Visible Light Spectroscopy Correlates with Controlled Abdominal Aortic Flow During Regional Low Flow Perfusion

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Purpose:
To explore sensitivity of Visible Light Spectroscopy (VLS) to detection of local gastrointestinal mucosal oximetry during mesenteric ischemia.

Materials and Methods:
Microvascular tissue oxygen saturation of intestinal serosa of piglets was measured using a visible light spectroscopy (VLS) oximetry probe. In 12 animals, blood flow was controlled by surgical cardiopulmonary bypass (CPB). In 6 animals, a VLS probe was placed around the mid-small intestine using direct vision to measure StO2%. A Doppler flow probe was placed around the abdominal aorta just below the renal arteries. Regional Low Flow Systemic Perfusion (RLFP) was adjusted to 40, 30, 20, 10 cc/kg/min for 10 min intervals, followed by Deep Hypothermic Cardiac Arrest (DHCA), followed by RLFP reestablishment and stepwise increases at 10 min intervals.

Results:
Serosal intestinal saturation during reduced perfusion and arrest is shown below (Figure 1). Figure 1. Blood flow in the Abdominal Aorta is highly correlated with serosal intestinal saturation during stepwise reductions in regional perfusion. Update time for the optical measurement is about 1 second, measured continuously.

Conclusion:
VLS mucosal oximetry provides a continuous monitor of tissue oxygenation during endovascular procedures that put mucosa at risk of ischemia. Prediction or detection of ischemia enables the practitioner to plan accordingly and to intervene early in the event of desaturation.