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Original Article

Effects of integrative intervention on the use of enteral nutrition support in the treatment of hypertensive intracerebral hemorrhage during coma

Weipeng Gu[1], Mei Li[2], Bolian Zhao[3], Hongmei Qiu[4], Xiping Liu[4]

Departments of [1]General Medicine, [2]Nuclear Medicine, [3]Ophthalmology, [4]Minimally Invasive Oncology, Taian City Central Hospital, Taian 271000, Shandong, China

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Abstract: Objective: To explore the effects of integrated interventions on the enteral nutrition support for patients with hypertensive intracerebral hemorrhage and coma. Methods: A total of 112 patients with hypertensive intracerebral hemorrhage and coma (HIHC) who received enteral nutrition support in our hospital from March 2015 to April 2017 were enrolled and divided into a control group (n = 56) and an observation group (n = 56) according to the time of admission. The control group received routine care and the observation group was additionally cared for with integrative interventions. The time and rate of awakening were counted, and complications, prognosis and pre- and post-intervention coma score (Glasgow coma scale, GCS), quality of life score (The MOS item short from health survey, SF-36), neurological function score (NIH Stroke Scale, NIHSS), and motor function score (Fugl-Meyer, FMA) were compared between the two groups. Results: The observation group showed shorter time to awakening and higher rate of awakening at 6 weeks of intervention than the control group ($P < 0.05$). GCS score, physical function, mental status, energy, and quality of life scores were higher in the observation group than in the control group after intervention ($P < 0.05$). The incidence of constipation, nausea and vomiting, and gastrointestinal bleeding were 5.36%, 5.36%, and 5.36%, respectively, in the observation group after intervention, lower than 17.86%, 19.64%, and 19.64% in the control group ($P < 0.05$). The prognosis of the observation group was superior to that of the control group ($P < 0.05$). The NIHSS scores of the observation group were lower while the FMA scores were higher than those of the control group ($P < 0.05$). Conclusion: Integrated interventions can significantly improve patients' symptoms of coma, shorten time to awakening, reduce the risk of complications and improve neurological function and motor function, quality of life as well as prognosis in patients with HIHC.

Keywords: Enteral nutrition support, hypertensive cerebral hemorrhage, coma, integrated intervention, complications, prognosis

Introduction

Patients with hypertensive intracerebral hemorrhage and coma (HIHC) are often malnourished because their bodies are under stress, their metabolism is hyperactive, and they are unable to eat for a long time [1]. Parenteral nutrition (PN) support refers to the provision of calories, amino acids, electrolytes, vitamins, minerals, trace elements, and fluids via a parenteral route [2]. PN is often unable to meet patients' nutritional needs, while Enteral nutrition generally refers to any method of feeding that uses the gastrointestinal (GI) tract to deliver part or all of a person's caloric requirements, improving the efficiency of nutrient supply and maintaining the integrity of the intestinal mucosal barrier function [3]. However, clinical practice found that the implementation of enteral nutrition support for patients with HIHC often caused gastrointestinal bleeding, metabolic abnormalities, and diarrhea, all of which decrease the quality of life due to the need for feeding tube delivery of nutrients [4]. Therefore, enteral nutrition support with effective intervention is of great significance to reduce the risk of complications and improve the quality of life of patients.

Integrated intervention is a "patient-centered" nursing model, which focuses on satisfying needs of patients, providing comprehensive, scientific and targeted nursing care, promoting rehabilitation while reducing complications [5].

Currently, integrated interventions are widely used in the clinical care of patients with hypertensive cerebral hemorrhage, with remarkable results [6]. It has been reported that patients with hypertensive cerebral hemorrhage have an overall complication rate of 19.05%, which is significantly lower than the 40.48% of routine care, and showed a significantly improved quality of life [7]. However, there are few studies on the application of integrated interventions in patient with HIHC receiving enteral nutrition support. Based on this, 112 patients with HIHC who received enteral nutrition support were selected in this study and divided into groups to receive routine nursing and integrated intervention. Through the preliminary comparison of neurological function, motor function, quality of life and other indicators, the application effect of integrated intervention was analyzed, which is innovative.

