albumin was 35~53 g/L [7]. (2) Gastrointestinal complications: diarrhea, constipation and gastric retention were counted; determination method: 1) diarrhea, frequency of defecation >3 times a day; 2) constipation, frequency of defecation <3 times in 7 days; 3) gastric retention: volume of gastric residue >200 mL [8]. (3) Adverse events: aspiration, pressure ulcer and hemorrhage, reflux, tube blockage, etc. (4) Glasgow coma scale (GCS) score and acute physiology and chronic health evaluation (APACHE II) score: GCS was used to assess the level of consciousness of the patient, which consists of eye-opening response, speech response, and motor response, with a maximum score of 15 points and a minimum of 3 points; 13 to 14 points indicates mild coma, 9 points to 12 points indicates moderate coma, and 3 points to 8 points indicates severe coma [9]. APACHE II was used to evaluate the patient's condition and prognosis, which consists of acute physiology score (APS), age score, and chronic health score. The final score is the sum of the three. The theoretical maximum score is 71 points. The higher the score, the more serious the condition. (5) Quality of life score: the quality of life of patients was evaluated at the time of admission, discharge and 2 months after discharge in accordance with the WHO quality of life assessment scale. The assessment content mainly includes psychological, physical, social, environmental aspects, with 26 items in total. Each item is rated from 1 to 5 points according to the severity. The higher the score, the better the quality of life [10].

Statistical analysis

SPSS 20.0 software was used to process the data. Quantitative data was represented by (x ± s), the comparison between the two groups was performed by t test, and the comparison of data at different time points between the groups was analyzed by repeated measures analysis of variance. Qualitive data was represented by n (%), the comparison was conducted by χ^2 test, and the chi-square value was corrected when 1≤ theoretical frequency <5. P<0.05 was considered statistically significant. GraphPad prism 8 software was applied to illustrate figures.

Results

Comparison of general data

Comparison of general data such as gender, age, height and weight between the two groups showed no significant difference (P> 0.05). See **Table 1**.

Comparison of the levels of nutritional indicators

Before nursing, the levels of nutritional indicators such as serum prealbumin, serum transferrin, and serum albumin in the observation group were not statistically different from those in the control group (P>0.05). After nursing, serum prealbumin, serum transferrin, serum albumin and other nutrition indicators were higher than those before nursing, and the

Table 2. Comparison of the levels of nutritional indicators (g/L, $\bar{x} \pm s$)

Groups	serum prealbumin		serum transferrin		serum albumin	
	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Control group (n=65)	0.19±0.34	0.29±0.07*	1.48±0.69	1.85±0.13*	33.91±1.39	37.54±1.53*
Observation group (n=65)	0.21±0.35	0.41±0.32*	1.49±0.02	2.89±0.27*	33.85±1.40	43.26±1.29*
t	0.331	2.954	0.117	27.980	0.2452	23.04
P	0.742	0.004	0.907	<0.001	0.807	<0.001

Note: *compared with data before nursing, *P*<0.05.

Table 3. Comparison of incidence of gastrointestinal complications [n (%)]

Groups	diarrhea	constipation	gastric retention
Control group (n=65)	16 (24.62)	13 (20.00)	12 (18.46)
Observation group (n=65)	7 (10.77)	5 (7.69)	4 (6.15)
χ^2	4.279	4.127	5.043
P	0.039	0.042	0.025

observation group was higher than the control group (P<0.05). See **Table 2**.

Comparison of gastrointestinal complications

The incidence of gastrointestinal complications such as diarrhea, constipation, and gastric retention in the observation group was lower than that in the control group (P<0.05). See **Table 3**.

Comparison of adverse events

The incidence rate of adverse events in the observation group was 9.23%, which was lower than 29.23% in the control group. See **Table 4**.

Comparison of GCS score and APACHE II score

Before nursing, there was no significant difference in GCS score and APACHE II score between the two groups (P>0.05). After nursing, the GCS scores of both groups were higher than those before nursing, and the observation group was higher than the control group (P<0.05). The APACHE II scores of both groups were lower than those before nursing, and the observation group was lower than the control group (P <0.05). See **Table 5**.

Comparison of quality of life scores

The quality of life scores of the observation group were higher than those of the control group (inter-group effect: F=867.100, P<0.001), and the quality of life scores of both groups tended to increase with time (time effect: F= 28.970, P<0.001), there was an interaction effect between grouping and time (interaction effect: F=6.309, P= 0.002). See **Figure 1**.

Discussion

When no contraindications are shown for enteral nutrition in critically ill patients, enteral nutrition treatment is usually performed in the clinic to ensure that patients receive adequate nutrition supply. Among them, the nasogastric tube is widely used, and the operation is simple and convenient. However, severely ill patients undergoing nasogastric tube nutrition therapy often suffer gastric motility disorders, gastric retention, etc., leading to reflux of gastric contents and triggering aspiration, and resulting in unsatisfactory effects of enteral nutrition [11]. Therefore, nutritional nursing with a nasogastric tube is of great significance for severe patients with indwelling nasogastric tube.

