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Effects of Conventional Treatment on The Composition of The Intestinal Microbiota

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ABSTRACT

Introduction: Crohn's disease is a chronic intestinal inflammation caused by genetic, immunological, microbiotic and environmental factors. The intestinal microbiota plays a crucial role in its pathogenesis, increasing the predisposition in genetically susceptible patients. Identification of changes in the gut microbiota is an important goal for predicting recurrence and remission of Crohn's disease.

Methodology: The relationship between Crohn's disease, microbiota, and postoperative recurrence was investigated through keyword search on the ResearchRabbit search engine from 2008-2023. 834 results were obtained, of which 22 relevant articles were selected for the preparation of the article.

Theoretical Framework: The intestinal microbiota plays a crucial role in the pathophysiology of inflammatory bowel diseases such as Crohn's disease. The alteration of the microbiota can increase the prevalence in genetically susceptible patients and affect the physiology of mammals. Intestinal surgery can alter the colonic microbiota in various ways, which can affect the composition and function of the microbiota. Understanding how these changes affect the colonic microbiota can help develop strategies to maintain or restore a healthy microbiota after surgery. The healthy microbiota is a protective factor for the host due to its resistance to colonization by harmful bacteria and its role in the immune system.

Conclusions: The intestinal microbiota has the potential to predict the postoperative course and recurrence of Crohn's disease.

ARTICLE DETAILS

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INTRODUCTION

Crohn's disease is a chronic inflammatory intestinal condition whose development results from the interaction of genetic, immunological, microbiotic, and environmental factors 1.

The intestinal microbiota plays a crucial role in the pathogenesis of this disease, since incorrect colonization can increase the predisposition of genetically susceptible patients to suffer from it. The disease is chronic and destructive; approximately half of patients require surgery within ten years of diagnosis 2. The most important risk factors for early recurrence are smoking, perforating disease, and a history of resection 2.

Treatment of Crohn's disease usually consists of a combination of drug therapy to reduce inflammation and surgery for patients refractory to treatment or with complications. Biological therapy is more effective than standard treatment and the need for surgery has decreased 2. Surgery is not considered curative and recurrence can be clinical, endoscopic, radiological or surgical, with a rate between 28% and 45% 5 to 10 years after the intervention. The greatest risk factor for postoperative recurrence is active smoking 2.

The composition of the gut microbiota is significantly altered in Crohn's disease, contributing to chronic inflammation of the gastrointestinal tract 2. The relationship between the gut microbiota and Crohn's disease is bidirectional, as the disease can affect the composition of the gut microbiota. the microbiota and, at the same time, the altered microbiota can contribute to the progression of the disease. In addition, the intestinal microbiota can influence the activation of immune system cells and the production of proinflammatory cytokines, which can perpetuate inflammation and an inappropriate immune response 2.

METHODOLOGY

This methodology investigated the relationship between Crohn's disease, the microbiota, and postoperative recurrence. The keywords Crohn's disease, Microbiota, Postoperative recurrence, Gut microbiome, Gut inflammation, Crohn's disease surgery, Microbiome disorders were used. Registrations are accepted from 2008-2023.

Impact of the microbiota in Crohn's disease. The search was performed using the ResearchRabbit search engine, which returned a total of 834 results.

After an initial review of the titles and summaries of the results, those irrelevant to the research topic were eliminated, leaving a total of 22 articles to be included in the preparation of the article.

