

Diagnosis and Treatment of Digestive System Diseases

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Abstract: Digestive diseases are multifactorial conditions influenced by genetic predisposition, microbial infections, diet, stress, and drug side effects. Recent advances in research highlight the significant role of the intestinal flora in the development and management of these diseases. This paper provides an in-depth analysis of the interactions between intestinal microecology and digestive disorders such as inflammatory bowel disease and irritable bowel syndrome, emphasizing the importance of intestinal flora balance in maintaining digestive health. It also examines various diagnostic and therapeutic approaches, including the use of probiotics, fecal microbiota transplantation (FMT), and immune-targeted therapies. The complexity of disease prevention and treatment is further explored through discussions of the role of nutrition, stress management, and drug side effects. By evaluating current methodologies and emerging technologies, this work aims to provide a comprehensive understanding of digestive diseases and offer insights into potential future developments in diagnostic precision and personalized medicine.

Keywords: Diagnosis, treatment, digestive system diseases, medical

1. INTRODUCTION

The relationship between intestinal flora and digestive system diseases is extremely complex and close. The intestinal microecological system of a healthy human body is in a dynamic equilibrium state, and the intestinal flora plays a vital role in it. The diversity and richness of the intestinal flora not only directly affect the function of the digestive system, but also participate in the host's metabolic regulation, immune response and maintenance of intestinal barrier function through various pathways. The human intestinal flora is mainly composed of five major groups, namely Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria and Verrucomicrobia. Each flora has different physiological functions in the intestine. For example, Ruminococcus and Clostridium in Firmicutes are mainly involved in carbohydrate metabolism and fermentation, while Bacteroidetes are more involved in protein and fat metabolism.

In addition, there are a small number of lactic acid bacteria, streptococci and Escherichia coli in the intestine. These flora maintain the integrity of the intestinal barrier through interactions with intestinal mucus, intestinal epithelial cells, immune system and intestinal vascular barrier. This complex network system not only involves bidirectional signal transmission and regulation, but also plays a key role in the generation and control of inflammation, thereby maintaining the steady-state environment of the intestine. The intestinal flora is also involved in a variety of biological processes, such as digestion and absorption, metabolic transformation of nutrients, etc., so its balance is crucial to human health. With the rapid development of metagenomics, metabolomics and other technologies, researchers have a deeper understanding of the role of intestinal flora in the development of diseases. More and more evidence shows that intestinal flora is closely related to a variety of digestive system diseases such as inflammatory bowel disease, irritable bowel syndrome, intestinal tumors, etc. For example, the overproliferation of certain pathogenic bacteria is directly related to the occurrence of intestinal inflammation, while the reduction of beneficial bacteria such as bifidobacteria and lactic acid bacteria may lead to intestinal immune dysfunction. This intricate relationship makes the study of intestinal flora of great clinical significance for understanding the pathological

mechanism of the disease and finding potential therapeutic targets.

In recent years, a variety of treatments have emerged for digestive system diseases caused by intestinal flora imbalance. For example, the use of probiotics, prebiotics and synbiotics to restore the balance of intestinal microecology by supplementing beneficial bacteria has become an important direction of clinical treatment. In addition, fecal microbiota transplantation (FMT), as an emerging treatment method, has shown significant effects in the treatment of intestinal diseases, especially recurrent Clostridium difficile infection. More cutting-edge technologies, such as immune targeted therapy, also provide new ideas for the intervention of intestinal diseases. This type of treatment achieves the purpose of treatment by regulating the host immune system's response to the intestinal flora.

Although many advances have been made in the study of intestinal flora, related research still faces many challenges due to the large number of intestinal flora and significant differences between individuals. Especially in the early prevention and early intervention of diseases, researchers need to further clarify the dynamic change pattern of intestinal flora and related biomarkers. By non-invasively detecting the characteristics of intestinal flora for the specific diseases, clinicians can detect potential disease risks earlier and provide patients with timely intervention measures. In addition, with the continuous advancement of detection technology, the ability to clinically detect intestinal flora and its metabolites is also constantly improving, which provides solid technical support for the implementation of personalized treatment and precision medicine. In the future, the research and clinical application of intestinal flora will open up new paths for the prevention and treatment of digestive system diseases and bring more possibilities for human health.

In the Figure 1, the digestive system diseases are visualized demonstrated.



Figure. 1 The Digestive System Diseases
(<https://www.shecares.com/symptoms/digestive-problems/articles/most-common-digestive-system-problems-or-diseases>)

2. THE PROPOSED METHODOLOGY

2.1 The causes of digestive system diseases

The causes of diseases are not only complex and diverse, but also often intertwined with multiple factors, affecting an individual's health status. The five major causative factors are discussed in more detail below:

genetic factors

Genetics plays a key role in many digestive disorders. Research shows that some diseases have obvious familial aggregation, which means that the probability of close relatives suffering from the disease is significantly higher than that of the general population. For example, inflammatory bowel diseases, such as Crohn's disease and ulcerative colitis, often run in families across generations, suggesting that genetic susceptibility plays an important role in the development of these diseases. In addition, certain genetic diseases related to pancreatic function also show similar characteristics. Gene mutations or variations in specific genes may affect the normal function of the digestive system, thereby increasing the risk of disease.

