

Review Article

Motor Function of the Gastrointestinal Tract and Biliary Tract in Microscopic Colitis

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Summary

The aim of the study was to identify disorders of the motor function of the gastrointestinal tract and VD in microscopic colitis.

Material and methods: The study included patients suffering from microscopic colitis. The motor function of the gastrointestinal tract and VD was recorded electromyographically. Statistical analysis was performed using the Mann-Whitney small sample method ($p < 0.05$).

Results: Prior to treatment with MC, hypomotor dyskinesia of the stomach and small intestine was detected. In MC, there is moderate hypermotor dyskinesia of the right colon and left colon, which is clinically accompanied by multiple liquid stools, and polyphaly. In the biliary system, mild hypomotor dyskinesia of the gallbladder was observed against the background of a slight increase in the motility of choledochus. As a result of the study, hypomotor dyskinesia of the stomach, gallbladder and small intestine was shown. Hypomotor dyskinesia of the stomach correlates with a decrease in the secretory function of the organ, which reduces the bactericidal activity of gastric juice and contributes to the development of SIBR in the small intestine. The analysis of the obtained results showed that in the large intestine there was a progressive increase in motor function in the distal direction, which leads to the development of diarrhea and polyphaly. After treatment with MC, there was a tendency to normalize the motor function of the stomach, restoration of the motor activity of the small intestine due to a decrease in the manifestations of SIBR, a stable decrease in the propulsive motility of the right and left parts of the colon, and hypomotor dyskinesia of the biliary system, motor function of the duodenum tends to recover.

Conclusions: Electromyography can be used to assess the dynamics of treatment in microscopic colitis. In the treatment of microscopic colitis, the passage of gastric contents into the small intestine is restored. Treatment of microscopic colitis is accompanied by the restoration of the propulsive activity of the colon, which contributes to the normalization of the stool. A decrease in biliary motility leads to a decrease in the content of bile acids in the lumen of the small intestine, a decrease in the motility of the large intestine, which generally has a positive effect on intestinal transit. Morphologically, the positive dynamics of the condition of patients suffering from microscopic colitis is shown.

Introduction

Lymphocytic and collagenic colitis are two phases of microscopic colitis – a rare disease of the colon. It is characterized by lymphocytic infiltration of the mucous membrane (lymphocytic colitis), the growth of collagen tissue under the surface epithelium and in the submucosal base of the colon (collagen colitis), a long

course and recurrent diarrhea [1]. It is known that lymphocytic and collagen colitis are observed mainly in patients suffering from rheumatoid arthritis, Sjogren's syndrome, celiac disease, that is, diseases associated with HLA-A1 and HLA-A3, pathogenic influence on the formation and differentiation of fibroblasts is exerted by the microbial flora of the intestine [2]. The disease occurs in two stages.

Stage 1 (microscopic colitis) is characterized by a non-specific inflammatory reaction with pronounced infiltration of the intestinal wall by lymphoid cells.

Stage 2 (collagen colitis) It is characterized by the growth of the collagen layer under the basal membrane of the colonocytes. The presence of a large amount of connective tissue leads to a violation of the function of colonocytes, as a result, the absorption of water and electrolytes in the colon is disrupted, which leads to the development of diarrhea. With collagenic colitis, the colon may take the form of a tube with smooth walls [3]. Clinically, there is pain and bloating, watery loose stools and polyuria. On palpation, the large intestine is dilated, painful, of a moderately dense consistency, the body weight decreases, the skin becomes dry as a result of diarrhea, but the functions of the small intestine are preserved and a severe syndrome of impaired absorption does not develop. When X-ray examination at the stage of microscopic colitis, the colon is not changed, when it is transformed into collagen colitis, the intestinal wall may resemble a tube with smooth, even walls.

When endoscopic examination of changes in the mucous membrane is usually not detected, the diagnosis is established only by histological examination of biopsies of the colon mucosa, Despite the data of a clinical study – the presence of multiple watery stools, which may indicate a violation of the motor function of the colon, a comprehensive study of the motility of the gastrointestinal tract and VD was not conducted.

The aim of the study was to identify disorders of the motor function of the gastrointestinal tract and VD in microscopic colitis.

Material and Methods

The study included 10 patients suffering from microscopic colitis, women aged 53.3 ± 4.2 years accounted for 60%, men aged 65.0 ± 5.3 years-40% of cases. In patients with Microscopic Colitis (MC), GERD was additionally diagnosed in 60%, gastric ulcer of the duodenum-in 20% of cases, SIBR, metabolic syndrome, chronic cholecystitis - in 10% of cases, liver steatosis in 80%, HIBOP - in 33.3%, esophageal and sigmoid colon polyps - in 10%. Stool frequency increased to 7-12 times before treatment. Treatment with antidiarrheal drugs, corticosteroids, anti-inflammatory drugs, antibacterial agents, immunomodulators, anti-TNF-alpha therapy was performed. The comparison group consisted of 9 patients suffering from chronic gastritis.

