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In-vivo dosimetry in prostate HDR brachytherapy with thermoluminescence detectors (TLDs)

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During complex conformal radiotherapy treatments it is very important, also if not mandatory, perform in-vivo dose measurements. In fact, in-vivo dosimetry allows monitoring the dose delivered to the patient and to compare this dose with the prescribed one, improving in such a way the quality assurance. Currently, the most utilised methods for the in-vivo dosimetry are based on thermoluminescent detectors (TLDs) and silicon diodes. TLDs are sometimes preferred, for small size (in this case 3x3x0.9 mm³), the lower dependence of the response on photon energy, the dose rate and the direction of incidence. In external beam radiotherapy, the dosimeters are placed on the patient's skin, in suitable positions in order to perform measurements at entrance and exit points. For brachytherapy, where treatments are carried out introducing the source within the patient's body, in-vivo measurements inside the patient are required.

A method for performing in-vivo dosimetry inside the patient body during brachytherapy treatments using LiF:Mg,Ti (TLD-100) has been studied and set up. A TLD calibration protocol has been defined, aimed at achieving absorbed dose values with the due precision. Some calibrated TLDs were used to perform control measurements during the brachytherapy treatments of the prostate in a few patients with the ¹⁹²Ir source of a Microselectron-HDR high dose rate remote afterloading device. Five TLDs were fixed to the echographic probe that remains inside the patient during the treatment. The results have been compared with those calculated by the treatment plane software (TPS) and the consistency of the technique has been verified.

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