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Original article

# Importance of malnutrition and associated diseases in the management of Zenker's diverticulum



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## ABSTRACT

**Objectives:** To study the impact of malnutrition on a population treated for Zenker's diverticulum and to look for the causes of persistence or recurrence of dysphagia after endoscopic surgery.

**Material and methods:** This retrospective study included 30 patients with Zenker's diverticulum treated by endoscopy. All swallowing disorders and manifestations of malnutrition and postoperative improvement in and/or recurrence of symptoms were noted.

**Results:** Nutritional status was evaluated for 26 patients. Before surgery, 54% suffered from malnutrition, which was severe in 31%; 28.6% of the cases with malnutrition showed postoperative complications, versus 8.3% of cases without baseline malnutrition. Ninety percent of patients ( $n = 27$ ) declared complete resolution of symptoms. Nine patients presented recurrence of dysphagia, including 6 with recurrence of Zenker's diverticulum and 3 with, respectively, inclusion body myopathy, esophageal hypertonia and central disease.

**Conclusion:** Malnutrition should be quantified and treated before and after surgery for Zenker's diverticulum to prevent complications and decrease mortality. Associated pathologies should be systematically screened for, especially in case of recurrence of swallowing disorder without recurrence of Zenker's diverticulum.

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## 1. Introduction

Zenker's diverticulum develops in the pharyngo-esophageal mucosa in Killian's dehiscence, a fragile area [1], contoured by the oblique fibers of the inferior pharyngeal constrictor muscle above and the horizontal fibers of the cricopharyngeus muscle below. Pathophysiology is little known. Impaired relaxation of the cricopharyngeus muscle, which is a major component of the superior esophageal sphincter, associated with muscle weakness adjacent to Killian's dehiscence may induce abnormally elevated pharyngeal pressure during the passage of food [2], leading to formation of a diverticulum.

Onset of Zenker's diverticulum is classically in the 6th to 8th decade of life, mainly affecting male subjects. Prevalence is reported as ranging from 0.01% to 0.1%, but is probably underestimated due to the long asymptomatic phase [3].

The most frequent functional signs are dysphagia, regurgitation of undigested food, chronic cough, halitosis, cervical borborygmi,

inhalation pneumopathy and weight loss [3,4]. These symptoms, associated with the "rising tide" sign on swallowing fiberoptic endoscopy, orient diagnosis [5]. Pharyngo-esophageal transit with a contrast-filled pouch confirms the presence of diverticulum [3]. Malnutrition is one result of dysphagia [6], and recognized as aggravating morbidity in elderly patients [7]. To the best of our knowledge, there have been no studies analyzing malnutrition and its impact on the treatment of Zenker's diverticulum.

Treatment in Zenker's diverticulum is well-codified. Extramucosal myotomy of the cricopharyngeus muscle by cervicotomy, with or without associated diverticulopexy or diverticulectomy, used to be the reference attitude [1] until, over the last 20 years, endoscopic techniques (transmucosal myotomy) were developed. These techniques comprise diverticulum marsupialization in the upper third of the esophagus by endoscopic sectioning of the pharyngo-esophageal septum, using various procedures: CO<sub>2</sub> laser [8], UltraCision® scalpel [9], or autosuture staple gun [10]. With over 90% symptom resolution, on both external and endoscopic approaches, the literature agrees on the efficacy of these techniques [8–11]. However, no studies have determined the causes of persistent or recurrent dysphagia in the absence of recurrence of diverticulum.

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The present study sought to determine the incidence and impact of malnutrition in Zenker's diverticulum and factors for persistent or recurrent dysphagia following endoscopic treatment.

## 2. Patients and methods

A retrospective study was performed on the files of patients receiving endoscopic treatment for Zenker's diverticulum, confirmed on pharyngo-esophageal transit, between June 1995 and June 2012 in the ENT department of Angers University Hospital (France). Files were retrieved using the codes HDPE 001 and HDPE 002 of the medical IT system (PMSI: *programme de médicalisation des systèmes d'information*). Only patients managed endoscopically were included.

Functional signs were assessed preoperatively, at 6 weeks post-operatively and at post-treatment follow-up. On the diagnostic criteria for malnutrition defined by the French Health Authority (HAS: *Haute Autorité de santé*) and shown in Table 1, body mass index and percentage weight loss were systematically calculated where data were available. Preoperative albuminemia was recorded. Patient history, time to refeeding and complications were noted. The Charlson comorbidity index, predicting overall survival and widely used in clinical studies in geriatrics, was systematically calculated.

Surgery systematically began with esophagoscopy to empty the diverticulum, measure its depth, and rule out neoplasia. A bivalve Weerda diverticuloscope (Storz®) was then positioned, with the anterior valve in the esophagus and the posterior valve in the diverticulum, exposing the entire height of the septum. Depending on the technique used, an autosuture staple gun (GIA, Endo-GIA Universal® 12 mm, Tyco Healthcare, USA) or an UltraCision® scalpel (Harmonic ACE, Ethicon Endo-Surgery®, Mexico) were introduced, using a 0°C endoscope; if CO<sub>2</sub> laser (Sharplan Laser®, Israel) was used, an AcuSpot microscope was positioned in the axis of the pharyngo-esophageal wall. The diverticulum septum was sectioned, marsupializing the diverticulum within the esophagus. Techniques were in some cases associated.

