

The Significance of Esophageal Myotomy in Surgical Treatment of Diffuse Esophageal Spasm

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Abstract: Introduction: Diffuse esophageal spasm (*DES*) is a rare primary esophageal motor disorder of unknown etiology, clinical syndrome of retrosternal and/or dysphagia symptoms with localized non-progressive tertiary simultaneous esophageal body contractions proven esophageal manometry. Even in the highly specialized institutions to examine the incidence of oesophageal motility *DES* is between 0.6 and 5.3%. The most common symptoms are chest pain and dysphagia. *DES* is diagnosed by esophageal manometry. Treatment of *DES* can be conservative (with the use of drugs, injections of botulinum toxin and esophagus dilatation) and surgical treatment (long esophageal myotomy). **Aim:** The aim of this research was to identify the basic characteristics of *DES*, the effectiveness and importance of surgical treatment, oesophageal myotomies, as well as functional results before and after surgical treatment. **Material and methods:** We evaluated 21 patients with *DES* at the Department of Digestive Surgery, Clinical Center of Serbia. Covered a period of 11 years (from the year 01/01/2005 to 31/12/2015). The data were systematized and analyzed using statistical methods: descriptive methods, tabulation and graphical representation. McNemar's test for attributed attributes was used to determine statistical significance. **Results:** The largest number of our respondents was between the ages of 51 and 60. To all patients, contrast radiography and manometry were performed preoperatively and all were diagnosed with *DES*. There is a statistically significant difference before and after surgery in the clinical presentation of the disease when it comes to dysphagia and retrospective pain (McNemar test, $p = 0.001$). Postoperatively, only one patient showed manometry the existence of relapse, the same patient complained about the presence of dysphagia postoperatively. **Conclusion:** Esophageal myotomy, observed through the percentage of relapse occurrence in one year postoperative follow-up, as well as in relation to the percentage of the resolution of dysphagic symptoms in patients suffering from this disease, is a surgical method of choice in patients with diffuse esophageal spasm.

Key words: Diffuse esophagus spasms, manometry, surgery, myotomy, thoracoscopy, thoracotomy.

1. Introduction

Diffuse esophageal spasm (*DES*) is a primary motor esophageal disease of unknown etiology characterized by retrosternal and/or dysphagic symptoms with localized, non-progressive, simultaneous, tertiary contractions of the esophageal body [1]. According to the American Gastroenterological Association, diffuse esophageal spasm (*DES*) can be diagnosed by esophageal manometry in patients with clinical presentation of symptoms of chest pain and/or dysphagia [2]. The diagnostic criterion is the identification of simultaneous contractions of esophageal smooth muscle in at least 20 and more

percent, with contraction amplitude of 30 mmHg or more, in 10 sips with the obligatory presence of normal peristaltic waves [3, 4]. The first clinical description of diffuse esophageal spasm was given by Osgood in 1889, who described 6 patients with symptoms of chest pain and dysphagia [5, 6]. In 1934, Moersch and Camp were the first to describe an X-ray of diffuse esophageal spasm [7]. In 1950, Lortat-Jacob performed the first surgical approach in such patients [8]. The clinical picture may be variable in patients with *DES*. The most common ailments of patients are retrosternal pain and dysphagia.

Excluding patients with organic lesions, 50% of all patients with dysphagia suffer from esophageal motility disorders [9]. Spiro [10] suggests that a multitude of synonyms (tertiary contractions, esophagus as cortex and presbyesophagus) are

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replaced by the term diffuse esophageal spasm.

The incidence of diffuse esophageal spasm (*DES*), in highly specialized institutions for functional diseases of the upper parts of the digestive tract, depending on the clinical picture of patients, is between 0.6 and 2.8% in patients with chest pain, between 3.3 and 5.3% in patients with dysphagia and 4 to 4.5% in patients with combined symptoms of chest pain and dysphagia [11, 12]. There is no data in the official literature on the frequency of *DES* by gender, age and race. According to the data from the domestic literature [13], this disease most often occurs in people over 50 years of age.

