Clinical Effect Analysis of Octreotide in The Treatment of Neonatal Necrotizing Enterocolitis

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Abstract: Objective: To explore the clinical effect of octreotide in the treatment of neonatal necrotizing enterocolitis. Methods: 50 cases of children with necrotizing enterocolitis treated in our hospitalfrom January 2023 to October 2024 were selected and divided into groups by randomization. The positive side was the reference group treated with conventional drugs (n = 25), and the negative side was the experimental group treated with conventional drugs + octreotide (n = 25). The therapeutic effect, nutritional status and intestinal colony of the two groups were observed and compared. Results: The total effective rate of the two groups was significantly improved, and the total effective rate of the experimental group was significantly higher than that of the reference group ($P < 0.05$); After treatment, the nutritional status indexes of the two groups were significantly improved compared with those before treatment, and the albumin (ALB) and serum prealbumin (PA) of the experimental group were significantly higher than those of the reference group ($P < 0.05$); After treatment, compared the two groups of patients, the indicators of intestinal flora had significant changes compared with those before treatment, in which the level of HMGB1 in the experimental group was significantly lower than that in the reference group, while hBD2 and AI-2 in the experimental group were significantly higher than that in the reference group ($P < 0.05$). Conclusion: Octreotide in the treatment of neonatal necrotizing enterocolitis can effectively improve the therapeutic effect of the disease, further improve the nutritional status of patients, and promote the significant improvement of intestinal colonies.
***Keywords*:** octreotide; necrotizing enterocolitis; neonates; conventional therapy

1. Introduction

Necrotizing enterocolitis is an acquired intestinal disease, and its main incidence groups are premature infants and neonates. The pathogenesis of the disease is extremely complex. Clinical studies have revealed that risk factors such as premature birth, infection, low birth weight, etc. may induce intestinal mucosal damage in children, and then cause severe complications such as small intestinal necrosis[1]. Once a child suffers from the disease, its clinical manifestations are abdominal distension, vomiting, hematochezia, etc. if it is not treated effectively in time, the condition will deteriorate rapidly, and it will also lead to intestinal perforation, peritonitis and other serious consequences[2]. The higher morbidity and mortality of necrotizing enterocolitis will pose a serious threat to the life safety of newborns. Therefore, it is of great significance to explore effective treatment methods for improving the prognosis of children. In the clinical treatment of necrotizing enterocolitis, conservative strategies are mainly adopted, such as electrolyte balance, gastrointestinal decompression and anti-infection. Although these methods can alleviate symptoms, they have limited curative effect, long treatment duration, organ hypoplasia, slow recovery, and are prone to complications, which will bring mental and economic pressure to the children's families. Octreotide, as a somatostatin analog, has gradually emerged in the treatment of neonatal necrotizing enterocolitis in recent years. It can play a therapeutic role by inhibiting gastrointestinal hormone secretion, reducing intestinal blood flow, promoting intestinal mucosal repair and other mechanisms[3]. Based on this, this study aims to explore the effect of octreotide treatment on 50 children with necrotizing enterocolitis treated in our hospital from January 2023 to October 2024.

2. Data and methods

2.1 General information

Research object: 50 cases of children with necrotizing enterocolitis in our hospital were included from January 2023 to October 2024. The selected patients were divided into groups according to the way of coin tossing. The front side was the reference group (n=25) and the reverse side was the experimental group (n=25). With the approval of the ethics committee, all patients (or legal guardians) agreed to sign the informed consent. The patient information of the two groups remained basically the same, with no statistical significance ($P > 0.05$), and was comparable, as shown in Table 1.

Table 1. General information

Group	Male	Female	Day (1-13; 2-10)d	Birth weight (1850~3600; 1860~3620 g)g	Gestational age	
					Term infant	Premature infant
Control (n=25)	13	12	5.48±1.02	2784±32	8	17
Experiment (n=25)	15	10	5.69±1.12	2781±34	10	15
t/x^2	0.325		0.693	0.321	0.347	
P	0.569		0.492	0.749	0.556	

Inclusion criteria: (1) Those who meet the diagnostic criteria for necrotizing colitis in children[4]; (2) Patients with complete medical records; (3) Prior to participating in the study, no medication promoting gastrointestinal motility was taken; (4) Pregnant women have used antibiotics and hormone drugs before giving birth.

Exclusion criteria: (1) Patients with contraindications to the treatment used in this study and those who withdrew midway; (2) Individuals with limb deformities; (3) Patients with important organ dysfunction or failure such as heart, liver, and kidney; (4) Children with congenital metabolic disorders.