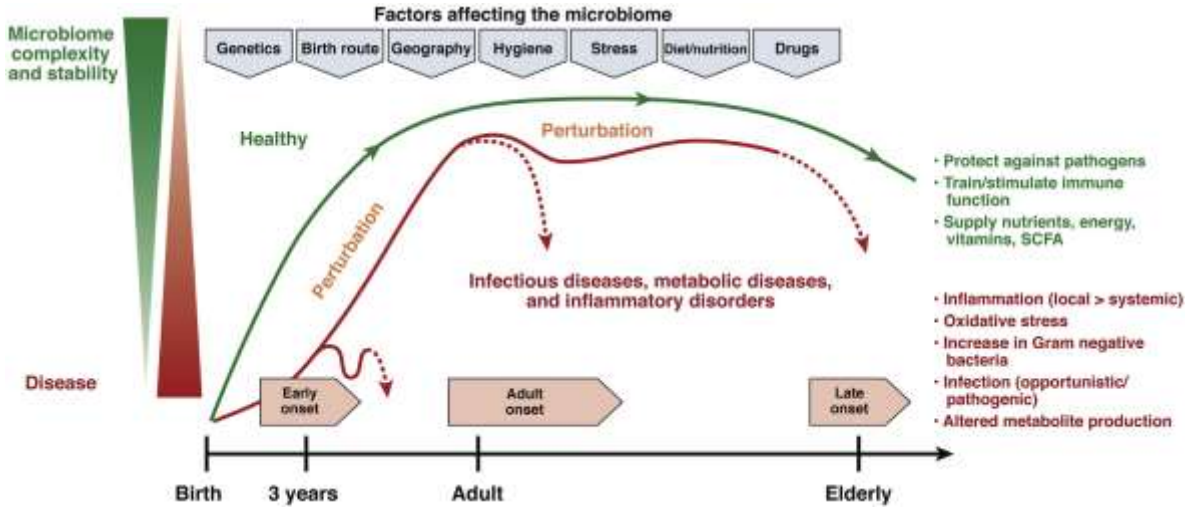
IMPORTANCE OF THE MICROBIOTA

*Crohn's disease is*a chronic inflammatory bowel disease that has increased its incidence worldwide. Its appearance is considered multifactorial, related to environmental alterations and an altered immune response of the host microbiota 3. The importance of the intestinal microbiota in the pathogenesis of this disease has been demonstrated in various studies, which have been increasing in recent years. thanks to technological advances.

The intestinal microbiota is an essential factor in the pathophysiology of inflammatory bowel diseases, and its incorrect colonization increases the prevalence in genetically susceptible patients 1. In addition, it has been shown that the intestinal microbiome can affect mammalian physiology, including predisposition to diseases such as type 1 diabetes, even in animal models without risk factors such as obesity 2. For these reasons, new hypotheses have been proposed on the readaptation of the microbiome as a therapeutic target using probiotics, defined as "live microorganisms that provide benefits to their host." Microorganisms used in the studies include Bifidobacterium, Lactobacillus, Lactococcus, Streptococcus, Bacillus, Bacteroides, Enterococcus, Escherichia, Faecalibacterium, Propionibacterium, and Saccharomyces 2.

The healthy microbiota is a protective factor for the host due to its resistance to colonization by harmful bacteria and to competition for space that could colonize new species. However, in some cases it has been observed that they can facilitate viral colonization. In addition, the microbiota plays an important role in the immune system, as evidenced by observations of Bacteroides and Clostridium species in regulating T cells and decreasing intestinal inflammation. Other members of the microbiota can also attenuate inflammation through the activation of NF-kB5.

The role of the gut microbiome in Crohn's disease is a constantly evolving topic, and identification of changes in the gut microbiota is an important goal for predicting Crohn's disease recurrence and remission 3.



Factors affecting the stability and complexity of the gut microbiome in health and disease. [7]

SURGERY AND THE MICROBIOTA

Intestinal surgery can alter the colonic microbiota in several ways. First, surgery can increase the supply of oxygen to the colon, which may favor the growth of aerobic bacteria over anaerobic bacteria. This can lead to a decrease in the diversity and abundance of the colonic microbiota. Also, surgery can affect the ileocecal valve, which is a structure that separates the colon from the small intestine. Alterations in the ileocecal valve may allow bacteria from the small intestine to migrate to the colon, which may alter the composition of the colonic microbiota. After surgery, a reduction in Firmicutes, Bacteroidetes, and invasive adherent E. coli species has been observed, suggesting that surgery alters the microbiota and its function.[4, 6]

