

Purpose: To investigate the imaging capabilities of two image-guided radiotherapy (IGRT) systems, TomoTherapy Hi-Art™ and Varian Trilogy™.

Methods and Materials: A 35 cm diameter phantom, developed in house for overall assessment of imaging capabilities for pelvic radiotherapy, was scanned on the Hi-Art™ from TomoTherapy Inc. and on Varian Medical System's Trilogy™ system half fan (boby scan) with half bow tie filter. This phantom consisted line pairs for assessing the X, Y and Z resolution, CT density plugs, a steel ball, air surrounded by acrylic, water ovoid in an acrylic base, low and high contrast plugs, and water holes surrounded by acrylic. Moreover all these objects are immersed in water. We used a farmer chamber for dose measurement for both the systems at the centre (isocenter) of the phantom and near the edge of the phantom.

Results: The X and Z resolution is better for Trilogy scans while Y resolution was better for Hi-Art™ scans. Metal artifacts were more pronounced in Trilogy™ scans as compared to Tomo scans. -6% contrast object was more prominent for Trilogy™ scans but for 3% contrast was more visible on the Tomo scans.. Quantitative analysis of CT density plugs and uniform water showed that the CT number uniformity is far better for TomoTherapy images than for Trilogy™ scans. The dose measured at the center of the phantom is more than 3 times higher for Trilogy™ and the dose at the off axis is more than 5 times higher as compared to the TomoTherapy imaging dose.

Conclusion: The Trilogy™ and Hi-Art™ scan perspicuity is similar. However, the CT numbers are more consistent on the Hi-Art™ unit and it produces fewer metal artifacts. The dose delivered to the patient is much greater on a Trilogy™ than on the Hi-Art™ unit.