2.2 Methods

Reference group: Implement conventional conservative treatment, specifically: the child should fast for 7 days and cooperate with total parenteral nutrition and gastrointestinal decompression treatment. The total parenteral nutrition formula includes fat emulsion, glucose, compound amino acids, compound vitamins, sodium ions, and calcium ions. This formula is dissolved in an injectable sodium chloride solution of 120-150 (mL/kg)/d, and the dosage is adjusted according to the vital signs and metabolic physiological needs of the child, administered via intravenous drip. At the same time, in order to prevent infection, piperacillin sodium and tazobactam sodium for injection (Huabei Pharmaceutical Co., Ltd., national drug approval number H20073378, specification 2.25 g/bottle x 10 bottles/box) were used for slow intravenous injection, once every 8 hours. Continuous treatment for 7 days.

Experimental group: Implement conventional conservative treatment+octreotide, specifically: conventional conservative treatment is basically the same as the reference group, and octreotide injection (Hainan Zhonghe Pharmaceutical Co., Ltd. National Medical Standard H20103209, specification: 1ml: 0.1mg) is used for treatment. Inject 30 μ g/kg octreotide injection and 50 mL 0.9% sodium chloride evenly through an infusion pump, once a day, continuously for 5 days.

3. Observation indicators

(1) Comparing the clinical outcomes of two groups of patients: According to the efficacy evaluation criteria[5], the efficacy assessment is divided into three levels: significant, effective, and ineffective. Specifically, significant improvement is defined as the improvement of clinical symptoms in the child, with laboratory indicators indicating negative results in fecal occult blood tests, indicating acceptance of breastfeeding; Effective refers to the improvement of clinical symptoms in the child, with laboratory indicators indicating negative results in fecal occult blood tests, and still not accepting breastfeeding; And ineffective means that the clinical symptoms of the child have not improved or even worsened. Total effective rate=(significant effect+effective)/total number of people x 100%.

(2) Compare the nutritional status of two groups of patients: 5ml of venous blood was collected from both groups before and after intervention, and albumin (ALB) and serum prealbumin (PA) were detected. The samples were centrifuged at 3500 rpm for 5 minutes using a COBAS C311 fully automatic biochemical analyzer produced by Roche, Switzerland.

(3) Compare the gut microbiota of two groups of patients: Collect fecal samples from the children before and after treatment, and use enzyme-linked immunosorbent assay (ELISA) kit to detect the levels of high mobility group box protein 1 (HMGB1), human β-defensin 2 (HBD2), and autoinducers (AI-2) in the children's feces.

4. Statistical processing

SPSS 23.0 software was used to analyze and process the data, and the measurement data was expressed as mean ± standard deviation. Paired t-test was used to compare the differences in indicators before and after treatment in the same group. Count data is presented in terms of number of instances (n) and rate (%), and subjected to a chi square test. A difference of $P<0.05$ is considered statistically significant.

5. Results

5.1 Comparison of clinical outcomes between two groups of patients

Comparing the two groups of patients, the total effective rate was significantly improved, and the experimental group had a significantly higher total effective rate than the reference group (P<0.05), as shown in Table 2.

Table 2. Compare the clinical outcomes of two groups of patients (n, %)

Group	Excellence	Efficiency	Inefficiency	Total effective rate (%)
Control (n=25)	8 (32.00)	5 (20.00)	12 (48.00)	13 (52.00)
Experiment (n=25)	18 (72.00)	5 (20.00)	2 (8.00)	23 (92.00)
x^2	/	/	/	9.921
P	/	/	/	0.002

5.2 Comparison of Nutritional Status between Two Groups of Patients

Before treatment, the nutritional status indicators of the two groups of patients were compared and found to be basically consistent, with no statistical significance (P>0.05); After treatment, the nutritional status indicators of the two groups of patients were significantly improved compared to before treatment, and the albumin (ALB) and serum prealbumin (PA) in the experimental group were significantly higher than those in the reference group (P<0.05), as shown in Table 3.