In the absence of any signs of complication (fever, interscapular pain, subcutaneous emphysema), feeding was resumed the day after surgery, beginning with liquid diet. Smooth foods were then prescribed for 1 week to 10 days. Discharge home was authorized when there was no more major swallowing disorder (false passage, persistent blockage) or complications. Postoperative pharyngo-esophageal transit was performed only in case of suspected complications, residual symptoms 6 weeks postoperatively or recurrence of dysphagia. Recurrence of Zenker's diverticulum was confirmed by an association of dysphagia or regurgitation after initially effective treatment and an aspect of diverticulum at the upper limit of the esophagus on pharyngo-esophageal transit.

Statistical analysis used SPSS software. Comorbidity was assessed on age-adjusted Charlson index. Pearson Chi<sup>2</sup> and

**Table 1**  
Diagnostic criteria for malnutrition according to the French Health Authority (HAS: *Haute Autorité de santé*) [17].

Criteria	Malnutrition	Severe malnutrition
Weight loss	≥ 5% in 1 month or ≥ 10% in 6 months	≥ 10% in 1 month or ≥ 15% in 6 months
BMI	< 21 kg/m <sup>2</sup>	< 18 kg/m <sup>2</sup>
Albuminemia <sup>a</sup>	< 35 g/L	< 30 g/L
Global MNA® score	< 17	-

BMI: body mass index; MNA®: Mini Nutritional Assessment®.

<sup>a</sup> To be interpreted according to inflammatory status on C-reactive protein assay.

**Table 2**  
Distribution of malnutrition criteria in the 14 malnourished patients.

	BMI ≥ 21 kg/m <sup>2</sup>	BMI < 21 kg/m <sup>2</sup>
Weight loss ≥ 10% in 6 months	4	1
Albuminemia < 35 g/L	2	1
Weight loss ≥ 5% in 1 month and albuminemia < 35 g/L	0	1
BMI < 21 alone	0	5
Total malnourished patients (including severe)	6 (4)	8 (4)

BMI: body mass index.

Mann-Whitney tests were used to assess results according to the assessment criteria.

## 3. Results

Thirty patients, 17 male and 13 female, with a mean age of 77.4 years (range, 56 to 92 years), were included and followed up for a mean 6.5 years (range, 1 to 14 years). The Charlson index was calculated in all cases and found positive in 8: two scoring 4, two 5, three 6 and one 8.

Nutritional status could be assessed for only 26 of the 30 patients. Malnutrition was found in 14 cases (54% of those assessed), and was severe in 8 (31% of those assessed). The 8 patients with Charlson index between 4 and 8 all showed malnutrition, including 5 with severe malnutrition. Table 2 presents distribution according to malnutrition criteria. Mini Nutritional Assessment® (MNA®), however, could not be made. Severe malnutrition was diagnosed in 4 patients for BMI < 18 kg/m<sup>2</sup> (associated with albuminemia < 30 g/L in 1 case and > 15% weight loss over 6 months in another), and for ≥ 15% weight loss in 4 patients. Table 3 shows complications, time to resume feeding and hospital stay according to nutritional status. In case of malnutrition, the complications rate was 28.6% (versus 8.3% without malnutrition;  $P=0.213$ ). Complications comprised: 1 death secondary to aspiration pneumonia; 1 esophageal perforation (managed medically by enteral feeding and antibioprophyllaxis for 6 days in hospital and continued at home after resumption of oral feeding once healing was confirmed on control pharyngo-esophageal transit at 10 days); 1 transient recurrent nerve palsy; and 1 case of loss of autonomy with delayed resumption of oral feeding. In case of severe malnutrition, time to resumption of feeding and hospital stay were longer, at respectively 2.6 versus 2.3 days and 4.2 versus 3.8 days.

At the 6-week postoperative check-up, 90% of patients reported complete relief of symptoms, and 3 partial relief with persistent symptoms at 3 and 6 months: 1 Barrett's esophagus, 1 persistent odynophagia, and 1, with severe malnutrition, unable to resume normal feeding.

At follow-up, 9 of the 30 patients (30%) showed progressive recurrence of swallowing disorder. Six had recurrent diverticulum, and the other 3 had associated pathology inducing dysphagia.

Three of the 6 patients with recurrence of diverticulum had been treated by isolated autosuture, 2 by associated autosuture and CO<sub>2</sub> laser and 1 by CO<sub>2</sub> laser alone. Recurrence in case of autosuture was 37.5%, versus 13.6% for the other techniques taken together ( $P=0.175$ ). Mean time to recurrence was 9 months (range, 5 months to 13 years); 3 occurred within the first year, including 2 managed by autosuture, and all the others after 5 years. Recurrence was systematically treated by endoscopy (autosuture, laser, both, or UltraCision®), with no further recurrence during follow-up (2 to 11 years).

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