Identification of Gastric Conduit perfusion deficits with Laparoscopic Laser Speckle Contrast Imaging

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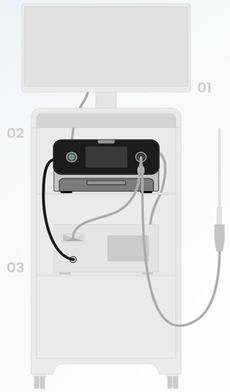
INTRODUCTION

Objective

Evaluate feasibility of laparoscopic Laser Speckle Contrast Imaging (LSCI) in assessing gastric conduit perfusion.

Background

- Anastomotic Leakage, a common complication, often arises from inadequate blood perfusion at the anastomotic site.
- Lack of precise and objective techniques for assessing tissue perfusion during surgery highlight the clinical demand for such methods.
- PerfusiX-Imaging (fig. 1) is a new and promising dye-free laparoscopic LSCI technology, developed for visualization of tissue perfusion.



01 Monitor

Displays the Real-time camera view or perfusion view

02 Perfusix-Imaging

Adds perfusion view to any laparoscopic device

03 Video processor

Processes the images from the laparoscopic camera

04 Laparoscope

The camera connected to the devices

Figure 1 | Position of the LSCI device in an existing laparoscopic video tower.

METHODOLOGY

Prospective observational

Medical Center Leeuwarden, Netherlands

30 Patients
- Minimally Invasive Esophagectomy

Comparison to State-of-the-Art
- Surgical eye
- IndoCyanine Green (ICG)

4 measurements during procedure
- LSCI blinded to Surgeon
- See fig. 2

Inter Observer Assessment
- Operating Surgeon
- Five Uninvolved Surgeons

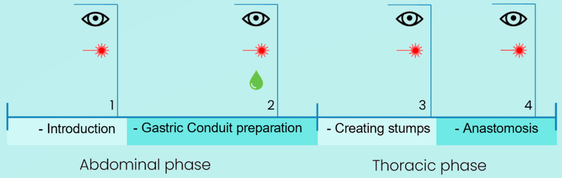


Figure 2 | Measurement moments during the Minimally Invasive Esopahagectomy.
1 = Baseline 2 = Gastric Conduit 3 = Stumps 4 = Anastomosis
= Surgical eye assessment = LSCI = ICG

RESULTS

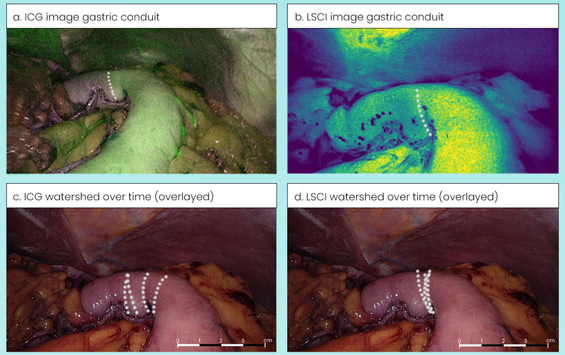


Figure 3 | Location of the watershed area as indicated by the operating surgeon (dotted lines). **a.** Image acquired using ICG fluorescence imaging. **b.** Image acquired with LSCI. **c-d.** ICG and LSCI watershed areas over a 20 second time span overlayed on whitelight images. A clear difference in homogeneity can be observed.

- LSCI showed little shift in location over time compared to ICG (fig. 3).
- Less time was needed for LSCI imaging than ICG fluorescence imaging (fig. 4)

Operating Surgeon
87.5% able to interpret images
37,5% changes resection site based on LSCI
1 cm proximal shift

Non-operating surgeons
92,5% able to interpret images
55% chooses more proximal site with LSCI
1.4 cm proximal shift
80% concordance with surgeon on ICG

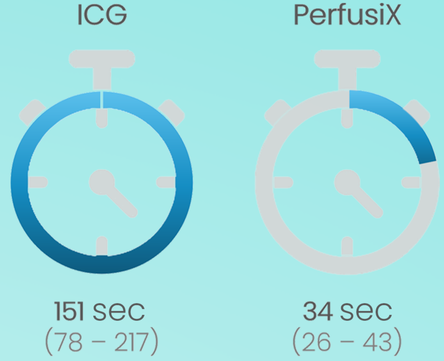


Figure 4 | Average duration of use of the modality per imaging moment in seconds. On average, LSCI was 5 times faster than ICG fluorescence imaging.

CONCLUSIONS

- PerfusiX-Imaging is capable of visualizing gastric conduit perfusion.
- LSCI shows higher homogeneity over time compared to ICG.
- Imaging time of LSCI is 5x faster compared to ICG.
- Uninvolved surgeons draw a more proximal watershed line than operating surgeons.
- Concordance on ICG images is higher, but indicates a more distal location than whitelight