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ORIGINAL ARTICLE

Evaluation of Different Surgical Modalities for the Management of End Stage Benign Esophageal Disease

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Abstract

Background: Esophageal resection is considered a complex procedure that is mostly indicated for a malignant pathology in the esophagus and rarely used for cure of other benign esophageal pathologies.
Disease of benign nature that affect the esophagus like achalasia, stricture, chemical injury, GERD and perforation are mostly managed by other less aggressive ways like endoscopic interventions or stent insertion but esophagectomy still has a valuable role in treatment of resistant cases that do not respond in other treatment modalities.
Methods: This is a retrospective observational study over a 10-year period from October 2012 to October 2022 for patients who operated due to an advanced stage resistant benign disease of the esophagus.
Results: Regarding the preoperative diagnosis, 9 patients were diagnosed with post corrosive esophageal stricture, 8 patients with dysmotility disorder or achalasia, one patient with hiatal hernia and one patient with contained esophageal perforation. The mean ICU stay in all patients was 2.53 ± 1.17 days and post operative anastomotic leakage was present in 7 patients (43.75%). Only two patients suffered from postoperative pulmonary complications: one patient with chest infection and the other with pleural effusion.
Conclusion: Esophageal resection and reconstruction using either stomach or colon as a conduit could be a valuable approach with very accepted outcome for this category of patients. Most of the patients could report relief of their symptoms, especially dysphagia that usually improve over a period of time ranging from 6months up to 1 year after surgery.

Keywords: Esophagectomy; Dysphagia; Esophagus; Stricture; Achalasia

INTRODUCTION

Esophageal resection is considered a complex procedure that is mostly indicated for a malignant pathology in the esophagus and rarely used for cure of other benign esophageal pathologies.
Disease of benign nature that affect the esophagus like achalasia, stricture, chemical injury, GERD and perforation are mostly managed by other less aggressive ways like endoscopic interventions or stent insertion but esophagectomy still has a valuable role in treatment of resistant cases that do not respond in other treatment modalities.
Esophageal resection is mostly indicated in a situation where functional or anatomical integrity of the esophagus is severely damaged and constitutes a resistant obstacle for other less invasive options of treatment.
Obstruction of the esophagus due to esophageal stricture resulting from caustic or chemical injury, peptic stricture due to chronic reflux and benign neoplasms of esophagus are important indications for

resection of the non-functional esophagus and reconstructing the alimentary tract either by colonic segment or gastric conduit. [1]
Esophageal dysmotility is another main category that could require esophagectomy like in achalasia at its resistant and advanced situations. Achalasia is usually managed by less aggressive modes of surgery like myotomy or balloon dilatation but advanced cases with hugely dilated esophagus that have severe motility restriction usually require esophagectomy as a final solution for the non-functional organ [2]. In addition, perforation of the esophagus constitutes another indication for organ resection in minority of specific situations where contamination and sepsis could not be controlled by other endoscopic less invasive methods leaving esophagectomy as a final destination to control that group of complex perforations.
Esophagectomy in benign pathologies of esophagus is a complex intervention that carries a high rate of complications and mortality, and patients should be carefully chosen for such an intervention [2,3].
Reconstruction using the stomach is the best option in most cases but in some cases like in caustic material ingestion colonic segment interposition could be used as the stomach mucosa might be affected by the chemical injury making the use of gastric conduit difficult.
Esophageal resection could be constructed either by transhiatal approach without the need for thoracotomy or could be done with thoracic incision and anastomosis and this is usually decided carefully for each individual patient case [4,5] .Our study aims to evaluate different surgical options for management of patients with resistant benign disease of the esophagus and its role in improving patient symptoms and related operative and postoperative outcomes and complications.

