In-vivo dosimetry in radiotherapy : a comparison of the response of semiconductor and thermoluminescence (TLD700) dosemeters.

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Semiconductor dosemeters and thermoluminescence dosemeters were calibrated in view of in-vivo dosimetry. Their response in a 8MV photon beam and the respective correction factors for the treatment conditions were systematically studied.
A total of 249 entrance and exit measurements with this dual detector combination were performed, mainly for treatments of the head and neck region. The resulting entrance and exit doses were compared with the expected doses at these positions, calculated on basis of the treatment and patient parameters.
The results at the entrance showed a value of 1.010 ± 2.8% for the ratio of the measured to the calculated dose by diodes, 1.013 ± 4.9% for the ratio of the measured to the calculated dose by TLD's and 1.003 ± 3.6% for the ratio of the measured dose by TLD's to diodes. With respect the exit dose, the results were 0.998 ± 4.9%, 1.016 ± 7.7% and 1.019 ± 7.0% respectively after correction for the heterogeneity's.
Although the standard deviation for the TLD dosemeters is systematically larger than the standard deviation for the diodes, it can be concluded that both dosemeters will yield similar results for in-vivo dosimetry, if utilized under the same conditions.

EVALUATION OF THE VIDAR'S VXR-12 DIGITIZER PERFORMANCES FOR FILM DOSIMETRY OF BEAMS DELIMITED BY MULTILEAF COLLIMATOR

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The development of new irradiation techniques such as conformal radiotherapy increasingly imply the use of a multileaf collimator. The measurement of dose gradients in the penumbra region, and of dose distributions at the edge of complex shaped fields defined by multileaf collimators requires a high definition dosimetric method. Nowadays film digitizers have been notably improved and allow the film dosimetry to be faster, more accurate, presenting a sensitivity and high spatial resolution.

To be able to perform the study of physical and dosimetric specifications of a multileaf collimator, we have been led to evaluate first the performances of the Vidar VXR-12 digitizer, with respect to its sensitivity, linearity, optical density range and the resolution. We have compared these performances with the performances of different systems already in use in our department, either manual or automatic, using specific patterns.

The main limitation for dosimetric use of the detection threshold that can introduce errors in isodose calculation, especially for the lowest values.

The result of the intercomparisons have allowed corrections to be added, taking into account this Vidar problem. The results obtained after correction for the dose profiles of squared fields are in good agreement with ionization chamber measurements in a water phantom.

Thus, the Vidar digitizer qualities are such that we think it suitable the use of film dosimetry for the dose distributions in fields defined by multileaf collimator.