CLINICAL USE OF THE L – Q MODEL IN INTRACAVITARY IRRADIATION OF CERVICAL CANCER WITH SELECTRON LDR (In Reply to Prof. Ram Das)

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In his commentary to the paper: „Calculation of physical correction factors based on the L – Q model", Prof. Ram Das pointed out the differences between the mathematical formulas to calculate ERD, presented by Barendsen (1982) and Dale (1985).

According to Dale's correction, the biological equivalence of the traditional Manchester method and the Selectron LDR (dose rate 1,67 Gy/h) for the early and late tissue damage, would require the reduction of the physical dose by 28,5% and 48% respectively (table 1 and 2).

However, we should not forget, that the radiobiological processes are not described by precisely defined parameters. For example, sub – lethal damage takes place in range of 30 minutes to several hours. Redistribution – in fast proliferating tissues – a few days; repopulation – several weeks; reoxygenation – probably a few days (Steel 1993). Similarly, the α/β values are usually presented in a relatively wide range. For this reason, we would like to point out, that the results of the mathematical models calculations have to be always referred to one's own and other authors' clinical experience.

Comparing the Selectron LDR (dose rate 1,67 Gy/h) with the traditional Manchester technique, our calculations indicate that the physical dose should be reduced by 17%, assuming the equivalence of ERD values for the early reaction due to radiation damage (being aware of the consequences of this, on the late responding tissues and on the tumor). This is consistent e.g. with the experience in the Christie Hospital in Manchester, where Stout and Hunter demonstrated in their trials (1983 – 88) exactly the same value i.e. 17%. In several other publications, for dose – rate in the range of 1,5 – 1,8 Gy/h, a reduction of the physical dose by 10-20% was considered necessary. Our own experience based on over 3000 intracavitary applications, also confirms the justness of the assumption.

The next point taken into consideration by Prof. Ram Das, was the rectal dose. According to our opinion, there do not exist any truly comparable methods of calculation or measurement of the dose in the rectum. For this reason, big differences between the rectal dose values quoted by different authors, occur.

Our definition of a choosen point at 0,5 cm from the posterior surface of the ovoids, has been adopted exclusively to determine the dependence of the dose on the position of the sources in the ovoids, and on the distance between them. In clinical practice, we put a Foley's catheter containing 5 ml of contrast in the rectum, and with the help of the simulator we place it under the ovoids. 3 or 4 reference points are then determined on it's anterior surface. Unfortunately this method is as good – or as bad – as any other. The dosimetry in vivo is not fully reliable either, because with the usage a rigid or a flexible semiconductor detectors, we would obtain significantly different results.

With big interest we read the last part of Prof. Ram Das' commentary concerning his own experience with introducing the Selectron LDR. In our opinion, placing only one source in the ovoids and 3 or 4 in the intrauterine tube, causes the necessity of using the times of irradiation of over 30 h, when applying typical doses to point A. Undoubtedly, this fact is associated with a big discomfort for the patients, and at the same time, has little clinical benefit, in our opinion.

In order to optimize the dose distribution in point A, bladder and rectum, we would rather stress the importance of a suitable application technique, the adjustment of the type of applicators to individual anatomical conditions of each patient, an appropriate – adjusted to the extent of the disease – configuration of the sources in the applicators, as well as different participation of intracavitary and external irradiation, and the possibility of applying the central shielding in external beam therapy.

The optimization of the combined irradiation of the cervical cancer, is the subject of considerations enclosed in the paper actually prepared.

Last remark. Elaborating new treatment schedules, that differ in applicated dose – rate values or dose per fraction, requires an arbitrary choise of a mathematical formula and the values of not always precisely defined radiobiological parameters. Therefore, it is very important to present one's own results in a way, which enables their comparison with the parameters assumed by other authors. For this reason we thank Prof. Ram Das for his valuable remarks, which will be taken into account in the actually prepared paper.

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