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Current Review of Diagnostic Procedure of Anastomotic Leakage after Esophagectomy

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Abstract: **In this review, we present currently accepted algorithms for the detection of anastomotic leakages, their classification and treatment algorithms. A literature search through PubMed Medline/PubMed, Science Direct, Scientific Electronic Library Online (SCIELO) database, was performed searching articles focusing on anastomotic leakage after esophagectomys, and surgical management. The proper therapy must be chosen with regard to the status of the neoesophagus and the patient's basic problem. Recently, a number of endoscopic intervention methods have been established that have shown favorable results in the treatment of smaller fistulas with intact conduit perfusion. In the case of necrosis, nonetheless, immediate and determined surgery is required. These situations are still associated with high morbidity and mortality; however high volume centers have shown improved outcome data even in this imperiled collective. Additional amelioration of patient results will be made possible by increased specialization and novel treatment methods relying on decreasingly invasive yet efficient intervention approaches.**

Keywords: **anastomotic leakages, treatment algorithms, tient's basic problem.**

1. INTRODUCTION

Indications for esophagectomy vary, consisting of oncologic and end-stage benign illness. The procedure is, nevertheless, associated with a high risk of morbidity and death, regardless of the underlying problem. While pneumonia is the most common aspect of postoperative morbidity, half of the patients managed surgically experience significant surgeryrelated difficulties [1], [2].Problems arising from the integrity of the neo-esophagus, preferentially containing a conduit produced from the gastric residue, are main outcome elements with potentially deadly effects [3].While the treatment normally entails laparotomy and thoracotomy, transhiatal esophagectomy, esophagectomy with cervical anastomosis, and Ivor Lewis esophagectomy in combination with cranial thoracic anastomosis, can be performed without thoracic dissection. Cervical anastomoses are connected with an increased threat of persistent laryngeal nerve injury and greater rates of leakage, yet they are a lot more convenient than thoracic leaks and thus have lower mortality [4].Minimally invasive operating techniques show up to have a desirable influence on extubation time factors and similar oncologic results contrasted to conventional esophagectomy, however no adjustments have so far been shown in relation to anastomotic failure and overall hospitalisation [5].

Postoperative morbidity and mortality (5.4% to 2.9%) were decreased over the previous years because of very early diagnostics combined with phase-adapted therapeutic pathways and the exemption of patients with numerous co-morbidities from surgery [6]. Law et al. record a remarkable mortality rate of 1.1% after esophagectomy in their facility from 1995 to 2001 [7].These numbers show advancements in clinical management over the last years and are originated from the establishment of high quantity centers and the increased application of choice and much less invasive therapies [8].Despite these breakthroughs, morbidity and death after esophagectomy have stayed considerable. Neoadjuvant therapy provides significant survival advantages for patients with resectable esophageal cancer and, therefore, is a basic part of the therapy algorithm [9].This advantage might come at a price as neoadjuvant chemoradiation has been variably connected to boosted or similar surgical problem rates after esophagectomy, a result that has been connected to radiation obtained by the gastric fundus [10].The most threatening of these difficulties is anastomotic leakage, as it is straight connected to

enhanced morbidity, raised intensive care remain, raised costs, and most notably, is a primary aspect for postoperative mortality [11].

Level and scientific impact of leaks are highly varying, some needing re-operation and perhaps even suspension. Other leaks continue to be virtually inapparent and are just identified by screening diagnostics or by refined clinical modifications. The decision process about which healing path should be chosen when facing leakage is dependent on the patient's problem, the time-point of leakage and the extent of sepsis. Thus, the selection of the therapeutic technique should be lugged out carefully to take full advantage of benefit while decreasing the added dangers incurred by the treatment.

In this review, we present currently accepted algorithms for the detection of anastomotic leakages, their classification and treatment algorithms.

2. METHODOLOGY

A literature search through PubMed Medline/PubMed, Science Direct, Scientific Electronic Library Online (SCIELO) database, was performed searching articles focusing on anastomotic leakage after esophagectomys, and surgical management for those studies published up to November, 2017. We restricted our search to studies with English that were published, and each identified study underwent manual search in its included references lists for more liable studies.

3. DISCUSSION

- **Diagnostic tools and goals:**

After esophagectomy, patients must be monitored as very closely as feasible. When suspicions worrying anastomotic failing develop, even more diagnostics are called for and need to be executed immediately and at all times of the day. The limit for performing better diagnostic procedures need to be low, as the moment required to deal with problems is an important factor in the limitation of their clinical effect [12]. The primary diagnostic goal is to provide sufficient info for the selection of an ideal therapeutic strategy that takes into consideration the patient's condition and the seriousness of the issue. Specialists besides the at first included surgeon, such as endoscopists and radiologists, commonly perform the diagnostic initiatives. In this situation, the info gotten by the professional must be relayed to the surgeon who should always be consisted of in the clinical decision-making process.

