RESEARCH ON THE EFFECT OF NUTRITION SUPPORT THERAPY ON CRANIOCEREBRAL NERVE INJURY IN CHILDREN

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ABSTRACT

Objective: *To study the effect of the nutrition support therapy on children with cranial nerve injury.*

Method: *This paper, with a total of 100 children with cranial nerve injury treated in the hospital as subjects that were divided them into three groups of the enteral nutrition, parenteral nutrition, and enteral-parenteral nutrition, observed and compared their hospitalization duration, nutritional indicators and complications.*

Results: *The results of the three groups are as follows. The scores of NIHSS decreased, while the scores of FMA and BI both increased, with the score difference both of statistical significance; the scores of NIHSS decreased, while the scores of FMA and BI increased, indicating statistical significance of score differences; NIHSS scores declined while FMA and BI scores increased, showing statistical significance of score differences; the NIHSS score was the lowest while the FMA and BI scores were the highest when discharged, with the score differences of statistical significance.*

Conclusion: *It is finally concluded that the nutrition support therapy can restore nerve functions of children with craniocerebral nerve injury and can be applied into clinics.*

Keywords: *Nutrition Support Therapy, Craniocerebral Nerve Injury in Children, Therapeutic Effect.*

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Introduction

Craniocerebral injury is a common trauma in the nervous system, including scalp injury, skull injury, and brain injury. For children, it is mainly caused by traffic accidents, falling at high altitudes, accidental falls, and firearm injuries (see Figure 1). The clinical manifestations vary, such as disturbance of consciousness, headache, vomiting, changes in respiratory blood pressure, etc.[(1)]. Craniocerebral injury is a serious stress event on the body. Patients will suffer changes in systemic physiological state after severe trauma, mainly featuring the hypermetabolism state. In patients with craniocerebral injury, the body's tissue protein is shown to be hyper-decomposed. At the same time, the intake is reduced and the body often exhibits negative nitrogen balance. After craniocerebral injury, especially severe craniocerebral injury, the patient's immune function is severely inhibited. The cellular immune function is severely impaired and the immunity is reduced. Meanwhile, patients undergo surgical treatment and stay in bed for a long time. Treatments such as catheterization and drainage are also needed if necessary. Patients are prone to urinary tract infections, pulmonary infections, severe sepsis and multiple organ failure[(2)].

In patients with craniocerebral injury in the stress state, systemic metabolic disorders, significantly increased resting energy expenditures, and poor nutritional conditions are more likely to cause infections and even serious sequelae, severely affecting the studies have shown that in all trauma patients under tissue repair, surgical treatment, or blood

loss, the body's demand for nutrients such as protein and fat is greatly increased[3]. Enteral nutrition can promote the gastrointestinal motility recovery in the early stages of injury, reduce the chance of bacterial translocation in the intestinal tract, provide the body with the energy needed for tissue repair and recovery, and reduce the body's hypermetabolism reaction. However, not all patients are in a state of severe malnutrition.

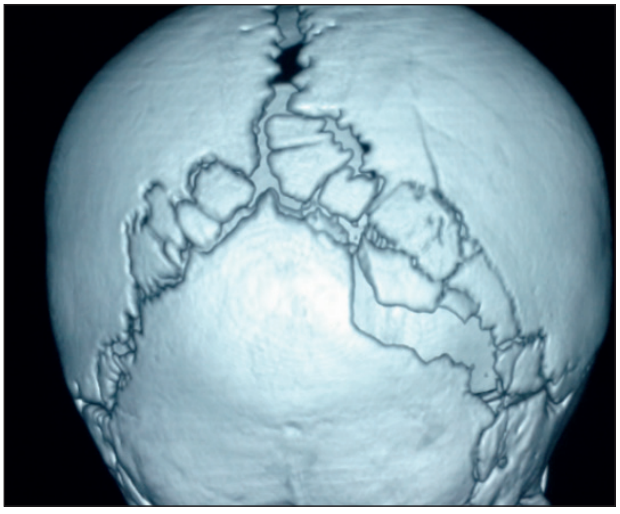

Fig 1: Cerebral nerve injury in children.

Surveys have shown that accurately assessing the patient's nutritional status is a prerequisite for choosing correct nutritional support. Nutritional risk screening is an important method to evaluate nutritional problems. Reasonable application of nutritional evaluation methods and then accurate and comprehensive assessment of the patient's nutritional conditions are the prerequisites and key to nursing and nutrition support. It is vital for the recovery of patients with craniocerebral injury to timely measure related nutrition indicators, evaluate the nutritional status and physical tolerability of the patient, formulate the appropriate calorie and nutrient composition based on the patient's physiological conditions, adopt the targeted nutrition support program, and timely monitor and adjust the infusion route. However, most of the current clinical nutrition treatment is blind and fail to make good use of nutritional assessment results for the formulation of individualized nutritional programs.

