

## Effect of Acupoint Injection Combined with Ventral Massage in Neurosurgical Patients with Gastric Retention After Enteral Nutrition

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### Keywords

Acupoint injection, Ventral massage, Neurosurgery, Gastric retention after enteral nutrition

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### Abstract

**Objective** To investigate the effect of acupoint injection combined with ventral massage in neurosurgical patients with gastric retention after enteral nutrition. **Methods** A total of 102 patients with gastric retention after enteral nutrition were randomly divided into observation group (51 cases) and control group (51 cases) from Jun. 2015 to Oct. 2016. The patients of control group were treated with acupoint injection of metoclopramide while the patients of the observation group were additionally treated with ventral massage based on the treatment of control group. Two groups were treated for 7 d. To observe clinical effect, GCS score, gastric residual, vomiting, abdominal distention and abdominal circumference change. **Results** The total effective rate of observation group was 96.08% whereas that of control group was 82.35%, implying that the effective rate of observation group was significantly higher than that in control group ( $P < 0.05$ ). Compared with before treatment, GCS scores increased significantly after treatment in two groups ( $P < 0.01$ ), GCS score of observation group increased more significantly than that in control group after treatment ( $P < 0.01$ ). Gastric residual volume of observation group was significantly lower than that in control group after treatment ( $P < 0.01$ ); vomiting incidence and abdominal distention incidence of observation group were significantly lower than those in control group after treatment ( $P < 0.05$ ); abdominal circumference change of observation group was significantly higher than that in control group after treatment ( $P < 0.01$ ). **Conclusion** Acupoint injection combined with ventral massage has a significant effect on improving GCS score, reducing gastric residual and decreasing occurrence of vomiting and abdominal distension in neurosurgical patients with gastric retention after enteral nutrition.

**Introduction**

Gastric retention is a common complication of enteral nutrition performed for severe neurosurgical patients. The morbidity of gastric retention can be up to 58.3%, among which about 88.2% developed the disease within 7 days [1]. Gastric retention of severe neurosurgical patients significantly increases incidence of aspiration, seriously influencing therapy and recovery of patients [2,3]. Therefore, how to treat and prevent gastric retention is an urgent problem that needs to be settled in neurosurgery department. At present, the clinical treatment approaches for gastric retention mainly include regulating nutrient proportion in enteral nutrition, adjusting infusion rate of enteral nutrition, elevating head of bed 30° to 45°, using gastric motility promoting drugs and so on [4,5]. Our study innovatively applied acupoint injection in combination with ventral massage to treat gastric retention after enteral nutrition of severe neurosurgical patients and then investigate the therapeutic efficacy,

trying to provide evidence for clinical treatment.

**Materials and methods**

**Clinical data**

**Research object**

In total, 102 severe neurosurgical patients with gastric retention after enteral nutrition in our hospital from June 2015 to October 2016 were selected and randomly divided into observation group (n=51) and control group (n=51). This study was approved by the Ethics Committee of Zhejiang Tongde Hospital and all patients volunteered to participate in the present work with the informed consent acquired. The clinical pathological features of each case comprising age, sex, type of disease and type of gastric tube were collected from patient records. As shown in Table 1, the two groups were comparable as no obvious difference among age, sex, type of disease and type of gastric tube was observed between two groups ( $P > 0.05$ ).

Table 1 Clinicopathological features between two groups

Group	n	Age(yea r)	Sex		Type of disease			type of gastric tube	
			Mal e	Fema le	Cerebrovascular accident	Severe craniocere bral trauma	Oth er	Nasogast ric tube	Gastrosto my tube
Observati on	51	51.68±8. 34	28	23	19	22	2	46	5
Control	51	53.02±8. 57	31	20	22	20	1	48	3

**Inclusion criteria**

Severe neurosurgical patients met the diagnostic criteria of gastric retention after enteral nutrition: 1. The residual of gastric content extracted through a nasogastric tube 6 h later after energy supply of 25 kcal/kg•d was estimated to be over 200 mL continuously; 2. Glasgow Coma Scale (GCS) ≤ 8; 3. 18 years old ≤ age ≤ 75 years old; 4. Those who could not eat by themselves were provided with enteral nutrition solution by nasogastric tube.

**Exclusion criteria**

Exclusion criteria were: 1. Organ failure (heart, liver,

kidney etc.); 2. Diabetes; 3. Gastrointestinal diseases; 4. History of abdominal operation; 5. Unstable vital signs; 6. Intolerance to drugs used.

**Methods**

**Research team**

The research team consisted of medical staff from neurosurgery department, digestive department, nutrition department and traditional Chinese medicine department. All the staff were trained with the examination passed, which included theory knowledge (gastric retention, enteral nutrition,

pharmacological action of metoclopramide and relevant knowledge of traditional Chinese medicine) and nursing operation (indwelling gastric tube, use of enteral nutrition pump, acupoint massage in the abdomen, acupoint injection and abdominal auscultation).