Initial treatment of patients with diffuse spasm can be conserved with the use of proton pump inhibitors, nitrates, tricyclic antidepressants, botulinum toxin injections and esophageal dilatation. This type of therapy usually gives transiently good results, but in most cases it is short-lived, and after stopping the therapy, the symptoms return quickly. Surgical treatment remains the method of choice in the treatment of *DES* [13-16]. It is achieved by transthoracic or thoracoscopic method of longitudinal myotomy of the esophageal body from the aortic arch to the lower esophageal sphincter (*DES*).

The aim of this paper is to identify the basic characteristics of diffuse esophageal spasm, efficiency and importance of surgical treatment, as well as functional results before and after surgical treatment, by reviewing our data and comparing the available literature.

2. Material and Methods

This research is a clinical cross-sectional study conducted at the Clinic for Digestive Surgery, University Clinical Center of Serbia. The time period from 01/01/2005 to 31/12/2015. Based on the surgical protocol, all surgically treated patients with diffuse esophageal spasm were identified.

The study included 21 patients with diffuse esophageal spasm (*DES*) who were treated surgically and who were consecutively examined at the Clinic for Digestive Surgery - I Surgical, Clinical Center of Serbia due to symptoms such as retrosternal pain and dysphagia. *DES* was diagnosed on the basis of contrast

radiography and stationary esophageal manometry, which is the most reliable diagnostic method in diagnosing functional disorders of the esophagus. Manometric characteristics of *DES* are the presence of simultaneous contractions of the distal esophagus that alternate with normal peristalsis, which occurs in at least 20% of patients, but in 90% of patients contractions provoked with 5-10 ml of water must be simultaneous [1, 11, 15, 17].

Cancer (as a cause of dysphagia) and ischemic heart disease (as a cause of chest pain) were excluded from all subjects by appropriate tests [18].

For patients with diffuse esophageal spasm, the following features have been registered in the appropriate modalities:

- ◆ Age and gender
- ◆ Preoperative and postoperative existence of symptoms (treatment efficiency)
- ◆ Preoperative and postoperative manometry, insight into functional results before and after surgery
- ◆ Occurrence of relapse.

Exclusion criteria: Presence of any gastrointestinal disorder other than diverticulum; the existence of cancer; corticosteroid use in the last 3 months; ischemic heart disease; current pregnancy; the existence of other chronic diseases.

2.1 Statistical Data Processing

Data were systematized and analyzed using statistical methods: descriptive methods, tabulation and graphical representation, McNemar test for attribute features.

Data distribution normality (*NDP*) was checked using the Shapiro-Wilk test. All variables that did not have *NDP* were logarithmically transformed. Differences in patients' age were analyzed by age-adjusted covariance analysis (ANCOVA), as there was a statistically significant difference in age between patients. The Pearson coefficient (*r*) was used to estimate the correlation of the parameters. Statistical analyzes were performed using the SPSS Ver. 20.0. The value of statistical tests less than 0.05 ($p < 0.05$) was considered significant. The obtained test results were compared with the publications obtained by computer search of the "PubMed" database.

3. Results

When it comes to the distribution of patients by gender of the 21 patients, 13 were men (62%) and 8 were women (38%) (Figure 1).

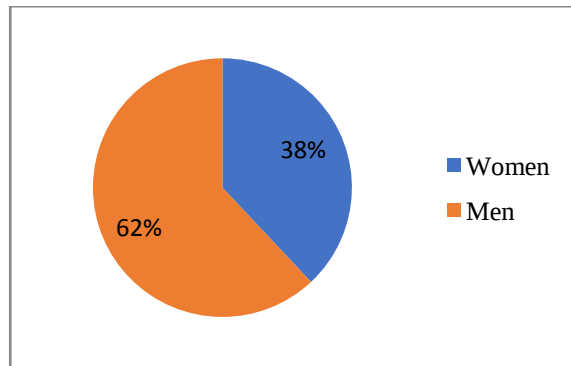


Fig. 1 Gender distribution of patients with diffuse esophageal spasm.