Therefore, it is essential to assess the nutritional risk and status in patients with craniocerebral for us to decide on the need for nutritional support and what kind of support methods to use and provide theoretical basis for clinical nutritional support[4].

This paper used the NRS2002 nutritional risk screening table to screen patients with craniocerebral injury and the SGA to evaluate the nutritional status of the patients, and investigated the state of nutritional support and clinical outcomes during hospitalization, so as to judge the necessity and scientific rationality of nutrition support for patients with craniocerebral injury based on comprehensive assessment, which serve to guide the rational implementation of the nutritional support therapy for craniocerebral injury.

Experiments

Clinical data

A total of 100 children with craniocerebral nerve injury who were treated at the Department of Neurosurgery in the First Hospital of Shijiazhuang from March 2016 to March 2017 were selected as the study subjects. There were 56 males and 44 females, aged from 3 to 13 and the average age of (6.7±1.5) years.

Types of injury: 11 cases of epidural hematoma, 9 cases of subdural hematoma, 46 cases of cerebral contusion with intracerebral hematoma, 25 cases of primary brain stem injury, and 9 cases of diffuse axonal injury. All patients gave their informed consent and expressed their willingness to join the study, and the Medical Ethics Committee of the hospital has approved this study.

Inclusion criteria: patients admitted to hospital within 24 hours after injury; patients who required surgical treatment and had no other organs with severe injuries; and patients who agreed to participate in the study.

Exclusion criteria: patients with intracranial or extracranial tumor complications; patients with digestive system diseases such as esophageal cancer and gastric cancer before cranial nerve injury[5]. The subjects included in this study were all children with craniocerebral nerve injury, with their scores of NRS2002 nutritional risk screening all of ≥3 points. They all suffered nutritional risks and must be given nutritional support (see Table 1 for the comparison of the nutritional status of the three groups).

Treatment methods

General treatment: All patients receive appropriate treatment according to the patient's specific conditions, age, type of injury, and severity of illness.

Group	The number	Good nutrition	Moderate malnutrition	Severe undernutrition	GCS score
EN group	32	21	10	1	6.4±1.2
PN group	29	18	9	2	5.5±1.1
EN+PN group	39	22	17	0	6.7±1.5

Table. 1: Comparison of nutritional status in the three groups.

The data of patients applicable to in this study were all registered by special personnel, including basic information of patients, the department, admission date, register number, admission diagnosis, choice of nutrition, neurological function recovery, complications (gastrointestinal bleeding, wound infection, electrolyte imbalance), discharge fees, etc. As for nutrition risk screening, diseases were classified into Level A, B, and C according to the three conditions of rest, between rest and activity, and acute phase. Subcutaneous fat and muscle consumption were classified into Grade A, B, and C according to normal, decline, and significant decrease. Edema was classified into Grade A, B, and C according to none, slight, and serious states. PN supports through various fat emulsions and amino acid nutritional preparations, while the enteral nutrition (EN) is defined as oral feeding or oral-nutritional support (ONS). If the energy of preparations for enteral or parenteral nutrition is greater than 500 kcal and lasts for more than 3 days, it is defined as nutrition support[6].

Observation of indicators

The indexes of children with craniocerebral nerve injury receiving different nutritional support methods were observed.

• *Nutritional indicators*: BMIs of patients were measured on the 1st day, the 7th day, the 14th day, and the 21st day after the start of treatment, and the elbow venous blood was drawn at the same time to measure the hemoglobin and serum albumin.

• *Recovery of neurological functio*n: Evaluate the scores of neurological function at the admission and discharge through the NIHSS from 11 aspects of consciousness, gaze, facial paralysis, upper limb muscle strength, lower limb muscle strength, ataxia, aphasia, dysarthria, feeling, vision, neglect of evidence, distal limb function.

• Observe and record the occurrence of infection, occurrence of complications (gastrointestinal bleeding, wound infection, electrolyte imbalance), and hospitalization time and costs[6].

Statistical method

All data were analyzed by SPSS 22.0 software, and normally distributed measurement data were expressed as mean ± standard deviation (X±s). F-test was used for comparison between groups. The count data were expressed as rates, and Z tests were used for inter-groupcomparison. The difference of $P<0.05$ was considered statistically significant[7].

Results and discussion

Comparison of general data and nutrition support in the three groups of patients

According to nutritional support methods, there were 32 cases in EN group, 29 cases in PN group, and 39 cases in PN+EN group. There was no statistical difference in nutritional support between the three groups ($P>0.05$). (See Table 2 for details).