Methods

Study design: This is a retrospective observational study over a 10-year period from October 2012 to October 2022 for patients who operated due to an advanced stage resistant benign disease of the esophagus. The study was conducted in Cardiothoracic Surgery Department, Alexandria University, Egypt. Patients with resistant benign esophageal pathology including advanced achalasia, corrosive or peptic stricture, perforation and GERD were included in this study. While patients with esophageal malignant neoplasms were excluded.
After revision of the department database, 19 patients were found to be eligible for the study as they were all operated on due to persistent complaints from a resistant benign disease of the esophagus (Figures 1,2) .Surgical intervention in the study group was retrosternal colon interposition mainly in cases diagnosed with post corrosive stenosis of the esophagus (Figures 3).
Our procedure of colon interposition was done using midline laparotomy and cervical incision where the diseased esophagus was bypassed with the colonic segment and upper esophageal end was ligated and the colon was delivered through retrosternal route to the neck where the anastomosis was made with the upper esophageal end.
Another case with persistent sepsis due to iatrogenic esophageal perforation during esophageal dilatation procedure for a post corrosive stricture have received colon interposition after failure of conservative measure or endoscopic measures to control sepsis.
Cases with advanced achalasia were carefully evaluated using manometry study, upper GIT endoscopy and CT scan and were mainly operated with esophagectomy either Ivor Lewis [6] esophagectomy with right thoracic anastomosis or trans hiatal esophagectomy with cervical anastomosis.

Myotomy of the esophagogastric junction was done in few cases of end stage achalasia who were unfit for esophagectomy procedure due to old age and comorbid conditions.

Data was collected from Cardiothoracic Surgery Department Database including preoperative and demographic data like age, sex, previous medical history, diagnosis and operative procedure.

The main outcome variables included number of days spent in ICU, occurrence of postoperative leakage, presence of pulmonary complications and number of days spent in the hospital.

Follow up was done for all patients for 1 year after surgery at the outpatient clinic in regular visits 3 months, 6 months and one year after surgery.

All patients were asked about presence of dysphagia and symptomatic patients were further evaluated by oral contrast study and upper GIT endoscopy.

Statistical analysis: Data was fed to the computer and analyzed using IBM SPSS software package version 20.0. **(**Armonk, NY: IBM Corp, released in 2011**)**. Categorical data were represented as numbers and percentages. Quantitative data were expressed as range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Cochran's test was used for non-parametric test for binary response variable and Post Hoc Test (Dunn's) for pairwise comparisons. The significance level for all statistical tests was set at 5%.

Results

Regarding preoperative and demographic data, the mean age was 62.79 years and most of the patient were males constituting about 63.2%, for previous medical history, 10.5% of the patients were diabetic, 10.5% of the patients were having hypertension and the rest were free from comorbidities. 9 patients were diagnosed with post corrosive esophageal stricture preoperative, 8 patients with dysmotility disorder or achalasia, one patient with hiatal hernia and one patient with esophageal perforation. **(Table1)**

Colon interposition was performed in 10 patients constituting about 52.6% and was mainly done for all patients with post corrosive esophageal stenosis (9 patients) and another patient with persistent contained perforation after esophageal dilatation. Ivor Lewis (6) esophagectomy was performed in four patients; three patients were diagnosed with advanced achalasia and another patient diagnosed with recurrent hiatal hernia and peptic stricture. Surgical myotomy was performed for three patients with advanced achalasia due to fragility and being unfit for esophagectomy. On the other hand, trans hiatal esophagectomy was performed in 2 patients diagnosed with end stage achalasia.

The mean ICU stay in all patients was 2.53 ± 1.17 days and post operative anastomotic leakage was present in 7 patients out of 16 patients who underwent esophagectomy or colon interposition (43.75%). Leakage was managed successfully in all patients using conservative measures in the form of stopping oral intake, intravenous antibiotics and good cervical drainage. Leakage was mainly present in cases where the cervical anastomotic leakage is usually a common complication. Only two patients suffered from postoperative pulmonary complications: one patient with chest infection and the other with pleural effusion.

