AbstractID: 1460 Title: Determination of the attenuation coefficient and reconstruction of ellipses from two x-ray projections

It is commonly held that an ellipse cannot be uniquely reconstructed from two x-ray projections because the attenuation coefficient, μ, is not known. We, however, have developed a technique to determine μ, and subsequently reconstruct an elliptic cross section from two x-ray images. Using the mathematical relationships for ellipses, we show that μ can be estimated from the profiles in the two images; specifically, μ is smallest for circular cross sections and/or when the angle between the major axis and the projection axis, θ, is zero. For each cross section along the vessel axis, μ is calculated. The minimum μ is taken as the best estimate of the actual μ. To evaluate the technique, vessel images were simulated using a series of elliptical vessel cross sections. The major and minor axes lengths, a and b, and the angle, θ, were randomly chosen. The cross sections were "filled" with a known concentration of contrast material. The values of μ, a, b, and θ were then estimated from the image data. Using random distributions for a, b, and θ, we found that μ could be estimated to within 1-5 percent, allowing estimation of a, b, and θ with accuracies also of 1-5 percent. Thus, by using the 3D continuity of μ and taking advantage of the elliptic nature of normal vessel cross sections, we demonstrate that one can accurately estimate μ, as well as the parameters describing elliptic cross sections. Supported by: NIH Grant # HL52567 and the Toshiba Corporation.