

## **Estimated effective lifetime risks of radiation-induced thyroid cancer in Computed Tomography (CT) brain examination**

### **ABSTRACT**

Thyroid is one of the most radiosensitive organs in the human body. Although the scanning range of brain computed tomography (CT) does not include lower neck region, there is possibility for thyroid to be irradiated due to scattered radiation because of its location near to the external beam collimation. The objective of this study was to evaluate effective lifetime risk of radiation-induced thyroid cancer in young adults following brain CT examination. A total of 306 patient data within the age range between 18 and 39 years old were retrospectively analysed. Absorbed dose of the thyroid organ was obtained through the input of data using WAZA-ARI v2. Effective lifetime risk was calculated by multiplying equivalent dose of the thyroid organ with the lifetime attributable cancer risk adapted from Biological Effects in Ionising Radiation (BEIR) Report V11. The effective lifetime risks were recorded as  $0.45 \pm 0.70$  per 100 000 and  $0.93 \pm 1.52$  per 100 000 for single and multiple exposures, respectively. In terms of gender, woman data ( $0.99 \pm 0.76$ ;  $1.95 \pm 2.15$ ) were found higher as compared to man data ( $0.13 \pm 0.39$ ;  $0.35 \pm 0.45$ ) for both single and multiple exposure. The percentage difference of effective lifetime risks between single and multiple exposures was up to 107%. The effective lifetime risk noted in this study may be low, however, the long-term risk of cancer development should be considered. This study serves as preliminary reference when revising clinical protocol especially in those involving repeated exposures in young adult patients. Future study should include other radiosensitive organs exploring the effective lifetime risk of radiation induced cancer following CT procedure.

**Keyword:** CT brain; Effective lifetime risk; Radiation risk; Thyroid cancer; Young adult