Journal of Radiotherapy in Practice

Journal of Radiotherapy in Practice (2009)
8, 163–164
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doi:10.1017/S1460396909990033

Short Communication

Correlation between mean lethal dose and organ weight

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Abstract

The assessment of mean lethal dose (D_o) with organ weight in human organs yields a correlation coefficient of 0.94. Results indicate that as the organ weight increases, the D_o decreases.

Keywords

Mean lethal dose; Organ weight; radiation tolerance

INTRODUCTION

With the introduction of three-dimensional treatment planning for dose calculation, it is becoming more apparent that there is an acute need for comprehensive information about the mean lethal radiation dose (D_o)/radiation tolerance dose data of normal human tissues. The degree of injury that is considered ''lethal'' is often measured at the time after irradiation at which lethality is assessed. Different investigators have arrived at different absolute ''D_os'' and even different relative rankings of D_os. Hence there is considerable disagreement as to its actual value.

MATERIALS AND METHODS

Cohen[1] has reported D_os (multi-target-model) for few human organs (Table 1). The D_os are calculated from patients of different age, sex and body weight as well as organ weight.

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Cohen[2], in his personal communication, had provided the best final values of D_os for the organs such as skin, spine, lung and gut whereas the brain and kidney values are extracted from his published works. However, Cohen[1] provided D_o values of other organs but unfortunately actual organ weights are not found in the literature.

RESULTS

Given these constraints, if one correlates D_os against 70 kg standard man organ weight[3]

Table 1. *Mean lethal radiation dose and organ weight of normal human organs*

Organs	Mean lethal dose D_o (Gy)	Organ weight (g)
Skin	1.26	2600.00
Spine	1.77	30.00
Lung	1.24	1000.00
Gut	1.68	0090.00
Brain	1.20	1400.00
Kidney	1.47	0310.00

https://doi.org/10.1017/S1460396909990033 Published online by Cambridge University Press

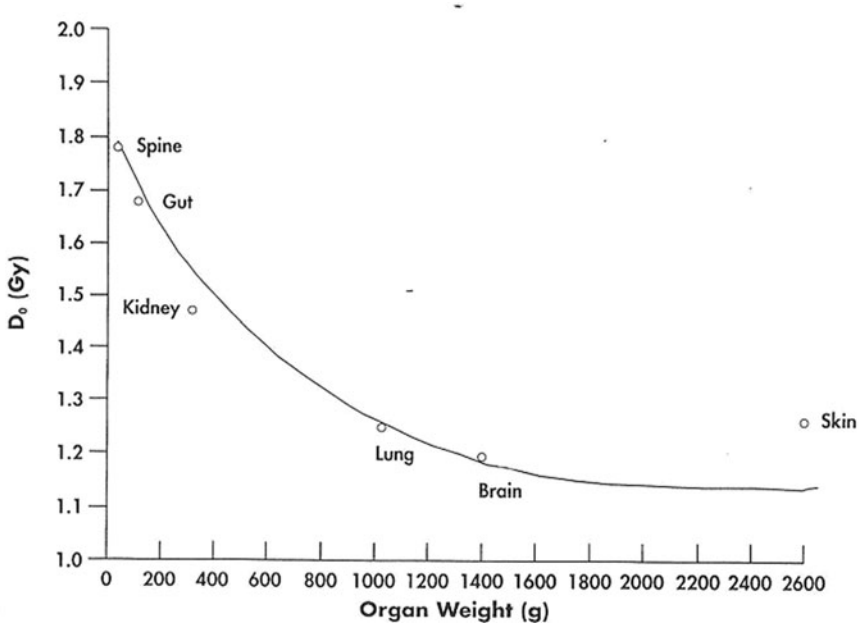


Figure 1. Correlation between mean lethal radiation dose and organ weight in human organs

one obtains a correlation coefficient of 0.94 (Figure 1). It is interesting to note from Figure 1 that as the organ increases in size/weight by assembling many cells of different function (tissue organisation) the mean D_o decreases. Similarly, Akber[4] has shown that the radiation tolerance dose (TD_{50}) in human decreases as organ weight increases.

DISCUSSION

It appears that the D_o/radiation tolerance dose is dependent on organ weight. It is, however, important to realise that many physiologic processes such as heat loss and oxygen diffusion from the blood to the tissue across the capillary walls are indeed functions of the tissue organisation. The overall metabolism, therefore, cannot be independent of tissue organisation—organ weight. However, it would be worthwhile to investigate this concept from autopsied human beings of organ weight. Animal models would also be very helpful in providing an insight to the present approach.

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https://doi.org/10.1017/S1460396909990033 Published online by Cambridge University Press