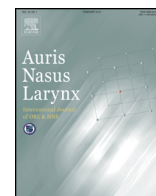




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Long-term symptom control after endoscopic laser-assisted diverticulotomy of Zenker's diverticulum



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ABSTRACT

Objective: To assess the long-term outcome after endoscopic laser-assisted diverticulotomy.

Methods: The medical files of patients who underwent endoscopic Zenker's diverticulum (ZD) surgery were reviewed retrospectively. Patients were interviewed using a questionnaire which assessed symptoms, other relevant disorders and satisfaction after the surgery.

Results: Mean follow-up period from 62 surgeries was 100 months (range 11–216 months). Follow-up data were obtained from 34 patients (response rate: 55%) in total. The surgery resulted in a significant reduction of symptoms (regurgitation, dysphagia and globus sensation). In four cases (12%) a postoperative impairment of swallowing solid food was reported, whereas, persisted difficulty of swallowing liquids was observed in two patients (6%). There was no reported case of impairment associated with everyday habits. The majority of patients were satisfied with the overall outcome of the surgery ($n = 31$, 91%).

Conclusion: The endoscopic laser-assisted diverticulotomy is an effective method of treating Zenker's diverticulum. The presented long-term results confirm that this technique offers a very high degree of symptom relief and patient's satisfaction.

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1. Introduction

The pharyngoesophageal or Zenker's diverticulum (ZD) is created by herniation of the mucosa and submucosa through the weak area of Killian's dehiscence in the pharyngoesophageal segment [1]. Abnormalities of the physiology of swallowing and local anatomical factors as well contribute to the development of ZD [2–4]. The treatment of ZD is surgical, whereby the task of the intervention is the complete division of the cricopharyngeal muscle bridge. Previously, various surgical methods used for the treatment of ZD were been evaluated in terms of surgical time, hospitalization time, complication rate and recurrence rate [5–7]. However, an important parameter of the success of the

treatment is the long-term symptom relief and patient's satisfaction after surgery. Long-term symptomatic outcome and patient's satisfaction are parameters that decline from the typical “hard data” that the clinicians are familiar with. However, these parameters reflect the success of the treatment in the eyes of the patient and the appreciated functional outcome. Health-related quality of life of the patient should be the primary goal of treatment. Thus, the use of patient's satisfaction surveys has increased and became more widely accepted as important data were used to determine patient functional outcomes [8].

The aim of this study was to evaluate the postoperative outcome of the surgery and the satisfaction of ZD patients treated with endoscopic laser-assisted diverticulotomy through a long-term follow-up.

2. Methods

The medical files and surgical reports of endoscopic laser-assisted ZD surgeries performed between 1983 and 2011 at an

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Table 1

Questionnaire on symptoms, other related disorders and patient satisfaction after treatment of Zenker's diverticulum (original in German, translation by the authors).

A. Questions about postoperative symptoms (to be answered with yes or no)	
1.	Did you suffer in the time after surgery or do you currently suffer from swallowing difficulties?
2.	Did you suffer in the time after surgery or do you currently suffer from fluid or food coming up into your mouth?
3.	Did you suffer in the time after surgery or do you currently suffer from foreign body feeling in the throat?
4.	Did you suffer in the time after surgery or do you currently suffer from sore throat?
5.	Did you or another person notice in the time after surgery or do you or another person currently notice bad breath from your mouth?
6.	Did you lose in the time after surgery or do you lose currently unwanted weight?
7.	Did you suffer in the time after surgery or do you currently suffer from irritation of the throat or cough?
8.	Did you suffer in the time after surgery or do you currently suffer from shortness of breath?
9.	Did you suffer in the time after surgery or do you currently suffer from increased salivation?
B. Questions about other related disorders (to be answered with yes or no):	
1.	Did you have in the time after surgery or do you currently have problems with intake of solid food and you think this is due to the surgery?
2.	Did you have in the time after surgery or do you currently have problems with intake of liquid food and you think this is due to the surgery?
3.	Did you have in the time after surgery or do you currently have problems with looking into the daily habits and you think this is due to the surgery?
4.	Did you have in the time after surgery or do you currently have problems with falling asleep or sleeping through the night and you think this is due to the surgery?
5.	Did you or your dentist have in the time after surgery noticed damages on your teeth and you or the dentist think this is due to the surgery?
C. Questions about patient's satisfaction (to be answered with yes or no):	
1.	Are you satisfied with your general condition after the surgery and currently?
2.	Are you satisfied with the overall outcome of the surgery?
3.	Would you propose the endoscopic laser-assisted diverticulotomy to a relative with the same diagnosis

