Pre-Clinical Trial To Assess Speed, Efficacy and Radiation Exposure Using The Perfint PIGA CT System For Needle Guidance

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Objective: To evaluate the accuracy, speed and radiation exposure using manual guidance compared with robotically assisted needle guidance via the PIGA CT system in a pre-clinical trial.
Methods: Using a CT phantom, a junior radiology resident and an experienced IR attending initially performed 15 CT guided needle placements into pre-selected targets in 3 sets with varying degrees of difficulty. The distance from the target center was determined, as was time for needle placement, distance from insertion site to target center, number of CT fluoroscopy acquisitions, and total number of CT images. The process was then repeated for both the resident and attending using the Perfint PIGA CT robotic guidance system.
Results: The resident radiologist targeted the lesions equally well conventionally (3.4-4.4 +/- 1.44 mm) or using robotic assistance (2.6-3.8 +/- 2.43 mm). There was a significant timesavings using the robotic system over conventional targeting (2:02 - 2:06 +/- 1:13 min vs. 7:20 - 9:11 +/- 3:24 min). The radiation exposure, as measured by increased CT images, was dramatically decreased both to the phantom and resident operator using the robotic guidance vs. conventional targeting (9.3 +/- 20.7 vs. 28-124 +/- 42.3 depending on target difficulty). The attending radiologist also targeted the lesions equally well conventionally (2.5 - 5.3 +/- 1.59 mm) or using robotic assistance (0.9 - 3.7 +/- 1.7 mm). The attending radiologist also experienced a timesavings using the robotic system vs. conventional targeting (1:50- 1:58 +/- 0:09 min vs. 2:47 - 5:15 +/- 1:21 min). Radiation exposure, as measured by increased CT images, was decreased using the robotic system vs. conventional guidance (0 vs. 24-52 +/- 20.9 depending on target difficulty.
Conclusions: Robotically assisted needle guidance was equally efficacious in lesion targeting while dramatically improving speed and radiation exposure to both the patient and operator. The speed and exposure savings were more pronounced for the lesser-experienced operator. These findings support the need for further studies utilizing the PIGA CT system for robotic assistance in more clinically relevant settings.

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