### Control group

Patients were treated with metoclopramide injection (10 mg) at Zusanli: with a patient maintained at supine position, a needle was quickly punctured about 2-3 cm at Zusanli, followed by slight lifting and thrusting. After no blood was drawn back, the drug was injected slowly. Half an hour later, gastric retention was evaluated and nutrition solution was pumped. The treatment was operated once in the morning (8 a.m.) and once in the evening (4 p.m.) for 7 d.

### Observation group

Patients were additionally treated with ventral massage on a basis of the treatment of control group. The ventral massage was performed immediately after acupoint injection of metoclopramide. With a patient maintained at supine position, a nurse standing on the right side of the patient: 1. massaged on Zhongwan, Daheng, Tianshu and Guanyuan by single-finger manipulation (lasting 1 min for each point); 2. put the hands on the lateral region of abdomen and pushed from the hypochondrium down to the groin using the bases of palms (repeating 30-50 times); 3. placed the right hand flat on the abdomen of the patient, briskly and smoothly massaged around the navel for 15 min with the strength gradually increasing, as the manipulation was kept gentle and even. The enteral nutrition program was the same as the control group. The treatment lasted for 7 d.

### Clinical efficacy criteria

The criteria were as follows: marked effectiveness, nasal feeding volume > 1000 mL/24 h, bowel sound > 3 times/min; effectiveness, nasal feeding volume > 500-1000 mL/24 h, bowel sound = 2-3 times/min; without effectiveness, nasal feeding volume < 500

mL/24 h, bowel sound < 2 times/min. Total effectiveness rate = (the number of marked effectiveness and effectiveness cases/the number of total cases) × 100%.

### Outcome measures

1. The GCS scores of the two groups before and after treatment; 2. Gastric residual of the two groups after treatment (primary nurses extracted gastric residual from the gastric tube through 50 mL-disposable syringes and the data were recorded for assessment), vomiting, abdominal distention (abdominal circumference accelerated in comparison with that before nasal feeding; abdominal wall was palpated rigid with tenseness elevating and mobility reducing) and abdominal circumference change (abdominal circumference was measured at navel level; the position and location for each measurement needed to be consistent).

### Statistical analysis

Statistical analysis was made by SPSS 17.0 (IBM, Armonk, NY, USA). Enumeration data were analyzed by the  $\chi^2$  test while measurement data were presented as the means ± standard deviation, as the two groups were contrasted using Student's *t* test.  $P < 0.05$  suggested a statistically significant difference.

### Results

#### Clinical efficacy

There were 30 cases of marked effectiveness, 19 cases of effectiveness and 2 cases of without effectiveness in observation group with a total effectiveness rate of 96.08%, whereas 22 cases of marked effectiveness, 20 cases of effectiveness and 9 cases of without effectiveness were viewed in control group with a total effectiveness rate of 82.35%, thus it could be seen that the therapeutic efficacy of observation group was notably higher than that of control group (Table 2,  $P < 0.05$ ).

#### GCS

GCS level was increased in both observation and control groups after treatment in contrast with that in

these groups before treatment (Table 3,  $P < 0.01$ ), with the GCS rise of patients in observation group

was more significant than that in control group (Table 3,  $P < 0.01$ ).

Table 2 Clinical efficacy between two groups

Group	n	Marked effectiveness	effectiveness	Without effectiveness	Total effectiveness rate (%)
Observation	51	30	19	2	96.08
Control	51	22	20	9	82.35
$\chi^2$ value					4.993
$P$ value					0.025

Table 3 GCS between two groups

Group	n	GCS		$t$ value	$P$ value
		Before	After		
Observation	51	7.03±2.36	12.02±3.01	-9.317	0.000
Control	51	7.08±2.40	10.37±2.76	-6/424	0.000
$t$ value		-0.106	2.885		
$P$ value		0.916	0.005		

**Other conditions**

After treatment, the gastric residual of patients in observation group appreciably declined when compared with that of control group (Table 4,  $P < 0.01$ ), as the similar consequences were obtained in

vomiting and abdominal distension occurrence (Table 4,  $P < 0.05$ ). Besides, the abdominal circumference change in observation group was prominently higher than that of control group (Table 4,  $P < 0.01$ ).

Table 4 Other conditions between two groups

Group	n	Gastric residual(mL)	Vomiting [n(%)]		Abdominal distension	Abdominal circumference change (cm)
Observation	51	100.34±18.48	0(0)	5(9.80)	8.41±3.16	
Control	51	139.27±38.16	5(9.80)	13(25.49)	5.48±2.01	
$\chi^2/t$ value		-6.557	5.258	4.317	5.587	
$P$ value		0.000	0.022	0.038	0.000	

**Discussion**

Gastric retention is also known as delayed gastric emptying or gastroparesis, which is caused by gastric contents that cannot be emptied in time [6]. It is diagnosed as gastric retention if the gastric residual extracted through a nasogastric tube was estimated to be over 200 mL continuously six hours later after

energy supply of 25 kcal/kg·d [7]. Specifically, regulation of vagus nerve on gastric motility was weakened by nervous system dysfunction leads to inhibition of gastric emptying and vasoconstriction-induced mucosa injury of the gastrointestinal tract slows down

gastrointestinal peristalsis, bringing about gastric retention. In addition, the excessive infusion rate of enteral nutrition beyond gastrointestinal tolerance of patients is also a risk factor for gastric retention occurrence [8,9]. Gastric retention not only negatively affects goal achievement of enteral nutrition, but also even stops the treatment of enteral nutrition. Moreover, the elevated regurgitation of gastric contents caused by gastric retention increases incidence of aspiration and it is easy to result in aspiration pneumonia, which brings great pain to patients and is unfavorable for treatment and prognosis of the disease with prolonged length of stay in hospital.

