VAN TIP DERGİSİ Medical Journal

KLİNİK ÇALIŞMA / CLINICAL RESEARCH

Van Tıp Derg 26(4): 545-549, 2019
DOI: 10.5505/vtd.2019.36043

Diaphragmatic Breathing Exercises Reduce Reflux Symptoms in Non-Erosive Reflux Disease

Non-Eroziv Reflü Hastalığında Diyafragmatik Nefes Egzersizleri Reflü Semptomlarını Azaltır

Derya Demirtaş[1]*, Hilmi Erdem Sümbül[1], Banu Kara[2]

[1]University of Health Sciences, Adana City Research and Education Hospital, Department of Internal Medicine, Turkey
[2]University of Health Sciences, Adana City Research and Education Hospital, Department of Internal Medicine, Gastroenterology Division, Turkey

ABSTRACT

Objective: There are not adequate studies conducted on the effectiveness of diaphragmatic breathing exercises on pyrosis and regurgitation in non-erosive reflux disease (NERD). Therefore, we aimed to examine the efficacy of diaphragmatic breathing exercise on pyrosis and regurgitation complaint in patients with NERD.
Materials and Methods: A total of 50 patients who were diagnosed with NERD and who did diaphragmatic breathing exercises in addition to proton pump inhibitor (PPI) treatment were included in the study, and 50 patients who received PPI treatment and who did not do any exercises were included as the control group. Scoring was carried out to determine the prevalence of pyrosis and regurgitation in the first and third months of the diaphragmatic breathing exercise program. The PPI use of the patients was evaluated as not using; using one-three days a week, using four-six days a week, and using every day.
Results: No differences were detected in demographic and laboratory parameters between two groups. When the effectiveness of diaphragmatic breathing exercises on pyrosis and regurgitation were compared for the first and third months; it was determined that the frequency of pyrosis was decreased at a significant level in patients doing exercise group ($p<0.001$). In these patients, the frequency of PPI use decreased when compared to the control group ($p<0.01$).
Conclusion: In NERD patients, there is long-term or on-demand PPI use for the symptoms. In this study, it was shown that diaphragmatic breathing exercises decrease the frequency of PPI use by reducing the symptoms of pyrosis and regurgitation in patients who have a NERD.

Key Words: Non-erosive reflux disease, gastroesophageal disease, diaphragmatic berating exercise

ÖZET

Amaç: Non-eroziv reflü hastalığında (NERD), diyafragmatik solunum egzersizinin pirozis ve regürjitasyon üzerine etkinliğine yönelik yapılan yeterli çalışma bulunmamaktadır. Bu nedenle NERD hastalarında diyafragmatik solunum egzersizinin pirozis ve regürjitasyon üzerine etkinliğinin araştırılmasını amaçladık.
Yöntem ve Gereçler: Bu çalışmaya NERD tanısı konulan ve proton pompa inhibitörü (PPI) tedavisine ek olarak diyafragmatik nefes egzersizleri yaptırılan 50 hasta ile sadece PPI tedavisi alan, egzersiz yapmayan 50 kontrol hastası alındı. Diyafragmatik nefes egzersizi programının birinci ve üçüncü ayında pirozis ve regürjitasyonun sıklığını belirlemek için skorlama yapıldı. Hastaların PPI kullanımı hiç kullanmama, haftada bir-üç gün, haftada dört-altı gün ve her gün olarak değerlendirildi.
Bulgular: İki grup arasında demografik ve laboratuvar parametreler açısından fark bulunmadı. Diyafragmatik nefes egzersizlerinin birinci ve üçüncü ayda pirozis ve regürjitasyon üzerindeki etkinliği karşılaştırıldığında; egzersiz yapan hastalarda pirozis sıklığında kontrol grubuna göre anlamlı azalma görüldü ($p<0.001$). Bu hastalarda PPI kullanım sıklığının kontrol grubuna göre azaldığı izlendi ($p<0.01$).
Sonuç: NERD hastalarında semptoma yönelik olarak uzun süre veya on demand PPI kullanımı olmaktadır. Çalışmamızda NERD tanısı olan hastalarda diyafragmatik nefes egzersizlerinin pirozis ve regürjitasyon şikayetlerini azaltarak PPI kullanım sıklığını azalttığını gösterdik.