The largest number of patients was between 51 and 60 years old (38.1%) and in this group all were men. In the group between 61 and 70 years there were 28.6% of patients, and in the group between 71 and 80 years there were 23.8% of patients, the remaining 9.5% were younger than 50 years and were women, so 90.5% of

patients were older than 51 years (Figure 2).

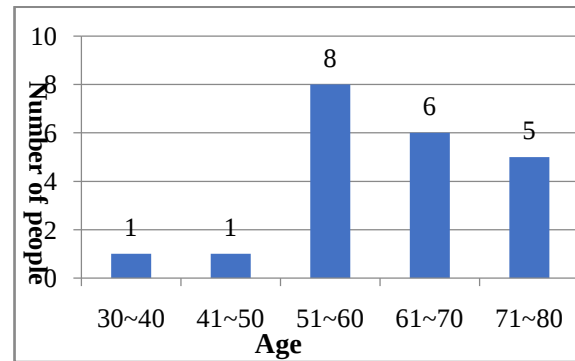


Fig. 2 Incidence of disease by age.

All patients underwent preoperative contrast radiography and manometry. After 12 months after the operation, everyone underwent a control manometry. Diffuse esophageal spasm was diagnosed in all patients by preoperative manometry.

Preoperatively, 20 patients complained of symptoms of dysphagia, while only one patient denied dysphagia. Postoperatively, 2 patients complained of symptoms of dysphagia. There is a statistically significant difference in dysphagia before and after surgery (McNemar test, $p < 0.001$) (Table 1).

Table 1 Preoperative and postoperative dysphagia.

Parameter	Symptoms of dysphagia		
	Yes	No	The total number of patients
Preoperative	20 (95%)	1 (5%)	21
Postoperative	2 (9.5%)	19 (90.5%)	21

Preoperative chest pain was experienced by 11 patients; there is a statistically significant difference in the patients. Postoperatively, no patient complained of intensity and incidence of the

associated occurrence of chest pain during the postoperative follow-up of 12 dysphagia and retrosternal pain before and postoperatively months. (McNemar test, $p = 0.001$) (Table 2).

Table 2 Presence of chest pain symptoms preoperatively and postoperatively.

Parameter	Symptoms of chest pain		
	Yes	No	The total number of patients
Preoperative	11 (52%)	10 (48%)	21
Postoperative	0	21 (100%)	21

Postoperatively, only one patient was diagnosed with recurrence by manometry, the same patient complained of the presence of dysphagia postoperatively, which is about 5% of the total number

of operated (Figure 3). No patient complained of regurgitation symptoms or other symptoms suggestive of gastroesophageal reflux disease within 12 months postoperatively.

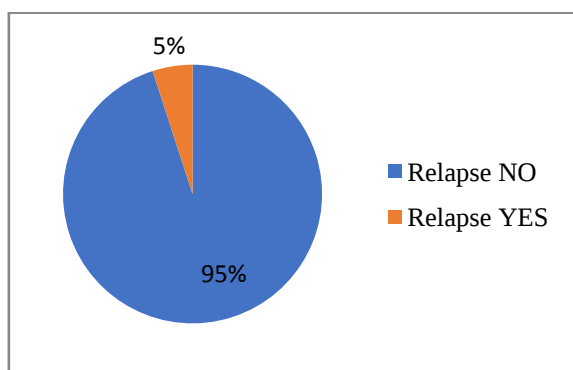


Fig. 3 Success of surgical treatment of DES with esophageal myotomy.

4. Discussion

The results of our study show that in patients with diffuse esophageal spasm, in whom a long esophageal myotomy was performed; there is a significant improvement in the presentation of the clinical picture postoperatively compared to the preoperative period.

