

# Effect of kVp, mAs, and Patient Position on Radiation Dose to the Thyroid in Chest X-ray Examination: Phantom Study

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## Background:

It is essential to understand the adjustment of technical factors that can lead to a change in the amount of radiation dose to thyroids of a patient in chest X-ray examination. As radiological examinations have been widely used in the field of health to diagnose or treat the pathology. The incidences related to radiation exposure have been increased. One of the incidences is the increasing number of thyroid cancers. This work aims to investigate the radiation dose to the thyroid in a chest X-ray projection when exposure factors and patient position is changed.

**Materials and Methods:** RANDO phantom was exposed using Multix Top X-ray machine from Siemens. The exposure factors (kVp, mAs) and position of phantom were changed. Radiation dose to thyroids was measured with nanoDot optically stimulated luminescence dosimeter (OSLD).

**Results and Discussion:** The results show a high radiation dose to the thyroid for an anterior-posterior (AP) projection followed by posterior-anterior (PA), left anterior oblique (LAO), right posterior oblique (RPO), and right lateral (RLAT) where the mean radiation doses recorded were 0.070 mGy, 0.023 mGy, 0.021 mGy, 0.019 mGy, and 0.008 mGy, respectively. An increasing trend in thyroid dose was seen with the increase in tube voltage; from 113 kVp to 117 kVp, 121 kVp, and 125 kVp. In addition, adjustment of tube current-exposure time from a low value (2.0 mAs) to higher values (2.5 and 2.8 mAs), also resulted more radiation dose to the thyroid.

## Conclusion:

On the account of the findings of this study it is concluded that increase in exposure factors and decrease in distance of the thyroid from the source of radiation manifest higher dose.

**Keywords:** Thyroid, Radiation Dose, Diagnostic Imaging, Chest X-ray, Radiation Protection