

## Excimer Laser Induced Autofluorescence from Atherosclerotic Human Arteries

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Autofluorescence analysis has great potential as a diagnostic aid in executing safe, rapid laser recanalization of stenotic human arteries. The angioplasty procedure requires that atherosclerotic lesions be selectively targeted and eliminated without compromising the essential vessel wall. The ultraviolet excimer laser is an attractive candidate to perform the ablative removal of plaque because it causes minimal thermal damage. This laser has been shown to elicit useful autofluorescence profiles from diseased arterial samples *in vitro*. Using a XeF excimer laser (351 nm wavelength) operating at low intensity, fluorescence spectra were elicited from both healthy and atheromatous sites along luminal iliac artery surfaces. A flexible optical fiber was used for the fluorescence collection. Healthy arterial tissue produced a characteristic fluorescence response which was virtually invariant in curve shape from site to site. Normal arterial wall could be distinguished from calcified plaque based on significant differences in profile shape, with fibrous or fatty regions (earlier stages of the disease) also deviating from the normal artery in spectral response. In a separate experiment, spectra were obtained before and after ablative laser excavation into the arterial wall at both healthy and diseased sites. The muscular middle wall layer of normal artery produced a slightly different fluorescence response than the thin overlying endothelium. The spectral profile from artery samples with endothelial surface plaques changed dramatically upon ablative penetration of the lesions. Fluorescence curves elicited at depth at diseased sites resembled the medial layer response of healthy artery. Acquisition of this muscular middle wall fluorescence curve during laser angioplasty could serve as a signal of the appropriate endpoint of the ablation process. In this manner, catastrophic wall perforation would be avoided. Thus it should be possible to utilize the excimer laser for both diagnostic spectroscopy and ablative plaque removal.

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