Material and methods

Baseline data

A total of 112 patients with HIHC who received enteral nutrition support in our hospital from March 2015 to April 2017 were divided into a control group and an observation group with 56 patients in each group. This study was approved by the ethics committee of Taian City Central Hospital.

Inclusion criteria

Patients who met the diagnostic criteria of cerebral hemorrhage in [8] of the Chinese Guidelines for the Diagnosis and Treatment of Cerebral Hemorrhage (2014), and confirmed by MRI and CT scans. Their cerebral hemorrhage was caused by hypertension; with GCS score of 3-8 points; receiving enteral nutrition support; signed a written consent form.

Exclusion criteria

Patients with serious infections and malignant tumors; those whose HIHC were not caused by hypertension; those with serious abnormalities in the organs such as the liver and kidneys; and women during pregnancy and lactation.

Methodology

Both groups were treated conventionally depending on the condition of the patients. For those who underwent surgery, a nasogastric tube was placed after surgery. For conservative treatment, the nasogastric tube was inserted immediately after the patient was admitted, and enteral nutrition support was administered after the patient's gastric retention within 24 hours was less than 300 ml.

The control group was given routine nursing, including regular cleaning and disinfection of the ward, restriction of visitor numbers/times, monitoring of the patient's condition, consciousness, changes in pupillary size, vital signs and the smooth flow of the drainage pipe. The volume and color of the drainage fluid was observed. Any abnormalities were reported to the nurses and physicians in a timely manner.

The observation group received integrated interventions in addition to the routine nursing care, including (1) prevention of complications: Patients often suffer from nausea and vomiting, gastrointestinal bleeding, constipation, diarrhea, aspiration and other complications in the course of treatment. Therefore, detailed prevention and treatment measures were formulated for these complications before intervention, and regular training was provided to the relevant nursing staff to make them understand the principles of prevention, treatment and handling of complications. Gastric blood tests were taken at regular intervals during treatment. If the result was positive, it is very likely that the patient has gastrointestinal bleeding, so these patient were promptly treated with acid and hemostatic treatment, and the rate of nasal feeding was adjusted according to the patient's specific condition; if the bleeding was serious, continuous gastrointestinal decompression was administrated. If the sputum contained nutritional fluid, it indicated aspiration, which was treated and antibiotics were used prophylactically to prevent lung infection. Patients often experience nausea and vomiting during enteral nutrition support therapy due to unpleasant odor, excessive fat content, lactose intolerance, etc. Therefore, the above factors were prevented in advance, such as adjusting the infusion speed, improving the dietary content, adding seasoning, etc., to prevent nausea and vomiting. (2) Respiratory intervention: Due to the long bedtime of patients with HIHC, it is difficult to discharge secretion from the oral cavity, so we strengthened the respiratory care for patients, regularly turning patients over and patting their backs, suction treatment if necessary, strictly implement the principle of aseptic operation, timely discharge of secretions from the patient's oral cavity, and ensured their respiratory tract was unobstructed. (3) Nursing

