Radiotherapy for lung cancer
Borst, G.R.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
LQ-model modification of chapter 6

Appendix of Chapter 6

The LQ1 model has a linear-quadratic shaped log-survival curve \( ad + \beta d^2 \) below a threshold dose \( d_T \) and a linear shaped log-survival curve \( \lambda d + \delta \) above \( d_T \). The LQ1 model and its derivative are continuous at the threshold dose:

\[
\lambda \, d_T + \delta = ad_T + \beta d_T^2
\]  

(1)

\[
\lambda = a + 2\beta d_T
\]  

(2)

Substituting equation 2 into equation 1 yields:

\[
\delta = ad_T + \beta d_T^2 - ad_T - 2\beta d_T^2 = -\beta d_T^2
\]  

(3)

The effect \( E_LQ1 \) of the total dose \( D \) given in \( n \) fractions of dose per fraction \( d \) exceeding \( d_T \) is thus given by:

\[
E_{LQ1} = n(\lambda d + \delta) = n[(a + 2\beta d_T) d - \beta d_T^2] = D (a + 2\beta d_T - \frac{\beta d_T^2}{d})
\]  

(4)

With the NTD [15] defined as the total dose given in 2-Gy fractions having an equivalent effect (as determined by the LQ model) as predicted by the LQ1 model, i.e., \( E_{LQ1} = E_{NTD} = NTD(a + 2\beta) \), the NTD can be calculated as:

\[
NTD = \frac{E_{LQ1}}{a + 2\beta} = D \frac{a \beta + 2d_T - \frac{d_T^2}{d}}{2 + a \beta}
\]  

(5)