

Evaluation of the results of pH-metry of the stomach in patients with peptic ulcer of the stomach and duodenum under the influence of a physical therapy program

Yuliya Kalmykova¹, Sergey Kalmykov¹, Daria Okun¹, Andrii Istomin²

¹Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

²Kharkiv National Medical University, Kharkiv, Ukraine

DOI: 10.15391/prrht.2022-7.22

Abstract

Received: 20.07.2022
Accepted: 07.08.2022
Published: 30.09.2022

Citation:

Kalmykova, Yu., Kalmykov, S., Okun, D. & Istomin, A. (2022). Evaluation of the results of pH-metry of the stomach in patients with peptic ulcer of the stomach and duodenum under the influence of a physical therapy program. *Physical rehabilitation and recreational health technologies*, 7(3), 111-119. doi: 10.15391/prrht.2022-7.22

✉ Corresponding author:

Yuliya Kalmykova

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine
orcid.org/0000-0002-6227-8046
e-mail: yamamaha13@gmail.com

Sergey Kalmykov

orcid.org/0000-0002-6837-2826

Daria Okun

orcid.org/0000-0002-0639-5846

Andrii Istomin

orcid.org/0000-0002-1510-6516

Purpose: to investigate and evaluate the secretory function of the stomach in patients with peptic ulcer of the stomach and duodenum under the influence of the use of a physical therapy program.

Material & Methods: 30 men aged 36 to 45 years were under observation with a diagnosis of peptic ulcer, inactive phase; cicatricial and ulcerative deformity of the duodenal bulb; increased secretory function of the stomach, they were randomly divided into two groups: the main group (MG) – 15 patients and the control group (CG) – 15 patients. The average age of patients MG was $41,5 \pm 0,1$ years, CG – $42,1 \pm 0,2$ years. Patients of the main and control groups, patients with peptic ulcer of the stomach and duodenum, underwent a course of physical therapy for 4 months. In the main group, patients were trained according to the developed program of physical therapy, which is based on the use of morning hygienic exercises, kinesiotherapy and self-study with the use of general developmental physical exercises, corrective exercises for the spine and breathing exercises performed at rest; therapeutic massage according to the method of P.B. Efimenko; diet therapy. Patients of the control group were engaged in the program of physical therapy used in medical institutions according to Parkhotik, I. (2003).

Results: in the initial study, the results of pH-metry of the stomach in patients of both groups did not differ significantly, that is, the phenomena of hyperacidity in combination with continuous acid formation prevailed. After the application of the physical therapy program in the main group according to the author's program, the indicators significantly improved compared to the control group: normalization of the acid-forming function of the stomach on an empty stomach and stimulated was observed, in addition, normal acidity on an empty stomach occurred in 100% of patients.

Conclusions: in the course of the study of the results of pH-metry of the stomach, the effectiveness of the physical therapy program for patients with dissecretory syndrome in gastric and duodenal ulcers was determined and it was concluded that the developed and applied physical therapy program is effective and contributes to a more stable normalization of the stomach, reduction of clinical manifestations of the disease. The conducted studies confirmed the expediency of using physical therapy in patients with this pathology, depending on the clinical manifestations of the disease, indicators of the secretory function of the stomach.



Copyright: © 2022 by the authors.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution 4.0 International (CC BY) License (<https://creativecommons.org/licenses/by/4.0/>).

Key words: peptic ulcer of the stomach and duodenum, pH-metry of the stomach, physical therapy.

Анотація

Юлія Калмикова, Сергій Калмиков, Дарія Окунь, Андрій Істомін. Оцінка результатів рН-метрії шлунку хворих на виразкову хворобу шлунку та дванадцятипалої кишки під впливом програми фізичної терапії. Мета: дослідити та оцінити секреторну функцію шлунку хворих на виразкову хворобу шлунку та дванадцятипалої кишки під впливом застосування програми фізичної терапії. **Матеріал і методи:** під спостереженням знаходилось 30 чоловіків у віці від 36 до 45 років з діагнозом: виразкова хвороба, неактивна фаза; рубцево-виразкова деформація цибулини дванадцятипалої кишки; підвищена секреторна функція шлунку, вони були довільно розділені на дві групи: основну (ОГ) – 15 хворих і контрольну (КГ) – 15 хворих. Середній вік хворих ОГ становив $41,5 \pm 0,1$ років, КГ – $42,1 \pm 0,2$ років. Пацієнти основної та контрольної групи, які хворі на виразкову хворобу шлунку та дванадцятипалої кишки отримували курс фізичної терапії протягом 4 місяців. В основній групі пацієнти займалися за розробленою програмою фізичної терапії, в основу якої покладено застосування ранкової гігієнічної гімнастики, кінезотерапії та самостійних занять із застосуванням загально-розвиваючих фізичних вправ, корегуючих вправ для хребта і дихальних вправ, що виконуються в спокої та при ходьбі; лікувального масажу за методикою П.Б. Єфіменко; дієтотерапії. Пацієнти контрольної групи займалися за програмою фізичної терапії, яка застосовується в лікувальних закладах за І.І. Parkhotik (2003). **Результати:** при первинному дослідженні результатів рН-метрії шлунку у хворих обох груп значно не відрізнялись, тобто, переважали явища гіперацидності в поєднанні з безперервним кислотоутворенням. Після застосування програми фізичної терапії в основній групі за авторською програмою значно покращились показники порівняно з контрольною групою: спостерігали нормалізацію кислотоутворюючої функції шлунку натще і стимульованої, крім того, нормаоцидність натще мала місце у 100% хворих. **Висновки:** в ході проведеного дослідження результатів рН-метрії шлунку було вивчено ефективність програми фізичної терапії для хворих з дисекреторним синдромом при виразковій хворобі шлунку та дванадцятипалої кишки і прийшли до висновку, що розроблена і застосована програма фізичної терапії є ефективною і сприяє більш стійкій нормалізації секреторної функції шлунку, зменшенню клінічних проявів захворювання. Проведені дослідження підтвердили необхідність застосування фізичної терапії у

