

Motor Function of the Digestive Organs in Rheumatoid Diseases

Lychkova AE^{1*}, Ashrafova TR² and Puzikov AM²

¹GBUZ Moscow Clinical Scientific Center Named After A. S. Loginov DZM, Russia

²AMG-ESTHETICUS Center, Russia

***Corresponding Author:** Lychkova AE, GBUZ Moscow Clinical Scientific Center Named After A. S. Loginov DZM, Russia.

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Abstract

Introduction: In rheumatism, all organs and systems are affected, however, in most cases, in the acute period, lesions of large joints are most clearly distinguished in the form of volatile arthritis (mostly reversible), somewhat less often - of the nervous system - neurorheumatism, chorea minor (in most cases, chorea minor does not subsequently leave noticeable organic and functional changes), almost always - the heart with the subsequent formation of rheumatic heart disease.

Purpose: To identify violations of the motor function of the gastrointestinal tract and biliary tract in rheumatoid diseases.

Materials and Methods: The examination included 18 patients suffering from rheumatism (1/3 patients), discoid lupus erythematosus (1/3 patients), Sjogren's disease (the remaining 1/3) at the age of 64.3 ± 7.5 years. The motor function of the gastrointestinal tract and GI was recorded electromyographically. The amplitude-frequency characteristics of slow waves and spikes, the power of phasic and tonic contractions, and propulsive activity were analyzed using the hardware-software complex of the Nihon Kohen electromyograph (Japan). The comparison group consisted of 9 patients suffering from chronic gastritis C. Statistical analysis was carried out using the Mann-Whitney small sample method, $M \pm m$ ($p < 0.05$).

Results: In rheumatoid diseases, a moderately pronounced hypermotor dyskinesia of the stomach was observed, a moderately pronounced hypomotor dyskinesia of the duodenum was detected, probably associated with the development of a syndrome of excessive bacterial growth. In rheumatoid diseases, there is a progressive decrease in the motor function of the small intestine in the distal direction. Hypermotor dyskinesia of the right colon was revealed. In rheumatoid diseases in the left sections of the colon, hypermotor dyskinesia was revealed due to an increase in the power of contraction of the longitudinal muscles.

Conclusion: The revealed pronounced hypermotor dyskinesia of the sigmoid colon causes the development of diarrhea. In the biliary system, hypomotor dyskinesia of both choledochus and the gallbladder was revealed, which, apparently, reduces the flow of both non-concentrated and concentrated bile into the duodenum. The decrease in the flow of bile is also due to the pronounced spastic activity of the circular muscles of the biliary system.

Keywords: Rheumatoid Diseases; Electromyography; Gastrointestinal Tract; Biliary System

Introduction

In rheumatism, all organs and systems are affected, however, in most cases, in the acute period, lesions of large joints are most clearly distinguished in the form of volatile arthritis (mostly reversible), somewhat less often - of the nervous system - neurorheumatism, chorea minor (in most cases, chorea minor does not subsequently leave noticeable organic and functional changes), almost always - the heart with the subsequent formation of rheumatic heart disease.

In the most typical cases of rheumatism in various organs and tissues, four phases of inflammatory-sclerotic changes in the connective tissue are distinguished:

- Mucoïd swelling,
- Fibrinoid changes,
- Granulomatosis,
- Sclerosis.

The occurrence of specific rheumatic granulomas in the gastrointestinal tract (GIT) usually does not manifest itself. The most striking symptoms of damage to the digestive system are associated with thromboembolic (thrombosis of the mesenteric vessels, infarcts of the intestine) and hemorrhagic syndromes. The latter is manifested by gastrointestinal bleeding.

