

# Advanced methods for quality assurance and dose distribution improvement for high dose rate brachytherapy

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Propositions accompanying the thesis of

## Advanced methods for quality assurance and dose distribution improvement for high dose rate brachytherapy

Murillo Bellezzo

1. Performing pretreatment verifications can avoid errors during the treatment, which may be highly beneficial to the patient. A reliable and detailed brachytherapy pre-treatment verification method is not commonly available due to the limitations of the currently used methods, which can lead to high uncertainties and inconclusive results. (this thesis)
2. The time-resolved source position verification and the possibility of multiple measurements (without having to go inside the brachytherapy room to replace the radiochromic film) drastically increases the capabilities of detecting problems with the applicator or afterloader, especially for errors that rarely happen and are only detected after several measurements. (this thesis)
3. The afterloader is an essential part of HDR brachytherapy. Its precision and accuracy for dwell times and dwell positions directly impacts the resulting dose distribution and, consequently, treatment outcome. (this thesis)
4. The transit time correction, however, can have a considerable impact on the dose distribution, especially for HDR treatments with many dwell positions with short dwell times, and most studies aimed to determine the transit time, adopt the average source speed instead of instantaneous source speed, which does not represent a realistic approach for the source movement. (this thesis)
5. The MAASTRO applicator holds the potential to be a cost-effective alternative to contact x-ray brachytherapy devices since it does not require any extra tool other than those that an oncology center that works with brachytherapy already has. Moreover, the possibility to control the shape of the dose distribution using a treatment planning system is an advantage of the MAASTRO applicator when compared to CBX devices. (Valorization)
6. The bottom line: Health care reform is about the patient, not about the physician (Abraham Verghese)
7. Replace Fear of Radiation with Curiosity (Steven Magee)
8. Every great advance in science has issued from a new audacity of imagination. (John Dewey)
9. We ourselves feel that what we are doing is just a drop in the ocean. But the ocean would be less because of that missing drop. (Mother Teresa)