хворих з даною патологією, в залежності від клінічних проявів захворювання, показників секреторної функції шлунку.

Ключові слова: виразкова хвороба шлунку та дванадцятипалої кишки, рН-метрія шлунку, фізична терапія.

Introduction

Peptic ulcer disease is one of the most common pathologies of the gastroduodenal zone. Peptic ulcer is a chronic, relapsing course, prone to progression of the disease, one of the most important signs of which is the formation in the wall of the stomach or duodenum during exacerbations of a peptic ulcer, which heals due to inflammation, with clinical syndromes and symptoms of impaired biomechanics, secretion and absorption of the organs of the gastrointestinal tract, symptomatically correlated with the volume, localization, nature and stage of development of the pathological process, disorders in the state of neurohumoral regulation systems, involvement in the process other digestive organs, which leads to the development of complications that threaten the life of the patient (Makolkin & Ovcharenko, 2005; Amosova, Babak & Zajceva, 2008; Malferteiner et al., 2009; Lanas, & Chan, 2017).

In the International Classification of Diseases (ICD-10), PU corresponds to the name peptic ulcer disease (WHO: International Statistical Classification of Diseases and Related Health Problems (ICD)).

In the United States, ulcers are diagnosed in approximately 4.5 million people each year, and the cost of treating such patients is \$3,3 billion per year. On average, in Western countries, the prevalence of this pathology is from 6 to 15%. In Ukraine, the proportion of gastric and duodenal ulcer (DU) reaches 13,3% of cases of diseases of the gastrointestinal tract (Sabadishin, 2021). According to the Ministry of Health of Ukraine, the incidence of gastric ulcer and DU in Ukraine in 2010 (Lobankov, 2010) was 127,3 people per 100 thousand population (absolute values – 58293,0), the prevalence was 2299,4 per 100 thousand population (absolute value – 1 052 741,0 (Unified clinical protocol of primary, secondary (specialized) medical care, approved by the order of the Ministry of Health of Ukraine, 2015; Ocheredko, & Kizlova, 2016), and in 2015 it was 129.8 people per 100 thousand population (absolute values – 60 303,0), prevalence – 2303,2 per 100 thousand population (absolute value – 1 093 531,0). The situation is aggravated by the fact that, according to the WHO (2015), 50% of patients do not follow the doctor's recommendations, 70% of them do it deliberately, 30% are not able to follow them in time. In 58% of patients with PU of the stomach and DU, there is no control of the course

of treatment by medical personnel (Khimion, Yashchenko, Danyliuk, & Sityuk, 2018).

Peptic ulcer with localization in the duodenum occurs 4 times more often than in the stomach. Among patients with duodenal ulcers, there are more men, while among patients with gastric ulcers, the ratio of men and women is approximately the same. Gastric ulcer usually occurs at an older age than duodenal ulcer, with a peak incidence in the sixth decade. The localization of ulcers in the stomach is different, mainly on the lesser curvature (46-50%), in the pyloric and prepyloric sections (38-45%), much less often in the upper section of the stomach (8-10%), on the anterior and posterior walls of the body of the stomach (3-5%) and very rare – in the fundus and greater curvature of the stomach (0,1-0,2%). In most cases, chronic gastric ulcers are single, and only in 10-20% of cases are multiple. Most of the multiple ulcers in localization does not differ from single ones. Duodenal ulcers are most often localized on the lesser curvature (30-35%) and anterior wall (35-45%) of the duodenum, less often on the posterior wall (10-15%) and greater curvature (5-8%), in 5- In 10% of cases, multiple ulcers are observed, and in 2-5% – extrabulbar duodenal ulcers, which are located more often in the upper third and less often in the middle third of the descending duodenum. Sometimes extrabulbar ulcers are combined with bulbar (Arunyn, 2006; Baryshnikov, at al., 2009; Chey, at al, 2017).