Manometry was used as a diagnostic standard and was performed in all patients preoperatively and after 12 months, as well as preoperative contrast radiography. In this group, the distribution by sex is dominated by males with 62% while women occur in 32% of patients and surgically treated for diffuse esophageal spasm, which is in line with data from recent publications [15-17]. Frequent presence of irritable bowel symptoms in patients with *DES* may help to resolve the diagnostic problem between *DES* and anginal pain due to coronary insufficiency; however, a cardiac examination with a complete electrocardiogram is necessary for any patient with suspected *DES* [19]. The differential diagnosis of diffuse spasm is complicated by the fact that some authors describe that it can be accompanied by ECG changes. On the other hand, esophageal motility disorders seen on radiography or manometry may not be accompanied by any symptoms at all [20]. One third of patients with proven coronary heart disease have associated dysphagia and a burning sensation in the sternum that originates from esophageal motor disorders.

In 90% of cases, the patients are older than 51 years, which also corresponds to the epidemiological data of the modern professional literature. All male patients

were older than 51 years. Symptoms of dysphagia were present in 95% of patients preoperatively, and symptoms of chest pain in 55% of patients. Tsuobi and Mittal state that about 50% of 4,923 patients diagnosed with diffuse esophageal spasm report dysphagia as the primary symptom, while retrosternal pain is the dominant symptom in only 25% of patients [21]. The incidence of postoperative dysphagia, in our study, was 5%, which is slightly lower than the data from the literature. Lecont et al. report that 27.2% of patients with esophageal myotomy report postoperative dysphagia [22]. This discrepancy in the data is most likely the result of a small sample of the patient being treated. Of the 55% of patients who had chest pain preoperatively, the postoperative incidence of retrosternal pain as a symptom was 0%. In the cumulative observation of symptoms, dysphagia and retrosternal pain preoperatively and postoperatively, there is a statistically significant difference in symptomatology before and after surgery, which speaks in favor of the success of surgical treatment of diffuse esophageal spasm. In the first 12 months of follow-up, recurrence, diagnosed by manometry, occurred in only one patient (5%). The success of esophageal myotomy in patients with diffuse esophageal spasm, observed through the percentage of recurrence in one-year postoperative follow-up, as well as in relation to the percentage of preoperative and postoperative dysphagia, ie resolution of symptoms, shows very high success of this surgical technique in as many as 95% of patients. The results of a study conducted by Lecont et al [22] on 20 patients who underwent esophageal myotomy to below the lower edge of *DES* are consistent with our results when it comes to surgery success. In a retrospective study, Patti et al [23] made a comparative review of the success of the thoracoscopic and laparoscopic approaches, where he preferred the laparoscopic approach, noting that any minimally invasive surgical approach is more successful and better than thoracotomy.

The results of this study showed that in patients with open access myotomy in 80% of cases there was a resolution of dysphagia, and in 75% there was a

reduction or complete disappearance of retrosternal pain. With the thoracoscopic approach, improvement occurs in patients with symptoms of dysphagia in 86% of cases, and in patients with chest pain in 80% of cases. A summary of publications in the period from 2000 to 2018, the success rate of the thoracoscopic approach ranges from 56% to 100%, where the maximum success rate of 100% is described by Patti and colleagues in patients diagnosed with diffuse esophageal spasm. Grübel et al [11] state that due to the small number of published studies, as well as short follow-up of patients, and the existence of different results when using different surgical techniques, as well as due to GER, surgical treatment of diffuse esophageal spasm is still approached with caution.

Diffuse spasm of the esophagus is a rare functional disease of the upper parts of the digestive tract, and the complete diagnosis and treatment of this disorder, due to the complexity of the disease itself, must be carried out exclusively in highly specialized centers. Surgical treatment is the method of choice in the treatment of this disease, while the thoracoscopic approach is the gold standard in relation to open surgery.

The limitation of this work is the small population of respondents, so it is necessary to conduct a study with a larger number of respondents, which would significantly contribute to shedding light on the problem in the population suffering from diffuse esophageal spasm.

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