Patient monitoring and consequences:

Early acknowledgment of difficulties allows for very early treatment and therefore is a mainstay to successful outcome after surgery. Patients going through esophagectomy are at high threat and are on a regular basis moved to an ICU unit complying with surgery, where close and continuous tracking could be executed. Early signs of difficulties, nonetheless refined, must be pursued. Clinical signs and symptoms should be utilized to trigger further diagnostics rather than accomplishing regular control imaging [13].

- **Clinical condition:**

Clinical monitoring is essential to any kind of postoperative course, yet takes on raised significance in such high-risk procedures as esophagectomy. Appraisal of the cervical, thoracic or abdominal wound and control of aspect and quantity of drain fluid is essential.Wound infection and adjustments in the facet of wound effluence merit instant adhere to up by further diagnostics.Changes in heart rate, typically through atrial fibrillation, could be the very first and only indicator of anastomotic insufficiency [14].This is especially crucial in cases without previous heart conditions where atrial fibrillation took place for the very first time after surgery and requires additional immediate examination. Early signs of incipient sepsis can be as subtle as modifications in the patient's subjective general condition (e.g. persisting pain) and small adjustments in neurological status, such as lowered compliance.

Blood tests:

After esophagectomy, leukocyte-, C-reactive protein (CRP)- and procalcitonin- (PCT) levels are consistently managed to detect infection but particular limitations relate to their analysis. Originally, leukocyte count does not sufficiently compare patients with leakage, as a very early postoperative rise is existing in all patients. CRP-levels are less impeded by surgery and go back to interpretable arrays previously, as previously demonstrated by our group [12].Stepwise regression revealed 80% sensitivity for the detection of leaks from the 2nd postoperative day onwards by CRP values > 13.5 mg/dL.

Leukocyte matter only got to the same accuracy on the eighth postoperative day. PCT has become a common parameter in the diagnosis of bacterial and viral sepsis over the previous years, yet has similar limitations as leukocyte monitoring. In the initial 2 postoperative days, PCT focus are much more depending on the type of procedure than on the visibility of sepsis [15].Considering that increased PCT degrees are related to the existence of bacterial endotoxin, [16] a likely explanation for typically elevated postoperative PCT levels could be intraoperative microbial translocation (potentially without medical influence) and also the mere visibility of surgical trauma [17], [18], [19].Nevertheless, when septic complications arise, a postinterventional reduction in PCT levels could aid assess whether the treatment succeeded in eliminating the source of the sepsis [20].

- **Diagnostics – detection and classification of complications:**

Vascularization of the conduit, existence of insufficiency, its size and drainage (or non-drainage) are the variables that are needed for choice of the proper therapeutic approach (Fig 1). Radio contrast representative based computed tomography (CT) and endoscopy, in combination with a comparison agent, are widely considered the gold basic diagnostics that the majority of centers perform [21].While a single technique may miss some leakages and be not able to supply certain information (e.g. CT can not determine vascularization and endoscopy could not provide topical information), their combination provides a powerful image of the patient's status. Along with examination of clinical status and blood tests, the results of these procedures give adequate info to assign the patient to a therapeutic avenue.

Figure 1.The diagnostic workup must provide information on key aspects of the leakage that are determinants of the therapeutic approach

Imaging:

X-ray based contrast radiology is promptly performed, however struggles with minimized sensitivity and could miss up to 50% of cervical anastomotic leaks, also a considerable amount of intrathoracic leaks [3].CT supplies boosted sensitivity and topical information, detecting abscess developments and permitting precise drain positioning.

Endoscopy:

To accurately assess the problem of the neo-esophagus, even more invasive treatments are required. Endoscopy with application of a contrast agent is the overall diagnostic technique of selection since it addresses almost all needed diagnostic dimensions [8]. It allows direct visual evaluation of potentially present leakages in addition to differentiated assessment of vascularization, mucosal condition, and possibly necrosis. In addition, biopsies for histological analysis of the avenue or interponate could be taken. Appraisal of the neoesophagus can be rendered difficult as a result of the visibility of mucus; thorough cleaning of the investigated location is mandatory or even then smaller leakages may continue to be undiscovered. In particular setups, bronchoscopy can provide additional information relating to the extent of an existing fistula, especially when suprabifurcal cancer is entailed and the patient displays clinical indicators of pulmonary infection. The endoscopist in several clinics will be a doctor who may be unknown with the patient's operative situs. To guarantee the very best possible details relay, it is crucial to make postoperative monitoring an interdisciplinary effort with close involvement of the surgeon that carried out the procedure.

- **Therapeutic options:**

Once the diagnostic procedures have been completed, the patient can be assigned to one of the three degrees shown in Table 1.