Infect

As an important cause of digestive system diseases, microbial infections usually involve a variety of pathogens, including bacteria, viruses, parasites, etc. Take *Helicobacter pylori*, for example, a bacterium widely considered to be a major cause of stomach ulcers and gastritis. It destroys the barrier function of the gastric mucosa, causing acidic gastric juice to directly damage the gastric wall. Viral infections, such as hepatitis virus, may cause liver inflammation, which may lead to more serious complications, such as cirrhosis and even liver cancer. Parasitic infections cannot be ignored. Certain parasites can live in the intestines and cause a series of digestive system problems, such as diarrhea and malnutrition.

unhealthy eating habits

The diet in modern society has gradually deviated from the healthy track, leading to an increase in the incidence of digestive system diseases year by year. A high-fat, high-salt, low-fiber diet has been shown to be an important factor in gastrointestinal diseases. For example, long-term consumption of a high-fat diet may increase the risk of gallstones and cholecystitis, while a low-fiber diet can slow bowel movements and increase the likelihood of constipation. In addition, excessive drinking and smoking also seriously harm the health of the digestive system. Alcohol is particularly

harmful to the liver. Frequent drinkers are prone to alcoholic hepatitis and cirrhosis. Smoking is closely related to the incidence of gastrointestinal tumors.

stress

Psychological stress not only affects mood, but also has a profound impact on the health of the digestive system. Studies have found that long-term stress can interfere with digestive function and lead to the occurrence of functional diseases such as irritable bowel syndrome. The stress response can activate the neuroendocrine system, causing gastrointestinal peristalsis dysfunction, resulting in symptoms such as abdominal pain, bloating, constipation or diarrhea. In addition, stress may trigger excessive secretion of gastric acid, increasing the risk of gastric ulcers and gastritis. Therefore, managing emotions and maintaining mental health are key to preventing digestive diseases.

drug side effects

With the popularity of drug treatment, the impact of drug side effects on the digestive system has also received increasing attention. Certain drugs, particularly nonsteroidal anti-inflammatory drugs (NSAIDs), may have adverse effects on the gastrointestinal mucosa while relieving pain and inflammation. By inhibiting the production of prostaglandins, these drugs weaken the protective function of the gastric mucosa and increase the risk of gastric ulcers and gastritis. Long-term use of these drugs, especially without taking measures to protect the gastric mucosa, may seriously impair digestive health. Therefore, rational use of drugs and following medical instructions are important measures to prevent drug side effects.

2.2 Some discussions

Patients with digestive system diseases often face nutrient absorption disorders due to the influence of the disease itself, which further aggravates their condition. The digestive tract function of these patients is impaired, resulting in the body's inability to absorb enough nutrients such as protein, fat, vitamins and minerals. In addition, many drugs for treating digestive system diseases, such as antibiotics, anti-inflammatory drugs and antacids, may also have negative effects on the digestive tract, further weakening the ability to absorb nutrients. Long-term use of drugs will not only interfere with the normal function of the gastrointestinal mucosa, but may also cause gastrointestinal flora imbalance and lead to abnormal nutrient metabolism. For example, long-term use of antibiotics may reduce the number of beneficial bacteria in the body and affect the synthesis of vitamin K and B vitamins, which play a vital role in blood coagulation and energy metabolism.

In addition, patients with digestive system diseases are often accompanied by symptoms such as diarrhea and vomiting, which accelerate the loss of nutrients. Diarrhea can lead to a large loss of water, electrolytes and nutrients, especially the deficiency of trace elements such as potassium, calcium and magnesium, which may cause muscle weakness, arrhythmia and other problems; while vomiting will cause gastric acid and food residues to be discharged together, leading to an imbalance in the gastrointestinal environment, further affecting digestion and absorption functions. As these nutrients are lost, the patient's body metabolism becomes abnormal, which not only affects energy supply but also weakens the function of the immune system.

Since nutrients cannot be effectively supplemented for a long time, patients with digestive system diseases are very likely to

have low immune function. Reduced immunity makes patients more vulnerable to external infections, and the condition worsens repeatedly, forming a vicious cycle. In addition, malnutrition may also affect the patient's muscle mass, wound healing and disease resistance, which is particularly common in patients with chronic diseases. In fact, the decline in immune function caused by malnutrition in patients with digestive system diseases is very likely to cause serious complications such as pneumonia and sepsis, further prolonging hospitalization and increasing the burden of medical expenses. In clinical practice, malnutrition has been proven to be a key risk factor for prolonged hospitalization and increased complication rates in patients with digestive system diseases. Therefore, early assessment and timely intervention of the nutritional status of these patients is particularly important. Through regular nutritional risk assessment, the medical team can quickly grasp the patient's physical condition and identify those at high risk of severe malnutrition. Such assessments usually include multiple indicators such as body mass index (BMI), blood tests, muscle mass assessment, and food intake.