The motor function of the gastrointestinal tract and VD was recorded electromyographically. The amplitude-frequency characteristics of slow waves and spikes, the power of phase and tonic contractions, and propulsive activity were analyzed using the Conan-M hardware and software complex with a bandwidth of 0.1-10 mV before and after treatment. Statistical analysis was performed using the Mann-Whitney small sample method ($p < 0.05$).

Results

Before treatment. The frequency of slow stomach waves was $9.7 \pm 1.3 \text{ } \backslash \text{min}$ (an increase of 78.2%, $p < 0.05$), the amplitude was $0.19 \pm 0.003 \text{ mV}$ (an increase of 26.7%, $p < 0.05$), the power of tonic contractions was 1.843 ± 0.113 (an increase of 123.4%, $p < 0.001$). The frequency of spikes was 2.6 ± 0.4 (an increase of 160%, $p < 0.001$), the amplitude $0.14 \pm 0.002 \text{ mV}$ (an increase of 39.8%, $p < 0.05$), the power of phase contractions - 0.364 ± 0.021 (an increase of 264%, $p < 0.001$), the propulsive activity 5.1 ± 0.3 (a decrease of 39.2%, $p < 0.05$). That is, microscopic colitis revealed hypomotor dyskinesia of the stomach. The frequency of slow waves of the small intestine was $9.2 \pm 0.8 \text{ } \backslash \text{min}$ (decrease by 59%, $p < 0.05$), the amplitude was $0.16 \pm 0.004 \text{ mV}$ (increase by 60.1%, $p < 0.05$), the power of tonic contractions was 1.472 ± 0.125 (decrease by 26.4%, $p < 0.05$). The frequency of spikes was 1.8 ± 0.3 (an increase of 79.8%, $p < 0.05$), the amplitude was $0.08 \pm 0.002 \text{ mV}$ (a decrease of 20%, $p < 0.05$), the power of phase contractions was 0.144 ± 0.013 (an increase of 44%, $p < 0.05$), the propulsive activity was 10.2 ± 1.3 (a decrease of 49%, $p < 0.05$). That is, in MC, hypomotor dyskinesia of the small intestine was detected.

Electromyographically, the frequency of slow waves of the right colon was $10.0 \pm 0.7 \text{ } \backslash \text{min}$ (a decrease of 9.1%, $p < 0.05$), the amplitude - $0.12 \pm 0.006 \text{ mV}$ (an increase of 20%, $p < 0.05$), the power of tonic contractions - 1.2 ± 0.14 (an increase of 9.1%, $p < 0.05$), the frequency of spikes was 1.4 ± 0.2 (an increase of 39.9%, $p < 0.05$), the amplitude - $0.06 \pm 0.003 \text{ mV}$ (a decrease of 40.1%, $p < 0.05$), power of phase contractions 0.084 ± 0.006 (decrease by 16%, $p < 0.05$), propulsive activity - 14.3 ± 0.12 (increase by 30%, $p < 0.05$). That is, moderate hypermotor dyskinesia of the right colon is observed in MC. In the left colon before treatment, the frequency of slow waves is $9.8 \pm 0.9 \text{ } \backslash \text{min}$ (an increase of 63.3%, $p < 0.05$), the amplitude is $0.14 \pm 0.002 \text{ mV}$ (an increase of 39.8%, $p < 0.05$), the power of tonic contractions is 1.372 ± 0.112 (an increase of 128.7%, $p < 0.001$). The frequency of spikes was 1.4 ± 0.2 (an increase of 39.9%, $p < 0.05$), the amplitude was $0.1 \pm 0.004 \text{ mV}$ (within the reference values), the power of phase contractions was 0.14 ± 0.011 (an increase of 40.1%, $p < 0.05$), the propulsive activity was 9.8 ± 0.3 (an increase of 63.3%, $p < 0.05$). That is, in MC, there was a pronounced hypermotor dyskinesia of the left colon, which is clinically accompanied by multiple liquid stools and polyuria.

