Outcome after accidental food bolus induced esophageal perforation

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Abstract

Objectives: Food bolus induced esophageal perforation is much more seldom than iatrogenic and emetic esophageal rupture. We present results from a non-operative treatment approach as well as long-term functional outcome.

Materials and methods: Medical records of 10 consecutive patients with food bolus induced esophageal perforation from October 2007 to May 2015 were retrospectively registered in a database. Six patients developed perforation related to endoscopic removal of impacted food, and four during esophageal passage of bone, meat, or bread. Treatement was sealing the perforation by stenting (n=7) with (n=4) or without (n=3) chest tube drainage, chest tube drainage (n=1), observation (n=1) and gastroesophageal resection (n=1) because of concomitant emesis of gastric effluent. After median 51 months nine patients reported about dysphagia, fatigue and health related quality of life.

Results: Ten patients aged median 62.5 years (range 30 – 85) stayed in our hospital for 12 days (5 – 68 days). There was no treatment-related mortality. Nine patients were alive 63 months (18 – 126) after perforation. Five needed restenting (leakage, migration, impacted stent), two had drainage of a mediastinal abscess, one patient developed a transient esophagobronchial fistula. Dysphagia score was 0 (0 – 1). One patient developed dysphagia for some solid food. Scores for fatigue and HRQoL was similar to a Norwegian reference population.

Conclusion: Treatment mainly with a non-operative approach occurred without mortality. Complications was handled by restenting and abscess drainage. Functional result for dysphagia was excellent. Interesting results on fatigue and HRQoL must be interpreted with caution because of a limited patient material.

Keywords: food bolus, perforation, stenting, drainage, dysphagia, fatigue, quality of life

Introduction

Esophageal perforation is a condition with considerable morbidity and mortality. In a review of 75 studies of 2971 patients [1] pooled immediate mortality was 11,9%, divided into 14,8%, 13,2% and 2,1% for spontaneous, iatrogenic and foreign body induced perforations, respectively. The corresponding frequency of these different types of esophageal perforations have been reported to be 59%, 15% and 12%, whilst the remaining 14% constitute trauma (9%), operative injury (2%), tumor (1%) and other causes (2%) [2]. Impacted food bolus in the esophagus in adults account for 60% of upper gastrointestinal foreign bodies, particularly pieces of meat, that upon endoscopic retrieval indirectly cause the rupture [3, 4]. The part of food bolus containing sharp pointed bones may, in addition, cause perforation simply during passage into the stomach. Most food impactions will pass spontaneously but endoscopic intervention is necessary in 10-20% of the patients. Incidence data on esophageal food impaction is lacking, but a health maintenance population study in California [5] reported an estimated annual incidence rate of 13 episodes per 100.000. Esophageal segments prone to foreign body perforation are zones of narrowing from compression by aorta, left main bronchus and hiatus as well as strictures and stenosis caused by benign and malign disease, respectively. Eosinophilic esophagitis also is a considerable risk factor for food impaction, that has been reported in 33% of such patients [6]. In a recent meta-analysis [7] only four studies were referred to [8-11] regarding short-term treatment outcome, that was dominated by a surgical approach based on primary repair or resection [8-10] compared with non-operative treatment [11]. Consequently, there is a need to focus more on initial treatment and, not-least, long-term outcome of accidental foreign body induced esophageal perforation, which usually is caused by ingestion of food bolus [4]. The aim was to report results for 10 consecutive patients with this diagnosis treated at Oslo University Hospital from 2007 to 2015. The patients' long-term well-being were examined with validated scores for dysphagia, fatigue and health-related quality of life.

Materials and Methods

Data from medical records of all 53 consecutive patients treated for esophageal perforation at Oslo University Hospital, Ullevål, from February 2007 to May 2015, were retrospectively registered in an Excel-created database. The etiology of the perforations was iatrogenic in 22 patients (41,5%), foreign body (food bolus) in 10 (19%), postemetic in 17 (32%) and miscellaneous in four (blunt trauma (n=2), perforated esophageal ulcer, cancer) (7.5%). The overall 30-day mortality was 9%. In this paper we focused on the group of 10 patients with accidental foreign body perforation related to ingestion of bone and large pieces of meat, bread and orange that directly or indirectly upon instrumental removal, caused esophageal perforation. The diagnosis was made by one or more of the following examinations; computed tomography (CT) scan with oral contrast of the thorax and upper abdomen, oral contrast enema and upper gastrointestinal endoscopy. Treatment was initially mainly based on combinations of antibiotics, sealing of the perforation by stenting, transthoracic drainage of the contaminated mediastinum and pleural cavities, usually with large diameter chest tube (usually 28-32 Fr). In one case both transthoracic external pleural drainage of effusion and internal catheter mediated drainage of a contained mediastinal abscess that communicated with the site of perforation were used. In another case open surgery with resection of the perforation and primary esophagogastric anastomosis was performed. The self expanding metal stents (SEMS) used for sealing of the perforation were fully covered (Wallflex , Niti-S, Polyflex, Ultraflex, Evolution esophageal) and partially covered (Wallflex, Endoflex). The preferred lengths varied from 10-15 cm and body diameter from 2.1 – 2.8 cm.

