

## Safety of Laser Application Through Blood Using an Endoscopic Laser Balloon Catheter

**Author Block:** Katsuaki Yokoyama, MD, PhD, Hiroshi Nakagawa, MD, PhD, Jan V Pitha, MD, PhD, Ralph Lazzara, MD, Warren M Jackman, MD *From Cardiac Arrhythmia Research Institute at the University of Oklahoma Health Sciences Center, Oklahoma City, Oklahoma*

**Background:** In laser ablation, laser is delivered through a fluid-filled balloon positioned against the tissue to minimize lasing into blood, which has a potential risk of thrombus since laser is absorbed by blood (heating blood). The purpose of this study was to determine the risk of thrombus during laser ablation in fields of stagnant blood or pulsatile blood using an endoscopic laser balloon catheter (ELBC, CardioFocus) in a canine model.

**Methods:** In 7 anesthetized dogs, the skin over the thigh muscle was incised and raised to form a cradle which was superfused with heparinized blood (ACT > 350 sec) at 37 °C. Aspirin (80 mg p.o) was administered before ablation. ELBC (980 nm, 25 mm balloon diameter) was positioned against the thigh muscle in the blood filled cradle. ELBC was filled with D2O (optically clear, does not absorb laser). An endoscopic fiber within ELBC (Fig) visualized a lasing arc (90° of circumference) and presence or absence of blood between the balloon and tissue. Sites were selected by endoscopy to lase with 2/3 of arc in bloodless field and 1/3 of arc into blood. Laser was applied for 60 sec with either stagnant blood (constant balloon contact) or pulsatile blood (increasing/decreasing ELBC pressure once per sec) under ELBC. Blood was removed after each lasing to examine for thrombus. Lesion size was measured by TTC staining.

### Results:

Lasing Power Density (Watts/cm)	Blood Field	n	Thrombus Formation	Lesion Depth (mm)
6.0 W/cm	Pulsatile	37	0/37	11.5 ± 1.2
	Stagnant	18	8/18*	12.7 ± 1.9*
7.2 W/cm	Pulsatile	21	1/21	14.2 ± 2.2
	Stagnant	3	1/3	18.9 ± 2.1*

**p <0.01 comparison between pulsatile and stagnant at the same lasing power density**

**Conclusions:** Lasing at 6.0 W/cm into pulsatile blood did not produce thrombus. Thrombus occurred with lasing at higher power (7.2 W/cm) into pulsatile blood or at power of 6.0 W/cm or 7.2 W/cm into stagnant blood. Laser energy should not be applied into the stagnant blood.