Acta Otorrinolaringol Esp. 2009;**60(6):**396-401

Acta Otorrinolaringológica Española

www.elsevier.es/otorrino

ORIGINAL ARTICLE

Combined endoscopic treatment for Zenker's diverticulum versus open approach; review of our experience

David Virós Porcuna,* Iñaki Zarraonandía Andraca, Xavier León Vintró, Montserrat López Vilas, Jacinto García Lorenzo, Albert Pujol Olmo, and Miquel Quer Agustí

Servicio de Otorrinolaringología, Hospital de La Santa Creu i Sant Pau, Barcelona, Spain

Received March 25, 2009; accepted May 26, 2009
Available online September 5, 2009

KEYWORDS
Zenker's diverticulum;
Endoscopic treatment;
CO_2 laser;
Surgical stapler

Abstract
Introduction: Zenker's diverticulum is a superior esophagus sphincter disease appropriate for surgical management in symptomatic cases. This treatment has undergone important changes in recent years.
Material and methods: A retrospective review was carried out on 16 patients treated in our department between 2001 and 2008. Conventional open surgery was used, as well as a combined endoscopic approach with stapler and CO_2 laser. Type of treatment, diverticulum size, operating time, oral feeding time, surgical complications, hospital stay, and occurrence of relapses were analyzed.
Results: The endoscopic approach was used in 8 patients, converting to conventional open surgery being necessary in 2 cases. Operating time was 90 min for the open approach and 45 for the endoscopic. Oral feeding could be reintroduced 36 h after open surgery and 24 h after endoscopic treatment. The average discharge date was 3.8 days after the surgery in the open group and 2 days in the endoscopic group. Complications appeared in 12.4% of the cases, all related to cervicotomy. There were 2 cases of relapse in the group treated with open surgery; one case was treated with the endoscopic approach and the other with the open approach.
Conclusions: The combined endoscopic approach offers good results in patients with symptomatic Zenker's diverticulum who can be under general anesthesia during the surgery. A conversion to open surgery with cervicotomy should be done when good endoscopic exposure is not possible.

*Corresponding author.
E-mail address: Dviros@santpau.cat (D. Virós Porcuna).

0001-6519/$ - see front matter

PALABRAS CLAVE
Divertículo de Zenker;
Tratamiento endoscópico;
Láser CO_2;
Grapadora quirúrgica

Tratamiento endoscópico combinado vs. abierto en el divertículo de Zenker

Resumen
Introducción: El divertículo de Zenker es una patología del esfínter esofágico superior susceptible de tratamiento quirúrgico en aquellos casos sintomáticos. Este tratamiento ha sufrido importantes cambios en los últimos años.
Material y métodos: Se realizó un estudio retrospectivo de 16 pacientes tratados en nuestro servicio entre 2001 y 2008. Se utilizó el abordaje quirúrgico abierto y el abordaje endoscópico combinado mediante grapadora endoscópica y láser. Se analizó el tipo de tratamiento llevado a cabo, tamaño del divertículo, tiempo quirúrgico, tiempo hasta la ingesta oral, complicaciones quirúrgicas, estancia hospitalaria y la presencia de recidiva.
Resultados: Se inició tratamiento endoscópico en 8 casos, siendo necesaria reconversión a técnica abierta en 2 casos. El tiempo operatorio fue de 90 min para el abordaje abierto y de 45 min en el endoscópico. La ingesta oral se reinició a las 36 horas en la abierta y a las 24 h en la endoscópica, siendo el alta hospitalaria a los 3,8 días en la abierta y a los 2 días en la endoscópica. Aparecieron un 12,4%de complicaciones en relación con la cervicotomía. Se presentó recidiva de la patología en 2 pacientes que se habían sometido a tratamiento abierto, un caso fue tratado con abordaje endoscópico y otro con abierto.
Conclusiones: El tratamiento endoscópico combinado parece ofrecer unos buenos resultados en aquellos enfermos con divertículo de Zenker sintomático que pueden ser sometidos a anestesia general. Si no es posible una buena exposición mediante el abordaje endoscópico se debe pasar a un abordaje mediante cervicotomía.