Anahtar Kelimeler: Non eroziv reflü hastalığı, gastroözofageal hastalık, diyafragmatik nefes egzersizi

***Sorumlu Yazar:** Derya Demirtaş, Department of Internal Medicine, University of Health Sciences - Adana Health Practice and Research Center, Dr. Mithat Özsan Bulvarı Kışla Mah. 4522 Sok. No: 1 Yüreğir, Adana, Turkey
E-mail: deryademirtas83@gmail.com Phone and fax: + (90) 530 521 87 01
Geliş Tarihi: 16.07.2019, **Kabul Tarihi:** 05.09.2019

Introductıon

Gastroesophageal Reflux Disease (GERD) is the return of the abnormal amount of gastric contents to the esophagus because of the insufficiency of the anti-reflux barrier in the lower esophageal sphincter (LES). Gastroesophageal Reflux (GER) is a physiological event and may occur many times during the day without causing any symptoms or mucosal damage. GERD; however, is associated with symptoms like chest burning and acid regurgitation and develops with mucosal damage (erosive) or without endoscopic damage (non-erosive) (1). According to the International Montreal Consensus (2006), GERD is defined as the condition that develops when the reflux of gastric contents causes disturbing symptoms and/or complications (2). GERD has a very high prevalence all over the world; and in Turkey, this rate goes up to 25%. Especially chronic GERD has a negative effect on the quality of life and also has high morbidity rates (3).

When GERD is suspected, the first diagnostic test that is carried out, in general, is the esophagogastroduodenoscopy (EGD), which visualizes the upper digestive tract directly allowing the exclusion of other gastrointestinal diseases (4). Although no mucosal damage is seen in most of the patients during the EGD (Non-erosive reflux disease), the esophagitis, peptic ulcer, stenosis or Barrett's esophagus are seen in others. This situation is called as the endoscopy-negative GERD (Non-erosive reflux disease, NERD) (5).

GERD treatments include lifestyle change, medical treatment and/or surgical treatment. The purpose of the treatment is to control the symptoms, improve the esophagitis, prevent the complications, and maintain the remission that is obtained in this context (6, 7). Proton Pump Inhibitors (PPI) constitute the most effective and beneficial treatment modality both to heal the symptoms in GERD and to provide mucosal healing; however, concerns on the long-term use of PPIs are increasing (8). In the sixth month following the treatment, the relapse rate in NERD is 75%; and maintenance therapy is needed in most patients (9). Alternative treatment methods were brought into the agenda to avoid long-term drug therapy or surgical procedures. In a recent study conducted by Ong et al. (10), it was shown that diaphragmatic respiration reduces symptoms in PPI refractory patients in GERD. However, there are no adequate data on the symptomatic improvement of diaphragmatic breathing exercises in NERD in the literature. For this purpose, we planned this study, which aims to use diaphragmatic breathing exercises as an alternative to PPI therapy or for support purposes in NERD.

Material and Methods

Study Population: A total of 50 patients were included in this prospective study (mean age: 47.8±15.1 years, male/female: 12/38). The patients were diagnosed with NERD in the Gastroenterology and Internal Medicine Clinics between August 2018 and February 2019 and were given diaphragmatic breathing exercises in addition to PPI. A total of 50 control patients (mean age: 50.8±11.3 years, male/female: 12/38), who received only PPI treatment and did not do any exercises, who were age and gender-matched, were included in the study as the control group. Cardiopulmonary disease, mental disorder, connective tissue disease, gastrointestinal surgery history, smoking, obesity, alcohol addiction, cancer, pregnancy, diabetes, thyroid disease were accepted as the exclusion criteria. The study protocol was approved by the local ethics committee, and each participant gave written informed consent.