Group	The number	Energy supply (kcal/d)	Protein supply (g/kg.d)	Nutrition support time (d)
EN group	32	608.4±181.2	0.5±0.2	21±1.5
PN group	29	625.2±180.2	0.6±0.1	22±1.1
EN+PN group	39	620.5±175.8	0.5±0.3	20±1.2

Table. 2: Nutritional support of the three groups.

Changes in nutritional indicators of the three groups of patients

Changes in nutritional status of the PN+EN group after intervention were as follows. On the 21st day, the hemoglobin and serum albumin all increased. Compared with the 1st, 7th, and 14th days, the differences in hemoglobin and serum albumin values were both statistically significant ($P<0.05$). See Table 3 for specific results. The scores of hemoglobin and serum albumin of PN+EN and PN groups on the 7th, 14th and 21st days both increased, indicating a statistical significance of the difference in hemoglobin and serum albumin scores ($P<0.05$). And there were no statistically significant differences in nutritional indicators between the PN group and the EN group ($P>0.05$). (See Table 3 for details).

group	The number	Hemoglobin (g/L)				Serum albumin (g/L)			
		Day 1	7 days	14 days	21 days	Day 1	7 days	14 days	21 days
EN group	32	116.2 ±10.2	105.2 ±7.9	104.7 ±7.3	114.3 ±8.5	36.2 ±3.8	31.5 ±3.1	32.5 ±3.8	35.4 ±3.6
PN group	29	118.5 ±9.8	100.9 ±5.2	97.7 ±6.7	108.5 ±9.5	35.7 ±4.1	30.7 ±4.0	30.4 ±4.5	32.6 ±2.5
EN+PN group	39	120.6 ±8.8	110.4 ±6.8 cd	112.4 ±1.2 cd	117.6 ±5.9 abcd	36.9 ±3.9	33.3 ±2.9 cd	33.9 ±2.4 cd	35.9 ±4.8 abcd

Table. 3: Nutrition indicators in three groups of patients.

Recovery of neurological functions in the three groups of patients

In the PN+EN group, neurological recovery at the discharge showed that the NIHSS scores decreased, while the FMA scores and BI scores both increased, with the score difference of statistical significance (P<0.05). The specific results can be seen in in Table 4. As for the neurological recovery of the EN group at the discharge, the NIHSS scores decreased but FMA and BI scores both increased, indicating statistical significance of the score difference (P<0.05)[8-10]. The specific results are shown in Table 4.

Group	The number	On admission			When out of the hospital		
		NIHSS	FMA	BI	NIHSS	FMA	BI
EN group	32	32.6±4.8	33.7±3.9	20.8±4.3	17.7±2.6[a]	54.9±12.7[a]	78.5±9.7[a]
PN group	29	32.1±3.4	32.5±2.8	21.0±5.5	22.5±1.8[a]	47.8±11.2[a]	64.0±6.3[a]
EN+PN group	39	33.0±2.1	33.1±1.9	21.4±6.3	14.9±2.8[abc]	68.4±12.6[abc]	83.5±7.9[abc]

Table. 4: Neural functional recovery in patients with three groups.

Regarding the recovery of neurological function of the PN group at the discharge, NIHSS scores decreased while FMA and BI scores both increased, showing the statistical significance of the score difference (P<0.05). See Table 4 for specific results. With regard to the comparison of recovery of neurological function among the PN+EN, EN and PN group at admission and discharge, there was no statistical significance of the score difference in NIHSS, FMA, and BI scores at the admission among the three groups (P>0.05). At the discharge, the scores of NIHSS were the lowest and the scores of FMA and BI were the highest, indicating statistical significance of the score difference (P<0.001). And there were no statistically significant differences in nutritional indicators between the PN group and the EN group (P>0.05) (See Table 4 for details)[11-13].

Infections in three groups of patients

After the end of the treatment, systemic infections occurred in all three groups of patients. The difference in the number of infections in the three groups was statistically significant (P<0.001), and the number of infections in the PN+EN group was the least (See Table 5 for details).

Group	The number	Lung infection	Digestive tract infection	Urinary tract infection	Multisystem infection
EN group	32	2	1	0	1
PN group	29	3	2	1	1
EN+PN group	39	1	1	0	0

Table. 5: Infection rates of three groups of patients.

Conclusion and outlook

Hospitalization of children with craniocerebral injury has a high nutritional risk and ay suffer malnutrition in varying degrees. Different nutritional support methods can improve the nutritional status, neurological function recovery, complications, and hospitalization duration and costs of patients with craniocerebral injury to a certain extent, among which parenteral nutrition and enteral nutrition present the best therapeutic effect.

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