^{131}I-MIBG – dosimetry and measurement for dosimetric purposes

F. Sudbrock, Cologne (GER)

The aim of dosimetry is in general to quantify the amount of energy deposited in matter. For targeted-radionuclide therapies it is first of all highly desirable to know the whole-body absorbed radiation dose. It has been demonstrated of neuroendocrinal tumours treated with ^{131}I-meta-Iodobenzylguanidine (^{131}I-MIBG) that this quantity correlates with the possible toxicity of treatment.

In order to make a further quantity available that correlates with the treatment outcome tumour absorbed doses have to be assessed.

For a total of 34 patients treated between 2004 and 2011 (25 neuroblastoma NB, 9 phaeochromocytoma PC, activity administered to the patient: 5.4 GBq – 10.9 GBq) whole-body dosimetry and tumour dosimetry was carried out. Whole-body dosimetry was in all cases accomplished by repeated measurements of the whole-body activity – typically 20 - 50 measurements during the in-patient stay of one week – using a scintillation counter. A time-activity curve could thereby be established for each patient by which the individual time-integrated "cumulated activity" was derived. By the use of an individual S-factor based on the patients´ weight the "cumulated activity" was converted into the individual whole-body absorbed dose.

In order to estimate the tumour absorbed doses quantitative gamma camera imaging was performed. By a series of typically five gamma camera scans and at least on SPECT acquisition the individual radionuclide storage in the lesion as well as the tumour volume were determined.

Whole-body absorbed doses for the treatment of neuroblastoma (NB) were achieved between 1.5 and 3.2 Gy with a mean of 2.1 Gy and for phaeochromocytoma (PC) 1.0 – 1.8Gy with a mean of 1.4 Gy.

The specific whole-body absorbed doses were found between 0.15 and 0.39 Gy / GBq (NB, mean: 0.28 Gy /GBq) and between 0.12 and 0.16 Gy / GBq (PC, mean: 0.13 Gy / GBq), respectively. Tumour doses ranged between 14 – 76 Gy (NB) and 6 – 56 Gy (PC).

References

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