Haemodialysis and Sequential I131 Ablation Therapy for Metastatic Follicular Ca: A Radiation Protection Perspective
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Clinical Background and Objective
A patient with lung metastases secondary to primary thyroid carcinoma was referred for potential I131-Sodium iodide radiouclide ablation therapy which is an established technique at our centre. Following administration of 74MBq of I131 sodium-iodide, SPECT/CT imaging on a Siemens Symbia T system localised intense uptake to a lymph node (figure 1) and to a moderate degree in lung metastases (figure 2).

However, this patient had chronic renal failure, requiring haemodialysis thrice weekly at a centre operating under The Royal Liverpool University Hospitals Trust. However, this patient had chronic renal failure, requiring haemodialysis thrice weekly at a centre operating under The Royal Liverpool University Hospitals Trust. Hence, the patient was unwilling to start another form of treatment with a long-term treatment process.

Literature Survey
A review of published literature saw a mixed approach to I131 treatment of patient on haemodialysis. Administering a lower activity (25% of the normal), performing dialysis at 24hours to reduce the quantity of I131 in the blood pool and repeating in 6 months was successful for one group [1]. Daily haemodialysis following treatment using the full activity on 3 different patients was carried out by Jimenez et al [2]. Analysis of the average clearance curve produced an effective half life of 3.9days. Another group analysed the half life of 3.9days. Analysis of the average clearance curve produced an effective half life of 3.9days.

Another group analysed the dialyse waste samples for dialysis sessions at 24, 72 and 144 hours to calculate the effective half life of I131 sodium-iodide during haemodialysis to be 2.7±0.8hours compared to 11.4hours in a patient with normal renal function [2].

Follow Up
Since these treatment episodes were carried out; it was appropriate to follow the same schedule and work procedures for a patient treated with Y90-Dotatate for neuroendocrine metastases.

Regarding disposal of radioactive waste in human excreta, The Radioactive Substances Act 1993 has been superseded by The Environmental Permitting Regulations 2010 and The Environmental Permitting (England and Wales) (Amendment) Regulations 2011.

Retained Activity
The quantity of I131 retained by the patient following therapy episodes was estimated at several time points during the in-patient phase using a fixed measurement geometry in the patient’s en-suite Controlled Area facility.

Activity (MBq) Retained Activity during the in-patient phase following administration of I131 Therapy

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<td>5413</td>
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<tr>
<td>Therapy 3 (T3)</td>
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Activities administered, 5209MBq (Therapy1), 5413MBq (Therapy2), 7513MBq (Therapy3).

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Equipment
- Dose Rate Monitor: Mini-Rad 1000 Survey Meter (Thermo Electron Corporation)
- Ratemeter: Radiation Alert Inspector EXP+ (E.S.International)

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Following simple radiation protection measures it is possible to provide high activity radiouclide therapy for patients on haemodialysis and still satisfy occupational and environmental radiation protection legislation in the UK.

Providing:
- Adequate Local Rules for radiation protection and prior Risk Assessments are carried out in advance of treatment
- Multiple staff members are utilised in the dialysis unit to spread the dose and reduce individual exposure
- Staff doses are recorded to ensure the threshold of 0.3mSv is exceeded by any individual

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Legislative Issues Addressed
- WR99, Occupational dosimetry: Staff in the dialysis suite are non-Radiation workers and were treated as ‘members of the public’ regarding Dose Limits. Lm/s/year with a limit of 0.4mSv per episode.
- WR99, Controlled Areas: the dialysis suite was designated as a Controlled Area for the duration of the hemodialysis sessions. Local rules were defined for the staff with necessary precautions practised.
- The temporary Controlled Area was surveyed for residual radioactive contamination before declassification.
- WR99, Liquid waste autorisation: non-Tc99m excretion order limit of 500MBq at the regular dialysis centre was satisfied by retaining the patient at our own centre until the estimated retained activity was less than 500MBq (figure 3). As a regular treatment centre, our own Waste Authorisation is ample for several ablation therapies each month and no adjustment was required. Note treatment sessions pre-date EP62010.

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