

# Pharyngoesophageal diverticulum: evaluation of treatment results

## *Divertículo faringoesofágico: avaliação dos resultados do tratamento*

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### A B S T R A C T

**Objective:** To evaluate the postoperative outcome of patients with pharyngoesophageal diverticulum submitted to surgical and endoscopic treatments. **Methods:** We retrospectively analyzed 36 patients with pharyngo-esophageal diverticulum treated at the Hospital of the Medical School of Botucatu – UNESP. Patients were divided into two groups, depending on the treatment: group 1 (n = 24): diverticulectomy associated myotomy through a left cervicotomy; group 2 (n = 12): endoscopic diverticulostomy with linear stapler. **Results:** Operative mortality was zero in both groups. Early complications: group 1 – two patients developed cervical fistula and two, hoarseness; group 2 – none. Late complications: group 1 – none; group 2: recurrence of dysphagia in four patients (p = .01). Mean follow-up was 33 months for group 1 and 28 months for group 2. **Conclusion:** Both procedures were effective in remission of dysphagia. Surgical treatment showed superiority to endoscopy, with resolution of dysphagia with a single procedure. Endoscopic treatment should be reserved for the elderly and those with comorbidities.

**Key words:** Deglutition disorders. Zenker diverticulum. Therapeutics. Surgical procedures, operative. Endoscopy.

### INTRODUCTION

Described in 1764 by Ludlow Abrahan<sup>1</sup>, pharyngoesophageal diverticulum (PED) is the most common esophageal diverticulum. This condition also receives the name of Zenker's diverticulum<sup>2</sup>, a German pathologist who, in association with Von Zienssen, published the first 27 cases, 5 from their own series.

The PED is uncommon, representing three to 5% of esophageal diseases, being more frequent in males<sup>3-5</sup>. This disease rarely occurs in individuals under 40 years and the decade from 65 to 75 years is the most affected<sup>6</sup>.

The pathophysiology of the PED is not yet fully elucidated. The most accepted mechanism is due to increased pressure in pharyngeal lumen, causing herniation of the mucosa through a weak point in the esophageal muscle (Killian's triangle). This is a space between the inferior pharyngeal constrictor and the cricopharyngeal muscles<sup>7</sup>.

Several techniques have been proposed for the treatment of the PDE. Among the techniques employed,

the diverticulopexy proposed by Lerut *et al.*<sup>8</sup> in 1990 was replaced by diverticulectomy associated with the cricopharyngeal muscle myotomy, the left cervicotomy being the standard access, with excellent results, represented by no mortality, low morbidity and satisfactory remission of symptoms<sup>9-15</sup>.

Endoscopic treatment, initially proposed by Mosher in 1917<sup>16</sup>, was revived by Dolhman and Mattsson in 1960<sup>17</sup>, and consisted of the complete section of the septum between the esophagus and the diverticulum, promoting communication between the two structures<sup>18-20</sup>. The authors noted that this procedure has advantages over e surgical treatment, such as the absence of skin incision, shorter operative time and hospital stay.

Collard *et al.* proposed a refinement of the endoscopic technique in 1993<sup>21</sup>: the septum should be sectioned with a mechanical suturing device, reducing the possibility of serious complications such as bleeding and fistula.

This study aimed to evaluate the postoperative outcome of patients with pharyngoesophageal diverticulum

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undergoing surgical and endoscopic treatments using the linear stapler.

## METHODS

The design of the present study was approved by the Ethics Committee of the Medical School of Botucatu - UNESP (No. 3767-2011).

Thirty-six individuals with pharyngoesophageal diverticulum participated in this study, 20 men and 16 women, aged between 37 and 97 years (mean:  $65.02 \pm 12.90$  years).

The symptom reported by patients was dysphagia, with associations in some cases (Table 1). Diagnostic confirmation was made by barium swallow.

The 36 patients were divided into two groups, depending on the approach adopted: Group 1 (n = 24): diverticulectomy associated with cricopharyngeal myotomy, Group 2 (n = 12): diverticulostomy performed with linear stapler.