intervention in nasal feeding. During nasal feeding, the head of the bed wase elevated 30~45°. The infusion of nutrient solution was controlled at 50~80 ml, and then gradually increased to 1000-1500 ml, and even to 2000 ml if no discomfort was felt. Injections were performed in several administered doses using syringes every 1-2 hours. Aspiration was tested by pushing of the gastric tube to see if there was any food aspirated, if there was none, it indicated that the nutrient fluid in the stomach was been emptied and another dose can be given. After delivering the nutrient solution, the tip of the tube should be plugged or folded back and wrapped with a sterile dressing to prevent contamination and air entry. (4) Nursing care during the rehabilitation period: After the patient's condition was basically stable, rehabilitation training was provided as soon as possible. At first, flexion and extension exercises and sit-up training were performed on the bed, followed by gradual transition to sitting and standing balance training, walking training with the assistance of crutches and other tools, and gradually getting rid of crutches and other tools for independent walking. At the same time, the patients are given hand coordination, skill and fine motor training, and are instructed to repeatedly hold a pencil and put on and take off clothes with correct postures, and are helped to master daily life activities such as using the toilet, brushing their teeth and washing their faces. In addition, the functional position of the paralyzed limb should be maintained, avoid inversion and eversion and strengthen the passive and active movements of the affected limb. The limb should be massaged to promote blood circulation, prevent joint stiffness and limb contracture, and ultimately promote the recovery of the patient's daily living abilities. We communicated with patients every day to understand their psychological condition, promptly eased their negative emotions, and explained to them about hypertensive cerebral hemorrhage to improve their disease awareness and encourage them to actively cooperate with treatment and care. Both groups continued the intervention for 6 weeks.

Observational indicators

(1) The time to awakening and the rate of awakening at 6 weeks of intervention were recorded.

(2) Coma in both groups was assessed by GCS before and 6 weeks after intervention, with a total score of 3 to 15 points. The lower the score, the more severe the coma [9].

(3) Before intervention and 6 weeks after intervention, the quality of life of the two groups was evaluated with Health Survey Short Form (SF-36) in terms of physical function, mental status, energy, and overall health, with a total score of 0-100, the lower the score, the worse the quality of life [10], which was completed by the patient's family members before the intervention.

(4) The incidence of complications in the two groups, including: aspiration, diarrhea, constipation, nausea and vomiting, and gastrointestinal bleeding were observed.

(5) During the 6 month-follow-up, the prognosis of the two groups was assessed by GOS, allowing the objective assessment of their recovery in five categories, namely death (1 point, without recovery of consciousness), persistent vegetative state (2 points, prolonged state of unresponsiveness and a lack of higher mental functions), severe disability (3 points, permanent need for help with daily living), moderate disability (4 points, no need for assistance in everyday life) and low disability (5 points, light damage with minor neurological and psychological deficits) [11].

(6) The NIHSS scale was applied to evaluate the neurological function of the two groups of patients before and 6 months after intervention, and the patients were scored according to eye movement, level of consciousness, and ataxia, with a total score of 0-42, with the lower the score the better the neurological function [12].

(7) Before and 6 months after intervention, the Fugl-Meyer scale was applied to evaluate motor function with a total score of 0-100, including a total upper limb function score of 66 and a lower limb function score of 34. < 50 was classified as severe motor impairment, 50-84 as significant motor impairment, 85-95 as moderate motor impairment, and 96-100 as mild motor impairment [13].

Statistical analysis

The analysis was performed by SPSS 19.0. Measurement data expressed as ($\bar{x}$ ± s) was examined by *t* test; Count data expressed as n (%) was compared by χ^2 test; Rank data was compared by sum test. $P < 0.05$ indicated significant differences.

Table 1. Comparison of general information between the two groups

Grouping	Cases	Sex (men/women, cases)	Bleeding volume (ml)	Age (years)	Bleeding site (%)			
					Basal ganglia	Thalamus	Cerebellum	Lobes
Observation group	56	29/27	50.42±4.82	59.47±7.04	18 (32.14)	16 (28.57)	12 (21.43)	10 (17.86)
Control group	56	31/25	50.91±4.60	58.98±7.51	19 (33.93)	15 (26.79)	13 (23.21)	9 (16.07)
$t/Z/\chi^2$	---	0.144	0.550	0.371	0.164			
P	---	0.705	0.583	0.712	0.870			

Table 2. Comparison of treatment options and associated symptoms between the two groups n (%)

Treatment options		Associated symptoms		
Surgical treatment	Conservative treatment	Fever	Convulsions	Nausea and vomiting
36 (64.29)	20 (35.71)	11 (19.64)	3 (5.36)	11 (19.64)
38 (67.86)	18 (32.14)	13 (23.21)	2 (3.57)	10 (17.86)
0.327		0.212	0.000	0.059
0.743		0.645	1.000	0.809

