AbstractID: 13439 Title: A phantom for physics QA to check the accuracy of an Ir-192 stepping source dwell position and reproducibility of dwell time in HDR brachytherapy

Purpose:
To determine the accuracy of dwell position, reproducibility of dwell time and effect of bending a transfer tube for Ir-192 high-dose rate (HDR) brachytherapy stepping source using an in-house made phantom.

Method and Materials:
Experiments were performed using a Nucletron microselectron V3 (30) HDR after loading device with Ir-192 single stepping source, Fuji Capusla XL computed radiography (CR) cassette and its reader and an in-house made phantom. The central part of the phantom, which has alternating strips of lead and Perspex was used to check the accuracy of dwell positions while the outer part of the phantom, which consists of four different materials, namely perspex, copper, aluminium and Styro-foam, was used to measure reproducibility of dwell time. Images were exported via network as DICOM images for further analysis by ImageJ.

Results:
- Positional error of an HDR source smaller than 1.0 mm can be detected. Hence, it is possible to regularly check dwell positions for selected transfer tubes of a treatment plan as a quick verification of dwell positions.
- Reproducibility of dwell time within 0.1 second could be verified.
- No effect of bending a transfer tube was observed for normal clinical situations. However, under extreme cases in which the transfer tube was highly bent, the source dwell position was changed by less than 0.5mm.

Conclusion:
The phantom was capable of detecting dwell positional error of 1.0 mm and reproducibility of dwell time of 0.1 second. For typical clinical scenarios in which transfer tubes are bent, no effect on dwell position was observed. The phantom can be used with radiographic films or CR cassette with the latter being a preferred tool, as hospitals are phasing out film processors in favour of digital technology. The method is simple and robust for routine use.