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X-ray Dosimetry for cervical spine on adults: A case study in a Provincial Hospital in Sri Lanka

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The cervical spine X-ray is the most commonly performed projection X-ray examination in patients for the initial diagnosis of spinal complaints, tumours, fractures, and degenerative pathologies. The radiosensitive organs are exposed to significant radiation doses, which imposes radiation-induced risks to the patients. The Diagnostic Reference Levels (DRLs) can be used as an effective optimisation tool in such instances. This study aimed to estimate the kerma-area product (KAP) of adult patients for the cervical spine (anteroposterior-AP and lateral-LAT) examinations and to compare the obtained patient doses with the DRLs published in countries: United Kingdom (UK), Ireland, France, Greece, India, Iran, and Australia. This descriptive cross-sectional study was conducted in a provincial hospital in Sri Lanka with 63 adult patients weighing between 38 and 78 kg. The patient characteristics (age, weight, height) and corresponding exposure parameters (tube voltage, tube current-exposure time product) were obtained. The KAP values were measured, and descriptive statistics were utilised for data analysis. The median KAP values were 0.23 and 0.19 Gy.cm^2 for the cervical spine AP and LAT examinations, respectively. Compared to published DRLs, the percentage difference in median KAP for cervical spine AP examinations was 109% higher than Australia's local DRLs (LDRLs), but 43% lower than France's national DRLs (NDRLs). Also, the median KAP for LAT examinations was 27% higher than the NDRLs of the UK and the LDRLs of Australia but 53% lower than the NDRLs of France. The median KAP values for cervical spine LAT examinations were comparable with Ireland's NDRLs and significantly lower than the DRLs of France, Greece, India, and Iran. The overall results show that the cervical spine LAT examinations were more comparable to those of other countries than the AP examinations. This recommends further dose optimisation for the cervical spine AP examination.

Keywords: Kerma-area product, X-ray examination, Diagnostic reference levels, Cervical spine, Patient dosimetry