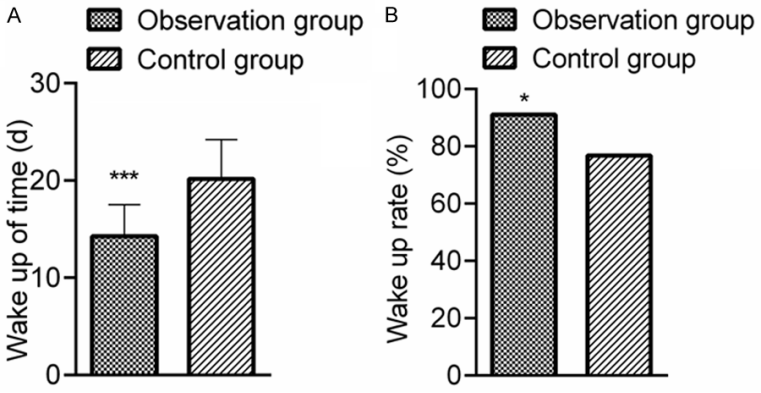

Figure 1. Comparison of the time to awakening. Note: A. The time to awakening was significantly shorter in the observation group than in the control group; B. At 6 weeks of intervention, the rate of awakening was higher in the observation group than in the control group. Compared with the control group, *P < 0.05 and ***P < 0.001.

Results

Comparison of clinical data

Baseline data such as age, sex, bleeding location, bleeding volume, treatment options, and accompanying symptoms were balanced and comparable between the two groups (*P* all > 0.05, **Tables 1** and **2**).

Comparison of awakening

The time to awakening was shorter in the observation group than in the control group and the rate of awakening was higher at 6 weeks of intervention than in the control group (*P* < 0.05). It showed that integrated intervention significantly shortens the time to awakening in patients with HIHC treated with enteral nutrition support (**Figure 1**).

Comparison of GCS scores

The GCS scores of the two groups before the intervention were not significantly different (*P* > 0.05); the GCS scores of the post-intervention in the observation group were higher than those of the control group (*P* < 0.05). This showed that integrated interventions can significantly improve coma outcome in patients with HIHC who receive enteral nutrition support (**Figure 2**).

Comparison of quality-of-life scores

The scores of physiological function, mental state, energy and overall healthy quality of life in the two groups before the intervention were not significantly different (*P* > 0.05); the scores of quality of life in the observation group after intervention were higher than those in the control group (*P* < 0.05). This shows that integrated intervention can significantly improve the quality of life of patients (**Figure 3**).

Comparison of complications

The incidences of constipation, nausea and vomiting, and gastrointestinal bleeding in the observation group were 5.36%, 5.36%, and

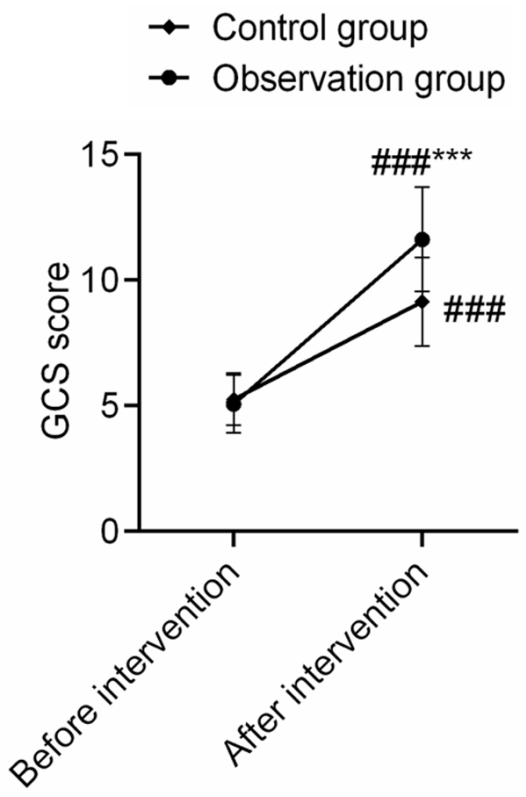

Figure 2. GCS scores before and after intervention for both groups. Note: **Figure 2** shows that the GCS score was significantly higher in the observation group than in the control group after intervention. Compared with before intervention, $^{###}P < 0.001$; compared with the control group, $P < 0.001$.

