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Research In-Progress

Bowel Perfusion Monitoring with FUJIFILM ELUXEO® VISION Imaging System in Colorectal Surgery

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Introduction: Thorough evaluation of colorectal anastomoses using white light endoscopy and leak testing is critical. Indocyanine green fluorescence angiography has emerged as a tool to assess bowel perfusion but has limitations. The FUJIFILM ELUXEO® VISION System allows for visualization of tissue oxygenation saturation (StO₂), without requiring dye injection. This system uses multispectral illuminations and absorption properties of oxy- and deoxyhemoglobin to provide numerical StO₂ measurements and superimposes an StO₂ “map” onto the image to provide a more quantitative assessment of perfusion. The technology can be applied to laparoscopic and endoscopic platforms. We look to investigate a quantitative approach for assessing bowel perfusion at colon anastomoses.

Methods: Our initial pilot study assessed oxygen saturation endoscopic imaging (OXEI) measurements at colon anastomoses of 12 patients. Measurements were taken using the FUJIFILM VISION System at four locations: proximal base, proximal staple line, distal staple line, and distal base. Two-tailed paired t-tests were used to compare StO₂ at healthy mucosa (base) to the staple line. Patients were followed longitudinally via chart review to monitor outcomes.

Preliminary Results: The average StO₂ differences were +12.58% (95% CI: 1.96-23.19%) between the proximal base and staple line and +15.34% (95% CI: 6.76-23.9%) between the distal base and staple line. Significant differences were observed between normal mucosa (base) and staple line-adjacent mucosa (proximal: p=0.025; distal: p=0.003). There were no intraoperative complications or anastomotic leaks.

Next Steps: Given there were no anastomotic leaks, our primary outcome measure, we were unable to draw conclusions regarding clinically relevant StO₂ cutoffs. A larger, prospective cohort study is underway at our institution to correlate both endoscopic and laparoscopic StO₂ measurements using the FUJIFILM ELUXEO® VISION System with clinical outcomes. Our current study aims to determine the best StO₂ assessment metric for a healthy anastomosis. Once our 50-person enrollment is complete, we will begin analysis.

Figure 1: Endoscopic white light image (A) with superimposed StO₂ map (B) and laparoscopic image (C) with superimposed StO₂ map (D) using FUJIFILM ELUXEO® VISION System.