The relevance of the problem of peptic ulcer is determined by the fact that it is the main cause of disability in 68,2% of men, 30,9% of women from all patients with diseases of the digestive system. Despite advances in the diagnosis and treatment of peptic ulcer, this disease continues to affect the entire younger population, without revealing tendencies to stabilize or reduce incidence rates. (Svintsytskyi & Solovyova, 2015).

There are several reasons for the increase in the incidence of peptic ulcer: improved diagnostic capabilities due to the introduction of new and complex research methods; high risk of malignant degeneration of stomach and duodenal ulcers; increase in the number of patients with peptic ulcer (Svintsytskyi & Solovyova, 2015; Khimion, at al., 2018).

An increase in the duration of remission of the disease, prevention of complications, maximum recovery of the working capacity of patients with peptic ulcer of the stomach and duodenum is possible only with an integrated approach to treatment. Features of the course of this disease, frequent relapses, requiring long-term anti-relapse and preventive treatment, determine the need for a wider use of physical therapy (Kalmykova, 2013; Malakhov, at al., 2020; Honcharov, at al., 2020; Sverdén, at al., 2019).

Material and methods of research

Participants

The study was conducted on the basis of the CNP "City Polyclinic No. 26" of the Kharkov City Council. Under observation were 30 men aged 36 to 45 years with a diagnosis of peptic ulcer, inactive phase; cicatricial and ulcerative deformity of the duodenal bulb; increased secretory function of the stomach. They were randomly divided into two groups: the main (MG) – 15 patients and the control (CG) – 15 patients. The average age of patients with MG was 41,5±0,1 years, CG – 42,1±0,2 years. The duration of the disease is from 3 to 6 years. By the number of patients, age, presence of concomitant pathology, the main and control groups were homogeneous. The course of physical therapy in patients of the main (MG) and control groups (CG) lasted for 4 months.

The patients of the main group underwent rehabilitation measures according to the author's program of physical therapy, the patients of the control group were engaged in the program of physical therapy for patients with peptic ulcer of the stomach and duodenum according to Parkhotik, I.I. (2003), used in medical institutions.

Methods

To analyze and summarize the results of the primary and repeated studies of the effectiveness of the physical therapy program for gastric and duodenal ulcers, a study of the secretory function of the stomach was carried out. It was carried out according to the results of pH-metry with an acidogastrometer AGM-MP-03-I – "AGM-03" (registration certificate No. FSR 2008/03042 dated 05/28/2019); acidity measurement range: lower limit – 1,1 units. pH, upper limit – 9,2 units. pH.

The evaluation of the obtained data was carried out on the basis of Table 1 (Gitnick, 2008; Chernobrov, 2008; Perederii, & Tkach, 2011; Kalmykov, Urdina, & Pelikh, 2014; Kalmykova, Sadat, & Kalmykov, 2019).

The studies were conducted according to compliance with international documents regulating biomedical research: "Declaration of the Ethnic Principles for Medical Research Involving Human Subjects" (World Medical Association, 2013); "Universal Declaration on Bioethics and Human Rights" (UNESCO, 2005); "The Convention on the Protection of Human Beings", adopted by the Council of Europe (1997).

Statistical analysis

The duration of the study was 4 months. The initial study was conducted before the start (day 1-2) and after (the last days of the month)

Table 1. The state of stomach acid formation

The state of acid formation in the body of the stomach	pH level	
	Basal	During stimulation
Hyperacidity, continuous acid formation	0,9-1,5	0,9-1,2
Normal acidity, continuous acid formation	1,6-2,0	1,2-2,0
Hypoauidity	2,1-6,0	2,1-3,0
Subacidity	-	3,1-5,0
Anacidity	more than 6,0	more than 5,0

of the physical therapy program. In the initial study, there was no statistically significant difference between the indicators of gastric secretion on an empty stomach and stimulated, and in the second study, the indicators improved statistically significantly. Statistical data processing was carried out using the Statistica 13 analysis package. Since all the studied indicators corresponded to the normal distribution law, we determined the arithmetic mean (\bar{X}) and the standard deviation (S). The significance of the difference was assessed using Student's t-test. Differences were considered statistically significant if they did not exceed the probability level $p < 0.05$ for a given number of degrees of freedom.