Often, with rheumatism, the liver suffers, in which certain changes are almost always found. In the acute phase, inflammatory - infiltrative, and later - sclerotic processes are found in the liver. With a long course of rheumatism, especially in the absence of modern treatment, liver damage occurs according to the type of diffuse parenchymal rheumatic hepatitis: vasculitis is detected, phenomena of granular and fatty degeneration, edema, fibrinoid changes in the walls of blood vessels and stroma, necrobiosis and resorption of necrotic tissue are observed in the interstitial tissue. Perivascular lymphohistiocytic infiltrations with subsequent outcome in sclerosis. When heart failure occurs, signs of venous congestion in the liver are added. In the late stage, sclerotic processes progress in the liver - the so-called cardiac fibrosis of the liver: with systemic lupus erythematosus less often than liver damage; in the literature there are descriptions of rheumatic pancreatitis and lesions of the islet apparatus of the pancreas with the development of diabetes mellitus.

In systemic lupus erythematosus (SLE), circulating antibodies, predominantly antinuclear, are formed, immune complexes are formed that are fixed on the basement membranes of various organs, which damages them and causes an inflammatory reaction [1]. Morphologically, this manifests itself as a fibrinoid swelling of the connective tissue of the endothelium of small vessels or the mesothelial layer of the serous membranes.

The pathology of the gastrointestinal tract in systemic lupus erythematosus is manifested by a high susceptibility of patients to infections of all types, and in about 10% of patients gastroenterological symptoms are a manifestation of systemic lupus erythematosus, about 1.5% of patients complain of persistent dysphagia: cases of atony and esophageal dilations occur in patients with Raynaud's syndrome. Patients report complaints of abdominal pain, nausea, vomiting, diarrhea that develop in 4 - 21% of patients with SLE, gastrointestinal bleeding due to the development of arteritis and thrombosis of small vessels, liver pathology (venous stasis, fibrosis of the portal vein system with weak or moderate cellular infiltration, violation of the structure of the lobules, proliferation in the bile ducts, lymphocytic granuloma, fatty infiltration). In the case of chronic active hepatitis, LE cells may circulate in patients.

With Sjogren's syndrome, dysphagia is detected, which is observed in 2/3 patients and is characterized by difficulty in swallowing dry food due to hypokinesia of the esophagus. The amplitude of peristaltic movements decreases in the distal direction and increases in

the proximal direction. Myopathy develops, the morphological basis of which is perivascular infiltration, myositis. In the stomach, there is a decrease in the secretion of hydrochloric acid, which correlates with a violation of the secretory and motor functions of the stomach.

The pathology of the extrahepatic biliary tract in patients with Sjogren's disease can be due to both changes in the bile ducts and impaired liver function (in the form of primary biliary cholangitis). In 28% of patients, dyskinesia of the colon develops, polyps and diverticula of the colon occur. Hypomotor dyskinesia of the duodenum develops, less often - hypomotor dyskinesia of the small intestine.

Thus, the literature describes violations of the motor function of individual organs of the gastrointestinal tract, however, a holistic picture of disorders of the motor function of the gastrointestinal tract and GIT in rheumatoid diseases is not described, which, along with the expansion of diagnostic capabilities, is a priority area of medicine [2-4].

Purpose of the Study

To identify violations of the motor function of the gastrointestinal tract and biliary tract in rheumatoid diseases.

Materials and Methods

The examination included 18 patients suffering from rheumatism (1/3 patients), discoid lupus erythematosus (1/3 patients), Sjogren's disease (the remaining 1/3) at the age of 64.3 ± 7.5 years. Along with the above pathology, patients noted shortness of breath, manifestations of type 2 diabetes mellitus. An objective study revealed the presence of hepato-splenomegaly with expansion of the splenic vein, peptic ulcer of the stomach and duodenum, Barrett's esophagus - in 11.2% of cases, diverticular disease with diverticulitis - in 33.4%, stool disorders - in 66.7%.

The motor function of the gastrointestinal tract and GI was recorded electromyographically. The amplitude-frequency characteristics of slow waves and spikes, the power of phasic and tonic contractions, and propulsive activity were analyzed using the hardware-software complex of the Nihon Kohen electromyograph (Japan). The comparison group consisted of 9 patients suffering from chronic gastritis C. Statistical analysis was carried out using the Mann-Whitney small sample method, $M \pm m$ ($p < 0.05$).