Nine patients still alive (90%) at time of inquiry in August 2016, gave a written answer about dysphagia, fatigue scores and health-related quality of life (HRQoL). Ogilvie`s dysphagia score [12] from 0 – 4 was used to determine ability to eat normal diet (score 0), swallow some solid foods (1) or only semi-solid foods (2) or liquids only (3) or unable to swallow (4) (total dysphagia).

Total fatigue score consists of 11 items of graded questions with score 0–3 per question, which is the sum of physical fatigue (7 items) and mental fatigue (4 items). This score has been validated in a Norwegian general population [13]. The respective scores for total, mental and physical fatigue are 0–33, 0–21 and 0–12, and the higher score the more fatigue. The items of physical (1–7) and mental (8–11) fatigue were: 1)

Do you have problems with tiredness? 2) Do you need to rest more? 3) Do you feel sleepy or drowsy? 4) Do you have problems with starting things? 5) Are you lacking in energy? 6) Do you have less strength in your muscles? 7) Do you feel weak? 8) Do you have difficulty concentrating? 9) Do you have problems thinking clearly? 10) Do you make slips of the tongue when speaking? 11) How is your memory?

Self-reported HRQoL was assessed with the short form 36 (SF-36) (version 2), which is a generic HRQoL questionnaire consisting of 36 items, of which 35 are grouped into the following eight health domains: (1) physical functioning (PF), (2) social functioning (SF), (3) role limitations due to physical problems (RP), (4) role limitation due to emotional problems (RE), (5) mental health (MH), (6) vitality (VT), (7) bodily pain (BP) and (8) general health perception (GH). Each domain is graded on a scale of 0-100, and the higher the score the better the HRQoL. The validity and reliability of the SF-36 form have been demonstrated for a number of countries including Norway (version 1) [14]. The data were compared with published norms from 2323 individuals in the general population. Although there are differences in the grading of some questions in version 2 versus version 1 of the SF-36 questionnaire for the four health dimensions 3, 4, 5 and 6, the mean values on a group level are comparable.

Student's t- test was used for comparison of fatigue and HRQoL scores between the patients and respective Norwegian population based cohorts [13,14] and p-values of or below 0.05 was considered statistically significant.

The study was approved by the regional ethical committee (2012/1604/REK south-east (D) Norway).

Results

The patient material consisted of 10 patients of equal gender ratio with median age 62,5 years (range 30 – 85). The length of stay at our hospital was median 12 days (range 5 – 68 days). Three patients were transferred to their local hospital, whilst the forth patient that had had a bilateral lung transplantation owing to emphysema, was transferred to the National Hospital. There was no 30-day and overall in hospital mortality, including the patients' subsequent hospital stay. After a median observation time (April 2018) of 63 months (range 18 – 126 months) 9 out of 10 patients (90%) were alive. The lung transplanted patient aged 65 died 18 months later from pancreatic cancer.

Initial treatment

Characterisation of the patient material, including type of treatment and their major complications, are summarised in Table 1. Half the patients had increased risk for perforation from esophageal stenosis or fragility, the latter because of immuno-suppressive medication (prednisolone, fujimycin) against recurrent rejections of a lung transplant (Table 1). The impacted food was retrieved by means of endoscopy and instrumentation in five patients and pushed into the stomach in one patient(s), respectively. More specifically, by forceps in three, forceps and endocap in one, balloon dilatation before retrieval in a bag in one. In the sixth case, the impacted meat was reduced in size by piece-meal technique and pushed into the stomach. A stiff scope was used in two of the patients, with retrieval of impacted food in the upper and middle segments. The perforations were initially detected by endoscopy in seven (70%) patients, by a CT scan in two and oral contrast enema in one patient, respectively. The size of the visible perforations at endoscopy, were described as 3-4 cm in one, beyond the 1 cm scope diameter in two, 1 cm in one and as small openings (presumably a few mm) in three patient(s), respectively. Antibiotic treatment was sufficient in a man aged 60, with a few mm large perforation after endoscopic retrieval of an impacted orange. This perforation without pleural effusion was initially detected by a CT scan demonstrating leakage of oral contrast. The mainstay of treatment was insertion of a SEMS in seven of the 10 patients. At initial stenting fully covered and partially covered stents were used in five and two patients, respectively.

