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Thyroid SAT510 I-131 Therapy with Dosimetry for Advanced Thyroid Carcinoma: Recombinant TSH vs Thyroid Hormone Withdrawal

Dana Awad

Jarod Hamsa

Abbey Fingeret

Craig M. Johnson

Frank Rutar

See next page for additional authors

Authors

Dana Awad, Jarod Hamsa, Abbey Fingeret, Craig M. Johnson, Frank Rutar, Carrie Carso, Anupam Kotwal, Anery Patel, Angela Thornburg, and Whitney Sears Goldner

[1]UNIV. OF NEBRASKA MEDICAL CENTER, Omaha, NE, USA; [2]University of Nebraska Medical Center, Omaha, NE, USA; [3]University of Nebraska Medical Center/Nebraska Medicine, Omaha, NE, USA; [4]Univ. of Nebraska Medical Center, Omaha, NE, USA; [5]UNMC, Omaha, NE, USA; [6]University of Nebraska Lincoln, Lincoln, NE, USA

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Background: Dosimetry can be used to calculate an optimal and safe dose of Iodine-131 (I-131) for treatment of advanced differentiated thyroid cancer (DTC). Thyroid hormone withdrawal (THW) is the preferred method of TSH elevation for I-131 therapy with dosimetry. At our institution, Recombinant TSH (RhTSH) is used in patients in whom prolonged hypothyroidism is deemed clinically unsafe or cannot tolerate THW. We aim to evaluate if RhTSH and THW are equivalent methods of preparation for I-131 therapy using dosimetry (I-131D). **Methods:** This is a single institution retrospective cohort study evaluating all patients who received I-131D from 2010-2022. Demographic, clinical variables were assessed and dosimetric calculations were obtained. Statistical analysis was performed with Mann Whitney U, Kruskal Wallis, Chi-squared and Fisher's exact testing. **Results:** Fifty-one unique patients were included with a total of fifty-five I-131D treatments, with 55% being female. Median (IQR) age at time of treatment was 60.3 years (42.8-70.4), and BMI kg/m2 was 29.3 (24-33.8). Of these patients 13% were stage I, 18.5% stage II, and 68.5% stage III/IV AJCC 7th ed. Sixty percent underwent THW and 40% received RhTSH. Gamma camera and blood activity measurements, at several time points following the pre-therapeutic I-131 dose, were taken to calculate the residence times and effective half-lives in whole body and blood. All patients demonstrated a monophasic elimination of I-131 activity in both the whole body and blood. Patients receiving RhTSH exhibited a slower elimination of the I-131 in the whole body than THW patients (effective half-life of 22 hrs vs 17 hrs) resulting in a higher fraction of I-131 activity remaining in the whole body 48 hours post-dose (25% vs 16%, p= 0.025). The effective half-life in the blood was also higher in the RhTSH group (p=0.025) resulting in a higher amount of activity remaining in the blood. As a result, the median (IQR) RAI dose was lower for those who received RhTSH (187.5 mCi (167-198)) vs those who underwent THW (260 mCi (202-306)) (p<0.001). As expected, TSH at the time of treatment was higher in the RhTSH group (p=0.0038). Thyroglobulin was higher at the time of treatment in the RhTSH group (p=0.031), but thyroglobulin drop at three months was not statistically different (p=0.0682) between groups. **Conclusion:** RhTSH administration is non-inferior to THW as a method of TSH elevation and preparation for I-131D for patients with advanced DTC. RhTSH, in comparison to THW, results in a significantly longer half-life in the whole-body and blood resulting in a lower calculated RAI dose. More studies are needed to confirm these findings.

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Dana Awad, MBBS[1], *Jarod Hamsa, BS*[2], *Abbey Fingeret, MD*[3], *Craig Johnson, MD*[2], *Frank Rutar, MS*[2], *Carrie Carson, BS*[2], *Anupam Kotwal, MD*[4], *Anery Patel, MD*[5], *Angela Thornburg*[6], *and Whitney Sears Goldner, MD*[2]