Introduction

Zenker's diverticulum is a posterior herniation of the pharyngo-esophageal mucosa at the junction of the 2 portions of the inferior constrictor muscle of the pharynx. It occurs most often in older people, with clinical manifestations of dysphagia and regurgitation of varying intensity. Although multiple etiopathogenic theories have been postulated to try to explain the formation of the diverticulum, there is only unanimity in pointing out that there is a problem in the cricopharyngeal muscle.[1]

At present, the only curative treatment for this condition is surgery. There have been attempts with botulinum toxin injections to temporarily relieve symptoms, but not with curative intent.[2]

Surgery has undergone significant changes in recent years. The more traditional surgery approaches the diverticulum through cervicotomy and performs its resection together with a myotomy of the inferior constrictor muscle. This process entails both a pharyngotomy and a cervicotomy, which requires longer hospitalization and, generally, nasogastric enteral feeding. This surgery has been modified to eliminate the pharyngotomy using various techniques like diverticulopexy, the imbrication of the esophagus to the diverticular pouch or the introduction of mechanical sutures to shorten hospitalization time and the risk of complications.

The main change has occurred with the reintroduction of endoscopic surgery, which, although it was described in 1917 by Mosher,[3] has attracted great interest in recent years. Mosher described the elimination of the common wall between the diverticulum and the esophagus constituted by the cricopharyngeal muscle, marsupializing the esophagus to the diverticulum; however, this technique was abandoned due to a high rate of mediastinitis. In 1960, Dohlman and Mattson[4] resumed this technique, presenting 100 patients treated without any major complication. They used diathermic coagulation to eliminate the common wall. In the 1980s, laser was introduced for the same purpose.[5] In 1993, Martin-Hirsch[6] and Collard[7] introduced the use of endoscopic staplers to divide the septum formed by the cricopharyngeal muscle.

In short, the open and the endoscopic techniques are currently the two main options for treating this entity. This study compares our results using open versus endoscopic surgery, introduced in our department in 2005.

Material and methods

A retrospective study was conducted on 16 patients diagnosed and treated in our center between 2001 and 2008. Most patients (n=11) were male and only 5 were female. Their average age at the time of surgery was 68.8, with a range between 37 and 89 years. The distribution of surgery by years is shown in Figure 1.

Fiberoptic laryngoscopy and esophageal-gastric barium transit were used in all cases for diagnosis of this entity

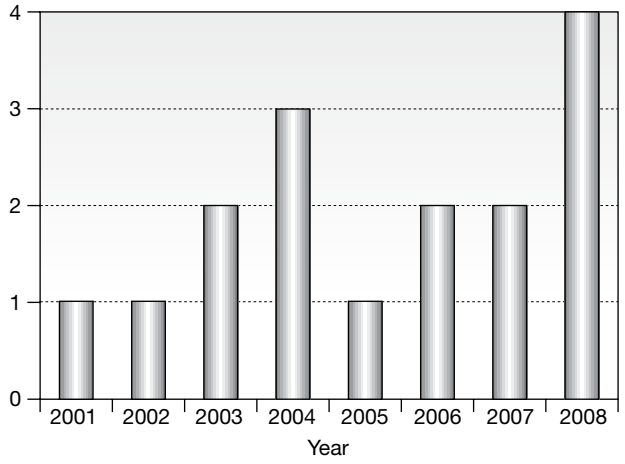

Figure 1 Distribution of cases operated by years.

after clinical suspicion. Esophageal manometry and upper endoscopy were performed in 2 cases to rule out other diseases of the digestive tract.

Two types of surgical approaches were used in the treatment: the external and the endoscopic. The external approach consisted of a cervicotomy, after placement of an endotracheal intubation tube with a balloon inflated in the diverticulum by laryngoscopy, followed by exposing and removing the diverticulum and performing a myotomy of the cricopharyngeal muscle. The endoscopic approach was based on affixing the diverticuloscope with its upper rim located in the esophagus and the lower in the lumen of the diverticulum. Next, a 25 mm EndoGIA-type endoscopic stapler was placed to divide the top part of the muscular septum between the esophagus and the diverticulum, followed by CO_2 laser sectioning of the remaining muscle fibers (since the stapler can not sever the most distal part) to obtain correct marsupialization of the diverticulum in the esophagus. This technique was introduced in our department in the year 2005.

We analyze the type of surgical approach, operation time, diverticulum size, time to oral intake, length of hospitalization, complications and the presence of disease recurrence with an average follow up of 2 years.

Results

Of the 9 patients operated on from the year 2005, surgery was initiated by endoscopic approach in 8; it was necessary to convert to an open approach in 2 cases due to poor endoscopic exposure because of the anatomic features of the patient. For the total of 16 patients, 62.5% (n=10) of surgeries were performed using an open approach and 37.5% (n=6) using an endoscopic approach. In the period since the introduction of the endoscopic approach in our department, 66.6% (6/9) of the surgeries were performed with this approach.