5.36%, respectively, which were lower than 17.86%, 19.64%, and 19.64% in the control group after intervention ($P < 0.05$), suggesting that integrated intervention can significantly reduce incidence of complications (**Table 3**).

Comparison of prognosis

After a 6-month follow-up, there was one discontinued patient in the observation group and two discontinued patients in the control group. The prognosis of the observation group was superior to that of the control group ($P < 0.05$), showing that integrated interventions can significantly improve the prognosis of patients with HIHC (**Table 4**).

Comparison of neurological and motor functions

NIHSS and FMA scores did not differ between two groups before the intervention ($P > 0.05$); NIHSS scores of the post-intervention in the observation group were lower, while FMA scores were higher than those of the control group ($P < 0.05$). This showed that integrated intervention can significantly improve neurological and motor functions in patients with HIHC (**Figure 4**).

Discussion

Patients with hypertensive cerebral hemorrhage are in critical condition, their metabolism is obviously accelerated, energy consumption is high and protein synthesis rate is low, and they are prone to hyperglycemia and hypoproteinemia, thus causing serious damage to the functions of various systems, requiring timely nutritional support therapy [14-16]. However, studies have found that enteral nutrition support or patients was performed with feeding tubes, which is likely to cause a variety of complications and affects patients' quality of life [17]. Therefore, effective nursing intervention should be employed to reduce complications and improve patient prognosis.

Conventional interventions are often carried out according to history of experience, focusing on disinfection, infection prevention, temperature control, and monitoring of the patient's condition, with poorly targeted and insufficient comprehensiveness, resulting in little benefits [18]. Integrated intervention is a new type of nursing intervention, which is patient-centered, and can provide targeted nursing interventions according to patients' specific conditions and needs, thus helping to improve the quality of routine nursing care [19, 20]. Li et al. [21] found that integrated intervention can significantly improve the GCS score of patients with hypertensive intracerebral hemorrhage treated with minimally invasive surgery. Zhong et al. [22] reported that comprehensive nursing intervention during the treatment of hemorrhagic coma patients receiving enteral nutrition support can significantly improve clinical outcomes, reduce the risk of complications and improve patient prognosis. The above studies are basically consistent with the results of this study. The present study showed that the post-intervention GCS score was higher than that of the control group, and the incidence of complications such as constipation, nausea and vomiting, and gas-