Results

The frequency of slow stomach waves was $9.0 \pm 0.8/\text{min}$ (increase by 63.4%, $p < 0.05$), amplitude - 0.11 ± 0.03 mV (decrease by 26.7%, $p < 0.05$), the power of tonic contractions was 0.99 ± 0.06 (an increase of 20%, $p < 0.05$). The spike frequency was 5.2 ± 0.6 (increase by 420%, $p < 0.001$), amplitude - 0.02 ± 0.001 mV (decrease by 79.8%, $p < 0.05$), power of phase contractions - 0.104 ± 0.03 (increase by 4%, $p < 0.05$), propulsive activity - 9.52 ± 0.7 (increase by 15.4%, $p < 0.05$) (Figure 1). That is, in rheumatoid diseases, a moderately pronounced hypermotor dyskinesia of the stomach was observed.

In the duodenum, the frequency of slow waves was $19.0 \pm 1.7/\text{min}$ (decrease by 13.6%, $p < 0.05$), amplitude - 0.09 ± 0.001 mV (decrease by 10%, $p < 0.05$), power of tonic contractions - 1.71 ± 0.13 (decrease by 22.3%, $p < 0.05$). The spike frequency was 3.7 ± 0.3 (an increase of 270%, $p < 0.001$), the amplitude was 0.03 ± 0.002 mV (a decrease of 69.8%, $p < 0.05$), the power of phase contractions was 0.111 ± 0.002 (increase by 11%, $p < 0.05$), propulsive activity 15.4 ± 1.3 (decrease by 30%, $p < 0.05$). That is, in rheumatoid diseases, a moderately pronounced hypomotor dyskinesia of the duodenum is observed, probably associated with the development of a syndrome of excessive bacterial growth.

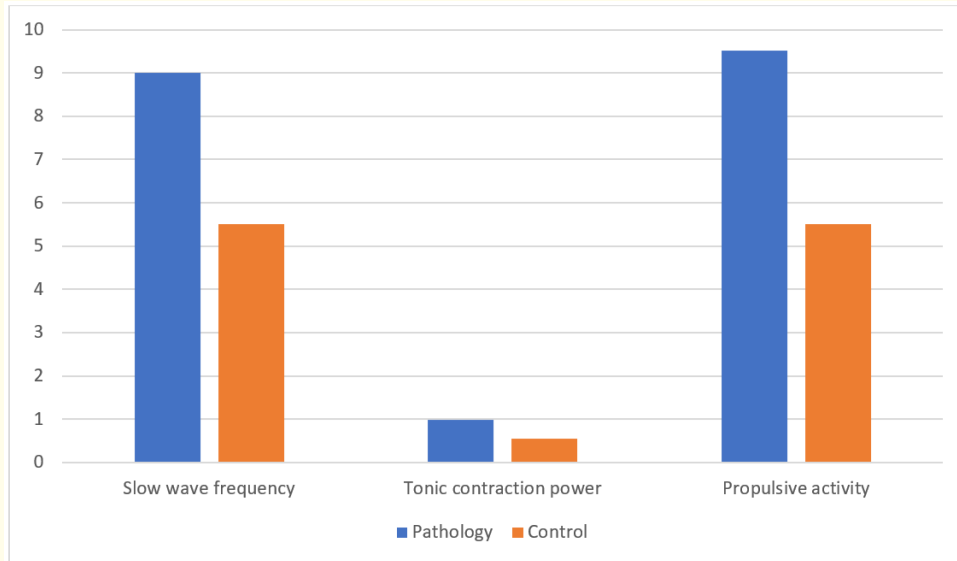


Figure 1: Frequency of slow waves, power of tonic contractions, propulsive activity of the stomach in pathology and control.