The average operating time for the external approach was 90 min, while it was 45 min for the endoscopic. The average size of the diverticula treated by external approach was 3.25 cm (1.5-5), while the average size of those treated by endoscopy was 3.13 cm (2-4.5). The average time until oral intake was 36 h for open surgery (24-48), while oral feeding was resumed within 24 h in all cases for endoscopic surgery. Hospital discharge took place after 3.8 days for the open (3-6) surgery, while it was after 2 days in all cases for the endoscopic.

No complications occurred in cases treated by the endoscopic approach, while one case (6.2%) of cervical hematoma and one case of cervical seroma (6.2%) appeared in the approach with cervicotomy.

In 2 patients (12.4%), there was recurrence of the disease; both cases were treated by open surgery. The first case appeared 4 years after the first surgery and was treated by another open approach. The patient is currently asymptomatic, 2 years after the second surgery. The second case had a recurrence a year after surgery, which was treated with endoscopic approach; the patient is asymptomatic after 3 years.

Discussion

Zenker's diverticulum is an uncommon disease that lies in a border area between different specialties. For this reason, in our environment, it is hard to find series with a significant number of patients treated for this entity at the ENT services.

In our center, once there is clinical suspicion, diagnosis is performed with fiberoptic laryngoscopy. It is sometimes possible to see the sign of the rising tide,[8] which consists of the emergence of saliva ascending up the retrocricoid region when the patient has swallowed (Figure 2). Subsequently, a request is placed for an esophageal-gastric barium transit, a test which gives the final diagnosis (Figure 3); when the diverticulum is symptomatic, surgery is arranged. In cases of suspicion of esophageal pathology, it is necessary to carry out upper endoscopy or esophageal manometry.

The treatment of Zenker's diverticulum must achieve 2 objectives: the elimination of the reservoir that traps food particles and myotomy of the cricopharyngeal muscle to try to eliminate the cause that has led to the formation of the diverticulum.[9] The classic treatment consists of a cervicotomy to approach the diverticulum and then excising it, together with myotomy. To avoid pharyngotomy, and the consequent risk of infection or fistula, various techniques on the diverticulum have been proposed, such as diverticulopexy or imbrication of the diverticular pouch to the esophagus.

The endoscopic approach enables the treatment this condition by achieving a marsupialization of the diverticulum and a myotomy of the inferior constrictor muscle without external incisions and without the need for pharyngotomy.

Studies comparing[9-11] open approaches with endoscopic surgery find that, with the latter, external scarring is avoided, surgical time and postoperative pain are reduced, oral intake may start earlier and hospital stay is less. In our series, the average operating time was lower (45 vs 90 min), oral intake was resumed after 24 h in the endoscopic approach and after 36 h in the open, and

Figure 2 Saliva ascending by the retrocricoid region after swallowing (sign of the tide).

Figure 3 Esophageal-gastric barium transit diagnosis of Zenker's diverticulum.

the average hospital stay was 2 days compared with 3.8 days in external approaches. Postoperative pain was not measured, although the reduced need for dissection in the endoscopic approach probably implies less postoperative algia.

The results of these different surgical approaches, as well as posterior quality of life,[11] are comparable with published series of patients. Bonavina[10] conducted a retrospective study of 297 patients, 181 who had undergone endoscopic treatment with endoscopic stapler and 116 with external treatment by diverticulectomy and myotomy. He obtained 92%improvement with the endoscopic approach, as against 94% with the open approach. With respect to disease relapses, they occurred in 5% of patients in the open approach, while in the endoscopic in 6.6%[12]

In our series, we obtained a recurrence rate of 12.4% (n=2), cases that had previously been treated by open surgery. These were treated successfully with a new open approach in one case and an endoscopic approach in the second case. Today, it is accepted that endoscopic treatment is satisfactory for the treatment of relapses of this pathology,[16] and it even eliminates the risk to the recurrent laryngeal nerve in the second cervicotomy if the left side of the patient is approached.[17]

Complications are less common in endoscopic surgery than in open.[12] In our series, we found no complications using the endoscopic approach, versus 12.4% (n=2) of minor complications with the open approach related to cervicotomy.

