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Diagnosing Upper Gastrointestinal Anastomotic Leaks: Should Computed Tomography Be the Gold Standard?

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Abstract

Anastomotic leak following upper gastrointestinal surgery is the most feared complications in the postoperative setting. Therefore, it is of utmost importance to diagnose it in a timely and safely manner. The diagnostic algorithm, however, differs across institutions worldwide. The aim of this study was to analyse analyze whether computed tomography should be the gold standard in detecting or ruling out an anastomotic leak after upper gastrointestinal surgery.

Material and Methods: Records of 212 patients undergoing oesophagealesophageal surgery for underlying malignancy were analyzed. Out of those patients, all those diagnosed with an anastomotic leak through a diagnostic modality were included in this study and grouped according to the modality used. Continuous variables were exposed as medians. Categorical variables were compared using Fisher's exact test or chi-square test.

Results: 23 out of 212 patients were diagnosed with an anastomotic leak after oesophagealesophageal surgery. Between 2013 and 2017 routine examination of the oesophagusesophagus was carried out using a dynamic swallow study. This routine examination was abolished after 2017 and replaced by an on-demand examination through computed tomography and upper endoscopy. Computed tomography had a sensitivity of 100% compared to DSS with a sensitivity of 21.42%.

Conclusion: Computed tomography in combination with upper endoscopy should be the gold standard in detecting and treating an anastomotic leak after oesophagealesophageal surgery. There is no need for a routine examination in the post-operative setting. Diagnostic tools should only be used in the event of clinical symptoms or pre-sepsis/sepsis of the patient.

Keywords: anastomosis, leak, computed tomography, esophageal, dynamic swallow study

Introduction:

The incidence of oesophagealesophageal cancer in the European Union is around 43700 cases per year and is the 19th most common cancer in Europe (1). Surgical resection after or without neoadjuvant therapy is indicated if a curative resection is possible. The most common procedure

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performed worldwide is the open or laparoscopic assisted abdominothoracic oesophagealesophageal resection with two-field lymph node dissection with an intrathoracic anastomosis after Ivor-Lewis (2). The stomach is the most commonly used substitute for reconstruction after esophagectomy resulting in an esophagogastrostomy.

A postoperative anastomotic leak is considered the most feared complication after surgery and is associated with an increased prolonged intensive care unit and hospital stay, increased hospital costs, decreased long-time survival and quality of life and with a postoperative mortality rate ranging between 12-50% (3). To combat this problem, many institutions perform a routine-examination in the postoperative setting to rule out or diagnose and anastomotic insufficiency. However, to this date, there is no international guideline whether a routine examination is useful and what imaging modality should be used. Hagens et. al questioned surgeons worldwide on their management of anastomotic leakage after esophageal surgery in 2018. 62.8% responded that a routine examination was carried out with a dynamic swallow study (DSS) being the most commonly performed (46.5%). Only 4.7% used a computed tomography (CT) and 8.5% an upper endoscopy (UE). However, available data on this subject over the last decade has shown that there is no clear benefit from a routine-examination and that there is no impact in doing so on survival (4-6). In addition, its proven that the DSS has high false-negatives and a low sensitivity and should therefore not be used as an image modality in detecting or ruling out an anastomotic leak (3). The aim of this study was to analyse whether a CT should be the gold standard in assessing the anastomosis after esophageal surgery.

Material and Methods

Between 2013 and 2020 all patients undergoing esophageal surgery at our department were analysed. The data was extracted from a prospective data bank and was retrospectively analysed. All patients that developed an anastomotic leak in the postoperative period were included in this study. Patients were divided into two groups: those treated before 2013 and those treated after 2017, as patients between 2013 and 2017 received a routine dynamic swallow study which was abolished in the following years. In addition, all patients with a postoperative anastomotic leak were grouped according to the image modality used (DSS, CT and UE).

Definition of an anastomotic leak

An anastomotic leak is defined as a defect of the wall at the anastomotic site leading to a communication between the intra - and extraluminal compartments (7). In addition, severity of the leak should be graded A to C according to the impact of needed treatment. Grade A leaks require no intervention, grade B leaks require active intervention but no surgery and grade C leaks require surgical intervention (8).