The research design

Physical therapy of patients of the main group at the outpatient stage was carried out in order to prolong the remission phase of the disease and normalize the secretory function of the stomach. A physical therapy program was developed, justified and applied for patients with dissecretory syndrome of gastric ulcer and duodenal ulcer, which is based on the use of morning hygienic exercises, kinesiotherapy and self-study with the use of general developmental physical exercises. performed at rest and while walking; therapeutic massage according to the method of Efimenko, P.B.; diet therapy. Classes of kinesiotherapy in the polyclinic were built according to the method with a gradually increasing load. The basis of the complexes of kinesiotherapy and self-study were general developmental physical exercises (GDE), corrective exercises for the spine and breathing exercises (BE), performed at rest and while walking, which were performed by patients during three parts of the lesson – preparatory (GDE for all muscle groups of the limbs, performed at a slow pace with full amplitude from the initial positions of "sitting" and "standing" in combination with rest pauses and breathing exercises), the main (consisting of corrective exercises for the spine, exercises for the muscles) of the abdominal press, regulated breathing exercises combined with rest pauses and relaxation exercises) and final (consisted of walking through the physical therapy room at a slow pace, combined with breathing exercises, relaxation exercises for 10-15 minutes).

We used corrective exercises for the spine, mainly for the lower thoracic and lumbar regions, due to the great importance of autonomic innervation in the regulation of the motor and secretory functions of the stomach. As well as the appointment of regulated breathing, taking into account the tone of the sympathetic and parasympathetic divisions of the autonomic nervous system. Morning hygienic gymnastics was used on all motor modes of the polyclinic stage of physical rehabilitation in order to adapt the body to the active regime of the day. For a more complete solution of the tasks of physical therapy, self-study (SS) was used, which was carried out by patients of the main group no earlier than 1-1.5 hours after eating. At the outpatient stage, for patients of the main group, we used therapeutic massage according to the method of Efimenko (2013): a light relaxing massage of the back and front surfaces of the body, including the abdomen.

In patients of the control group, the program of physical therapy according to Parkhotik, I.I. (2003). (Parkhotik, 2003). In accordance with the motor regimen and the level of physical condition of the patients, the load was as follows: morning exercises were carried out in group No. 1 (a group of weak physical impact with the exception of running, jumping,). Kinesiotherapy was carried out according to the complex mastered in the hospital, running, jumping, tension was excluded. Dosed walking on stairs and flat terrain was carried out at a slow, medium and fast pace, depending on the state of the secretory and motor functions of the stomach and the functional state of the intestine, in compliance with the breathing regimen; air and water hardening; therapeutic massage, walks up to 2 hours a day; sedentary games up to 1 hour a day with rest breaks, sitting or lying down. Morning gymnastics was recommended to the 2nd group (the group of pronounced physical impact), according to individual indications, jumps and running were included. Exercises were used for all muscle groups with the maximum possible amplitude for the patient, static and dynamic breathing exercises of full depth, exercises with objects (gymnastic sticks, dumbbells up to 1 kg), exercises on apparatus (gymnastic benches, gymnastic wall), exercises of any starting position, hiking. Therapeutic massage was applied according to the method Parkhotik, I.I. (2003).

Patients of the main and control groups received anti-relapse treatment prescribed by a gastroenterologist at the polyclinic. All patients were recommended individually selected diet therapy based on the principle of sparing the stomach with fractional meals. In the process of therapeutic exercises in patients of the control group, we also used medical and pedagogical supervision, which included the determination of signs of fatigue, the measurement of blood pressure and heart rate. (Sokrut, et al, 2003; Berezov, et al, 2004; Shakhlina, et al, 2018).

Results of the study

In the primary study of the *results of pH-metry of the stomach* in patients of both groups, the phenomena of hyperacidity in combination with continuous acid formation prevailed (Table 2). Gastric secretion on an empty stomach in the MG was $1,31 \pm 0,06$, in the CG – $1,26 \pm 0,06$; stimulated in the OG was $1,09 \pm 0,04$, in the CG – $1,10 \pm 0,04$ ($p > 0,05$). In the MG, normoacidity on an empty stomach occurred in 3 patients (20,0%), in the CG – in 2 (13,3%) patients; in MG, normoacidity during stimulation was observed in 2 patients (13,3%), in CG – in 1 patient (6,7%).

After four months of using the physical therapy

program, the *results of gastric pH-metry* in patients of both groups showed an improvement in the acid-forming function of the stomach during a second study (Table 3).

In patients of the main group, we observed normalization of the acid-forming function of the stomach on an empty stomach and stimulated: $1,73 \pm 0,04$ and $1,73 \pm 0,04$, respectively ($p < 0,05$). In the control group, there was also an improvement in basal and stimulated acid-forming function: $1,44 \pm 0,05$ and $1,26 \pm 0,04$, respectively ($p < 0,05$).