The frequency of slow waves of choledochus before treatment was $7.3 \pm 0.8 \text{ } \backslash \text{min}$ (decrease by 18.9%, $p < 0.05$), the amplitude- $0.15 \pm 0.003 \text{ mV}$ (increase by 49.8%, $p < 0.05$), the power of tonic contractions 1.095 ± 0.103 (increase by 21.7%, $p < 0.05$). The frequency of spikes was 1.5 ± 0.5 (an increase of 50.1%, $p < 0.05$), the amplitude was $0.07 \pm 0.002 \text{ mV}$ (a decrease of 30%, $p < 0.05$), the power of phase contractions was 0.105 ± 0.011 (an

increase of 5%, $p < 0.05$), the propulsive activity was 10.5 ± 0.7 (an increase of 16.7%, $p < 0.05$). Morphologically, in microscopic colitis (lymphocytic type), the architectonics of intestinal crypts are not disturbed. There is a slight decrease in the number of goblet cells. The lamina proper is unevenly infiltrated by lymphocytes and plasmocytes. Dystrophy of surface epithelial cells. The number of interepithelial lymphocytes is more than 30 per 100 epithelial cells. Electromyographically, the frequency of slow gallbladder waves before treatment was $7.5 \pm 0.6 \text{ } \backslash \text{min}$ (decrease by 6.3%, $p < 0.05$), the amplitude $-0.15 \pm 0.002 \text{ mV}$ (increase by 49.8%, $p < 0.05$), the power of tonic contractions 1.125 ± 0.09 (increase by 40.6%, $p < 0.05$). The frequency of spikes was 1.5 ± 0.5 (an increase of 50.1%, $p < 0.05$), the amplitude was $0.1 \pm 0.003 \text{ mV}$ (within the reference values), the power of phase contractions was 0.15 ± 0.0013 (an increase of 49.8%, $p < 0.05$), and the propulsive activity was 7.5 ± 0.6 (a decrease of 6.3%, $p < 0.05$). Thus, in the biliary system, weakly expressed hypomotor dyskinesia of the gallbladder was observed against the background of a slight increase in the motility of choledochus, which, apparently, has a compensatory character. In addition, a decrease in the concentration of bile acids in the conditions of hypomotor dyskinesia of the gallbladder leads to the development of excessive Bacterial Growth Syndrome (SIBR) in the small intestine.

As a result of the study, hypomotor dyskinesia of the stomach, gallbladder and small intestine was shown. Hypomotor dyskinesia of the stomach correlates with a decrease in the secretory function of the organ, which reduces the bactericidal activity of gastric juice and contributes to the development of SIBR in the small intestine. Antro-duodenal coordination, normally 1: 4, in patients with MC was 1.54 :1, which further accelerates the evacuation of the contents to the small intestine. Hypomotor dyskinesia of the gallbladder increases the manifestations of SIBR in the small intestine. The analysis of the obtained results showed that in the large intestine there was a progressive increase in motor function in the distal direction, which leads to the development of diarrhea and polyphaly. After MC treatment, the frequency of slow stomach waves was $4.7 \pm 0.5 \text{ } \backslash \text{min}$ (decrease by 14.5%, $p < 0.05$), the amplitude was $0.17 \pm 0.002 \text{ mV}$ (increase by 13.3%, $p < 0.05$), the power of tonic contractions was 0.799 ± 0.081 (decrease by 3.2%, $p > 0.1$). The frequency of spikes was 2.5 ± 0.3 (an increase of 150%, $p < 0.001$), the amplitude $0.07 \pm 0.004 \text{ mV}$ (a decrease of 30%, $p < 0.05$), the power of phase contractions 0.175 ± 0.012 (an increase of 75%, $p < 0.05$), propulsive activity - 4.6 ± 0.5 (a decrease of 18.2%, $p < 0.05$). That is, after the treatment of MC, there was a tendency to normalize the motor function of the stomach.

Electromyographically, the frequency of slow waves of the small intestine was $10.3 \pm 0.9 \text{ } \backslash \text{min}$ (a decrease of 48.5 %, $p < 0.05$), the amplitude $-0.17 \pm 0.002 \text{ mV}$ (an increase of 69.8%, $p < 0.05$), the power of tonic contractions 1.751 ± 0.102 (a decrease of

12.4%, $p < 0.05$). The frequency of spikes is 1.5 ± 0.1 (an increase of 49.8%, $p < 0.05$), the amplitude is $0.07 \pm 0.008 \text{ mV}$ (a decrease of 30%, $p < 0.05$), the power of phase contractions is 0.105 ± 0.014 (an increase of 5%, $p < 0.05$), the propulsive activity is 16.7 ± 2.1 (a decrease of 16.5%, $p < 0.05$). That is, in MC after treatment, there is a restoration of the motor activity of the small intestine due to a decrease in the manifestations of SIBR. In the right colon after treatment, the frequency of slow waves was $8.7 \pm 0.3 \text{ } \backslash \text{min}$ (a decrease of 20.9%, $p < 0.05$), the amplitude was $0.18 \pm 0.002 \text{ mV}$ (an increase of 79.8%, $p < 0.05$), the power of tonic contractions was 1.566 ± 0.132 (an increase of 62.3%, $p < 0.05$). The frequency of spikes was 2.0 ± 0.001 (an increase of 99.8%, $p < 0.001$), the amplitude was $0.1 \pm 0.001 \text{ mV}$ (within the reference values), the power of phase contractions was 0.2 ± 0.003 (an increase of 99.8%, $p < 0.001$), the propulsive activity was 7.83 ± 0.62 (a decrease of 28.8%, $p < 0.05$).

