

Outcome of Using Penpat Pinyowattanasilp Equation for Prediction of 24-Hour Uptake, First and Second Therapeutic Doses Calculation in Graves' Disease Patient

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Abstract : The radioactive iodine thyroid uptake (RAIU) has been widely used to differentiate the cause of thyrotoxicosis and treatment. Twenty-four hours RAIU is routinely used to calculate the dose of radioactive iodine (RAI) therapy; however, 2 days protocol is required. This study aims to evaluate the modification of Penpat Pinyowattanasilp equation application by the exclusion of outlier data, 3 hours RAIU less than 20% and more than 80%, to improve prediction of 24-hour uptake. The equation is predicted 24 hours RAIU (P24RAIU) = $32.5 + 0.702$ (3 hours RAIU). Then calculating separation first and second therapeutic doses in Graves' disease patients. Methods; This study was a retrospective study at Faculty of Medicine Vajira Hospital in Bangkok, Thailand. Inclusion were Graves' disease patients who visited RAI clinic between January 2014-March 2019. We divided subjects into 2 groups according to first and second therapeutic doses. Results; Our study had a total of 151 patients. The study was done in 115 patients with first RAI dose and 36 patients with second RAI dose. The P24RAIU are highly correlated with actual 24-hour RAIU in first and second therapeutic doses ($r = 0.913$, 95% CI = 0.876 to 0.939 and $r = 0.806$, 95% CI = 0.649 to 0.897). Bland-Altman plot shows that mean differences between predictive and actual 24 hours RAI in the first dose and second dose were 2.14% (95%CI 0.83-3.46) and 1.37% (95%CI -1.41-4.14). The mean first actual and predictive therapeutic doses are 8.33 ± 4.93 and 7.38 ± 3.43 milliCuries (mCi) respectively. The mean second actual and predictive therapeutic doses are 6.51 ± 3.96 and 6.01 ± 3.11 mCi respectively. The predictive therapeutic doses are highly correlated with the actual dose in first and second therapeutic doses ($r = 0.907$, 95% CI = 0.868 to 0.935 and $r = 0.953$, 95% CI = 0.909 to 0.976). Bland-Altman plot shows that mean difference between predictive and actual P24RAIU in the first dose and second dose were less than 1 mCi (-0.94 and -0.5 mCi). This modification equation application is simply used in clinical practice especially patient with 3 hours RAIU in range of 20-80% in a Thai population. Before use, this equation for other population should be tested for the correlation.

Keywords : equation, Graves'disease, prediction, 24-hour uptake

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