In addition, during a repeated study in the MG, fasting normoacidity occurred in 100% of patients, in the CG – in 33,3% of patients (5 cases); in MG, normoacidity during stimulation was observed in 100% of patients, in CG – in 73,3% of patients (11 cases). When comparing repeated indicators of the level of acid formation in the body of the stomach on an empty stomach and after stimulation in both groups, we found a statistically significant improvement in indicators in the main group compared to the control, which indicates a more stable normalization of the secretory function of the stomach under the influence of the proposed author's program of physical therapy in the main group patients (Table 4) (Ganji, & Kovalenko, 2002; Laya, 2005;

Table 2. Indicators of gastric secretion in the MG and CG during the primary study

Indicators	Gastric secretion	Norm	Surveyed groups		t-criterion of Student	P
			main group n=15	control group n=15		
			$\bar{X} \pm S$	$\bar{X} \pm S$		
State of acid formation in the body of the stomach	on an empty stomach	1,6-2,0	$1,31 \pm 0,06$	$1,26 \pm 0,06$	0,58	>0,05
	stimulated	1,2-2,0	$1,09 \pm 0,04$	$1,10 \pm 0,04$	0,16	>0,05

Table 3. Indicators of gastric secretion in the main and control groups during the initial and repeated examination

Indicators	Gastric secretion	Norm	Group	Before experiment	After experiment	t-criterion of Student	P
				$\bar{X} \pm S$	$\bar{X} \pm S$		
				State of acid formation in the body of the stomach	on an empty stomach		
Control	$1,26 \pm 0,06$	$1,44 \pm 0,05$	2,45			<0,05	
stimulated	1,2-2,0	Main	$1,09 \pm 0,04$		$1,48 \pm 0,04$	6,63	<0,05
		Control	$1,10 \pm 0,04$		$1,26 \pm 0,04$	2,61	<0,05

Table 4. Comparative characteristics of indicators of gastric secretion in the main and control groups during the second study, n=15

State of acid formation in the body of the stomach	Gastric secretion	Norm	Surveyed groups		t-criterion of Student	p
			Main Group, $\bar{X} \pm S$	Control Group, $\bar{X} \pm S$		
			On an empty stomach	on an empty stomach		
Stimulated	stimulated	1,2-2,0	$1,48 \pm 0,04$	$1,26 \pm 0,04$	3,92	<0,05

Yurenev, at al, 2018; Dumitru, at al, 2020)

Discussion

The leading link in the pathogenesis of peptic ulcer is an imbalance between the factors of aggression and protection of the mucosa (Osadchuk, Kupaev, & Osadchuk, 2012). Factors of aggression include hydrochloric acid, pepsin, impaired motor-evacuation function of the gastroduodenal zone, bacteria *Helicobacter pylori* (Bytzer, et al., 2011; Fischbach, & Malfertheiner, 2018; Lee, Dore, & Graham, 2022). The group of exogenous aggressors includes nicotine, alcohol, drugs and other factors.

Since J. Cruveil's description of the symptoms and pathomorphological signs of peptic ulcer disease, dozens of theories have alternately replaced peptic ulcer disease from the standpoint of a local pathological process in the gastric or duodenal mucosa – vascular, traumatic, inflammatory-gastric, general regulatory mechanisms (neurogenic, neurotrophic, autonomic "stigmatization", constitutional-genetic, corticovisceral and others). However, even in the middle of the 20th century, one of the closest students of V.P. Obratsova, M.M. Gubergritz still called peptic ulcer "mysterious stranger". After 20 years, A.S. Radbil said: "We have lifted the veil a little, but have not yet looked into the stranger's face".

Timely treatment of *H. pylori* infection in combination with lifestyle correction is a component of the treatment and prevention of the further development of peptic ulcers and malignant neoplasms of the stomach (Unified clinical protocol of primary, secondary (specialized) medical care, approved by the order of the Ministry of Health of Ukraine).

In gastric and duodenal ulcers, as noted by Murza (2004), Mukhin (2005), Epifanov (2006), Kalmykov (2016), the main mechanisms of action of physical exercises are neuro-reflex and neuro-humoral. The restoration of the functions of internal organs is based on the mechanism of motor-visceral reflexes, closely related to nervous and humoral factors. The very appointment of a complex of therapeutic exercises to the patient increases his confidence in the successful outcome of the disease, distracts him from immersion in the disease, improves the neuropsychic state, and it is also argued that physical exercises carry out the following actions on the patient's body: trophic, tonic, normalizing emotional and physical. formation of compensation.

The most important and main thing in the rehabilitation of persons with pathology of the digestive system is the determination of the motor regime, the intensity and duration of physical activity. Despite the age of the problem and the large number of works devoted to it, there

are conflicting data on the effect of muscle activity on the functions of the digestive system. So, L.A. Orbeli (1942, 1949), in experiments on dogs with an isolated stomach according to Pavlov, found that intense muscle load (jogging for 30 minutes in a wheel) sharply inhibits the nervous phase of gastric secretion, namely: the total amount of gastric juice decreases, it decreases. The mechanism of these phenomena depends on the central inhibitory effects and the redistribution of blood at the time of muscular activity. On the contrary, moderate habitual work, for example, calm walking, stimulates juice secretion (Sokrut, Kazakov, & Povazhnaya, 2003; Kalmykova, Sadat, & Kalmykov, 2019).