The frequency of slow waves of the left colon after treatment was $5.5 \pm 0.4 \text{ } \backslash \text{min}$ (decrease by 8.3%, $p < 0.05$), the amplitude $-0.07 \pm 0.002 \text{ mV}$ (decrease by 28.0%, $p < 0.05$), the power of tonic contractions - 0.385 ± 0.040 (decrease by 35.8%, $p < 0.05$). The frequency of spikes was 1.7 ± 0.06 (an increase of 70.1%, $p < 0.05$), the amplitude $-0.05 \pm 0.001 \text{ mV}$ (a decrease of 50.1%, $p < 0.05$), the power of phase contractions - 0.085 ± 0.004 (a decrease of 15%, $p < 0.05$), propulsive activity - 4.53 ± 0.32 (a decrease of 24.5%, $p < 0.05$). That is, after the treatment of MC, there is a stable decrease in the propulsive motility of the right and left parts of the colon. Morphologically, in microscopic colitis after treatment, the number of goblet cells in the crypt epithelium increases in the colon mucosa, and the severity of inflammatory infiltration of the lamina propria decreases. The number of interepithelial lymphocytes does not exceed 20 per 100 epithelial cells. In choledoch, the frequency of slow waves was $6.0 \pm 1.0 \text{ } \backslash \text{min}$ (decrease by 33.4%, $p < 0.05$), the amplitude was $0.15 \pm 0.003 \text{ mV}$ (increase by 50.1%, $p < 0.05$), the power of tonic contractions was 0.90 ± 0.04 (within the reference values). The frequency of spikes was 2.2 ± 0.3 (an increase of 120%, $p < 0.001$), the amplitude was $0.1 \pm 0.001 \text{ mV}$ (within the reference values), the power of phase contractions was 0.22 ± 0.018 (an increase of 120%, $p < 0.001$), and the propulsive activity was 4.1 ± 0.3 (a decrease of 54.5%, $p < 0.05$). Electromyographically, the frequency of slow gallbladder waves was $8.0 \pm 0.5 \text{ } \backslash \text{min}$ (within the reference values), the amplitude was $0.15 \pm 0.001 \text{ mV}$ (an increase of 50.1%, $p < 0.05$), the power of tonic contractions was 1.20 ± 0.18 (an increase of 50.1%, $p < 0.05$). The frequency of spikes was 2.2 ± 0.06 (an increase of 120%, $p < 0.001$), the amplitude was $0.1 \pm 0.002 \text{ mV}$ (within the reference values), the power of phase contractions was 0.22 ± 0.03 (an increase of 120%, $p < 0.001$), and the propulsive activity was 5.45 ± 0.6 (a decrease of 31.9%, $p < 0.05$). That is, after the treatment of MC, hypomotor dyskinesia of the biliary system was noted, the motor function of the duodenum tends to recover.

Conclusion

Analysis of the results of the study showed that the motor activity of the stomach and duodenum after treatment tends to recover. Thus, the antro-duodenal coordination before treatment was 1:2, while after treatment-1:3.63 (norm 1 : 4), which indicates the restoration of the passage of gastric contents into the small intestine. Motor activity of the small intestine of the small intestine is restored and propulsive activity increases by 2.95 times, while the severity of SIBR decreased, which was clinically accompanied by a decrease in the manifestations of flatulence. Hypermotor dyskinesia of the colon, especially pronounced in the distal part, after treatment is reduced by 137%, which ensures the normalization of the stool.

- Electromyography can be used to assess the dynamics of treatment in microscopic colitis.
- In the treatment of microscopic colitis, the passage of gastric contents into the small intestine is restored.
- Treatment of microscopic colitis is accompanied by the restoration of the propulsive activity of the colon, which contributes to the normalization of the stool.

- Reduced biliary motility leads to a decrease in the content of bile acids in the lumen of the small intestine, a decrease in the motility of the large intestine, which generally has a positive effect on intestinal transit. Morphologically, the positive dynamics of the condition of patients suffering from microscopic colitis is shown.

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