Based on the assessment, the medical team can develop a personalized nutritional intervention plan to ensure that the patient receives adequate nutritional support. For patients with mild to moderate malnutrition, enteral nutrition (taking nutrition orally or through a gastric tube) is usually the preferred method of nutritional support because it can better maintain gastrointestinal function and has fewer side effects. For critically ill patients who cannot absorb nutrients through the digestive tract, parenteral nutrition (through intravenous injection of nutrient solution) becomes an indispensable means to ensure that their basic metabolic needs are met. In some cases, enteral and parenteral nutrition may be used in combination to provide the most appropriate support plan for patients. Timely nutritional intervention can not only effectively improve the overall health of patients, but also significantly reduce the length of hospital stay and the incidence of complications, ultimately improving clinical treatment outcomes. An optimized nutritional treatment plan can enhance the patient's immunity, speed up recovery from illness, and reduce the risk of complications caused by malnutrition.

2.3 The tips for preventing digestive system diseases

Developing healthy eating and living habits is a key step in maintaining good digestive system function. Good eating habits can not only help prevent digestive system diseases, but also promote overall health. First of all, people should follow regular meal times, eat on time, and avoid fasting for too long or eating snacks at will. Too long fasting time will cause excessive gastric acid secretion and increase the risk of gastric mucosal damage, while eating at will can easily cause nutritional imbalance. The amount of food during meals should also be moderate, and overeating should be avoided, which will put too much burden on the gastrointestinal tract and increase the probability of problems such as indigestion and bloating.

In addition, the scientific combination of dietary structure is equally important. Adequate intake of vitamins, minerals and dietary fiber can provide comprehensive nutritional support for the body and maintain the normal functioning of the digestive system. Antioxidants such as vitamins A, C, and E can not only help repair the gastrointestinal mucosa, but also enhance the body's immunity and prevent the occurrence of inflammatory diseases. Minerals such as calcium, magnesium,

and potassium help regulate the contraction function of gastrointestinal muscles and promote the secretion of digestive juices. Dietary fiber is particularly important. High-fiber foods such as whole grains, fruits, vegetables, beans, etc. can effectively promote gastrointestinal motility and reduce the occurrence of constipation. Dietary fiber also has the effect of increasing satiety, which can help control food intake, prevent overeating, and thus reduce the burden on the gastrointestinal tract.

At the same time, healthy eating habits should also include reducing the intake of irritating foods. Spicy, greasy, overly sweet or overly salty foods can irritate the gastrointestinal mucosa and increase gastric acid secretion. Long-term intake of these foods may cause digestive system diseases such as gastric ulcers and gastritis. Therefore, in daily diet, the intake of such foods should be minimized, while light, nutritious foods should be increased. Drinking plenty of water is also part of developing healthy eating habits. Adequate water intake can help dilute gastric acid, promote food digestion and nutrient absorption.

Moderate exercise not only helps to enhance cardiopulmonary function and muscle strength, but also has a significant promoting effect on the health of the digestive system. Exercise can help food pass through the digestive tract faster by increasing gastrointestinal motility, thereby reducing stomach retention time and avoiding problems such as acid reflux. In particular, moderate-intensity aerobic exercise such as walking, jogging, and swimming can effectively stimulate intestinal activity and improve digestion and absorption. In addition, regular exercise can also help control weight and avoid obesity-related digestive system diseases. Obesity increases the risk of problems such as acid reflux and gallstones, so maintaining a healthy weight is essential for protecting the digestive system.

The benefits of exercise to the digestive system are also reflected in the improvement of blood circulation. During exercise, the blood flow of the whole body is accelerated, and the blood supply to the gastrointestinal tract also increases. This can not only increase the secretion of digestive enzymes, but also promote the absorption and metabolism of nutrients, which helps to maintain the efficient operation of the digestive system. It is worth noting that exercise should be based on the principle of moderation. Excessive exercise or high-intensity exercise may cause intestinal discomfort and even aggravate the symptoms of acid reflux. Therefore, choosing the right amount of exercise and exercise method is the key to maintaining a healthy digestive system. A healthy lifestyle also requires attention to the maintenance of mental health. The fast-paced life and high-pressure environment of modern society often lead to anxiety and tension, and these psychological factors will directly affect gastrointestinal function. Studies have shown that long-term emotional stress increases the risk of functional digestive system diseases such as irritable bowel syndrome. Therefore, in addition to healthy eating and moderate exercise, maintaining a balanced mind and learning to release stress are also beneficial to maintaining a healthy digestive system. Only by combining these comprehensive measures can we effectively prevent the occurrence of digestive system diseases and promote overall health.

3. CONCLUSION

The relationship between gut flora and digestive diseases is complex and has significant clinical implications. Advances in the study of the gut microbiota have led to innovative

treatments, including probiotics and FMT, which show promise in treating conditions such as recurrent *Clostridium difficile* infections. Despite these advances, challenges remain, particularly in early diagnosis and prevention. Personalized nutrition and new diagnostic tools offer potential avenues for improving patient outcomes. As research into gut flora and digestive diseases continues, the integration of precision medicine and tailored interventions is likely to drive future breakthroughs, leading to more effective management of these complex conditions.

4. REFERENCES

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