Patients in group 1 underwent diverticulectomy under general anesthesia. The approach adopted was longitudinal left cervicotomy along the inner edge of the sternocleidomastoid muscle, with good exposure of the operative field. After dissection of the cervical structures, section of the omohyoid muscle was held in most cases. The prior introduction of nasogastric tube facilitated palpation of the esophagus and complete isolation of the diverticulum and its ostium (Figure 1). The section of the diverticular sac was followed by a continuous suture of the esophageal wall in two planes, one mucous and other muscular, with 3-0 polyglycolic acid sutures. Prophylactic antibiotic therapy was performed during anesthesia (IV cephalosporin, 2g, single dose).

The cricopharyngeal myotomy was performed in all cases. Periesophagic laminar drainage was kept for 24 hours. In the first two days after surgery, food was offered by nasogastric tube, which was removed on the third day. Since then, and in the absence of signs of fistula, oral feeding was resumed. Hospital discharge occurred around the fifth postoperative day.

Endoscopic treatment was performed in the group 2 patients under general anesthesia. The Weerda laryngoscope (Karl Storz, Tuttinger, Germany) allowed identification of the hypopharynx and the diverticulum. The diverticulum contents were aspirated and the 45mm stapler introduced (Ethicon, Inc., Somerville, NJ, USA). The branches of the stapler were positioned in the esophageal lumen and in the diverticulum, respectively. When making the firing of the stapler, the septum between the esophagus and the diverticulum is transected and stapled, providing the esophagus and the diverticulum with a single lumen.

Prophylactic antibiotic therapy was performed in a manner similar to that adopted in group 1 (cephalosporin, 2g, IV, single dose). Liquid diet was introduced on the second

**Table 1** - Symptoms reported by patients with PED.

Symptom	Group 1	Group 2
Dysphagia	13	06
Dysphagia + regurgitation	02	03
Dysphagia + weight loss	02	02
Dysphagia + hoarseness	0	01
Dysphagia + globus	02	0
Dysphagia + cervical bulging	03	0
Dysphagia + recurrent pneumonia	01	0
Sore throat+ dysphagia	01	0
Total	24	12



**Figure 1** - Left cervicotomy showing a pharyngoesophageal diverticulum.

day after surgery and discharge, 48 hours after the procedure.

For comparison between procedures, we evaluated symptoms, duration of complaints, size of the diverticula and complications: early and late.

For statistical analysis we used the chi-square test for qualitative variables and the Student t for quantitative variables. The significance level of 5% was adopted for statistical analysis ( $p < .05$ ).

## RESULTS

Of the 24 patients in group 1, 14 were men and 10 women. In group 2, five patients were male and seven were female. There was no difference in distribution regarding genders in both groups ( $p = 0.3$ , Table 2). Patients in group 2 were older than those in group 1 ( $72.96 \pm 11.30$  versus  $61.2 \pm 12.14$  –  $p = 0.011$  – Table 2).

The duration of complaints (Table 2) of patients in group 1 ( $33.8 \pm 37.9$  months) did not differ from those observed in group 2 ( $23.7 \pm 16.5$  months –  $p = 0,38$ ).

In Group 2, the diverticula were larger ( $5.3 \pm 1.5$  cm) than in group 1 ( $4.1 \pm 1.5$  cm,  $p = 0.031$ ).

Operative mortality was zero in both groups. Also, there were no intraoperative complications.

In the immediate postoperative period, two patients in group 1 had low-output fistula, with spontaneous resolution; two patients reported hoarseness, which gradually receded until full resolution. Remission or improvement of dysphagia was observed in all patients from group 1.

In Group 2, there were no complications in the immediate postoperative period. However, in the late follow-up, four patients (33.3%) complained of recurrent dysphagia, requiring a new endoscopic procedure, with symptom improvement.

## DISCUSSION

In this retrospective study we studied, in a comparative manner, the clinical and therapeutic aspects of patients with PED undergoing two types of treatment, surgical and endoscopic.

The PED being a condition of senility, conducting random research raises ethical issues. This is because the allocation of an elderly with comorbidities in the surgical branch of the study constitutes a breach of ethics. Perhaps this is the reason Silveira *et al.*<sup>22</sup> mentioned the lack of randomized trial on this subject.