Regarding the surgical technique of endoscopic surgery, it seems that the time for reintroducing oral intake is less, as is also the case with hospitalization time, with the use of endoscopic stapler versus the use of CO_2 laser surgery.[12] The results did not differ between these 2 techniques. The occurrence of complications does not present differences either,[13,14] although there is greater certainty of incision depth with the endoscopic stapler than with the laser.

In our centre, we have used a combined technique based on the placement of 25 mm EndoGIA and completing the excision of the rest of the muscular septum after it was divided. In addition, the rest of the fibers of the cricopharyngeal sphincter were sectioned with CO_2 laser (Figure 4) because the distal ends of the stapler do not cut. We believe that a good marsupialization of the diverticulum is important, as early recurrences of endoscopic surgery are usually caused by an insufficient section of the inferior constrictor muscle.

Some series[10,15] find that the endoscopic approach through EndoGIA is contraindicated in diverticula of less than 3 cm due to the difficulty in positioning the stapler because the septum is so small. In our series, the average size of the diverticulum was 3.13 cm, measured in the transit, being used in diverticula of less than 3 cm. Carrying out the combined technique by endoscopy, we see no contraindication to the endoscopic treatment related to size of the diverticulum, as long as it is present and there is a separation between the diverticulum and the esophagus.

It must be kept in mind that the endoscopic approach cannot be performed in all patients. The proper exposure of the diverticulum and the esophagus is a necessary element in this surgery. This exposure may be limited by problems of mouth opening or cervical flexion and extension; we must not forget that this disease occurs most often in advanced age. In these cases, it is necessary to carry out the conversion of the surgery and use the open approach. In our review, this was necessary in 25% (2/8) of the cases.

Treating this condition through flexible endoscopy has been described since 1995.[18] This process has the advantage of not requiring general anesthesia or cervical hyperextension. It presents more variable results and usually requires several sessions to achieve the elimination of the septum between the diverticulum and esophagus.[19] Currently, this treatment

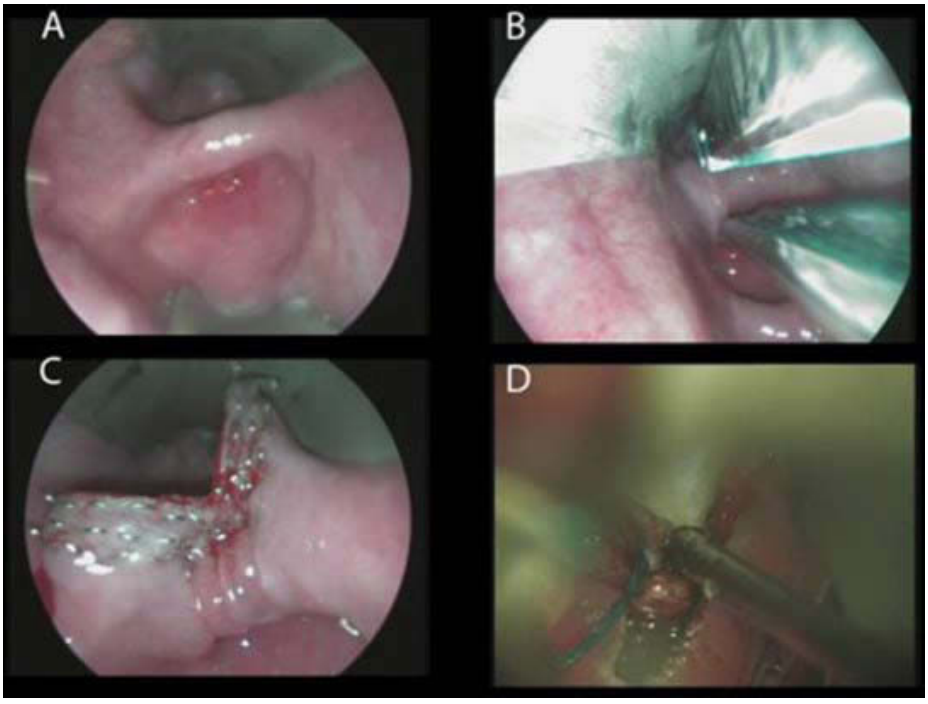

Figure 4 Surgical steps in the endoscopic approach: A) Endoscopic exposure. B) Placement of endoscopic stapler. C) Section of septum through EndoGIA. D) Section of the remaining septum with CO_2 laser.

is carried out in few centers, but it may be a good option for those patients with symptomatic Zenker's diverticulum who cannot undergo general anesthesia.