Patient 6, a man aged 72, developed a mediastinal abscess after retrieval of impacted meat that was internally drained using a catheter introduced through the perforation. Patient 7, a woman aged 61, who ingested a meat bone that combined with emesis resulted in a 3-4 cm long distal perforation with considerable pleural effusion, underwent successful gastroesophageal resection via open access thoracolaparotomy.

Subsequent treatment for complications

Altogether five patients (50%) experienced complications (Table 1). Five out of seven patients with stent-mediated complications were restented. Two patients each received 2 and 3 stents, whilst the fifth patient ended up with 4 stents. Total number of stents used were median 2 (range 1 – 4). Both covered and partially covered stents were inserted and time to ultimate stent removal was median 50 days (range 36 – 193). Among the stented patients two previously healthy men, aged 84 and 52, developed mediastinal abscess that healed within 3 weeks of percutaneous CT- and ultrasonography guided drainage with 8 Fr and 10 Fr pigtail catheters. Patient 3, a woman aged 85 with a middle segment perforation (Table 1) after removal of impacted meat with a stiff scope, had a complicated course that involved treatments at local hospital and our hospital. Because of proximal stent migration the perforation (Table 1) was restended three times with covered Wallflex stents. During the course of treatment an esophagobronchial fistula (Fig. 1) complicated with airway symptoms was demonstrated after 68 days, as well as a limited lung embolus. However, at stent removal after 193 days, the fistula was healed without any long-term sequela. Ultimately, all perforations healed in this patient material.

Dysphagia, fatigue and HRQoL

In August 2016 after median 51 months (range 15 – 106), nine patients alive with median age 67 years (33 – 91) were sent questions concerning scores for dysphagia, fatigue and HRQoL, with response rates from 9 (100%), 7 (78%) and 7 patients, respectively. Dysphagia score was median 0 (range 0 -1), of whom two scored 1. None of the seven stented patients reported any kind of dysphagia. A man aged 70 (patient 2) had a peptic stricture which has not been dilated since October 2016. The other patient aged 75 (patient 4) treated with internal catheter-based drainage of the mediastinal accumulation, had a relative stenosis passable for the scope but dilation has not been

performed during 57 months post-perforation.

Total fatigue score (mean ± SD) was 15.3 ± 4.6, whilst physical and mental scores were 10.6 ± 3.8 and 4.7 ± 1.5, respectively. For comparison, general Norwegian population based values in the age bracket above 60 years, based on 238 males [13] were 12.9 ± 3.8 (p=0.10), 8.4 ± 3.2 (p=0.07) and 4.5 ± 1.2 (p=0.66).

The results for HRQOL for the eight different dimensions were compared with the general population Norwegian population aged 60-69, based on 117-129 men [14] (Table 2), and no significant reductions were found. However, with the exception of bodily pain and social functioning, there was a trend towards lower scores for the remaining 6 dimensions (PF, RP, GH, RE, MH, VT) in the patient group.

Discussion

Accidental esophageal perforation in adults is mainly related to food consumption [4], and the perforation is usually caused by a bone during passage through esophagus or by food impacted within the organ. Here we report the short and long-term treatment outcome, that included the patients' functional status with respect to dysphagia, fatigue and HRQoL. Interestingly, in the half of patients without risk factors for perforation owing to stenosis and fragility (Table 1), the perforation was located in the distal segment close or at the hiatal level.

There was no mortality, which compared favorably with pooled mortality of 2.1% (95% CI 0.6-4.4) based on 11 studies with a total of 215 patients [1]. With the exception of patient 7 (Table 1) who were resected because of the large size of the perforation (3-4 cm) and considerable emesis-induced bilateral pleural contamination, the remaining patients underwent non-operative treatment. Type of non-operative treatment was differentiated mainly according to the size of the perforation and whether pleural effusion was present, but the time from perforation to onset of treatment was also taken into consideration (Table 1). Using this treatment approach the four patients without pleural effusion were either solely treated with broad spectrum antibiotics and fasting in one and antibiotics combined with stenting in three patients, respectively. Despite late development of an esophagobronchial fistula in one of these patients, this fistula healed after 6 months without stenosis. In the remaining five patients, the mainstay of initial treatment was chest tube drainage and stenting of the perforation in four. Due to a contained mediastinal accumulation [15], the fifth patient was drained both by an internal transesophageal nasocystic catheter and with external bilateral pigtail catheters. Despite restenting in five patients (71%), there were no long-term sequele after this treatment. Two patients needed drainage of a mediastinal abscess that developed after a week's time, which emphasized the need for close clinical and biochemical follow-up.

