Intraoperative Assessment of Perfusion of the Gastric Graft and Correlation With Anastomotic Leaks After Esophagectomy


Objective: The aim of the study was to evaluate laser-assisted fluorescent- (LAA) dye angiography to assess perfusion in the gastric graft and to correlate perfusion with subsequent anastomotic leak.

Background: Anastomotic leaks are a major source of morbidity after esophagectomy with gastric pull-up (GPU). In large part, they occur as a consequence of poor perfusion in the gastric graft.

Methods: Real-time intraoperative perfusion was assessed using LAA before bringing the graft up through the mediastinum. When there was a transition from rapid and bright to slow and less robust perfusion, this site was marked with a suture. The location of the anastomosis relative to the suture was noted and the outcome of the anastomosis ascertained by retrospective record review.

Results: Intraoperative LAA was used to assess graft perfusion in 150 consecutive patients undergoing esophagectomy with planned GPU reconstruction. An esophagogastric anastomosis was performed in 144 patients. A leak was found in 24 patients (16.7%) and were significantly less likely when the anastomosis was placed in an area of good perfusion compared with when the anastomosis was placed in an area of less robust perfusion by LAA (2% vs. 45%, $P < 0.0001$).
By multivariate analysis perfusion at the site of the anastomosis was the only significant factor associated with a leak.

**Conclusions:** Intraoperative real-time assessment of perfusion with LAA correlated with the likelihood of an anastomotic leak and confirmed the critical relationship between good perfusion and anastomotic healing. The use of LAA may contribute to reduced anastomotic morbidity.

**Critical Appraisal**

Anastomotic leak can be a dreadful complication of esophageal resection and is associated with significant patient morbidity and mortality (1). Indocyanine green (ICG) enhanced fluorescence by near infra-red or laser excitement has been recently proposed to study the vascular supply of different organs since it allows a real time visualization of the blood flow after a simple I.V. injection of the dye.

The authors report a retrospective series of 150 patients undergoing esophagectomy via a transhiatal, en bloc transthoracic, minimally invasive thoracosscopic/laparoscopic approach, with a posterior mediastinum handsewn single layer cervical anastomosis between 2008 and 2011.

In 44% of the patients the entire graft showed a good perfusion while in the remaining 66% of the cases a difference between a rapid and bright perfusion of the proximal part of the conduit contrasted with a slower and less “robust” perfusion of the fundus of the gastric tube. In
this latter group of patients, the surgeons identified a sort of “line” of demarcation between the two parts by placing a suture and performed the anastomosis proximal to the stitch (29 cases) or distal to the stitch (49 cases).

The overall incidence of anastomotic leaks was in keeping with the literature (16.7%, 24 patients (2)). Patients in whom the entire graft was reported well perfused or the anastomosis was placed proximal to the transition point in an area of good perfusion assessed by fluorescence had a significantly lower incidence of anastomotic leaks (2% vs. 45% p<0.0001).

The eight leaks that required an endoscopic or surgical treatment were classified as major and they all occurred in the group where the anastomosis was placed in a poorly perfused area.

Multivariate and univariate analysis were also performed to analyze comorbidities that could be significantly associated with anastomotic leak according to literature (3); in this study only hypertension was reported to be significantly associated in univariate analysis.

The authors also evaluated the graft by Doppler but they found that this was not useful to identify the precise site of demarcation because the signal often disappeared at the fundus (data not shown).

Strong points:

1) This is, to our knowledge, the study with the largest number of cases for assessment of the gastric graft perfusion in esophagectomy using laser-detected fluorescence.

2) Weak points
1) The limitations are characteristic of a retrospective study, with missing data and variation in the surgical technique; moreover, the anastomotic leak rate was not analyzed according to the different operative approaches.

2) Lack of uniformity in the evaluation of images. As stated by the authors, their evaluation changed from qualitative to quantitative during the study, obviously more objective

3) The imaging system has evolved since 2011 (date of the end of this study); results might be even better today.

4) The authors evaluated the perfusion before the graft was pulled up into the neck. There may have been some stretching on the graft that could have influenced the perfusion that was not captured by the ICG test.

In conclusion, the use of indocyanine green enhanced fluorescence is a safe and feasible technique for the assessment of organ perfusion and its use in gastrointestinal surgery has increased in recent years (4,5, 6). This study, as well as others, should lead to safer surgery. Despite the limitations of this retrospective study design, the authors should be recommended to report their continued experience analyzing the impact of comorbidities and operative techniques on the leak rate for esophageal surgery.
Additional Reading


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