Imaging techniques

Computed Tomography

CT is performed with intravenous and oral contrast. Extravasation of the contrast agent was defined as an anastomotic leak. In addition, mediastinal fluid collection and mediastinal air were associated with the presence of an anastomotic leak (Figure 1 and Figure 2).

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Dynamic Swallow Study

A DSS is performed to examine the integrity of the anastomosis. Diatrizoic acid, a water-soluble contrast agent, is administered orally and is then radiologically display in different planes to assess and evaluate the anastomosis, width of the lumen and course of the esophageal passage. Extravasation of the contrast agent during the examination suggests an anastomotic leak (Figure 3).

Upper Endoscopy

UE was performed to evaluate the conduit and the anastomosis after esophageal surgery. It proviedes excellent visibility and can detect a malperfused or necrotic conduit. In addition, endoscopy can be safely used in ventilated and neurologically deficient patient. Also, treatment such as SEMS or endoluminal vacuum therapy can be initiated.

Results

Out of 212 patients a total of n=23 developed an anastomotic leak post-operatively yielding an insufficiency rate of 10.84%. As every one of those patients received an UE, UE was defined as the baseline diagnostic tool. CT and DSS were then compared based on their findings.

Computed Tomography

CT was performed in a total of n=13 patients. CT diagnosed in all 13 patients an anastomotic leak which was confirmed by a subsequent UE. This led to a calculated sensitivity of 100% (Table 1). Typical findings on the CT were extravasation of the contrast agent, mediastinal fluid collection and mediastinal air.

Dynamic Swallow Study

DSS was performed in a total of n=14 patients. DSS detected an anastomotic leak in n=3 patients correctly and in n=11 patients incorrectly yielding a sensitivity of 21.42% (Table 2).

Upper Endoscopy

UE was used as a baseline diagnostic tool in all patients. UE confirmed the anastomotic leaks in all patients who received a CT. In addition, it correctly diagnosed an anastomotic leak in n=11 patients who had a negative DSS.

Discussion

Following surgery of the upper gastrointestinal tract, the status of the intrathoracic anastomosis is of utmost importance as an insufficiency dramatically increases morbidity and mortality and therefore leads to an increased intensive care unity stay, increases hospital stay and has a major impact on the long-time survival of the patient (9-11). Up to this day, a gold standard for the diagnosis of an anastomotic insufficiency does not exit. To this day, many institutions still discuss the value of dynamic swallow studies in detecting an anastomotic leak, although experiences and our own data show that the image modality has a very low sensitivity and a high false negative ratio (3). This is also in concordance with our results. Compared to endoscopy,

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which was used as a baseline diagnostic and was performed in every patient, the dynamic swallow study only identified three anastomotic leaks correctly. In n=11 patients dynamic swallow ruled out an anastomotic insufficiency, although it was present during endoscopy. Compared to that, CT scan was performed in 13 patients and correctly diagnosed all patients with an anastomotic insufficiency thus prompting a timely and safely management whereas a negative dynamic swallow study delays initial treatment, therefore increasing the risk of postoperative morbidity and mortality.

In addition, it was shown that a "routine check" of the anastomosis before initiating oral uptake does not have a benefit on the outcome of the patient (12). This was also proven by us in a study published in 2017. Between 2013 and 2017, DSS was routinely performed. After 2017, however, routine examination was abolished and CT in combination with UE was performed when a patient showed clinical symptoms or was pre-septic/septic. In all of those cases, CT in combination with UE correctly diagnosed an anastomotic insufficiency and treatment could be initiated promptly.

Although our results show that CT has a sensitivity of 100%, the result itself might be overestimated, since it has not been evaluated in the context as a routine tool and has been only employed when an anastomotic leakage has been suspected. In general, employing any method to detect anastomotic leakage as a routine practice is not reasonable, since smaller insufficiencies are most often not clinically relevant.