In case of diseases of the digestive system, it is necessary to massage the organ affected by the pathological process, the area of its projection on the surface of the body, paravertebral and reflexogenic zones segmentally associated with the affected organ. Given that the disease of individual organs is often accompanied by damage to the entire digestive system, massage should be directed to the entire digestive tract. *With an increase in secretory function and smooth muscle tone*, massage is recommended to be carried out using a gentle technique. It involves massage of the anterior abdominal wall and internal organs. With a decrease in the secretory function and tone of the smooth muscles of the internal organs, these techniques are performed more intensively. The intensity of the implementation of these techniques is selected taking into account not only the clinical manifestations of the disease, but also the individual characteristics of the patient (Kalmykov, 2016; Vakulenko, 2020).

The use of preformed physical factors in peptic ulcer supplements kinesitherapy, therapeutic massage, diet therapy and drug treatment, optimizing the regulatory mechanisms and recovery processes in the ulcer area (Ananieva, & Orshatska, 2016). In case of peptic ulcer, it is expedient to use physical factors of low and medium intensity. In cases of a long course of the phase of unstable remission, it is better to apply sequential, step-by-step actions by various physical factors (Fedorov, 2004; Ponomarenko, 2022). However, Khimion, Yashchenko, Danyliuk, and Sityuk (2018) recommend the use of physiotherapy methods for patients with uncomplicated peptic ulcer in the acute phase (sinusoidal modulated currents, diadynamic Bernard currents, microwave therapy, intranasal electrophoresis with a solution – cadmium, argon, neon and krypton lasers); in the decay phase of exacerbation: thermal procedures (mud, peat, ozocerite, paraffin applications), electrophoresis of drugs (papaverine, platifillin, novocaine, dalargin) on the epigastric region, hydrotherapy; in remission phase: ultrasound, microwave therapy, diadynamic sinusoidal modulated currents, electrophoresis with

the use of drugs, baths (pine, pearl, oxygen, radon), local thermal procedures, acupuncture (Yakovenko, & Samoilenko, 2011; Khimion, et al., 2018; Deinega, 2018)

A special place in the treatment of peptic ulcer is given to therapeutic nutrition (diet therapy), the main principle of which is the physiological interaction between individual nutrients, taking into account the needs of the body. It is necessary to introduce fats of animal (70%) and vegetable (30%) origin into the diet. The function of the digestive tract is soon normalized by the action of olive oil. Eating qualitatively different fats leads to faster scarring of the ulcer (Kolyashkin, & Polushkina, 2009; Myloslavskyi, 2016). But, according to the Order of the Ministry of Health of Ukraine dated October 29, 2013 No. 931 "On the improvement of medical nutrition and the work of the dietary service of Ukraine", the system of numbered diets according to M. I. Pevzner. This is explained by the fact that the current level of scientific knowledge about the effect of nutrition on the body of a sick person does not imply specific diets for certain groups of diseases. These approaches have not been shown to be effective and do not speed up recovery. The vast majority of healthy and sick people need adequate caloric content and a balanced content of healthy foods (Order of the Ministry of Health of Ukraine No. 931).

References

- Ananieva, T. G., & Orshatska, N. V. (2016). Therapeutic physical culture and physiotherapy in complex rehabilitation of patients in the period of remission of gastric ulcer disease. *Physical rehabilitation and recreational health technologies*, 3, 17-22.
- Amosova, E.N., Babak, O.IA., & Zajceva, V.N. (2008). *Internal Medicine, Kiev: Medicine*.
- Arunyn L.I. (2006). Quality of healing of gastroduodenal ulcers: functional morphology, role of pathogenetic therapy methods. *Experimental and clinical gastroenterology*, 5, 1-5.
- Baryshnikova N.V., Uspenskyi Y.P., & Tkachenko E.I. (2009). Optimizing the treatment of patients with diseases associated with *Helicobacter pylori*: justification of the necessity of using bismuth preparations. *Experimental and clinical gastroenterology*, 6, 116-121.
- Berezov, V.M., Vasiliev, V.M., & Dzys. E.I. (2004). *Propaedeutics of internal diseases: a textbook. Poltava, 2004. 419 p.*
- Bytzer, P., Dahlerup, J. F., Eriksen, J. R., Jarbøl, D. E., Rosenstock, S., & Wildt, S. (2011). Diagnosis and treatment of *Helicobacter pylori* infection. *Dan Med Bull*, 58(4), C4271.
- Chernobrov, V. V. (2008). Study of express gastro-pH monitoring as a means of diagnosis and control of the effectiveness of acid-inhibiting pharmacotherapy of peptic pH-associated gastroduodenal diseases (Doctoral dissertation, NMU-Kyiv).
- Chey, W. D., Leontiadis, G. I., Howden, C. W., & Moss, S. F. (2017). ACG clinical guideline: treatment of *Helicobacter pylori* infection. *The American journal of gastroenterology*, 112(2), 212. <https://doi.org/10.1038/ajg.2016.563>
- Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine. Council of Europe. Oviedo, 04.04.1997. URL: <http://conventions.coe.int/treaty/rus/Treaties/Html/164.htm>
- Deinega, V. G. (2018). Physiotherapy and restorative treatment in the practice of a family doctor.

