

Study protocol

Study title: Treatment of reflux disease using targeted physiotherapy

Patients meeting the inclusion criteria who agree to be included in the study will complete entry questionnaires assessing the subjective severity of reflux disease (GerdQ - 1 or RSI - 1) and the impact of reflux disease on their quality of life (GERD-HRQL - 1), as well as assessing their current proton pump inhibitors (PPI) consumption in mg/week (PPI consumption - 1).

First, the **Control phase** of the study begins and lasts for 3 months. Patients will follow the diet and regimen measures and take their antireflux medication, i.e. the established PPI at the adjusted dose, without changing the type or frequency of PPI using within the whole period. Their exercise regimen will be the same as they are used to have. At the end of the *Control Phase*, they will complete ongoing questionnaires assessing the subjective severity of their reflux disease (GerdQ - 2 or RSI - 2) and the impact of the reflux disease on their quality of life (GERD-HRQL - 2).

After that, **Active phase** of the study continues for next 3 months, when patients start training and practicing diaphragmatic breathing. At the beginning of this phase, patients are taken off antireflux medication for at least 14 days and undergo initial functional esophageal examinations, i.e. High Resolution Manometry (HRM - 1) and 24-hour esophageal pH metry with impedance (24pHZ - 1), as well as an initial gastroscopic examination (EGDS - 1) with biopsy from the lower and middle esophagus to evaluate the esophageal findings (histology - 1), to exclude possible florid inflammation or complication of reflux disease and to evaluate microscopic signs of reflux disease. They then return to their prior medication.

The training of diaphragmatic breathing will take place under the guidance of a specialized physiotherapist. There will be a total of 6 sessions at an interval of 1 week (GERD - Physio 1-6). Each session will last 60 minutes and will consist of approximately 30 minutes of soft techniques (including visceral manipulation) + 30 minutes of diaphragmatic breathing training and will follow a well-defined protocol (*Physiotherapy Protocol*). Besides the sessions with the physiotherapist, the patients will practice diaphragmatic breathing training daily according to a recommended protocol (*Exercise Protocol for Self-Therapy*). After completing 6 sessions with the physiotherapist, the patients will continue to practice diaphragmatic breathing training regularly throughout the *Active Phase*. The patients will also continue to follow the dietary and regimen measures and take their antireflux medication, i.e., the established PPI at the adjusted dose, throughout the entire period, with no change in the type or frequency of PPI using. At the end of the *Active Phase*, the patients will complete ongoing questionnaires assessing the subjective severity of reflux disease (GerdQ - 3 or RSI - 3) and the impact of reflux disease on their quality of life (GERD-HRQL - 3). The patients will then discontinue their antireflux medication for a minimum of 14 days and undergo follow-up examinations, i.e. control High Resolution Manometry (HRM - 2) and 24-hour esophageal pH metry with impedance (24h pHZ - 2) and control gastroscopy with biopsy of the lower and middle esophagus (EGDS - 2, histology - 2).

After the Active Phase, the **Maintenance Phase** will continue for 9 months, where the patients continue to perform regular diaphragmatic breathing according to the recommended protocol (*Exercise Protocol for Self-Therapy*), while beginning to reduce the PPI dose according to the recommendations (*Procedure for PPI Dose Reduction*). PPI reduction will be guided by their symptoms. There will be two check-ups during this *Maintenance Phase*, the first check-up 3 months after the Active Phase to assess the effect of the ½ year of exercise (i.e., check-up at month 9), the second check-up 6 months after the Active Phase to assess the ¾ year effect of exercise (i.e., check-up at month 12). Patients will complete ongoing questionnaires assessing the subjective severity of reflux disease (GerdQ - 4 and 5 or RSI - 4 and 5) and the impact of reflux disease on their quality of life (GERD-HRQL - 4 and 5), and current antireflux medication consumption (PPI consumption - 2 and 3) will also be assessed. A 30-minute check-up by a physiotherapist will also take place at each of these follow-ups to assess the accuracy of diaphragmatic breathing performance.

The patients then will come for a final examination at month 15 to assess the annual effect of the diaphragmatic breathing training. First they will assess their current antireflux medication consumption (PPI consumption - 4), complete final questionnaires assessing the subjective severity of reflux disease (GerdQ - 6 or RSI - 6) and the impact of reflux disease on their quality of life (GERD-HRQL - 6). They are then taken off any antireflux medication for a minimum of 14 days and undergo a final gastroscopic examination (EGDS - 3) with biopsy from the distal and middle oesophagus to assess microscopic changes (histology - 3) and a set of functional oesophageal examinations, i.e. High Resolution Manometry (HRM - 3) and 24-hour oesophageal pH metry with impedance (24h pHZ - 3). This concludes the study for the patients.