A Novel Method Using KV and MV Imaging of a Linear Accelerator to Improve Metal and MRI Compatible HDR Applicator Source Simulation And Delivery

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PURPOSE

To implement a novel method using kV and MV imaging of a linear accelerator to improve the positional accuracy of metal and MRI compatible HDR applicator source simulation and delivery.

METHOD

- A Varian Novalis Tx was used to image:
  - 3 tandem and ring sets
  - 2 MRI compatible cylinder sets
  - 2 MRI compatible tandem and ovoid sets
  - 1 metal tandem and ovoid set
- Each set was imaged with the source position simulator (SPS) set to the treatment position, and their respective dummy sources.
- The SPS and actual source was compared using a connected ruler and camera system.
- The coincidence of the SPS and the dummy sources were compared.
- The time to take the measurements and user variation with six different users evaluating images were also recorded.

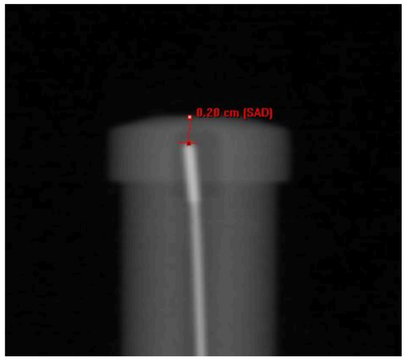

Figure 1: Captured image of the HDR source position check cable measurement.

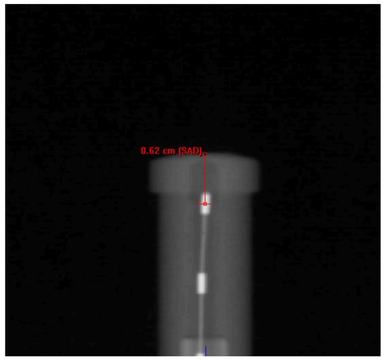

Figure 2: Captured image of the HDR dummy sources measurement.

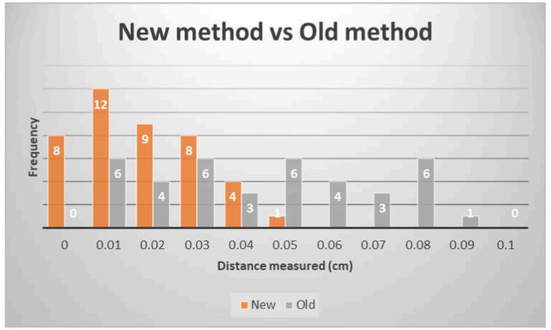

Figure 3: A histogram comparing the frequency of distances measured using both methods.

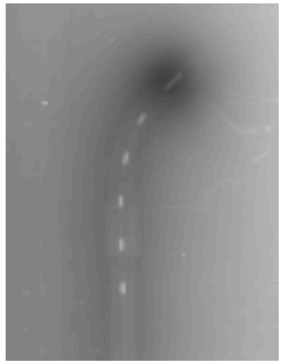

Figure 4: Captured image of the traditional applicator position test.

RESULTS

- Applicator positional accuracy showed to be within 0.5mm with an average accuracy of 0.2mm of the expected position.
- The new method proved to be independent of user.
- The new method showed an efficiency improvement of:
  - Up to 53.75 minutes for 3 applicators
  - Up to 125.5 minutes for 10 applicators.

CONCLUSIONS

- The proposed method using kV and MV imaging of a linear accelerator proved to be a feasible method of measuring the positional accuracy of HDR applicators.
- There was no user dependence found.
- The accuracy and time to perform the test were improved when compared to a traditional method using film and a CT scanner.

CONTACT INFORMATION

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