Formulas for the Calculation of the Total Dose in Fractionated Radiotherapy

Recently, Spring (4) proposed a formula for the calculation of the total dose required in a course of radiotherapy when the fractionation has been modified from that established.

The rationale for his proposition was that the Ellis formula for nominal standard dose calculations was a "rule of thumb" and that its computation presents a challenge in arithmetic. Such arguments are the antithesis of the scientific method since it presents no sound basis for rejecting or refining a model that has been proposed and is in use. Spring did not show that his model gave a better prediction than the Ellis formula for the total dose required, whereas Ellis has shown some success for his model (1).

He did not discuss any deviations from existing formulas that might arise using his formula. Table 1 shows an extreme but possible case of the difference in the total dose predicted by his formula and that proposed by Ellis. According to the work of Herring (2), differences in dose on the order of ±10% manifest themselves at the clinical level, and hence the radiotherapist who uses the Spring relationship should be aware that he is using a relationship that deviates in its predictions from a formula that is the current model to a clinically observable degree.

As regards the arithmetic difficulty posed by Spring, the tables published by Kroening and Deiterman (3) are just as easy to use as his Table 1. In fact, there are 2 arithmetic steps less in the solution of the problem using those tables rather than the ones in the Spring relationship.

Table 1
The difference in total dose calculated by the Spring relationship compared to the nominal standard dose relationship

<table>
<thead>
<tr>
<th>Nold</th>
<th>Told (days)</th>
<th>Dnew (rads)</th>
<th>% difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Spring</td>
<td>Ellis</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>1199</td>
<td>1859</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>1389</td>
<td>2005</td>
</tr>
<tr>
<td>15</td>
<td>18</td>
<td>1857</td>
<td>2333</td>
</tr>
<tr>
<td>20</td>
<td>25</td>
<td>2268</td>
<td>2591</td>
</tr>
<tr>
<td>25</td>
<td>32</td>
<td>2645</td>
<td>2809</td>
</tr>
<tr>
<td>30</td>
<td>39</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

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REFERENCES


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