The pathophysiology of the PED is a matter of controversy, and several mechanisms have been described, all of them related to abnormalities presented by the cricopharyngeal muscle, such as spasm, hypertrophy and fibrosis<sup>23</sup>. Manometric studies have shown that contraction after opening of the upper esophageal sphincter happens prematurely, coinciding with the peak of contraction of the pharynx<sup>14</sup>. The a result of this increase is herniation of mucosa and submucosa of the pharynx through the area of weakness in the wall, with formation of diverticula. These are called pseudodiverticula, since they do not contain all layers of the esophageal wall. Corroborating this theory is the finding of tone reduction pressure of the upper

esophageal sphincter postoperatively in patients with PED<sup>14,19,21,24</sup>.

Besides the dysmotility factor, another aspect has been evaluated in the pathophysiology of PED. Histological studies of the cricopharyngeal muscle of patients with PED demonstrate marked reduction of muscle fibers and collagen when compared to controls<sup>4</sup>.

Many authors have reported a higher incidence of PED in males<sup>3,10,12-15,18,25</sup>. In our sample, the incidence was similar in both genders.

The average age of patients undergoing endoscopic treatment (group 2) was higher than that observed in group 1 (surgery) and similar to those reported by some authors<sup>26-28</sup>. The discrepancy in age between the two groups relates to the fact that endoscopic therapy was reserved for patients with comorbidities and without conditions to endure surgical treatment, as already advocated<sup>19,29</sup>.

Table 1 shows that several patients from both groups have symptoms of reflux, globus, hoarseness, sore throat and recurrent pneumonia. This is the characteristic of oropharyngeal dysphagia, or of transference, where the difficulty lies in the passage of the bolus from the mouth to the pharynx and its penetration through the upper esophageal sphincter<sup>30</sup>.

Another controversy regarding PED concerns treatment. Until the sixties, the only recommended treatment was surgical; endoscopic treatment as conceived by Mosher<sup>16</sup> was abandoned by him, because the patients died as a result of mediastinitis<sup>20</sup>.

Surgery, performed by left cervicotomy, consists of diverticulectomy or diverticulopexy, the latter being suitable for smaller diverticula. The two procedures are generally associated with cricopharyngeal myotomy.

Patients in group 1 underwent diverticulectomy associated with cricopharyngeal myotomy, with no mortality. The extent of the diverticular sac was on average  $4.1 \pm 1.5$  cm and pathology studies of diverticulum showed chronic inflammatory process.

In the early postoperative period, two patients developed fistula. Given the experience with the use of transhiatal esophagectomy<sup>31</sup>, the management of cervical

**Table 2** – PED demographics, clinical aspects and complications.

	Group 1	Group 2	Value of p
Men	14	5	
Women	10	7	0.34
Mean age	$61.2 \pm 12.14$	$72.06 \pm 11.30$	0.011*
Duration of complaints	$33.8 \pm 37.9$	$23.7 \pm 16.5$	0.38
Size of the diverticulum	$4.1 \pm 1.5$	$5.3 \pm 1.5$	0.031*
Cervical fistula	2 (8.3%)	0 (0%)	
Relapse	0 (0%)	4 (33.3%)	0.01*
Hoarseness	2 (8.3%)	0 (0%)	

\* $p < 0.05$

fistulas offered no difficulty, much less risk to the patient. The incidence of this complication, 8.3%, was no different from the published elsewhere<sup>3,9-11,14,19,23</sup>.

Another early postoperative complication observed, hoarseness was reported by two patients. This symptom was ephemeral, disappearing completely after two weeks.

Late follow-up of patients in group 1 ranged from three to 180 months (mean 33). Patients showed themselves satisfied with the result of the operation, with remission of dysphagia, swallowing any kind of food without difficulty.

Endoscopic treatment was revived by Dohlman and Mattson<sup>17</sup>, which advocated the procedure under general anesthesia, using a rigid endoscope and section of the septum between the esophagus and diverticulum performed with electrocautery. With this technique, cervical incision was abolished, procedure time and hospital stay shortened, the introduction of the diet abbreviated and the number of complications decreased<sup>6</sup>. After employing the method in more than 100 patients, the authors observed no serious complications, recurrence being reported in only 5% of cases.