academic tertiary referral center were reviewed retrospectively. The study was approved by the Ethics Commission of Cologne University's Faculty of Medicine. Patient data including age, sex, size of the diverticula and preoperative symptoms were analyzed. The second part of the study consisted of a telephone interview of the patients. For this purpose a questionnaire which assessed symptoms, other relevant disorders and satisfaction after the surgery was used. The telephone interview was carried out in the period March–April 2012 by one author of this study (M.F.). Data of these patients regarding surgical technique, length of hospital stay and related complications were already reported in a previous publication [5].

The diagnosis of ZD had been based on the control dynamic contrast radiography with diatrizoic acid (Gastrografin[®], Bayer Schering, Germany) of the hypopharynx and the esophagus. The size of the diverticulum was defined by the maximal depth of the diverticular sac on the preoperative dynamic contrast radiography.

The patients were treated using the carbon dioxide (CO₂) laser endoscopic–microscopic diverticulotomy in a standardized way using the spreadable diverticuloscope. A nasogastric tube for postoperative feeding was placed at the beginning of the intervention. Using an operating microscope (OPMI-MD; Zeiss, Germany) the cricopharyngeal bridge and the bottom of the diverticulum sac was exposed. A CO₂ laser device (Illuminia 730, Heraeus Lasersonics Inc., Germany until 2001; Sharplan 1041S, Sharplan Lasers, Germany after 2001) was set on a working distance of 400 mm. Next step was to empty the diverticular sac from any food debris and then a moist swab was placed to protect the rest of mucosa from accidental laser injury. The muscular bridge was then transected in the midline using the CO₂ laser (2–8 W, super pulse mode) up to the last visible muscle fibers, without entering the mediastinal fat. More details to the surgical procedure are given in our previous publication [5].

Postoperatively and before removal of the tube in the postoperative phase, control dynamic contrast radiography was performed. All patients received intraoperatively intravenous antibiotics (usually ampicillin–sulbactam or clindamycin in the case of allergy to penicillin), which were continued at least until the removal of the nasogastric tube. A gastric protection therapy with proton pump inhibitor was applied as well.

In order to evaluate the postoperative symptom relief, other relevant disorders and satisfaction of the patients after surgery,

data were obtained through a telephone interview. For this purpose we developed a questionnaire that includes the main symptoms and disorders of patients with ZD. The questionnaire was formulated based on the Gastro-Intestinal Quality of Life Index (GIQLI) questionnaire but was adapted for patients treated for ZD (Table 1) [9].

Statistical analysis was completed using SPSS statistical software version 20 for Windows (SPSS Inc., Chicago, IL). Statistical analysis was performed using non-parametric tests. A *p*-value of <0.05 was considered statistically significant.

3. Results

A total of 72 patients underwent surgical treatment for Zenker's diverticulum in our institution between 1983 and 2011. Sixty-two patients (86%) received laser-assisted endoscopic surgery and 10 patients (14%) an open surgery through transcervical approach. All patients who underwent endoscopic laser-assisted diverticulotomy were included in this study (*n* = 62). The majority of patients were males (77%, *n* = 48), whereas, the females were represented with a smaller number of cases (23%, *n* = 14). The mean age of the study group was 66 years (range 43–82 years).

A total of five patients (8.1%) underwent more than one surgery because of symptomatic recurrence of the diverticulum. In three cases a single successful endoscopic revision operation was necessary; in two patients a second endoscopic revision was needed. One patient developed mediastinitis after the second endoscopic revision operation and therefore a third revision via transcervical approach was performed. Four more patients were operated for recurrence at our hospital after an initial surgical treatment of ZD at other institutions.

Reported preoperative symptoms included regurgitation, dysphagia, globus sensation, cough, loss of weight, sore throat, hypersalivation and dyspnea. Regurgitation was the most common preoperative symptom, presenting in 47 of the study patients (76%), followed by dysphagia in 42 patients (68%). The patients' symptoms are shown in an overview in Table 2.

The size of the diverticula ranged from 1 to 8 cm with a median size of 3.1 cm. The cases with a globus sensation generally presented with a smaller diverticulum sac (2.7 cm, *n* = 21) compared with patients without this symptom (3.4 cm, *n* = 41, *p* = 0.04). In contrast, there was no statistically significant

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