A new Technique for the Assessment of Perfusion in Gastric Grafts prior to Reconstruction after Esophageal Resection: Laser-assisted Indocyanine Green Fluorescent-Dye Angiography

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Background

Reconstruction after esophagectomy is typically performed with a gastric pull-up (GPU). Given the variable communication between the right and the left gastroepiploic arcades, the tip of the graft is often relatively ischemic.

The aim of this study was to assess a new imaging system for laser-assisted indocyanine green fluorescent-dye angiography (LA-ICGA) for evaluation of perfusion of the GPU.

Methods

The Spy-Imaging-System® (Novadaq, Ontario, Canada) was used to obtain fluorescent angiography images in 45 patients who had GPU between 03/2008 and 02/2009. Images were obtained beginning 5sec after intravenous central-line injection of 2.5mg of indocyanine green (**Figure 1** and **2** show a sample image)

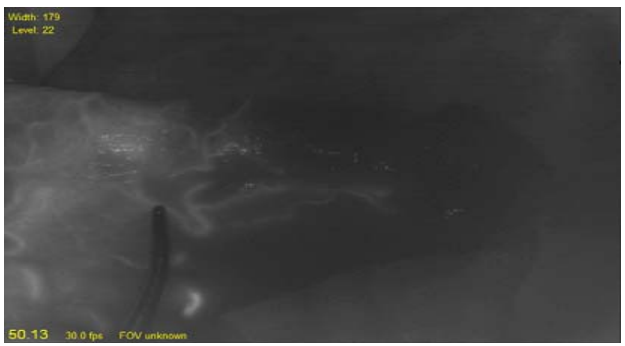

Figure 1: Sample image of fluorescent angiography (Spy-image) after injection of indocyanine-green: Distal tip shows uneven perfusion.

Results

Demographic data is shown in **Table 1**. Indications for operation were: cancer (n=39), caustic injury/perforation (n=3), achalasia (n=1), leiomyoma (n=1) and sclerodermia (n=1). There were no technical difficulties or complications related to the LA-ICGA, and in all patients images were obtained within 3-5 min.

The LA-ICGA showed globally even perfusion of the GPU in 22 patients (49%) and uneven perfusion in 14 patients (31%). The best location for the anastomosis was selected based on the LA-ICGA study. In 8 patients (18%) compromised perfusion of the tip of the graft led to resection of this area and in 1 patient prompted delayed reconstruction. **(Table 2)**

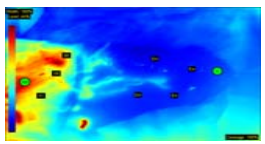

Figure 2: Same image review in color-mode for better visualisation: Distal tip shows uneven perfusion, anastomotic site was selected at area with good perfusion.

Table 1: Demographic data n= 45

Median age (years)	69 (35 – 85)
Gender (male/female)	35/10
Median Body Mass Index (kg/m^2)	25.8 (15.6 – 47.5)
Median operation time (min)	392.5 (221 – 692)
Median hospital stay (d)	13.5 (9-165)

Table 2: Anastomotic leakage and postoperative stricture rates

	Globally even perfusion n= 22	**Uneven perfusion** Anastomotic site selected n= 14	**Compromised perfusion** Tip resected n= 8*
Anastomotic leakage	3 (13.6%) (2 conservative, 1 stenting)	0	1 (12.5%) (reoperation and drainage)
Postoperative strictures**	5 (22.7%)	4 (28.6%)	4 (50%)

** The patient with delayed anastomosis is not included in this group.*
*** In 12/13 patients endoscopic dilatations were performed [median number of dilatations: 1 (range 1-6)]*

Conclusion

Our initial results show that LA-ICGA is a simple technique that can be used to objectively assess perfusion of the GPU. This new imaging system may reduce the rate of anastomotic complications and aid in selecting the location for the anastomosis.