Evaluation of the Dosimetric and Radioprotection Features of a New Automatic Needles Loading System, the IsoloaderTM.

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Body of Abstract: Purpose:

As more permanent prostate implants are performed because of their proven efficiency, the safe handling of seeds becomes a major concern. The goal of this study is to evaluate the dosimetric capabilities and the radiation protection (RP) performances of a recently introduced automatic needles loading system, the IsoloaderTM (Mentor Corp.), which has already been used in more than 50 clinical cases at our institution.

Materials and Methods:
The IsoloaderTM, a computerized workstation, allows automated seeds testing (solid state CdZnTe detector) and loading in surgical needles following the treatment plan while preserving their sterile conditions. The seeds are received in sterilized, shielded and ready-to-use cartridges, which are individually prepared for each patient. The unit is operational as soon as the cartridge is introduced on its front panel. RP measurements, using a Geiger-Müller tube (Inspector), were done on a cartridge filled with 67 Iodine-125 seeds of 0.595mCi. RP evaluations, paired with times measurements, were also performed during the dosimetric seeds verification and during the loading of needles. The reproducibility and the accuracy of the detector were evaluated by comparison to a well-chamber (WC), Victoreen 34-070-5000, calibrated at an accredited lab (February 2003).

Results:
The cartridge appeared adequately shielded since no significant amount of radiation was detected around it. Radiation during the seeds assay was found to be worst at the cartridge’s bottom where it has a value of 0.0152mSv/h (0.0014mSv/h at 10 cm). For the needle-loading task, measurements were performed with a typical needle (3 seeds) at the shielded needle holder’s surface and at the junction between the cartridge and the needle holder, yielding 0.3072mSv/h (0.0083mSv/h at 20cm) and 0.0533mSv/h respectively. The same measurements performed in a worst case scenario (10 seeds) gave us 0.0294mSv/h at a normal working distance of 20cm. In this case, the work of the person in charge of the needle loading would be restricted to 34 hours/year to respect the public dose equivalent limit recommended by the ICRP. The dosimetric verification of seeds takes an average of 15 s/seed while it takes from 10s to 60s to load a needle depending on its content. Measurements of the seeds activities were 1.9% higher on average than those from the WC (min=0,7% , max=3,5%), well inside the precision of the WC. The reproducibility of the measurements with the CdZnTe detector was excellent with an average of 0.01% (N=120 ; sigma=1.9%).

Conclusion:
These results put forward the good accuracy and reproducibility of the CdZnTe detector. They also allow to conclude that the times required to perform the dosimetric seeds verification and needles loading are short enough to be used in the OR. RP features during needle loading are however not optimal at this time. Furthermore, the Isoloader produces a detailed radiation report after each cartridge’s assay and the assay of one seed is quick enough to allow us to verify 100% of the seeds for each patient. This report is a strong addition to any QA program and makes a welcome supplement to the patient medical file to be assured of respecting the legislation.