Accuracy of Tumour Targeting Using A CT-Compatible Robotic System – A Phantom Study

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PURPOSE

A new CT- or PET-CT-compatible robotic system, MAXIO^{TM} was developed by Perfint Healthcare, USA to assist tumour targetingin biopsy and interventional procedures. This study aimed to evaluate the accuracy of the robotic system in tumour targeting.

MATERIAL AND METHODS

Watermelon, with aluminum seeds (1 x 0.5 mm) implanted at 30, 50, 70 and 90 mm depth, was used as a phantom. Theimplanted seeds were identified and targeted in the treatment plan. The orbital angulations of the needle insertion were varied at 0^o, 30^o, 45^o, 60^o, -30^o, -45^o and -60^o, whereas the cranio-caudal angulations were varied at 0^o, 30^o, 45^o, -30^o and -45^o.After needle insertion, CT check scans were done to determine the deviation in X, Y and Z axis of the needle tip and target.

RESULTS

A total of 120 needle trajectories were assessed using 4 watermelons. The depth of target from the surface did not show significant difference in affecting accuracy of needle positioning. The orbital and craniocaudal angulation alone also did not affect the accuracy. The highest deviation of needle tip from the target was 2±1 mm, occurred more frequently in the combination of orbital and cranio-caudal angulations, e.g. $(45, 45)^0$, $(-45, 45)^0$, $(45, -45)^0$. Higher accuracy was noted with the robot docked at the right compared to the left side of the scanner.

CONCLUSION

The MAXIO^{TM} robotic system achieved high accuracy of ±2 mm in tumour targeting. It showed great potential to improve accuracy and minimize radiation exposure during CT-guided biopsy or interventional procedures.

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