Conclusion

In the course of the study of the results of pH-metry of the stomach, the effectiveness of a physical therapy program for patients with dis-secretory syndrome in gastric and duodenal ulcers was studied, that is, the developed and applied physical therapy program is effective and contributes to a more stable normalization of the secretory function of the stomach, a decrease in clinical manifestations diseases. The conducted studies have confirmed the need for the use of physical therapy in patients with this pathology, depending on the clinical manifestations of the disease, indicators of the secretory function of the stomach. Our studies have shown the need for a wider use of therapeutic exercises based on general developmental, corrective exercises, breathing exercises, taking into account the tone of the ANS; therapeutic massage according to the method of P. B. Efimenko in combination with diet therapy.

Conflicts of Interest

The authors declare no conflict of interest.

Funding

This article didn't receive financial support from the state, public or commercial organizations.

Strelbytskyy Multimedia Publishing.

- Dumitru, V., Hoară, P., Bîrlă, R., Mitrea, M., & Constantinoiu, S. (2020). The role of 24-hour ambulatory ph-metry and manometry in the diagnosis of non-erosive gastroesophageal reflux disease. *Romanian Journal of Clinical Research*, 3(2), 55-61. <https://doi.org/10.33695/rjcr.v3i2.57>
- Efimenko, P.B. (2013). Technique and methodology of classical massage. *Kharkiv: KhNADU*, 382.
- Epifanov, V.A. (2006). Therapeutic Physical Culture. GEOTAR-Media. 249-262.
- Fedorov, Y.R.M. (2004). *Basics of physiotherapy (educational manual)*. Lviv: publishing house "Nautilus".
- Fischbach, W., & Malfertheiner, P. (2018). Helicobacter Pylori infection: when to eradicate, how to diagnose and treat. *Deutsches Ärzteblatt International*, 115(25), 429.
- Ganji, I.M., & Kovalenko, V.M. (2002). Internal diseases: a textbook. Kyiv.
- Gitnick, G. (2008). *Gastroesophageal reflux disease: a clinician's guide*. Professional communications.
- Honcharov, A., Kalmykov, S., Kalmykova, Y. (2020), Current issues of physical therapy for peptic ulcer of the stomach and duodenum. Collection of scientific works of the Kharkiv State Academy of physical culture. HDAFC, Harkiv, issue 6, pp. 265–267.
- Kalmykov, S.A., Urdina, G.S., & Pelikh, I.V. (2014). Study of the efficiency use of physical rehabilitation in patients with chronic gastritis. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 9, 30-35. doi:10.5281/zenodo.10125
- Kalmykov, S.A. (2016). Physical rehabilitation in diseases of the digestive system. *Kharkiv;Panov AM*
- Kalmykova, Y., Sadat, K., & Kalmykov, S. (2019). Physical therapy of dissecretory syndrome and autonomic disorders in patients with chronic gastritis. *Journal of Human Sport and Exercise*, 14(4), 893-905. doi:<https://doi.org/10.14198/jhse.2019.144.17>
- Kalmykova, Yu. S. (2013). Complex physical rehabilitation for peptic ulcer disease of the stomach and duodenum. *Kharkiv: KhDAFK*.
- Khimion, L.V., Yashchenko, O.B., Danyliuk, S.V., & Sityuk, T.O. (2018). Modern approaches to diagnosis and management patients with gastric ulcer and duodenum at the primary level medical assistance. *Family medicine*, 1(75), 6-11.
- Lee, Y. C., Dore, M. P., & Graham, D. Y. (2022). Diagnosis and treatment of Helicobacter pylori infection. *Annu Rev Med*, 73, 4-1.
- Leya, Yu. Ya. (2005). New approaches in pH-metry of the stomach. *Clinical medicine*, 11, 65-69.
- Lobankov V. M. (2010). Population severity of peptic ulcer disease: determining factors. *Experimental and Clinical Gastroenterology*, 11, 78-8351
- Makolkin, V. I., & Ovcharenko, S. I. (2005). Internal diseases. *Textbook. 5th ed. Moscow: Meditsina*.
- Malakhov, V.O., Azhippo, O.Yu., Kalmykov, S.A., Petrenko, V.Yu., Kalmykova, Yu.S. etc. (2020). Physical and rehabilitation medicine in the internal medicine clinic Physical and rehabilitation medicine in the internal medicine clinic: a guide for doctors. *Kharkiv*. 325
- Malfertheiner, P., Chan, F. K., & McColl, K. E. (2009). Peptic ulcer disease. *The lancet*, 374(9699), 1449-1461. [https://doi.org/10.1016/S0140-6736\(09\)60938-7](https://doi.org/10.1016/S0140-6736(09)60938-7)
- Mukhin V.M. Physical rehabilitation: textbook. Kyiv, 2005. 471 p
- Murza, V.P. (2004). Physical rehabilitation. *Kyiv: Olan*, 559.
- Myloslavskiy, D. K. (2016). Peculiarities of therapeutic and preventive nutrition for gastroenterological pathology, which occurs against the background of the leading diseases of civilization. *Modern gastroenterology*, (5), 108-117
- Kolyashkin, M. A., & Polushkina, N. N. (2009). *Medical nutrition*. Phoenix.
- Ocheredko, A. N. and Kizlova, N. N. (2016), Evaluation of efficacy of rehabilitation program administered to patients with incidence of gastric and duodenal ulcers. *ScienceRise: Medical Science*, 6 (2), 46-50. <https://doi.org/10.15587/2519-4798.2016.72756>
- Orbeli, L.A. (1942). Evolutionary principle applied to the physiology of the central nervous system.

