



## Endoscopic-Vacuum-Therapy in Esophageous Perforations and Anastomotic Leakages after Esophagectomy. The Best Treatment Option to Solve a Major Complication in Upper GI-Surgery?

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### Editorial

Anastomotic leakages and esophageous perforations remain to be severe complications of the upper gastrointestinal (GI) tract. Reported leak rates after esophagectomy vary widely from 1% to 30% [1]. According to the severity of the anastomotic leakage, the time interval after primary surgery, the general condition of the patient and/or the anastomotic location several treatment options are available, such as conservative, endoscopic or surgical treatment [2-4]. Nevertheless, the mortality of anastomotic leakage can exceed 50% [5]. Also, in patients with esophageal perforations high mortality rates close to 20% [6-8], despite recent progress in surgical, endoscopic, intensive care, and infectious treatment options have been reported. The mortality rate of patients requiring surgical revision due to an anastomotic leakage after esophageal resection are very divergent in the literature and reach from 3.3% up to 67% [3,9-11]. Therefore, leakage from an esophageal anastomosis is a life-threatening complication and optimal management is of tremendous importance. The surgical treatment options reach from the redo of the anastomosis with augmentation of the anastomotic area by vital tissue (e.g. muscle flap, omental flap) to complete surgical deviation by taking down the esophageal conduit and creation of a cervical stoma [3,9-11].

Next to surgical revision various strategies have been employed in the management of these complications. Several endoscopic approaches have been suggested. The by far most prevalent approach at present is the application of covered self-expanding metallic or plastic stents. Since the millennium more than 20 studies had referred to this topic with reported mortality rates of 0% to 50% [4,12-21]. Next to endoscopic stenting several other techniques like clipping, application of fibrin glue, endoscopic suturing and the application biodegradable fistula plugs have also been suggested [22]. In the case of small, clinically silent leaks, conservative management with nasogastric decompression and tube feeding has been suggested [23]. The difficulty of managing the septic condition in major anastomotic leakages remains a major problem with all of these strategies. In this context the endoscopic endoluminal vacuum therapy (EVT), an endoscopic vacuum-assisted wound closure system, might add to the currently available therapeutic strategies by addressing the septic focus by using constant vacuum drainage of infected wound fluid from the wound cavity. This treatment option has been introduced and successfully used in the last decade [3,4]. With this technique the endoscope is used to appraise the size of the wound cavity, and apolyurethane sponge is trimmed to the cavity size. In cases of a large cavity a second sponge can be placed to fully seal and better drain the cavity. An over tube is placed over the endoscope and brought into the cavity under vision using a pusher device. The placed sponge is connected to the drainage tube, which was diverted through the nose and connected to a vacuum pump or redon bottle that provided a continuous negative pressure of 70 to 125 mmHg [2]. The replacement intervals are every two to 3 days depending on the condition of the patient. Longer intervals have shown to be a risk for in growth and device integration of the sponge [24]. Advantages of the EVT-procedure are the possibility of an endoscopic jet lavage, active closure and drainage of the septic wound cavity and the inspection of the wound cavity during the change of the sponge at least every three days. The use of EVT is terminated when the remaining wound cavity is closed and granulated (Figure 1a-

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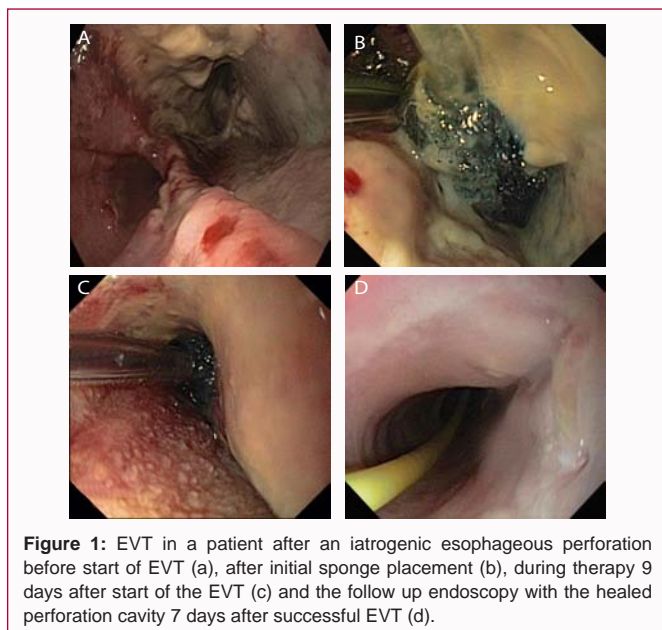
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**Table 1:** Published data of outcome and treatment characteristics for patients treat by EVT for anastomotic leakages after esophagectomy or esophageous perforations in 2009-2016 (EVT: Endoscopic Vacuum Therapy, d: days, n.s.: not shown).

