Purpose:
To study the spatial characteristics of the dose delivered by the Xoft Axxent Electronic Brachytherapy system within a volumetric (voxel) visualization system. Further, to extend the study from tools available in treatment planning systems, which are typically limited to a single set of TG43 input data for a source type, to be able to investigate data for individual sources. Additionally, to allow for comparisons to be made between the standard or average source, and a particular source of interest via difference images, line plots, and histograms.

Method and Materials:
Input spatial data in the form of polar and azimuthal angular distributions, and depth dose readings acquired in the course of source characterization, were loaded into a custom LabVIEW program. This program created 3D voxel arrays for an average reference set and for individual sources, allowing two data sets in memory simultaneously. Analyses on the voxel arrays include visualization of the distributions via 2D false-color images and line plots, scatterplots and histograms of values and cumulative values. The visualization tools can be applied to either source or reference data set or the difference between them.

Results:
2D images representing slices through the volume, and line plots along chosen lines on the images, provide information on the spatial variation in either the source data or in the difference, or percent difference, between a specific source and the reference. Histograms provide quantitative results on the degree of variation between source and reference, while scatterplots provide insight into the region or characteristic causing variations.

Conclusion:
Volumetric analysis of the Xoft Axxent™ source is a powerful tool for understanding the dose distribution and expected variation from source to source, which can be applied to any brachytherapy source for which 3D spatial data is available.