The mean postoperative hospital stay for all patients was 14.16 ± 6.10 days. **(Table2)**

Regarding postoperative follow up of patients and recording the persistence of symptoms mainly difficulty of swallowing, seven patients (36.8%) were complaining of dysphagia 3 months after surgery and all of them were patients who received colon interposition surgery. Two of them needed postoperative esophageal dilatation once and other patients were assured and followed up.

Six months after surgery, four patients (21.1%) were having difficulty to swallow but after one year all patients were satisfied with the result of surgery and were no longer complaining from dysphagia. **(Table3)**

Oral contrast study showed post corrosive esophageal stricture **(Figure1).** CT scan of the chest showed megaesophagus in end stage achalasia patient **(Figure 2).** post operative oral contrast for a patient with colon interposition was shown in **(figure 3)**

Table (1): Distribution of preoperative and demographic data

	No. (%)
Age (years)	
Min. – Max.	**54.0 – 70.0**
Mean ± SD.	**62.79 ± 5.32**
Median (IQR)	**63.0 (60.0 – 67.0)**
Sex	
Male	**12 (63.2%)**
Female	**7 (36.8%)**
Past history	
No	**15 (78.9%)**
DM	**2 (10.5%)**
HTN	**2 (10.5%)**
Diagnosis	
Caust Stricture	**9 (47.4%)**
Achalasia	**8 (42.1%)**
Hiatal Hernia	**1 (5.3%)**
Perforation	**1 (5.3%)**

IQR: Inter quartile range SD: Standard deviation

Table (2): Distribution of operative and postoperative data

	No. (%)
Procedure	
Colon interposition	**10 (52.6%)**
Ivor Lewis esophagectomy	**4 (21.1%)**
Myotomy	**3 (15.8%)**
Trans hiatal esophagectomy	**2 (10.5%)**
ICU stay (days)	
Min. – Max.	**1.0 – 5.0**
Mean ± SD.	**2.53 ± 1.17**
Median (IQR)	**2.0 (2.0 – 3.0)**
Anastomotic leak	**7 (43.75%)**
Pulmonary complication	
None	**17 (89.5%)**
Pneumonia	**1 (5.3%)**
Pleural effusion	**1 (5.3%)**

	No. (%)
Post-operative stay (days)	
Min. – Max.	**4.0 – 25.0**
Mean ± SD.	**14.16 ± 6.10**
Median (IQR)	**15.0 (9.50 – 18.50)**

IQR: Inter quartile range SD: Standard deviation

Table (3): Percentage of dysphagia at 3months, 6 months and 1 year after surgery.

	3 months	6 months	1 year		p
Presence of symptom					
Free	**12 (63.2%)**	**15 (78.9%)**	**19 (100.0%)**		**0.005***
Dysphagia	**7 (36.8%)**	**4 (21.1%)**	**0 (0.0%)**		
Sig. bet. periods	**p_1=0.165,p_2=0.001*,p_3=0.064**				

Q: Cochran's test, Sig. bet. periods were done using Post Hoc Test (Dunn's)

Figure 1: Oral contrast study showing post corrosive esophageal stricture

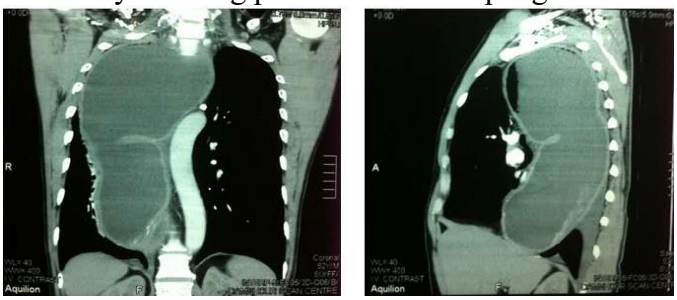

Figure 2: CT scan of the chest showing megaesophagus in end stage achalasia patient

Figure 3: post operative oral contrast for a patient with colon interposition

Discussion

Esophageal surgery is mostly complex and challenging and each patient case should be carefully evaluated to decide the best type and approach for relief of symptoms. Benign diseases of the esophagus are usually managed by endoscopic interventions or less invasive surgical procedures but in certain occasions esophageal benign disease could be advance and resistant to treatment that could require esophageal resection and replacement by either stomach or colonic conduit.