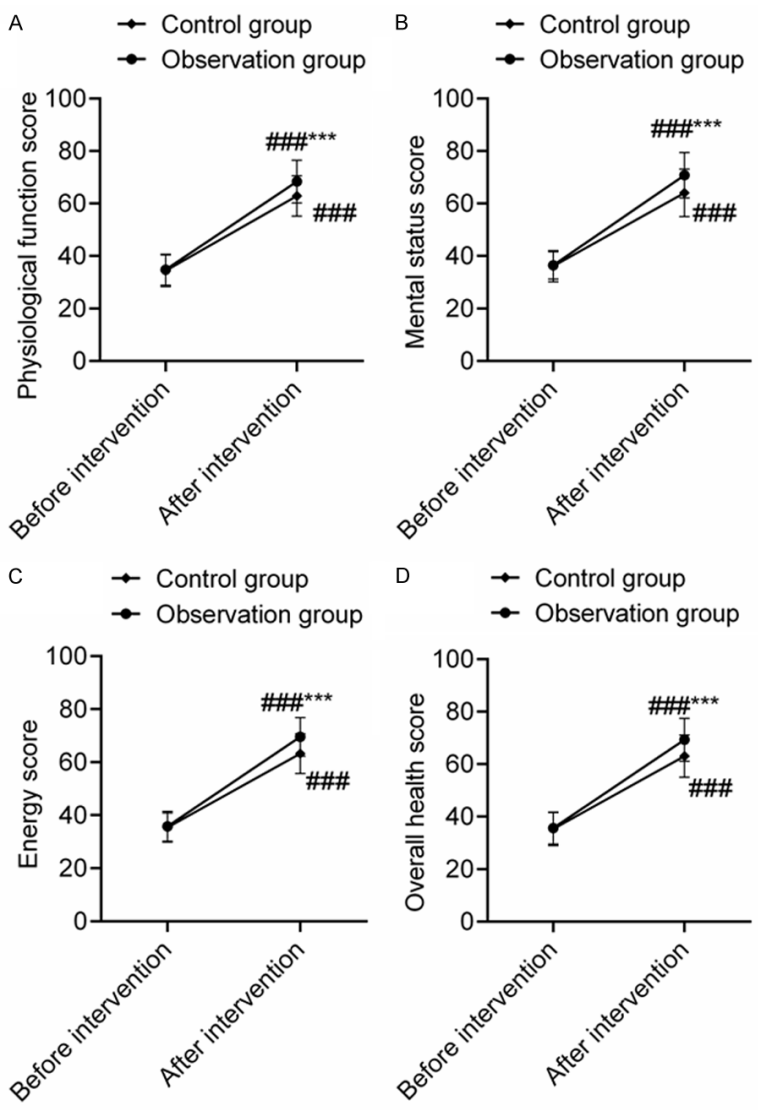

Figure 3. Comparison of quality of life scores between the two groups before and after intervention (points). Note: A. Mental function scores were significantly lower in the observation group than in the control group; B. Mental status scores were higher in the observation group than in the control group; C. Energy scores were higher in the observation group than in the control group; D. Overall healthy quality of life scores were higher in the observation group than in the control group. Compared with before intervention, $^{###}P < 0.001$; compared with the control group, $P < 0.001$.

trointestinal bleeding was lower than that of the control group, and the prognosis was better than that of the control group. It is clearly demonstrated that integrated intervention can significantly improve patients' coma symptoms, reduce their risk of complications, and improve patient prognosis.

Integrated intervention has the following advantages: Due to the critical condition of patients with HIV, they need to lie in bed for a long time and are prone to produce more oral secretions, which are not easy to be discharged, therefore, it is necessary to strengthen the respiratory care intervention, timely turn over and pat the patient's back, remove secretions from the oral cavity, maintain their respiratory tract smoothly and prevent complications such as aspiration and lung infection [23]. More detailed nursing interventions need to be offered, such as elevating the head of the bed 30-45° before pushing nutrient solution, paying attention to the volume, speed, temperature of nutrient solution as well as the intervals between infusions, flushing the gastric tube with warm water before and after re-infusion of nutrient solution, while avoiding tube blockage and catheter contamination [24]. At the same time, detailed complication prevention and control measures should be formulated before nursing interventions, and nursing staff need to be trained on a regular basis, so that they can understand the various complications that may arise in the course of enteral nutrition support therapy and corresponding treatment options such as performing gastric blood test regularly and providing targeted treatment when necessary, which is conducive to the effective prevention and treatment of gastrointestinal bleeding, and observing whether patients have symptoms of coughing and aspiration and the shape and nature of sputum. Antibiotic therapy and other treatments can be employed to reduce the occurrence of pulmonary infections, and nutrient liquid concentration, fat content, dietary variety, and infusion speed should be controlled to help reduce the

Table 3. Comparison of complication rates between the two groups n (%)