In the jejunum, the frequency of slow waves was $18.9 \pm 1.5/\text{min}$ (decrease by 5.5%, $p < 0.05$), the amplitude was $0.06 \pm 0.001 \text{ mV}$ (decrease by 40.1%, $p < 0.05$), power of tonic contractions - 1.134 ± 0.121 (decrease by 43.3%, $p < 0.05$). The spike frequency was 3.5 ± 0.4 (increase by 250%, $p < 0.001$), amplitude - $0.03 \pm 0.002 \text{ mV}$ (decrease by 69.8%, $p < 0.05$), power of phase contractions - 0.105 ± 0.07 (increase by 5%, $p < 0.05$), propulsive activity - 10.8 ± 1.3 (decrease by 46%, $p < 0.05$). That is, in rheumatoid diseases, there is a progressive decrease in the motor function of the small intestine in the distal direction.

In the right sections of the colon, the frequency of slow waves was $10.1 \pm 0.9/\text{min}$ (decrease by 0.9%, $p > 0.1$), the amplitude was $0.09 \pm 0.007 \text{ mV}$ (decrease by 10%, $p < 0.05$), power of tonic contractions - 0.909 ± 0.07 (decrease by 17.4%, $p < 0.05$). The spike frequency was 3.3 ± 0.4 (an increase of 230%, $p < 0.001$), the amplitude was $0.02 \pm 0.001 \text{ mV}$ (a decrease of 79.8%, $p < 0.05$), the power of phase contractions was 0.066 ± 0.004 (decrease by 34%, $p < 0.05$), propulsive activity - 13.7 ± 1.6 (increase by 24.5%, $p < 0.05$). That is, hypermotor dyskinesia of the right sections of the colon was revealed.

In the left sections of the colon, the frequency of slow waves was $7.6 \pm 0.1/\text{min}$ (an increase of 26.7%, $p < 0.05$), the amplitude was $0.14 \pm 0.02 \text{ mV}$ (an increase of 40%, $p < 0.05$), power of tonic contractions - 0.964 ± 0.062 (increase by 60.7%, $p < 0.05$). The frequency of a spikes was 4.0 ± 0.3 (increase by 299.8%, $p < 0.001$), amplitude - $0.01 \pm 0.001 \text{ mV}$ (decrease by 99%, $p < 0.03$), power of phase contractions - 0.04 ± 0.003 (decrease by 59.8%, $p < 0.05$), propulsive activity - 24.1 ± 2.0 (increase by 301.6%, $p < 0.001$). That is, in rheumatoid diseases in the left sections of the colon, hypermotor dyskinesia was detected due to an increase in the power of contraction of the longitudinal muscles.

In the sigmoid colon, the frequency a of slow waves was $9.7 \pm 0.6/\text{min}$ (an increase of 94%, $p < 0.04$), the amplitude was $0.15 \pm 0.003 \text{ mV}$ (an increase of 49.8%, $p < 0.05$), the power of tonic contractions was 1.455 ± 0.12 (an increase of 191%, $p < 0.001$). The spike frequency was 5.4 ± 0.4 (an increase of 440%, $p < 0.001$), the amplitude was $0.03 \pm 0.002 \text{ mV}$ (a decrease of 69.8%, $p < 0.05$), the power of

phase contractions was 0.162 ± 0.014 (increase by 62%, $p < 0.05$), propulsive activity - 8.9 ± 0.5 (increase by 78%, $p < 0.05$). That is, in rheumatoid diseases, a pronounced hypermotor dyskinesia of the sigmoid colon was revealed, which causes the development of diarrhea.

In choledochus in rheumatoid diseases, the frequency of slow waves is $11.3 \pm 0.4/\text{min}$ (an increase of 25.6%, $p < 0.05$), the amplitude is 0.11 ± 0.003 mV (an increase of 10%, $p < 0.05$), power of tonic contractions - 1.243 ± 0.13 (increase by 38.1%, $p < 0.05$). The spike frequency was 5.7 ± 0.3 (an increase of 470%, $p < 0.001$), the amplitude was 0.04 ± 0.002 mV (a decrease of 60.1%, $p < 0.05$), the power of phase contractions was 0.228 ± 0.031 (increase by 128%, $p < 0.001$), propulsive activity - 5.45 ± 0.6 (decrease by 39.4%, $p < 0.05$).

