INSTRUCTIONS FOR USE

for

Microsoft (®) Excel spread sheets

“Reporting GYN HDR BT sheet” and “LQ spread sheet_v2.1”

The Microsoft (®) Excel spread sheet “Reporting GYN HDR BT sheet” is designed for reporting gynaecological HDR brachytherapy. It is intended that the data is entered into the blue fields. On top of the sheet you can enter the dose of external beam therapy. In the columns F1-F6 the dose of brachytherapy fraction number 1 to 6 (max. possible) can be entered. The 2 columns on the right side give the result in equivalent (isoeffective) dose in 2 Gy fractions (EQD_2) for brachytherapy alone and brachytherapy plus external beam therapy, respectively. For the volumes the mean value and the standard deviation is calculated.

The Microsoft (®) Excel spread sheet “LQ spread sheet_v2.1” is designed for calculating BED (Biologically Effective Dose) and equivalent (isoeffective) dose in 2 Gy fractions (EQD_2). It is intended that the data is entered into the blue fields. The section “treatment planning” enables to set a total EQD_2 isoeffective dose of external beam therapy plus brachytherapy and the number of remaining brachytherapy fractions. The physical dose per remaining brachytherapy fraction is than calculated, in order to come up with the specified isoeffective total dose. This tool can be used to set a EQD_2-dose constraint (CTV-min or OAR-max) for the whole treatment. The corresponding physical dose constraint per remaining brachytherapy fraction is than calculated. Recommended tissue parameters are α/β = 10 Gy for tumour and target structures of cervical cancer, α/β = 3 Gy for late effects of the organs at risk bladder, rectum and sigmoid colon and $T_{1/2}$ = 1.5 h for tumour and target structures as well as organs at risk ($T_{1/2}$ is not relevant for external beam therapy and HDR brachytherapy).

Both spread sheets work based on the linear-quadratic model for incomplete monoexponential sublethal cell damage repair (LQ model). If you want to see the formulas just mark the whole sheet. Please be aware that only repair due to different fractionation and dose rate schedules is taken into account, the effects of

repopulation, reoxygenation, redistribution and dose and dose rate heterogeneity are ignored.

We emphasise that these spread sheets are in-house developed research tools and we ask you to handle the results with care. Neither the authors nor anybody else can accept any legal responsibility or liability for any errors or omissions that may be made. In particular (but without limiting the generality of the preceding disclaimer) effort has been made to check the calculation process; however, it is still possible that errors have been missed.

For details please refer to the following references:

Pötter R, Haie-Meder C, Limbergen EV, et al. Recommendations from gynaecological (GYN) GEC ESTRO working group (II): Concepts and terms in 3D image-based treatment planning in cervix cancer brachytherapy-3D dose volume parameters and aspects of 3D image-based anatomy, radiation physics, radiobiology. Radiother Oncol 2006;78:67-77.
Details on radiobiology can be found in the electronic appendix of the online version of this article.

Steel GG, editor. Basic clinical radiobiology. Arnold, London. 3rd ed 2002.
This is the course book of the ESTRO teaching course on Basic Clinical Radiobiology.

Further references:

Brenner DJ, Hall EJ. Conditions for the equivalence of continuous to pulsed low dose rate brachytherapy. Int J Radiat Oncol Biol Phys 1991;20:181-190.

Dale RG. The application of the linear-quadratic dose-effect equation to fractionated and protracted radiotherapy. Br J Radiol 1985;58:515-528.

Dale RG, Huczkowski J, Trott KR. Possible dose rate dependence of recovery kinetics as deduced from a preliminary analysis of the effects of fractionated irradiations at varying dose rates. Br J Radiol 1988;61:153-157.

Dale RG, Coles IP, Deehan C, O´Donoghue JA. Calculation of integrated biological response in brachytherapy. Int J Radiat Oncol Biol Phys 1997;38:633-42.

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Mazeron JJ, Scalliet P, Van Limbergen E, Lartigau E. Radiobiology of brachytherapy and the dose-rate effect. In: Gerbaulet A, Pötter R, Mazeron JJ, Meertens H, Van Limbergen E, editors. The GEC-ESTRO handbook of brachytherapy. ESTRO, Brussels. 2002;95-121.

Nag S, Gupta N. A simple method of obtaining equivalent doses for use in HDR brachytherapy. Int J Radiat Oncol Biol Phys 2000;46:507-513.

Orton CG, Brenner DJ, Dale RG, Fowler JF. Radiobiology. In: Nag S, editor. High dose rate brachytherapy: a textbook. Futura Publishing Company, New York. 1994;11-25.

Withers HR, Thames HD Jr, Peters LJ. A new isoeffect curve for change in dose per fraction. Radiother Oncol 1983;1:187-191.