The demographic data, medical history, physical examination results and habits of both groups were evaluated; and the body mass index (BMI) was calculated by measuring the weights and heights. The program, which should be applied by the patients twice a day for 10 minutes, and for three months before breakfast and dinner, was prepared after the diaphragmatic breathing exercises were performed and taught under the supervision of internal diseases specialist. The patients were called by phone on a weekly basis, and their exercise compliance was checked. Scoring was carried out to determine the frequency of pyrosis in the first and third months of the exercise program. In scoring the frequency of symptoms: having <three times a day was evaluated as "0"; having three times a day was evaluated as "1"; and having >three a day was evaluated as "2" points. Esomeprazole 40 mg 1x1 was initiated for the patients as PPI. The use of PPI by the patients was evaluated as not using, using one-three days a week, using four-six days a week, and using every day. The drug use of the patients in the first and third months were questioned and recorded.

Statistical Analysis: All analyzes were carried out with the SPSS 23.0 (Chicago, IL, the USA) statistical software package. The variables were

divided into two groups as categorical and continuous. The Kolmogorov-Smirnov test was employed to assess whether the continuous variable fit a normal distribution. Continuous variables were expressed as mean ± standard deviation (mean ± SD), and categorical variables were given as number and percentage. The comparison of the continuous variables was made by the Student *t*-test or Mann-Whitney U and Kruskal Wallis Test according to the distribution. The Chi-Square Test was employed to compare the categorical variables. For multiple comparisons of the groups, we used the Bonferroni corrected z test. The statistical significance level was taken as $p<0.05$.

Results

The patients who were included in the study were divided into two groups as the one that used PPI, but that did not do diaphragmatic breathing exercise, and the one that did diaphragmatic breathing exercise in addition to PPI treatment, and these two groups were compared.

No differences were detected between the two groups in terms of general demographic data, and laboratory and clinical parameters (Table 1).

When the effects of diaphragmatic breathing exercises on the symptoms in the first and third months were compared, it was determined that presence of >three pyrosis a day was found to be lower at a significant level in patients who did exercise (Table 2). In the group that did not do diaphragmatic exercise, 23 patients needed to take PPI every day; however, it was determined in the exercise and PPI group that 26 patients discontinued the PPI because they did not need to use it after three months; 19 patients needed to take it one-three days a week; and five patients needed four-six days a week (Table 2).

Discussion

The main finding of the present study was that diaphragmatic breathing exercises applied as an alternative to PPI therapy in patients with NERD decrease the frequency of PPI use and the symptoms.

Pyrosis complaint increases the need for PPI and the number of visits to doctors in patients who have reflux. Lifestyle change is very important and is recommended together with applying a low-fat diet, increased intake of foods that have fiber, avoiding foods that can aggravate symptoms, not eating before sleeping, losing excess weight, giving up smoking and alcohol, and raising the head of the bed up to 15-17 cm are among the recommended support therapies to reduce the use of PPI (11). However, there are no adequate data suggesting that lifestyle changes show objective improvement in reflux symptoms (12). Recent studies have shown that breathing exercises are promising in reflux disease treatment. Casale et al. (13) showed that breathing exercises in GERD reduced symptoms by causing an increase in lower esophageal sphincter pressure.

LES is surrounded by the diaphragm muscle, which consists of striated muscles and which has a specific innervation structure, and it is known that the contraction of this muscle has an important role in the anti-reflux barrier (14). It was shown by Dantas et al. (15) that contraction in the diaphragmatic cruralis that constitute the LES tonus increased LES pressure. Again, Carvalho et al. (16) applied an eight week breathing exercise program to strengthen the diaphragmatic cruralis; and showed that these exercises increased the LES pressure by causing an increase in the thickness of the diaphragm, and thereby alleviated reflux symptoms. The active contraction of the diaphragm muscle during the inspiration time has brought to mind the hypothesis that breathing exercises can train the diaphragmatic cruralis in patients; and in this way, positively affect the anti-reflux barrier.