Surgery can also induce inflammatory changes in the colon, which can affect the colonic microbiota. Inflammation can alter the microbial environment of the colon and favor the growth of certain bacteria over others. Finally, surgery can also alter the immune function of the colon, which can affect the colonic microbiota. The immune system plays an important role in maintaining the microbial balance in the colon, and any alteration in its function can have

consequences on the composition of the microbiota. Understanding how these changes affect the colonic microbiota can help develop strategies to maintain or restore a healthy microbiota after surgery. 6

ALTERATIONS IN THE MICROBIOTA

The microbiome is an important component of human health, and its disruption may be a factor in the development of diseases such as Crohn's disease. The quantity and diversity of microorganisms in the human intestine are divided into microbiota associated with mucosa and fecal microbiota. In metagenomic studies it has been found that the presence and diversity of Firmicutes decreases. In contrast, gammaproteobacteria are increased in patients with Crohn's disease compared to healthy individuals 7,8,9. The diversity of microorganisms is greater in healthy individuals and is dominated by Firmicutes, Bacteroidetes, and Proteobacteria. However, a lower diversity of microorganisms and an increase in proteolytic bacteria have been observed in patients with Crohn's disease.

At the phylogenetic level, the functional composition of the human microbiome is usually stable. However, up to 12% of metabolic pathways have been found to be altered between healthy and Crohn's disease patients 5. Certain Fusobacterium species have been positively correlated with Crohn's disease and have also been shown to correlate with tumors. and lesions related to colorectal cancer 5. It has been shown that some species of bacteria, such as Bifidobacterium, Lactobacillus and Faecalibacterium, have a protective role in the mucosa by regulating inflammatory cytokines and stimulating anti-inflammatory cytokines 5.

Diet is an important relationship to the microbiome, and eating patterns affect the presence of Bacteroides, Bifidobacterium, and Firmicutes. For example, vegetarian dietary patterns decrease the presence of Bacteroides, Bifidobacterium and Enterobacteriaceae 5.

In addition to diet, age, stress, antibiotics, and other environmental factors can also affect the diversity and composition of the human microbiota. For example, studies have shown that the excessive use of antibiotics can have a negative effect on the microbiota, reducing diversity and changing its composition. 5

In the case of Crohn's disease, the alteration in the composition and diversity of the microbiota may contribute to the pathogenesis of the disease and the abnormal immune response. It has been shown that decreased microbiota diversity and the presence of proteolytic-fed fermenting and lactic acid-producing bacteria can trigger an inflammatory response and downregulation of cytokines. 1

On the other hand, the presence of Fusobacterium species in the human microbiota may influence the pathophysiology of Crohn's disease. Furthermore, the positive correlation of the presence of Fusobacterium with Crohn's disease and with tumors and lesions related to colorectal cancer suggests that these species may play an important role in the pathogenesis of these diseases. 5

Finally, the importance of the microbiota in Crohn's disease can also be seen in the fact that the administration of probiotics or prebiotics has been shown to be effective in the treatment of the disease. Probiotics are useful in regulating the inflammatory response and preventing disease recurrence. 7,8,9

Antibiotics

The importance of the microbiota in Crohn's disease has been recognized in recent years. Antibiotics, previously used as a treatment for Crohn's disease, have been shown to cause alterations in the diversity and composition of patients' gut microbiota, making them more likely to acquire new gastrointestinal infections such as diarrhea caused by Clostridium difficile or perfringens. 3

In addition, the indiscriminate use of antibiotics can also affect the protective capacity of the microbiota against the inflammatory lesions present in Crohn's disease, decreasing its effectiveness in the treatment of the disease. 10,11,12

Therefore, it is important to consider antimicrobial therapy as an option only for specific septic complications such as intra-abdominal abscesses, fistulas, and toxic megacolon, among others. 3

The microbiological study of the intestine has been increasing in different areas of health, which could improve the results of patients with Crohn's disease in a more natural way. This could open new horizons for pharmaceutical companies and improve the quality of life of patients. 5

Probiotics

Crohn's disease can be difficult to treat. The microbiota has been identified as a key factor in the pathogenesis of Crohn's disease. 13,14,15 Although research on the use of probiotics in the treatment of Crohn's disease is still limited, 13,14,15 studies have shown mixed results regarding the effectiveness of probiotics.