Conclusions

In cases of patients with clinically symptomatic Zenker's diverticulum who can undergo general anesthesia, the use of endoscopic surgery is safe and as effective as open surgery. If good exposure of the diverticulum and the esophagus cannot be obtained, then there should be a conversion to an open technique. Although our series of endoscopic treatment is short, we believe the technical combination of EndoGIA and laser is adequate for attempting to obtain the best possible results.

Conflict of interests

The authors declare no conflict of interests.

References

1. Peters JH, Mason R. The physiopathological basis for Zenker's diverticulum. Chirurg. 1999;70:741-6.
2. Spinelli P, Ballardini G. Botulinum toxin type A (Dysport) for the treatment of Zenker's diverticulum. Surg Endosc. 2003;17:660.
3. Mosher HP. TWebs and pouches of the esophagus: Their diagnosis and treatment. Surg Gynecol Obstet. 1917;25:175-87.
4. Dohlman G, Mattson O. The endoscopic operation for hypopharyngeal diverticula: Aroentgen cinematographic study. Arch Otolaryngol Head Surg. 1960;71:744-52.
5. van Overbeek JJ. Meditation on the pathogenesis of hypopharyngeal (Zenker's) diverticulum and a report of endoscopic treatment in 545 patients. Ann Otol Rhinol Laryngol. 1994;103:178-85.
6. Martin-Hirsch DP, Newbegin CJ. Autosuture GIA gun: A new application in the treatment of hypopharyngeal diverticula. J Laryngol Otol. 1993;107:723-5.
7. Collard JM, Otte JB, Kestens PJ. Endoscopic stapling technique of esophagodiverticulostomy for Zenker's diverticulum. Ann Thorac Surg. 1993;56:573-6.
8. Pórió S, Dernis HP, Monceaux G, Angelard B, St. Guily JL. The ''sign of the rising tide'' during swallowing fiberoscopy: A specific manifestation of Zenker's diverticulum. Ann Otol Rhinol Laryngol. 1999;108:296-9.
9. Smith SR, Genden EM, Urken ML. Endoscopic stapling technique for the treatment of Zenker diverticulum vs. standard open-neck technique: A direct comparison and charge analysis. Arch Otolaryngol Head Neck Surg. 2002;128:141-4.
10. Bonavina L, Bona D, Abraham M, Saino G, Abate E. Long-term results of endosurgical and open surgical approach for Zenker diverticulum. World J Gastroenterol. 2007;13:2586-9.
11. Wirth D, Kern B, Guenin MO, Montali I, Peterli R, Ackermann C, et al. Outcome and quality of life after open surgery versus endoscopic stapler-assisted esophagodiverticulostomy for Zenker's diverticulum. Dis Esophagus. 2006;19:294-8.
12. Chang CY, Payyapilli RJ, Scher RL. Endoscopic staple diverticulostomy for Zenker's diverticulum: Review of literature and experience in 159 consecutive cases. Laryngoscope. 2003;113:957-65.
13. Miller FR, Bartley J, Otto RA. The endoscopic management of Zenker diverticulum: CO2 laser versus endoscopic stapling. Laryngoscope. 2006;116:1608-11.

14. Chang CW, Burkey BB, Netterville JL, Courey MS, Garrett CG, Bayles SW. Carbon dioxide laser endoscopic diverticulotomy versus open diverticulectomy for Zenker's diverticulum. Laryngoscope. 2004;114:519-27.
15. Peracchia A, Bonavina L, Narne S, Segalin A, Antoniazzi L, Marotta G. Minimally invasive surgery for Zenker diverticulum: Analysis of results in 95 consecutive patients. Arch Surg. 1998;133:695-700.
16. Scher RL. Endoscopic staple diverticulostomy for recurrent Zenker's diverticulum. Laryngoscope. 2003;113:63-7.
17. Huang B, Payne WS, Cameron AJ. Surgical management for recurrent pharyngoesophageal (Zenker's) diverticulum. Ann Thorac Surg. 1984;37:189-91.
18. Mulder CJ, Den Hartog G, Robijn RJ, Thies JE. Flexible endoscopic treatment of Zenker's diverticulum: A new approach. Endoscopy. 1995;27:438-42.
19. Ferreira LE, Simmons DT, Baron TH. Zenker's diverticula: Pathophysiology, clinical presentation, and flexible endoscopic management. Dis Esophagus. 2008;21:1-8.