Table 1: Intrathoracic leaks

Degree	Findings	Course of action
1st	– Small fistula – Sufficient drainage – Vascularization intact – No sepsis, mediastinitis	Conservative treatment
2nd	– Significant insufficiency – Significant leakage – Vascularization intact – No sepsis/signs of incipient sepsis	Endoscopy a nd one of the following – Stent – Fibrin glue – OTSC-Clip – Endo-VAC – Drain placement if necessary
3rd	– Large insufficiency – Insufficient drainage – Significant leakage – Conduit necrosis – Sepsis	Re-thoracotomy and – Resection of anastomosis and re-anastomosis or – Discontinuity

First degree:

Patients with tiny and sufficiently drained fistulas that reveal neither indications of mediastinitis nor sepsis can be dealt with conservatively by anti-biotics and enteral nutrition through an esophageal feeding tube [22].In any type of occasion, adequate drainage of the leak is paramount and is normally achieved by drains positioned throughout the operation [23].Need to these drains verify inefficient at draining the leaks, new drains must be placed. Total parenteral nutrition can be considered if the placement of a nasogastric feeding tube is considered unsuitable (e.g. threat of microaspiration, patient discomfort), yet enteral nutrition is chosen [24].Smaller sized leaks may additionally be treated by a novel, over the scope clipping system, which imitates a surgical suture. Pohl et al. report their treatment of 2 patients utilizing this method[25].Clipping led to complete closure of the fistula in one patient that did not after that have to undergo added treatments. In the other patient, nonetheless, the clip dislocated with the fistula lingering. Seebach et al. and Albert et al. reported comparable results of effective closing of postoperative fistulas using a clipping gadget (Seebach et al. had successes in 6 out of 9 situations; Albertet al. 4 from 7, most of which were, nevertheless, colonic leakages) [26].No big instance collection (allow alone randomized trials) exist approximately date that compare endoscopic treatment to surgical choices. Given the difficult and unique setup of postoperative leakage, this circumstance is not likely to change in the future. Thus, no clearly defined standard indications exist for this relatively new method, which is still under development. Nevertheless, current reports show that endoscopic clipping is a safe procedure without particular procedure-related risks. It appears likely that it will become a conventional first line therapy in the management of anastomotic leakage. Continued monitoring and re-assessment of the patient's standing is needed during conservative treatment as an acceleration of therapeutic treatments may yet be needed.

Second degree:

Second degree insufficiencies are bigger in dimension than initial degree leaks and are connected with increased quantities of leakage, along with indicators of incipient sepsis. The vascularization of the neo-esophagus is intact and necrosis is absent. In these patients, the emphasis of the infection should be removed by giving sufficient drainage and avoiding additional contamination. Endoscopical treatment of second degree leaks could be effectively performed using vicryl mesh and fibrin to secure the leak [26].After thorough cleaning with 0.9% salt chloride, a vicryl mesh is inserted as a plug and further secured by fibrin adhesive. This approach resulted in a success rate of 87% in patients with fistulas of up to 30 mm in size as reported by Böhm et al. [27] The mean variety of necessary endoscopic treatment sessions was 6.7 per patient and enhanced with the size of the leak, which was mostly since even more sessions were required prior to the leak was clean sufficient to proceed with sealing. This element is central to the procedure and has to be done to any kind of type of fistula or cavity, which is to be filled with sealant [28].

Third degree:

Third degree insufficiencies are characterized by a big area leakage, insufficient drainage and impaired conduit perfusion as well as conduit necrosis. Such leakages are normally accompanied by severe sepsis and/or mediastinitis. In instances of very early detection, that is, within the very first postoperative days after esophagectomy, and restricted necrosis, a brief segmental resection of the necrotic location with prompt re-anastomosis can be executed. In the majority of patients, nonetheless, an esophageal discontinuity is unpreventable as a result of concomitant sepsis and mediastinitis. After having conquered the septic situation, reconstruction can be accomplished. These procedures often prove difficult to do, as the procedure location, especially the posterior mediastinum, can be signifi- cantly modified by the preceding surgery and the inflammatory reaction to mediastinitis. Reconstruction can make use of colonic, jejunal or gastric conduits, either by means of the esophageal bed or a substernal route.

4. CONCLUSION

Leaks after esophagectomy manifest in various methods and have a high variety of clinical impacts, ranging from local wound infections to life threatening sepsis. After esophagectomy, patients should be monitored as closely as possible. Once suspicions worrying anastomotic failing arise, further diagnostics are required and need to be carried out instantly and at all times of the day. The diagnostic workup needs to give information on key elements of the leakage that are determinants of the therapeutic approach. The proper therapy must be chosen with regard to the status of the neoesophagus and the patient's basic problem. Recently, a number of endoscopic intervention methods have been established that have shown favorable results in the treatment of smaller fistulas with intact conduit perfusion. In the case of necrosis, nonetheless, immediate and determined surgery is required. These situations are still associated with high morbidity and mortality, however high volume centers have shown improved outcome data even in this imperiled collective. Additional amelioration of patient results will be made possible by increased specialization and novel treatment methods relying on decreasingly invasive yet efficient intervention approaches.

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