Study	Year	No. of patients (n)	Cause (%)		No. of EVT-procedures (n)	Length of EVT (d)	Negative pressure (mmHg)	Success (%)	Stricture (%)	Mortality (%)
			Perforation	Leakage						
Smallwood et al. [33]	2016	6	5	1	7.2	35.8	n.s.	100	0	16.7
Hwang et al. [34]	2016	7	-	7	4.3	19.5	125	100	0	0
Laukoetter et al. [15]	2016	52	14	39	6	22	125	93,3	7.7	5.8
Mölscher et al. [16]	2015	10	5	5	1-39	1-150	100-125	70	10	10
Bludau et al. [17]	2014	14	5	9	3.9	12.1	100	87.5	16.6	14.3
Schniewind et al. [24]	2013	17	-	17	n.s.	n.s.	70-80	n.s.	n.s.	11.8
Brangewitz et al. [31]	2013	32	2	30	7	23	125	84.4	11.1	15.6
Heits et al. [29]	2013	10	10	-	5.4	19	80-125	90	n.s.	10
Kuehn et al. [32]	2012	9	4	5	5.7	18.4	125	88.9	0	11.1
Schorsch et al. [39]	2012	24	7	17	1-12	11	125	95	4.2	4.16
Weidenhagen et al. [26]	2010	6	-	6	9.8	24.4	n.s.	100	n.s.	0
Ahrens et al. [2]	2010	5	-	5			70-80	100	n.s.	0
Wedemeyer et al. [36]	2009	8	-	8	7	23	n.s.	88	0	0



1d). Several studies showed, that under EVT the inflammatory septic response can be controlled and stabilized by drainage of the mediastinal leakage cavity and a healing of the wound cavity can be achieved [12,13,25]. Different studies reported good results in short term survival of 80-96% [4,12-18] in EVT for anastomotic leakages and perforations. A successful healing of the leakage or perforation cavity is reported in 84-100% [26-34]. Recently the first groups from the USA and South Korea were able to confirm these good results of wound closure and survival [30,31]. Furthermore, three studies from Germany and South Korea showed a higher success rate in healed and closed anastomotic leakages comparing EVT and stent therapy [31,34,35] (Table 1). The healing rates were reported to be successful in 84-100% after EVT and 54-64% after stent placement. EVT-related complications. Anastomotic strictures after EVT are a known long-term complication with an incidence 4.2-16% [15-18,31], which can be successfully cured by endoscopic balloon dilation in most

of the cases. A reason for the higher incidence is mostly due to the inflammatory response in the leakage cavity and following enhanced cicatrization.

Due to these good results in esophageous perforations and leakages of the upper GI-tract different authors recently started to use EVT to drain leakages after bariatric sleeve gastrectomy or gastric bypass surgery. Moreover, some case reports reported of a successful use of EVT to drain infectious pancreatic pseudocysts or leakage of a pancreaticogastrostomy [36-40]. However, all studies are single center studies and case reports with small numbers of treated patients without reporting on long-term survival and Quality of Life. To prove the efficacy of the endoscopic vacuum therapy at the upper GI-tract and assess clinical data in an international multicenter study a prospective open online registry was set up in collaboration between the University Hospital Schleswig-Holstein, Campus Kiel, and the department of Medical Scientific Affairs of the company B.Braun®, Aesculap AG [41].

## Conclusion

EVT is an effective procedure for the management of major leakage from esophageal anastomoses and other conditions in the upper gastrointestinal tract and might be superior especially in septic patients compared to surgical revision and stent placement. In addition, in selected cases EVT might also be a good treatment option to drain septic cavities in the upper GI-tract and abdominal cavity after bariatric and pancreatic surgery. Decisive for the rate of success using EVT therapy is an interdisciplinary work between thoracic surgery, radiology, endoscopy, and intensive care medicine departments in an experienced center.

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