Grouping	Cases	Aspiration	Diarrhea	Constipation	Nausea and vomiting	Gastrointestinal bleeding
Observation group	56	1 (1.79)	3 (5.36)	3 (5.36)	3 (5.36)	3 (5.36)
Control group	56	2 (3.57)	5 (8.93)	10 (17.86)	11 (19.64)	11 (19.64)
χ^2	---	0.000	0.135	4.264	5.225	5.225
P	---	1.000	0.714	0.039	0.022	0.022

Table 4. Comparison of the prognosis of the two groups n (%)

Grouping	Cases	Recovery	Mild disability	Severe disability	Persistent vegetative state	Death
Observation group	55	7 (12.73)	36 (65.45)	8 (14.55)	2 (3.64)	2 (3.64)
Control group	54	4 (7.41)	23 (42.59)	15 (24.78)	8 (14.81)	4 (7.41)
Z	---			2.685		
P	---			0.007		

Note: Discontinued cases have been excluded from the evaluation of prognosis.

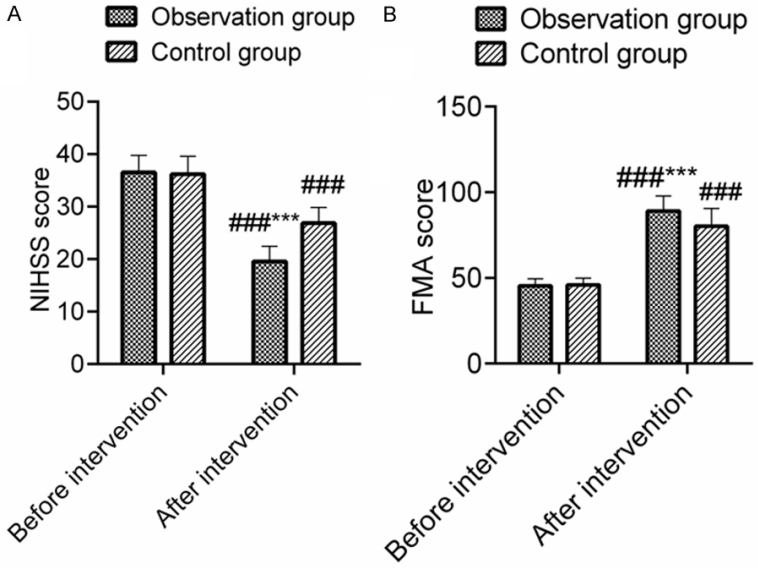

Figure 4. Comparison of NIHSS and FMA scores between the two groups before and after intervention (points). Note: Cases of discontinued and death have been excluded from the evaluation of prognosis. A. NIHSS scores were significantly lower in the observation group than in the control group; B. FMA scores were higher in the observation group than in the control group. Compared with before intervention, $^{###}P < 0.001$; compared with the control group, $P < 0.001$.

risk of complications [24]; in addition, early rehabilitation training after the patient's condition is basically stable can help promote the recovery of limb motor function and daily living ability [25]. Xu et al. [26] found that rehabilitation training for patients with cerebral hemorrhage in the hypertensive basal ganglia region resulted in FMA score of (80.03±19.21), significantly higher than that of routine care, which was basically consistent with the results of the present study. This study also found that the SF-36 score was higher in the observation group than in the control group after intervention; the NIHSS score was lower and the FMA score was higher in the observation group than in the control group after intervention, suggesting that integrated interventions can significantly improve the quality of life of patients, which may be related to the accelerated medical transition, reduced physical and psychological burden, and increased daily living ability of the patients.

However, the sample size of this study was small, and whether the results are representative or not still needs to be further investigated by multi-channel and multi-center study.

In summary, integrated intervention can significantly improve coma symptoms, reduce the risk of complications, and improve quality of life and prognosis in patients with HIHC.

Disclosure of conflict of interest

None.

Address correspondence to: Xiping Liu, Department of Minimally Invasive Oncology, Taian City

Central Hospital, Taian 271000, Shandong, China. Tel: +86-15953816262; E-mail: liuxiping369@163.com

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