The results of this study showed that serum prealbumin, serum transferrin, and serum albumin after nursing were higher than those before nursing, and the observation group had higher values than the control group; the observation group had lower incidence of diarrhea, constipation and gastric retention; the incidence of adverse events in the observation group was lower as well; the GCS score of the observation group after nursing was higher in comparison with the control group, while APACHE II score in the observation group was lower; and the observation group had higher quality of life score as compared with the control group. It is indicated that the nursing of nasogastric tube nutrition in severe patients

Table 4. Comparison of adverse events [n (%)]

Groups	Accidental aspiration	Pressure ulcer and hemorrhage	Reflux	Tube blockage	Adverse events
Control group (n=65)	3 (4.62)	3 (4.62)	8 (12.31)	5 (7.69)	19 (29.23)
Observation group (n=65)	2 (3.08)	1 (1.54)	1 (1.54)	2 (3.08)	6 (9.23)
χ^2					8.370
P					0.004

Table 5. Comparison of GCS score and APACHE II score (point, $\bar{x} \pm s$)

Groups	GCS		APACHE II	
	Before nursing	After nursing	Before nursing	After nursing
Control group (n=65)	8.12±2.55	9.01±2.32*	21.86±1.17	18.45±1.22*
Observation group (n=65)	8.26±2.14	10.03±2.41*	22.02±1.14	16.72±1.06*
t	0.339	2.458	0.790	8.630
P	0.735	0.015	0.431	<0.001

Note: *compared with data before nursing, *P*<0.05.

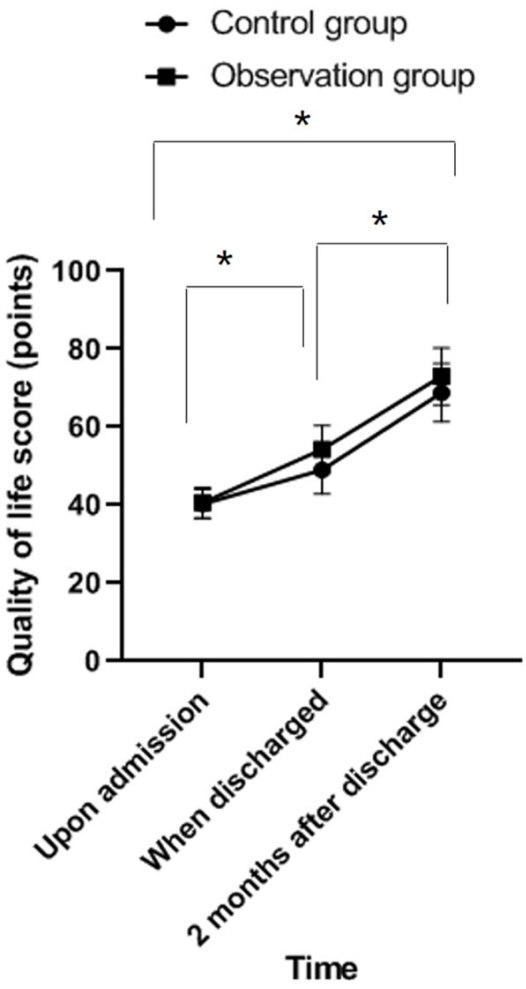

Figure 1. Comparison of quality of life scores between two groups. Note: * represents P<0.05.

with an indwelling nasogastric tube can improve the level of nutritional indicators such as serum prealbumin, serum transferrin, and serum albumin, reduce the occurrence of complications and adverse events, and improve the GCS score and life quality score, lower APACHE II score. (1) Nasogastric tube nutritional nursing can improve the nutritional efficiency and the effect of nutritional treatment, enhance the patient's serum prealbumin, serum transferrin, serum albumin and other nutritional indicators; and it is conducive to improve the prognosis, increase the GCS score, reduce the APACHE II score, and indirectly reduce the incidence of complications if severe patients receive adequate nutrition during treatment [11, 12]. (2) The cleanliness of the nasal feeding solution can prevent patients from diarrhea; using appropriate speed, temperature, concentration of the nasogastric tube feeding, and soft, small-caliber gastric tube (to reduce the stimulation for gastrointestinal mucosa) can effectively reduce the patient's discomfort (nausea and vomiting) and the occurrence of complications [13]. (3) Regular observation of the length of the exposed gastric tube during daily nasal feeding can effectively reduce the occurrence of adverse events; for patients with large amounts of sputum, airway care before the gastric tube is conducted to effectively avoid airway blockage [14, 15]. It is strictly prohibited to confirm the position of the gastric tube by auscultating gurgling or observing bubbles. The patient is

placed in a semi-recumbent position after nasogastric tube feeding to prevent accidental aspiration; standard operations such as liquid paraffin, aerosol inhalation, and tape replacement during the indwelling of the gastric tube benefits patients with nasopharyngeal and espohageal epithelium pressure ulcers and reduces bleeding induced by long-term intubation [16, 17]. The feeding speed of nasogastric tube adheres to the principle of gradual improvement in a slow-fast manner, avoiding reflux caused by incomplete closure of the cardiac sphincter due to indwelling gastric tube. The strict adherence to "three links and three rinses" effectively reduces the risk of tube blockage [18, 19]. Strict implementation of the "three signs, four specials", the strict distinctions and warnings of use of colors, signs, equipment and items, as well as the establishment of risk emergency plans, the preparation of rescue items, etc., all contributes to reduce the occurrence of adverse events of indwelling nursing and safeguard patient safety [20, 21]. Due to the small sample size in this study, it may result in a certain bias in the results, which needs to be further verified by studies with larger sample sizes.

In summary, the application value of nasogastric tube nutritional nursing in severe patients with indwelling nasogastric tube is high, and it is worth promoting.

Disclosure of conflict of interest

None.

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