In-vivo Dosimetry for Quality Control in Conformal Brachytherapy for Cervical Carcinoma.

The aim of this study was to demonstrate the suitability of in-vivo dosimetry for on-line quality control in HDR-brachytherapy for cervical carcinoma.

The dose distribution delivered by a Fletcher type applicator with standardized source loading is well-known, tables and atlas dosedistributions can be employed for quality control.

Nowadays anatomical data is obtained from MRI making it possible to conform the dosedistribution to the target volume using a stepping source. The inversely planned dosedistribution is difficult to verify by pre-calulated dosetables. For this reason in-vivo dosimetry was introduced.

In our institute the Rotterdam applicator is modified with a channel through each ovoid allowing for implant of needles into the cervix. After insertion, a calibrated semiconductor dosimeter (Scanditronix) is connected to the applicator at a pre-defined position making it possible to pre-calculate the dose.

Since April 1998, 89 measurements have been recorded in 22 patients. On an average the ratio between the dose measured and that computed amounted to 0.88 ($n=44$, $\sigma=0.04$) for the ovoids, 0.95 ($n=22$, $\sigma=0.03$) for the intrauterine tube and 0.91 ($n=23$, $\sigma=0.06$) for the needles respectively. A systematic discrepancy between computed and measured dose is registered. The calibration factor of the dosimeter should be adjusted accordingly.

The relatively small standard deviations demonstrate the suitability of confirmatory in-vivo dosimetry for on-line quality control. In present-day a difference of 10 % (about 2σ) between measured and pre-computed dose is regarded as tolerance level.