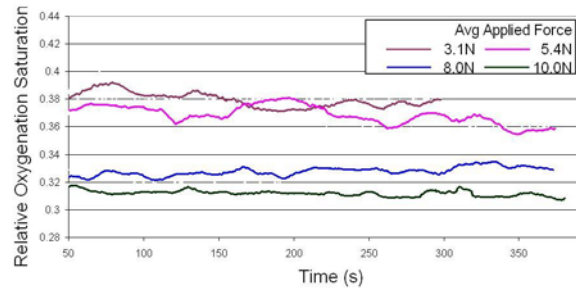


## 850. P4.97. An Intra-Operative System For Relating Ischemic Damage To Retraction Forces

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In general and laparoscopic surgery, tissues and organs are often retracted to provide a field of view and workspace for the surgeon. Clinical studies show that excessive retraction force may cause ischemic damage. We have developed a system to determine the effects of magnitude and duration of retraction force on the oxygen saturation (ischemia) of living tissues. Specialized surgical retractors with integrated force and oxygenation sensors were designed and manufactured. Force is measured using both commercial force/torque transducers and custom strain gages. Oxygenation is measured optically using sensors mounted on plastic sheaths that fit over the retractors. Real-time force and oxygenation data from the instruments are recorded and displayed to the surgeon through a graphical user interface. Experiments were performed on *in vivo* porcine liver at the Minimally Invasive Surgical Training Center of the Johns Hopkins Hospital. Preliminary data indicate that (1) tissue oxygenation is inversely related to applied force and (2) there exists a retraction force threshold beyond which a significant decrease in oxygen saturation is not observed.



Data show that relative oxygen saturation decreases as retraction force increases.