Considering the safety and cost effectiveness, diaphragmatic breathing exercises play very important roles in the treatment of NERD. In the study conducted by Eherer et al. (14) on the effects of breathing exercises in GERD, it was shown that these exercises decreased the frequency of drug use in PPI refractory patients and was promising.

After 12 weeks of breathing exercise program in the present study of ours, we showed that there were significant decreases in pyrosis in NERD patients, and the need for drug decreased. However, the results of our study must be supported with larger-scale studies that will be conducted with different patient groups because there are no adequate data on respiratory exercises in NERD patients.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Cukurova University (date: 06.07.2018; approval number: 2018-79-57).

Table 1. Demographic, clinical and laboratory findings of the groups

	Exercise (+) (n= 50)	Exercise (-) (n= 50)	p
Age (year)	47.8 ± 15.1	50.8 ± 11.3	0.262
Gender (female)	38	38	0.592
Body mass index (kg/m2)	28.3 ± 2.6	29.0 ± 4.0	0.332
Blood urea nitrogen (mg/dL)	26.4 ± 4.8	27.2 ± 9.2	0.612
Creatinine (mg/dL)	0.76 ± 0.1	0.77 ± 0.2	0.860
Sodium (mmol/L)	137.3 ± 5.0	138.5 ± 3.9	0.196
Potassium (mmol/L)	4.3 ± 0.5	4.1 ± 0.4	0.027
Aspartate aminotransferase (u/L)	23.7 ± 9.3	22.2 ± 8.0	0.411
Alanine aminotransferase (u/L)	20.2 ± 9.2	20.3 ± 9.1	0.931
White blood cell (μL)	9.02 ± 2.65	8.01 ± 3.08	0.146
Hbg (g/dl±SD)	12.2 ± 2.4	13.1 ± 1.8	0.816
Platelet (1000/μl±SD)	282 ± 125	255 ± 58	0.169
INR (mean±SD)	0.47 ± 0.15	0.51 ± 0.24	0.323
HBV, (n, %)	4 (8)	4 (8)	0.643
HCV, (n, %)	2 (4)	4 (8)	0.339
Diabetes mellitus, (n, %)	2 (4)	6 (12)	0.134
Hypertension, n (%)	6 (12)	6 (12)	0.620
Alcohol, (n, %)	12 (24)	10 (20)	0.405
Smoking, (n, %)	18 (36)	14 (28)	0.260
NSAID, (n, %)	6 (12)	8 (16)	0.387

Hbg: Hemoglobin; **INR:** International normalized ratio; **HBV:** Hepatitis B virus; **HCV:** Hepatitis C virus; **NSAID:** Nonsteroidal anti-inflammatory drug

Table 2. The effects of diaphragmatic breathing exercises on the symptoms in the 1st and 3rd months

	Exercise (+) (n= 50)	Exercise (-) (n= 50)	p
1st month symptoms			
<3 pyrosis per day, (n, %)	28 (56)	10 (20)	<0.001
3 pyrosis per day, (n, %)	14 (28)	12 (24)	<0.001
> 3 pyrosis per day, (n, %)	8 (16)	28 (56)	<0.001
3rd month symptoms			
<3 pyrosis per day, (n, %)	36 (72)	14 (28)	<0.001
3 pyrosis per day, (n, %)	12 (24)	12 (24)	<0.001
>3 pyrosis per day, (n, %)	2 (4)	24 (48)	<0.001
PPI use, (n, %)			
0 day/week, (n, %)	26 (52)	0 (0)	<0.001
1-3 day/week, (n, %)	19(38)	12 (24)	<0.001
4-6 day/week, (n, %)	5 (10)	15 (30)	<0.001
7 day/week, (n, %)	0 (0)	23 (46)	<0.001

PPI: Proton pomp inhibitor

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: Concept – D.D.; Design – D.D., B.K.; Supervision – D.D., B.K.; Resources – D.D., H.E.S.; Materials – D.D., H.E.S.; Data Collection and/or Processing – D.D., H.E.S., B.K.; Analysis and/or Interpretation – D.D., H.E.S.; Literature Search – D.D., H.E.S.; Writing Manuscript – D.D.; Critical Review – D.D.