Regulation of nutrient proportion in enteral nutrition, adjustment on infusion rate of enteral nutrition, bed head elevation at 30° to 45° and use of gastric motility promoting drugs are the current treatment strategies for gastric retention in clinic. Recently, a study showed a marked decline of gastric retention volume and an obvious rise of feeding amount after acupuncture at Zusanli of patients with gastric retention for 1-7 days [10]. Besides, the application of electroacupuncture at bilateral Tianshu points alleviated gastric retention after enteral nutrition of patients with severe traumatic brain injury and increased feeding amount [11]; the ventral massage could advance gastrointestinal peristalsis and avoided delayed gastric emptying so as to effectively prevent occurrence of gastric retention in critically ill patients after enteral nutrition [12]; the clinical efficacy of Zusanli acupoint injection of metoclopramide on gastric retention of neurosurgical patients after enteral nutrition was dramatically better than the treatment of domperidone [13]. Although there are many researches about intervention on gastric retention, no work explores whether the combined therapy of Zusanli acupoint injection of metoclopramide and ventral massage is more effective than the alone treatment of ventral massage or Zusanli acupoint injection of metoclopramide. In our previous research, 30 cases of neurosurgical coma patients with gastric retention were selected and treated with acupoint injection of metoclopramide combined with ventral massage, which exhibited a significant efficacy on

gastric retention. In order to standardize that method and makes it beneficial to more people, we conducted a clinical study through gastric retention monitor and estimation for neurosurgical coma patients to summarize an effective approach for mitigating gastric retention of neurosurgical coma patients, thereby ameliorating nutritional status of patients, promoting recovery of patients and providing the basis data for clinical treatment.

Metoclopramide is able to stimulate gastrointestinal tract, facilitate gastrointestinal peristalsis, raise esophageal sphincter pressure, promote gastric emptying and shorten the transit time of chyme in small intestine. The tradition Chinese medicine thinks that Zusanli is a he-sea point of Yangming Stomach Meridian of Foot, which can regulate the spleen and stomach, invigorate spleen-stomach and replenish qi, disperse wind and eliminate damp, clear and activate meridians and collaterals as well as strengthen vital qi to eliminate pathogenic factor. Metoclopramide injection at Zusanli, a combination of stimulation on Zusanli acupoint and pharmacological effect of metoclopramide, directly deliver the drug to the focus through channel tropism of meridian so as to takes effect quickly. Furthermore, the drug absorption and continuous acupoint stimulation at the same time achieve a stack effect to ensure the lasting therapeutic effect [14]. Additionally, direct force generated by various fingering during ventral massage combined in our study changes morphology of the gastrointestinal lumen and accelerates gastrointestinal peristalsis to advance the movement and discharge of gastrointestinal contents, which also enhances gastrointestinal peristalsis and secretion of digestive juice by conduction and reflex of meridian and acupoint so as to reinforce the curative efficiency of gastric retention[15]. The results of our work presented that the therapeutic efficacy of observation group was notably higher than that of control group ( $P < 0.05$ ) as the total effectiveness of observation group was 96.08% and that of control group was 82.35%; both groups increased GCS scores after treatment in contrast with their respective GCS scores before treatment ( $P < 0.01$ ) with the rise in observation group

more significant ( $P < 0.01$ ); after treatment, the gastric residual ( $P < 0.01$ ), vomiting incidence ( $P < 0.05$ ) and abdominal distension incidence ( $P < 0.05$ ) of patients in observation group was appreciably lower than that of control group whereas the abdominal circumference change in observation group was prominently higher than that of control group ( $P < 0.01$ ). Those findings implicated that the acupoint injection of metoclopramide in combination with ventral massage has a certain clinical value on improvement of gastric retention through decreasing vomiting, abdominal distension to reduce abdominal circumference and ameliorate GSC score.

In conclusion, acupoint injection combined with ventral massage had a notable effect on managing gastric retention of neurosurgical patients after enteral nutrition, which could improve GCS score, decline gastric residual volume and decrease occurrence of vomiting and abdominal distension.

#### Acknowledgement

Not applicable.

#### Conflict of Interest

The authors declare no conflicts of interest.

#### Author Contributions

Conceptualization, Data curation, Writing-Original draft, Writing-review and editing, J.P.Z; All authors have read and agreed to the published version of the manuscript.

#### Ethics Approval and Consent to Participate

The study was approved by the Medical Ethics Committee, and the patients were informed and consented.

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#### Availability of Data and Materials

The data presented in this study are available on request from the corresponding author.

#### Supplementary Material

Not applicable.

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