Table 3. Comparison of Nutritional Status between Two Groups of Patients ($x \pm s$)

Group	Albumin (μg/ml)		Pre-albumin (g/l)	
	Before treatment	After treatment	Before treatment	After treatment
Control (n=25)	80.36±10.25	100.65±13.58a	27.45±2.45	31.52±5.58a
Experiment (n=25)	80.58±10.54	115.45±14.87a	27.54±2.58	44.56±2.79a
t	0.075	3.675	0.126	10.451
P	0.941	0.001	0.900	<0.001

5.3 Comparison of gut microbiota between two groups of patients

Before treatment, a comparison was made between the two groups of patients, and all indicators of gut microbiota were basically consistent with no statistical significance (P>0.05); After treatment, a comparison was made between the two groups of patients, and significant changes were observed in various indicators of gut microbiota compared to before treatment. Among them, the HMGB1 level in the experimental group was significantly lower than that in the reference group, while the HBD2 and AI-2 levels in the experimental group were significantly higher than those in the reference group (P<0.05), as shown in Table 4.

Table 4. Comparison of gut microbiota between two groups of patients ($x \pm s$)

Group	Hmgb1 (μg/g)		Hbd2 (μg/g)		Ai-2 (%)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control (n=25)	24.58±4.17	16.21±2.25[b]	125.47±22.14	148.78±24.78[b]	45.13±5.26	60.47±8.16[b]
Experiment (n=25)	24.36±4.12	14.41±2.14[b]	125.17±22.52	167.47±23.28[b]	45.28±5.32	73.48±8.47[b]
t	0.188	2.898	0.047	2.749	0.101	5.531
P	0.852	0.006	0.962	0.008	0.920	<0.001

6. Discussion

With the implementation of the three child policy, the number of newborns has shown an upward trend, and society's attention to newborn health issues has also increased. Necrotizing enterocolitis, as a common gastrointestinal disease in the neonatal population, mainly affects premature infants. According to relevant literature, when the body weight of premature infants is between 500 and 1500 grams, the incidence rate of necrotizing enterocolitis is about 7%[6]. This disease poses a significant threat to the life safety of premature infants, and timely and accurate diagnosis and treatment are particularly crucial to ensure the prognosis and quality of life of the affected children.

In clinical practice, octreotide is commonly used to treat children with necrotizing enterocolitis. It is an octapeptide

cyclic compound with strong and long-lasting effects, which can improve gastrointestinal motility, reduce reperfusion injury, decrease intestinal endotoxin absorption, and inhibit intestinal inflammation. This study found that comparing two groups of patients, the total effective rate was significantly improved, and the experimental group had a significantly higher total effective rate than the reference group, indicating that octreotide treatment can effectively improve the treatment effect of necrotizing enterocolitis in children. The reason is that octreotide is an octapeptide cyclic compound with a mechanism of action similar to endogenous somatostatin, but the drug exhibits more significant and long-lasting pharmacological effects, effectively reducing the secretion of gastrointestinal digestive fluids and enhancing the gastrointestinal tract's ability to absorb water and sodium ions (Na+)[7]. This study found that after treatment, the nutritional status indicators of the two groups of patients were significantly improved compared to before treatment, and the albumin (ALB) and serum prealbumin (PA) in the experimental group were significantly higher than those in the reference group, indicating that octreotide treatment can effectively improve the nutritional status of children with necrotizing enterocolitis. The reason is that octreotide slows down gastrointestinal peristalsis, reduces the stimulation of digestive fluids on the intestines, helps with intestinal mucosal repair, promotes water and electrolyte absorption, maintains intestinal water balance, prevents dehydration, regulates body metabolism, improves the absorption and utilization of nutrients in children, and improves nutritional status. HMGB1, as an inflammation related factor, plays an important role in the pathogenesis of necrotizing enterocolitis. The decrease in its level indicates a reduction in intestinal inflammatory response. As important molecules for intestinal immunity and microbiota regulation, the increase in HBD2 and AI-2 levels reflects the enhanced immune defense function of the intestine[8]. Another study found that after treatment, comparing the two groups of patients, there were significant changes in various markers of gut microbiota compared to before treatment. Among them, the HMGB1 level in the experimental group was significantly lower than that in the reference group, and the HBD2 and AI-2 levels in the experimental group were significantly higher than those in the reference group, indicating that octreotide treatment can effectively restore the gut microbiota of children with necrotizing enterocolitis. The reason is that octreotide regulates the intestinal microenvironment, inhibits the excessive proliferation of harmful bacteria, and promotes the growth of beneficial bacteria, helping to restore the balance of intestinal microbiota.

In summary, octreotide has shown significant therapeutic effects in improving the nutritional status of children with necrotizing enterocolitis, which can further enhance the clinical treatment of the disease and help restore the balance of gut microbiota.

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