Our study was conducted to evaluate different types of surgical intervention performed for patients with advance benign disease of the esophagus. Our retrospective study included 19 patients, 9 patients were diagnosed with post corrosive esophageal stricture, 8 patients with dysmotility disorder or achalasia, one patient with hiatal hernia and one patient with contained esophageal perforation.

The mean ICU stay in all patients was 2.53 ± 1.17 days and post operative anastomotic leakage was present in 7 patients (36.8%). Only two patients suffered from postoperative pulmonary complications: one patient with chest infection and the other with pleural effusion. The mean postoperative hospital stay for all patients was 14.16 ± 6.10 days.

Numerous articles and publications in literature have discussed the issue of surgical management of advanced esophageal benign disease.

Jesudason JS et al. [7] have conducted a prospective study to evaluate outcome after esophageal resection for non-malignant disease of the esophagus. This study included 20 patients, and stomach was the conduit used in most patients (90%). Pulmonary complications occurred in 40% of patients, anastomotic stricture in 30% and duration of hospital stay ranged from 10 to 35 days.

In comparison to our results, colon was the most frequent conduit used in our patients (52.6%), pulmonary complications occurred only in 10.6% of the patients and the mean hospital stay was 14.16 days. [7]

On the other hand, Okonta KE et al. [8] have conducted the best evidence study to evaluate the superiority of esophagectomy over the conservative management for delayed presentation perforation of the esophagus. They have analyzed and reviewed one hundred and fifty papers from literature from 1966 up to 2011 and concluded that esophageal resection was superior to all conservative measures for delayed onset esophageal perforation. (8)

In our study, we had an experience with a case of persistent esophageal perforation after dilatation and was successfully managed by colon interposition.

In addition, Guo W et al. [9] have conducted a study to view the importance and outcome for esophageal resection in the management of benign esophageal disease and concluded that this aggressive way of surgery was important and could be beneficial for patients in terms of survival and quality of life.

Waters J et al. [10] have concluded also in their study that outcomes of esophageal resection for end stage achalasia were good if performed in experienced hospitals. In our study 42.2% of patients were diagnosed with advanced stage achalasia and most of them were treated by esophagectomy with good outcome.

In addition, Aiolfi A et al. [11] have performed a literature search between 1987 to 2017 for end stage achalasia treated by esophagectomy and found that esophageal resection was performed through transthoracic approach in 74% of patients and trans hiatal approach in 26%. In 95% of patients, stomach was used as conduit. Symptom relief occurred in 75% up to 100% of patients over a period of 43 months follow up.

Patients with persistent symptoms of dysphagia and GERD with nonmalignant etiology constitute a complex and challenging situation facing esophageal surgeons especially if other forms of endoscopic or less invasive surgical modalities have failed to relieve the symptoms. Esophageal resection should be carefully selected as the procedure of choice for those patients as if it is properly addressed, most of the patients will have a good outcome.

Conclusions

Advanced benign esophageal disease constitutes a special and challenging category of patients who needs special evaluation and precise decision for selection of best management approach.

Decision is preferably evaluated in an MDT meeting having chest surgeons, endoscopist, gastrointestinal specialist to give the best

decision. Esophageal resection and reconstruction using either stomach or colon as a conduit could be a valuable approach with very accepted outcome for this category of patients. Most of the patients could report relief of their symptoms, especially dysphagia, that usually improve over a period ranging from 6months up to 1 year after surgery. Patients with advanced stage achalasia, delayed onset contained perforation, corrosive stricture and peptic stricture could benefit from surgical management with good outcome.

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Authors contribution: Ahmed Daoud: Idea selection, writing the manuscript, data collection, analysis of results and revision of manuscript. Khaled Karara: revision of manuscript. Walid Abu Arab: Data collection and revision of manuscript. Amr Rayan: Analysis of results.

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