In-patients Receiving $^{90}$Y-Dotatoc / Dotatate Therapy: Dose Rate Analysis & Advice

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Introduction

[$^{90}$Y]-DOTATOC / DOTATE Therapy Protocol:
Suitable patients: positive $^{[111]}$In-Octreotide scan followed by $^{[111]}$In-Dotatoc / Dotatate diagnostic images at 4 and 24 hours ± SPECT-CT. If pronounced focal uptake is observed patient may be offered $^{[90]}$Y-Dotatoc / Dotatate Therapy e.g.

Objective

At present patients receiving $^{90}$Y-Dotatoc / Dotatate for cancers expressing somatostatin receptors are treated as an inpatient procedure being discharged at around 45 hours post treatment (two nights stay). The patients occupy a single room (a disposable floor lining is laid) and after imaging are free to go home. A sheet outlining instructions (obeyed for the following 3 days post discharge is given to the patient).

A dose rate assessment has been undertaken to determine if this period can be reduced thereby benefiting the patient and freeing up a single occupancy room sooner for use.

Method

Dose rate (DR) measurements were taken on thirteen patients (12M : 1F). Administered activities ranged Between 4860 - 5200 MBq with an average of 5060 MBq (it should be noted that on 3 occasions patients receiving MIBG therapy were located next door, however this was deemed to have little effect on the measurements). Dose rates were recorded at distances of 0.5 and 1.0 m from each patient on right and left hand side at various times up to 48 hours post therapy.

Table 1.0 details averaged measured DR at 1.0 m for various times post therapy and the max-to-min range of values.

Results

Graphs 1.0 and 1.1 show the measured dose rates at 1.0 m from the right and left hand sides respectively as a function of time. Average measured dose rates at 1.0 m (max-to-min ranges) immediately after therapy were 7.2 (20-3) and 8.2 (20-4) for right and left hand sides respectively. At 24 hours dose rates were 1.5 (4-1) and 1.5 (3-1) for right and left hand sides respectively. A single exponential decay model was fitted to the data to give calculated dose rates as a function of time.

Using this model, calculated dose rates were obtained at 6 hour intervals between $t = 0$ and $t = 48$ hours (refer to Table 1.1).

Conclusions

The conclusion is that at 1.0 m, both the mathematical calculation of a single exponential fit and the actual measured data indicate dose rates at levels at around 4 $\mu$Sv.hr$^{-1}$ worst case and typically 1.5 $\mu$Sv.hr$^{-1}$ or less on average at 24+ hours (By examining the data at 0.5 m by the same techniques dose rates at levels also around 4 $\mu$Sv.hr$^{-1}$ worst case and typically 1.8 $\mu$Sv.hr$^{-1}$ or less on average at 24+ hours).

With these dose rates, it is deemed acceptable for patients to leave after a minimum of 24 hours along with a amended patient instruction sheet (obeying the instructions for 4 days post discharge). A patient specific risk assessment can be carried out when an individual given "cause for concern" arises (e.g. incontinence etc.).