In the gallbladder, the frequency of slow waves was $9.9 \pm 0.7/\text{min}$ (an increase of 23.8%, $p < 0.05$), the amplitude was 0.16 ± 0.001 mV (an increase of 59.8%, $p < 0.05$), power of tonic contractions - 1.584 ± 0.14 (increase by 98%, $p < 0.02$). Spike frequency was 3.6 ± 0.2 (increase by 260%, $p < 0.001$), amplitude - 0.06 ± 0.003 mV (decrease by 40.1%, $p < 0.05$), power of phase contractions - 0.216 ± 0.15 (increase by 116%, $p < 0.001$), propulsive activity - 7.3 ± 0.5 (decrease by 8.8%, $p < 0.05$). Thus, hypomotor dyskinesia of both choledochus and the gallbladder was revealed in the biliary system, which, apparently, reduces the flow of both non-concentrated and concentrated bile into the duodenum. The decrease in the flow of bile is also due to the pronounced spastic activity of the circular muscles of the biliary system.

Discussion and Conclusion

Analysis of the profile of the propulsive activity of the gastrointestinal tract and biliary tract in rheumatic diseases showed that moderate hypermotor dyskinesia is observed in the stomach and right sections of the colon; in the left sections of the colon and sigmoid colon, pronounced hypermotor dyskinesia was revealed, which causes the development of hyperkinetic diarrhea in the clinic [5].

Hypomotor dyskinesia in rheumatoid diseases is characteristic of the organs of the biliary system and the small intestine. Clinically, this may be accompanied by a feeling of heaviness in the right hypochondrium, flatulence with the development of secretory insufficiency in the small intestine. The development of SIBO in the small intestine causes damage to the brush border and a violation of its enzymatic activity. The main factor that damages the mucous membrane of the small intestine is free bile acids, which are formed as a result of increased processes of deconjugation of bile acids in the jejunum under the influence of intestinal bacteria. An increase in the concentration of free bile acids leads to a decrease in the proportion of conjugated bile acids involved in the digestion and absorption of lipids. Unabsorbed fatty acids in the small intestine cause hypersecretion of water and electrolytes in the colon. Under the influence of enzymes secreted by bacteria, alcohols, fatty acids, oxidation products of endogenous alcohols are formed. Reaching high concentrations, these substances lead to dysfunction of enterocytes. The phenomenon of translocation of bacteria into the ileum mucosa from the proximal colon has been proven.

Attention should be paid to the high spastic activity of the circular muscle layer in the stomach, biliary system and distal colon. In addition, a relatively reduced activity in the small intestine and proximal colon was revealed, which, apparently, is due to the development of intestinal dysbiosis in rheumatoid diseases. A change in the ratio of the motor function of the stomach/in particular, its antrum/ to the motility of the proximal duodenum - the so-called anthro-duodenal coordination, which in rheumatic diseases was 1:6 instead of 1:4/, was revealed, which ensures accelerated evacuation of gastric contents into the duodenum gut. The identified disorders of motor function determine the clinical symptoms of rheumatoid diseases, in the pathogenesis of which the phases of the inflammatory process play an important role. in the gastrointestinal tract and GI.

Findings

1. Electromyography of the smooth muscles of the gastrointestinal tract and biliary tract reflects the nature of the violations of the motor function of the hollow organs of these systems.

2. Identified hypomotor dyskinesia of the biliary system and small intestine, which may indicate the development of dysbiosis of the small intestine against the background of a decrease in cholekinetic.
3. Hypermotor dyskinesia of the stomach and colon was revealed, which together contributes to the development of diarrhea, as well as reflect the development of entero-gastric and colo-iliac reflexes and intestinal dysbiosis.

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