In one study, the use of Saccharomyces boulardii as a probiotic did not show a decrease in remission of Crohn's disease. 13,14,15 On the other hand, the use of multiple species of probiotics in patients has been shown to reduce the symptoms of Crohn's disease. 2 The probiotics Lactobacillus johnsonii, Lactobacillus Rhamnosus, VSL#3, and Synbiotic 2000 have shown promising results in postoperative patients. However, isolated probiotics have not yet been shown to be effective for these patients. 16-19

However, formulation of probiotics with single species of bacteria has not been effective in preventing recurrence of Crohn's disease after surgery. 13,14,15 The American Gastroenterological Association (AGA) suggests that mesalamine, budesonide, or probiotics should not be used in patients with surgically induced CD in remission. 20,21,22 More clarity is still required on the effectiveness of budesonide and probiotics in the postoperative setting, as the available evidence is of very low quality. 20,21,22

DISCUSSION

Crohn's disease is a chronic inflammatory bowel disease that has increased its incidence worldwide. Its appearance is considered multifactorial, related to environmental alterations and an altered immune response of the host microbiota. The importance of the intestinal microbiota in the pathogenesis of this disease has been demonstrated in various studies, which have increased in recent years thanks to technological advances.

The intestinal microbiota is an essential factor in the pathophysiology of inflammatory bowel diseases, and its incorrect colonization increases the prevalence in genetically susceptible patients. Furthermore, it has been shown that the gut microbiome can affect mammalian physiology, including predisposition to diseases such as type 1 diabetes, even in animal models without risk factors such as obesity.

For these reasons, new hypotheses have been proposed on the readaptation of the microbiome as a therapeutic target using probiotics, defined as "live microorganisms that provide benefits to their host." Organisms observed in studies include Bifidobacterium, Lactobacillus, Lactococcus, Streptococcus, Bacillus, Bacteroides, Enterococcus, Escherichia, Faecalibacterium, Propionibacterium, and Saccharomyces.

The healthy microbiota is a protective factor for the host due to its resistance to colonization by harmful bacteria and to competition for space that could colonize new species. However, in some cases it has been observed that they can facilitate viral colonization. In addition, the microbiota plays an important role in the immune system, as evidenced by observations of Bacteroides and Clostridium species in regulating T cells and decreasing intestinal inflammation. Other members of the microbiota may also attenuate inflammation through NF-kB activation.

On the other hand, intestinal surgery can alter the colonic microbiota in several ways, which can affect the composition and function of the microbiota. Understanding how these changes affect the colonic microbiota can help develop strategies to maintain or restore a healthy microbiota after surgery.

CONCLUSIONS

Advances in human microbiome research and therapeutic microbiology allow for a greater understanding of the diversity in the gastrointestinal tract and its effects on human health. Careful selection of drugs, nutrients, and bacterial strains is essential in this area, and careful preclinical evaluations will be necessary as gastroenterology enters the era of metagenomics.

The gut microbiota has the potential to predict the postoperative course and recurrence of Crohn's disease. However, there are still limitations to understanding its relationship with inflammation and its frequent use of antibiotics. A thorough understanding of host and microbiological interactions is required for the appropriate use of the discovered knowledge. Conscious manipulation of the human microbiome with antibiotics, probiotics, and prebiotics is a therapeutic approach that will enable personalized medicine in the future. These advances will allow for a more holistic medicine considering human genotypes and associated microbial communities.

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