

CIMIT MEETING SUMMARY 12/11/01

CIMIT was a cosponsor of the Lester Wolfe Workshop in Laser Biomedicine, which replaced the regular CIMIT forum. The workshop was devoted to "Optical Methods for Detection and Treatment of Atherosclerosis". John R. Kramer, MD, Department of Cardiology, Cleveland Clinic Foundation, gave an overview of this topic. In reviewing the field he noted that the initial goal of laser angioplasty systems was to open a vascular occlusion and that a number of 308-nm excimer laser systems were developed to do this. While early trials of these systems reported a high procedure success rate, adjunctive balloon angioplasty was often needed and the 6-month restenosis rate was nearly 50%. Later studies, in 1997, showed lower success rates (30%), 93% use of adjunctive balloon angioplasty and many complications. As more research was done some of the problems involved in laser angioplasty became clearer. A mismatch between catheter diameter and vessel lumen led to an inability to create a large lumen. Cuts often showed a high degree of eccentricity, leading to wall perforation and other problems; dense plaque was especially likely to lead to catheter deflection and possible perforation. Other problems included bubble formation in the optically-absorbing blood field, leading to tissue damage, as well as thermoelastic effects. The possible mutagenicity of 308-nm radiation was also raised as an issue. Excimer laser angioplasty is now little used; however 355-nm tripled Nd:YAG radiation was suggested as a possible source that might be useful if the dosimetry and pulse duration were optimized. Dr. Kramer was optimistic about the role of improved systems for spectral data collection, combined with new diagnostic algorithms, in providing information about the chemical composition of arterial lesions. In the discussion it was pointed out that the good data on control of restenosis with coated stents makes it likely that the role of laser angioplasty will be limited to those occlusions that cannot be crossed in order to place a stent.

Brett Bouma, PhD, Wellman Laboratories, MGH described the Characterization of Atherosclerotic Plaque with OCT. The overall goal is the assessment of vulnerable plaque using OCT. Three studies are being conducted in parallel. An Ex-Vivo study serves to define the criteria for characterizing vulnerable plaque by OCT and to prospectively test those criteria. An animal model is used both to examine the safety of new catheter designs and to study of the progression and regression of plaque. Finally, a human study is ongoing and serves to characterize sites in patients who have had an acute MI. To date 39 patients who were undergoing stent placement have been studied by OCT as well as by IVUS. An OCT image of a stent buried in restenotic tissue was shown to demonstrate the resolution of the images obtained.

Wai-Fung Cheong, PhD, Pharmacyclics Inc., discussed Cardiovascular Applications Using Texaphyrins. Antrin™, a photosensitizer absorbing at 732 (and 470) nm and fluorescing near 750 nm is being studied for localization of atherosclerotic plaque. The dye gives high fluorescence contrast at 24 hours and has no significant phototoxicity. Both IV and intra-arterial delivery have been investigated. The drug is also being studied for therapy, removal of lesions in the peripheral vasculature. A Phase I safety study has been complete and Phase II study is in progress. Some lesion regression has been observed. A Phase I study of the drug for use in the coronary arteries, involving both

light and drug escalation studies, has been initiated. Work to date indicates the therapy is feasible and well tolerated. Progress in treating lesions with coated stents may lead to a shift in strategy to the detection/treatment of vulnerable plaque.

Finally, two graduate students, Abigail Haka and Jason Motz debated the relative merits of fluorescence and Raman spectroscopy in the diagnosis of atherosclerosis and in so doing presented a summary of their work on the two approaches.

Thomas F. Deutsch 12/14/01