Disclosure of Interest: The authors declare that they have no competing interest.

Acknowledgments: None.

References

1. Bredenoord AJ, Pandolfino JE, Smout AJ. Gastro-oesophageal reflux disease. Lancet 2013; 381(9881): 1933-1942.
2. Vakil N, van Zanten SV, Kahrilas P, Dent J, Jones R, Global Consensus Group. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. Am J Gastroenterol 2006; 101(8): 1900-1920.
3. Nwokediuko SC. Current trends in the management of gastroesophageal reflux disease: a review. ISRN Gastroenterol 2012; 2012: 391631-391631.
4. Moraes-Filho J, Cecconello I, Gama-Rodrigues J, Castro L, Henry MA, Meneghelli UG, et al. Brazilian Consensus Group Brazilian consensus on gastroesophageal reflux disease: proposals for assessment, classification, and management. Am J Gastroenterol 2002; 97(2): 241-248.
5. Richter JE. Long-term management of gastroesophageal reflux disease and its complications. Am J Gastroenterol 1997; 92(4): 30-34S.
6. Nwokediuko SC. Current trends in the management of gastroesophageal reflux disease: a review. ISRN Gastroenterol 2012; 2012: 391631.
7. DeVault KR, Castell DO. Updated guidelines for the diagnosis and treatment of gastroesophageal reflux disease. Am J Gastroenterol 2005; 100(1): 190-200.
8. Jensen RT. Consequences of long-term proton pump blockade: insights from studies of patients with gastrinomas. Basic Clin Pharmacol Toxicol 2006; 98(1): 4-19.
9. Sung HJ, Cho YK, Moon SJ, Kim JS, Lim CH, Park JM, et al. Role of acid and weakly acidic reflux in gastroesophageal reflux disease off proton pump inhibitor therapy. J Neurogastroenterol Motil 2012; 18(3): 291-297.
10. Ong AM, Chua LT, Khor CJ, Asokkumar R, S/O Namasivayam V, Wang YT. Diaphragmatic Breathing Reduces Belching and Proton Pump Inhibitor Refractory Gastroesophageal Reflux Symptoms. Clin Gastroenterol Hepatol 2018; 16(3): 407-416.
11. Eherer A. Management of gastroesophageal reflux disease: lifestyle modification and alternative approaches. Dig Dis 2014; 32(1-2): 149-151.
12. Kaltenbach T, Crockett S, Gerson LB. Are lifestyle measures eff ective in patients with gastroesophageal refl ux disease? An evidence-based approach. Arch Intern Med 2006; 166: 965-971.
13. Casale M, Sabatino L, Moffa A, Capuano F, Luccarelli V, Vitali M, et al. Breathing training on lower esophageal sphincter as a complementary treatment of gastroesophageal reflux disease (GERD): a systematic review. Eur Rev Med Pharmacol Sci 2016; 20(21): 4547-4552.
14. Eherer AJ, Netolitzky F, Högenauer C, Puschnig G, Hinterleitner TA, Scheidl S, et al. Positive effect of abdominal breathing exercise on gastroesophageal reflux disease: a randomized, controlled study. Am J Gastroenterol 2012; 107(3): 372-378.
15. Dantas RO, Lôbo CJ. Diaphragmatic contraction in the lower esophageal sphincter pressure in Chagas disease patients. Arq Gastroenterol 1994; 31(1): 14-17.
16. Carvalho de Miranda Chaves R, Suesada M, Polisel F, de Sá CC, Navarro-Rodriguez T. Respiratory physiotherapy can increase lower esophageal sphincter pressure in GERD patients. Respir Med 2012; 106(12): 1794-1799.