Crucial series [8-11] on foreign body-induced thoracic perforations are small with a total of 24 patients, ranging from two to 10 patients. Treatment was based on surgical repair in a total of 17 patients [8-10]. Only in one study without mortality [11] seven patients had initial non-operative treatment with antibiotics and drainage, but not stenting. However, in one case subsequent surgical repair was necessary for closure of the perforation. Criteria for a non-operative approach to foreign body-induced perforation must include that i) the patient is without severe sepsis and there is limited

pleural soilage, ii) the leakage is sealed by introduction of an expandable metal stent or iii) the leakage is contained and can heal without intervention beyond fasting, antibiotics and catheter-based internal drainage into esophagus. If the patient deteriorates, surgery is necessary [2] with chest debridement reported in Boerhaaves syndrome [16], or more radical procedures with resection and primary anastomosis, exclusion of the perforation or esophageal diversion (esophagostomy).

A major issue is to what extent the frequency of perforations can be reduced at endoscopic removal of impacted bolus, beyond using an overtube on the scope and avoiding a stiff scope during the procedure [17]. A supplemental option is use of glucagon intravenously [18] which in pharmacological doses relaxes the smooth muscle and reduces lower esophageal sphincter pressure by up to 60%. Glucagon given concurrent with endoscopy facilitated in one study [19] esophageal clearing of the food bolus. The success rate of glucagon treatment has varied from 12 – 50% [20, 21] and whether glucagon is better than placebo has also been questioned [22].

In this study, for the first time, the long-term functional outcome with respect to dysphagia, fatigue and HRQoL was also examined (Table 2) after about 4 years. The fact that only one patient developed a mild degree of dysphagia and that there was no permanent need for permanent nutritive support were the main criteria for a satisfactorily long-term outcome for these patients. The fatigue scores consisting of physical, mental and total fatigue were not significantly different from the general Norwegian population, although there was a trend towards reduction physical fatigue (p=0,07) and total fatigue (p=0,1). Also for HRQoL there were no significant differences, but for six of the eight dimensions (Table 2), except bodily pain and vitality, there was comparably lower scores in the patient group (range 7,5 – 11,9 points). Therefore, an increased number of patients may have resulted into significant results with deterioration of fatigue and health related quality of life in the patient group versus the general population. It was promising for the general condition of these patients that vitality and bodily pain were the dimensions that seemed smilar to the general Norwegian population. More studies are necessary in order to increase our knowledge about how these patients perform in daily life.

Most patients received fully covered stents at initial stenting. Owing to the high rate of migration, partially covered stents with tulips at both ends are now mainly preferred. The tulips will have ingrowth of the surrounding esophageal wall and hence seal off

entrance and exit, so that hardly any contamination can enter on the side of the stent. These stents will have to be removed within a month to prevent impaction. Furthermore, treatment with a sponge coupled to a suction-catheter and put into the abscess cavity via the endoscope, has become an interesting option [23]. In the case of a large abscess with a large perforated opening, this will provide the best drainage and minimize further soiling. In the case of a smaller opening, a large bore catheter can be placed instead which will also seal off the perforation.

Conclusion

Esophageal perforation induced directly or indirectly by food bolus ingestion, was mainly based on a non-operative treatment approach without mortality and the need for delayed surgery. The long term functional result was quite promising with respect to dysphagia, fatigue and health related quality of life. However, owing to the limited number of patients more studies of this kind are warranted.

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Disclosure statement

The authors have no conflicts of interest or financial ties disclose.

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Table 1 Characteristics and treatment of 10 patients with esophageal perforation that occurred during passage of or related to endoscopic removal of impacted food bolus (see table on a separate sheet not integrated in this document).

Table 2 Mean (standard deviation) SF-36 scale scores defining health related quality of life in seven patients with food bolus induced esophageal perforation compared with normative data from the Norwegian male population aged 60-69.

Dimension	Patient material (n=6-7)	Normative data (n=117-131)	P Pm vs Nd
*PF	74.0 (16.2)	84.3 (16.9)	0.12
RP	58.9 (37.3)	68.1 (43.8)	0.59
*BP	70.8 (28.0)	70.6 (25.4)	0.98
*GH	59.5 (31.7)	68.0 (25.1)	0.42
VT	52.8 (1.6)	64.7 (21.6)	0.15
*SF	85.4 (22.9)	89.3 (20.2)	0.64
*RE	65.5 (35.1)	78.6 (31.9)	0.29
MH	73.7 (29.5)	81.2 (15.8)	0.24

Values are given as mean and standard deviation (SD). The four dimensions marked with * means that data are from six of the seven patients.
Abbreviations: SF-36; Short form, PF; physical functioning, RP; role limitations, physical, BP; bodily pain, GH; general health, VT; vitality, SF; social functioning, RE; role limitations, emotional, MH; mental health. Pm; patient material, Nd; normative data

Figure 1. A contrast enema in a woman aged 85 with detection of a temporary esophagobronchial fistula that emerged after 68 days benath the proximally dislocated stent. Delineated was a thin fistular tract to the left main bronchus and several contrast-filled branches of the bronchial tree.