- Advances in modern biology, 15 (2), 257-272.
- Orbeli, L.A. (1949). Questions higher nervous activity. *Moscow-Leningrad: Izd-vo Akad. nauk SSSR*, 801.
- Order of the Ministry of Health of Ukraine dated October 29, 2013 No. 931 "On the improvement of the juicy eating and the work of the nutritional service of Ukraine". URL: <https://zakon.rada.gov.ua/laws/show/z2205-13#Text>
- Osadchuk, M. M., Kupaev, V. I., & Osadchuk, A. M. (2012). Helicobacteriosis. Actual and unresolved problems of pathogenesis and treatment. *Practical Medicine*, 1 (56), 16-21.
- Parkhotik, I.I. (2003). Physical rehabilitation in diseases of the abdominal organs. *Kiev: Olimpiyskaya literature*.
- Perederij, V. G., & Tkach, S. M. (2011). *Practical gastroenterology: Guide for doctors*. New Book.
- Ponomarenko, G.N. (2022). Rehabilitation medicine: fundamental basics and prospective developments. *Medicine*, 4(1), 8-20.
- Sabadishin, R. O. (2021). Gastric ulcer: etiological and pathogenetic causes. *Medicine of Ukraine*, (7(253), 24-27. [https://doi.org/10.37987/1997-9894.2021.7\(253\).245652](https://doi.org/10.37987/1997-9894.2021.7(253).245652)
- Shakhlina, L. G., Kogan, B. G., Tereshchenko, T. O., Tyshchenko, V. P., & Futorniy, S. M. (2018). Sports medicine, Kyiv, edition of "Olympic literature". ISBN 978-617-7492-04-6
- Sokrut, V. N., Kazakov, V. N. & Povazhnaya, Ye.S. (2003). Medical rehabilitation in therapy. *Donetskiy GMU, Donetsk*.
- Sverdén, E., Agréus, L., Dunn, J. M., & Lagergren, J. (2019). Peptic ulcer disease. *Bmj*, 367-15495 doi:10.1136/bmj.l5495
- Svintsytskyi A.S., & Solovyova G.A. (2015). Modern approaches to the pathogenesis, diagnosis and treatment of peptic ulcer disease. Health-ua.com. 27.03.2015. URL: <http://health-ua.com/article/17876-suchasn-pdhodi-do-patogenezu-dagnostiki-ta-lkuvannya-virazkovo-hvorobi>.
- Unified clinical protocol of primary, secondary (specialized) medical care, approved by the order of the Ministry of Health of Ukraine dated September 3, 2014 No. 613, "Peptic ulcer of the stomach and duodenum in adults". *Medicines of Ukraine*. 2015. 3(189). P. 4-15
- Universal Declaration on Bioethics and Human Rights (Adopted on 10/19/2005 at the 33rd session of the General Conference of UNESCO). United Nations Educational, Scientific and Cultural Organization, available at: http://www.un.org/ru/documents/decl_conv/declarations/bioethics_and_hr.shtml
- Vakulenko, D.V., Vakulenko, L.O., Kutakova, O.V., Prylutska, G.V. (2020). Therapeutic and rehabilitation massage. Kyiv.
- WHO: *International Statistical Classification of Diseases and Related Health Problems (ICD)* <https://www.who.int/standards/classifications/classification-of-diseases>
- World Medical Association, Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *JAMA*. 2013;310(20):2191-2194. doi:10.1001/jama.2013.281053
- Yakovenko N.P., Samoilenko V.B. (2011). Physiotherapy. Kyiv.
- Yurenev, G. L., Partsvania-Vinogradova, E. V., Andreev, D. N., Dycheva, D. T., & Maev, I. V. (2018). The state of acid-forming function of the stomach in patients with Helicobacter pylori-associated peptic ulcer disease of the stomach and duodenum who did not respond to eradication therapy. *Medical Council*, (6), 174-179. <https://doi:10.21518/2079-701X-2018-6-174-179>