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## Detection of Enteric Ischemia Using T-Stat®

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**Purpose:** We tested a through-the-scope device that measures mucosal capillary hemoglobin oxygen saturation during endoscopy. This device, which was approved by the Food and Drug Administration (FDA) in 2004, gives physicians the ability to objectively evaluate areas of the gastrointestinal tract for the presence of ischemia.

**Materials and Methods:** An IRB approved prospective study of the T-Stat® Ischemia Detection System was performed at the Palo Alto VA Hospital and Stanford University from 2000 to 2004. Patients with a wide variety of clinical conditions were recruited for the study. Mucosal tissue oximetry was performed using an optical catheter passed through the instrument channel of standard endoscopes and colonoscopes. Measurements were performed in triplicate at each abnormal area and in at least one uninvolved region of the gastrointestinal tract for control purposes.

**Results:** Normal mucosa was found to have a capillary hemoglobin oxygen saturation of 60-80% in the esophagus, stomach, small intestine, colon and rectum (Table 1).

Measurement Group	Tissue Oximeter (mean ± SD)	No. of Measures
Normal	70 ± 4	(65)
Ischemia		
– Before Stenting	44 ± 14	(7)
– After Stenting	64 ± 8	(7)

**Table 1.** Ischemic G.I. tissue had a significantly different saturation than normal G.I. tissue. Ischemic tissue saturation significantly improved with stenting, to near normal levels.

Highly significant decreases in capillary oxygen saturation were observed in patients with chronic mesenteric ischemia, with capillary saturations of 20-40% in severe cases. These decreases were corrected by percutaneous stenting of the affected arteries. Capillary oxygen saturation was also found to be significantly lower than normal in ischemic colitis and in advanced gastrointestinal neoplasms. In contrast, capillary oxygen saturation was found to be normal in most cases of chronic radiation proctopathy and peptic ulcer.

**Conclusion:** The T-Stat® Ischemia Detection System is an FDA-approved instrument that can be used during endoscopy to evaluate patients for the presence of ischemia. We measured substantially decreased levels of capillary hemoglobin oxygen saturation in patients with known bowel ischemia, and observed normalization of these values with appropriate treatment and resolution of symptoms. We also investigated a wide variety of other gastrointestinal disorders for the presence of ischemia, and observed that ischemia is commonly present in advanced malignancies, but other conditions such as radiation proctopathy and peptic ulcer are typically not associated with ischemia.