Other techniques have been proposed for the section of the septum between the esophagus and the diverticulum, with the CO2 laser, papilloscopy and mechanical suturing device are the most used. Of these, the CO2 laser was the one that caused more complications, hemorrhage being the most serious, requiring the need for conversion to surgical treatment<sup>20</sup>. In this series, no bleeding was observed.

The endoscopic treatment can be performed with a rigid or flexible endoscope. The rigid one requires the patient to assume the position of hyperextension of the neck, not always feasible in the elderly, due to cervical arthritis. Thus, the flexible endoscope has been the most suitable for the procedure<sup>19,23</sup>. In this study, we used the rigid endoscope, with no complication.

The technique described by Collard *et al.* was performed in 21 patients in group 2, with no mortality, nor immediate postoperative complications. Wirth *et al.*<sup>32</sup> refer a 5% mortality rate with this procedure.

The average late follow-up of 28 months showed that four patients (33.3%) reported recurrence of dysphagia. Patients underwent the new procedure with marked improvement of the symptom. Thus, the average number of 1.3 procedures was similar to that observed by Saeti *et al.*<sup>33</sup>. The lack of effectiveness of the procedure was unexpected, since a single surgical treatment time was sufficient.

However, the literature shows that endoscopic treatment in its various forms, including the use of stapler, requires one or several complements<sup>25,28,29,33</sup>.

Saeti *et al.*<sup>33</sup> reported that 37% of their patients required a second stapler charge, a fact that makes the procedure more expensive than surgery.

The recurrence rate of 33% observed in the present study is higher than the one reported by Lang *et al.*<sup>25</sup>. It should be noted that the stapler used by these authors was modified, having 35mm in length and containing wound clips to its tip, which provides a complete section of the septum, minimizing the risk of recurrence.

Another aspect that must be considered is that the endoscopic procedure is more recent, with the authors of this research in the learning curve, still finding difficulty to adjust the type of stapler to the treatment of the diverticulum.

Another factor that may have contributed to the poor results of the endoscopic treatment was the size of the diverticula. In this group, the mean length of diverticula was  $5.3 \pm 1.5$  cm, larger than in group 1 ( $p < 0.05$ ). The extent of the septum exceeded the stapler, leaving a residue of diverticula, which, in time could dilate, this being the cause of relapse.

Thus, the analysis of the results of the present study leads us to conclude that the two procedures are effective in the treatment of PED, but the superiority of the surgical approach may be mooted by fewer complications and their efficiency in a single procedure, rendering the endoscopic treatment reserved for elderly patients unable to tolerate surgery.

It is noteworthy, however, that patients undergoing surgical treatment were younger than the endoscopic group and their diverticula were smaller.

## R E S U M O

**Objetivo:** Avaliar a evolução pós-operatória de pacientes com divertículo faringoesofágico submetidos aos tratamentos cirúrgico e endoscópico. **Métodos:** Foram analisados de maneira retrospectiva 36 pacientes com divertículo faringo-esofágico atendidos no Hospital das Clínicas da Faculdade de Medicina de Botucatu – UNESP. Os pacientes foram distribuídos em dois grupos, na dependência do tratamento: grupo 1 (n=24) – diverticulectomia associada à miotomia do cricofaríngeo, através de cervicotomia esquerda; grupo 2 (n=12) – diverticulostomia endoscópica usando grampeador linear. **Resultados:** A mortalidade operatória foi nula em ambos os grupos. Complicações precoces: grupo 1 – dois pacientes desenvolveram fistula cervical e outros dois, rouquidão; grupo 2 – sem complicações. Complicações tardias: grupo 1 – sem complicações; grupo 2: recidiva da disfagia em quatro pacientes ( $p=0,01$ ). O seguimento médio foi 33 meses para o grupo 1 e 28 meses para o grupo 2. **Conclusão:** Os dois procedimentos foram eficazes na remissão da disfagia. O tratamento cirúrgico apresentou superioridade em relação ao endoscópico, com resolução da disfagia com um único procedimento. O tratamento endoscópico deve ser reservado para os mais idosos e portadores de comorbidades.

**Descritores:** Transtornos de deglutição. Divertículo de Zenker. Terapêutica. Procedimentos cirúrgicos operatórios. Endoscopia.

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