AbstractID: 1771 Title: Effect of vessel walls on the accuracy of optical CT densitometry using laser and cone-beam scanners

Optical computed tomograhpy (CT) is a general quantitative technique for measuring optical properties of materials in three dimensions. One application is reading dose images written into radiochromic materials such as ferrous xylenol orange gelatin hydrogels. This work compares reconstructed absorption coefficients for laser CT (594 nm) and cone beam CT with a LED diffuse light (590 +\- 5 nm) and CCD camera (256x256 pixels). The calibration solution contained nigrosin (black dye), 7% propylene glycol and water. The laser CT data is considered as "standard" while cone beam CT offers the opportunity of faster 3D scanning. Scan times for 450 projections over 360 degrees were 12 minutes per 2 slices (parallel scanning) and 40 minutes (150 slices) for laser and cone beam CT respectively. Data were compared at 0.5x0.5x0.5 mm spatial resolution. Three 10 cm diameter cylinders of teflon, polycarbonate and polymethylmethacrylate (PMMA) with wall thicknesses of 0.5, 0.3 and 2.0 mm respectively were compared. Both the teflon and polycarbonate walls allowed reconstructed uniform attenuation to within 2 mm of the inner walls. PMMA wall caused deviation from uniformity at 10 mm from the wall as a result of missing transmission data caused by refraction. Standard deviation of the mean attenuation was 3%. Attenuation coefficients for teflon and polycarbonate agreed within experimental error with independent spectrometer measurements while PMMA values were 2% elevated due to the missing data artifact in the reconstruction.
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