To summarise, the method of choice in diagnosing an anastomotic insufficiency from our stand point of view is a CT in combination with an UE if treatment such as a self-expanding metal stent or endoluminal vacuum therapy is necessary. If there is no clinical suspicion, no image modality should be carried out.

Conclusion

Detecting an anastomotic leak is of utmost importance as it severely impacts the postoperative outcome of the patient. Therefore, we can recommend to perform a CT in combination with an UE if an anastomotic leak is suspected. A routine examination after surgery is not recommended. Previously used image modalities such as a dynamic swallow study should be abolished as there is no benefit whether it is performed routinely or when a leakage is suspected as sensitivity is low and false negatives are high.

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Figures

Figure 1. CT displaying an anastomotic leak with extravasation of contrast agent

Figure 2. CT displaying an anastomotic leak with extravasation of contrast agent and free air

Figure 3. DSS showing extravasation of contrast agent

Tables

Table 1. CT Findings

CT	Leak	No Leak	Total
Positive	13	0	13
Negative	0	0	0
Total	13	0	13

Table 2. DSS findings

DSS	Leak	No Leak	Total
Positive	3	0	3
Negative	11	0	11
Total	14	0	14

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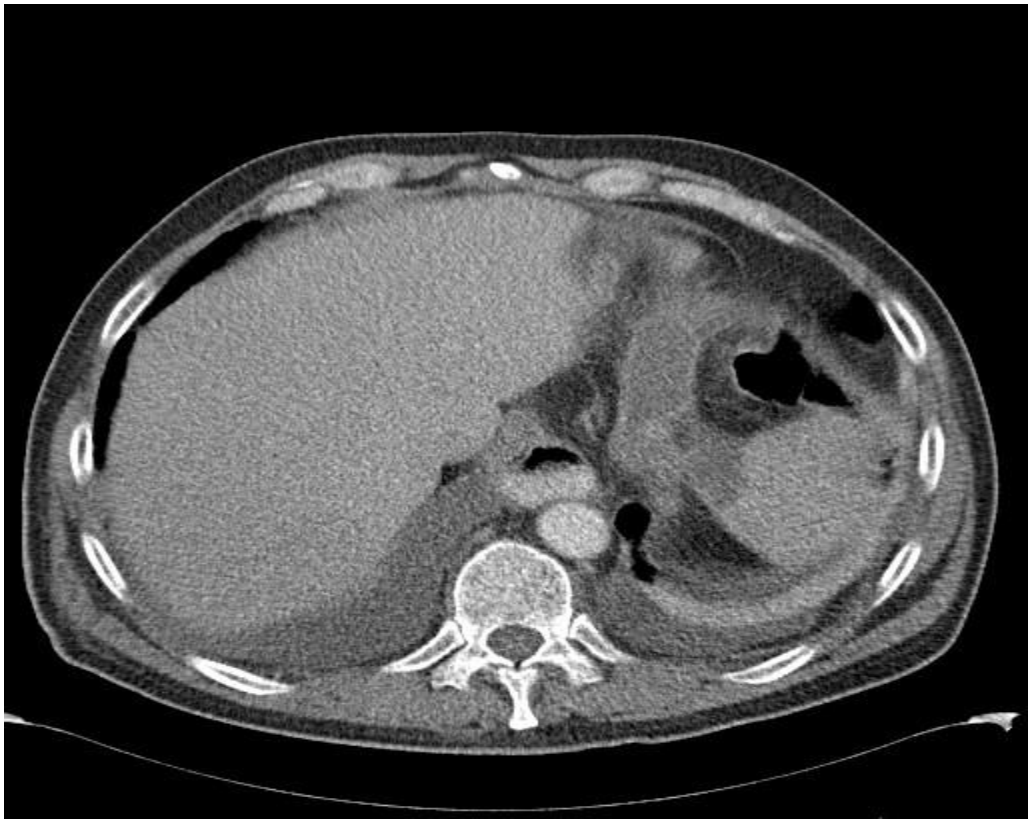

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