



Diagnostic Reference Levels for Computed Tomography Examinations of Adult Patients



İsmail Özsoykal, MSc¹, Ayşegül Yurt, P.h.D.¹, and Recep Kandemir, MSc^{1,2}

¹ Dokuz Eylul University Institute of Health Sciences, Department of Medical Physics, Izmir, Turkey

² Dokuz Eylul University Faculty of Medicine, Department of Radiation Oncology, Izmir, Turkey

PURPOSE

Diagnostic Reference Levels (DRLs) are important databases which help to optimize the radiation exposure to patients undergoing similar radiological examinations at different centers operating region-wide, countrywide or worldwide. This study aims to develop regional DRLs for the most common computed tomography (CT) examinations carried out around Izmir, Turkey, and to compare the results with national and international studies present in the literature.

MATERIAL and METHOD

Survey data were based on 5 most common adult CT examinations; Head, Neck, Thorax, Abdomen-Pelvis (AP) and Thorax-Abdomen-Pelvis (TAP) carried out in 4 different radiology departments located in Izmir (n=50 per protocol for each department; i.e. n=1000 in total). Collected data included the examination accession number, patient sex, age, effective tube current, tube voltage, Computed Tomography Dose Index-Volume (CTDI_{vol}) and Dose Length Product (DLP) for each examination. Among all the exposure parameters, only CTDI_{vol} and DLP values were statistically analyzed, since they account for the overall dosimetric information regarding the examination. CTDI_{vol} information were based on body phantoms for all examinations except head examinations which were based on head phantoms for all departments. Third quartiles of CTDI_{vol} and DLP datasets have been recognized as DRLs parallel to the literature. Statistical analysis has been performed by using IBM SPSS 23 Statistics software program.

RESULTS

51.3% of patients were male and 48.7% was female, with a mean age of 57 (between 18 and 93). DRLs for CTDI_{vol} were recorded as 70 mGy, 16 mGy, 15 mGy, 23 mGy and 16 mGy for head, neck, thorax, abdomen-pelvis and thorax-abdomen-pelvis examinations respectively, while DLP results were 1385 mGy.cm, 605 mGy.cm, 567 mGy.cm, 998 mGy.cm and 1180 mGy.cm with respect to the same order.

Table 1: Demographic properties of patients involved in the study.

Exam	Male	Female	Mean Age (min-max)
Head (n=200)	84	116	49.5 (18-93)
Neck (n=200)	98	102	53.6 (20-84)
Thorax (n=200)	117	83	59.6 (19-83)
AP (n=200)	96	104	57.2 (19-76)
TAP (n=200)	118	82	64.7 (35-83)

Table 2: Diagnostic Reference Levels established by means of CTDI_{vol} and DLP. Results represent the 3rd quartiles of the statistical analysis carried out on the overall data obtained from 4 different centers.

Exam	CTDI _{vol} (mGy)	DLP(mGy.cm)
Head	70	1385
Neck	16	605
Thorax	15	567
AP	23	998
TAP	16	1180

CONCLUSION

This study was carried out on a wide range of patient age and size. Results agree well with the latest national and international data, except for the head examinations which were observed to slightly exceed the DRLs established by other countries^{1,2}. Consequently, it is planned to bring this study to a furtherly comprehensive point based on data collected countrywide.

Acknowledgements

This study has been financially supported by the Department of Scientific Projects, Dokuz Eylul University. The project number is 2016.KB.SAG.007.

References

1. Kalpana M. Kanal, Priscilla F. Butler, Debapriya Sengupta, et al. U.S. Diagnostic Reference Levels and Achievable Doses for 10 Adult CT Examinations. *Radiology*. 2017; 284(1):120-133.
2. Ataç GK, Parmaksız A, İnal T, et al. Patient doses from CT examinations in Turkey. *Diagnostic and Interventional Radiology*. 2015;21(5):428-434.

Keywords

Diagnostic Radiology, DRLs, CTDI_{vol}

Author Contact

ozsoykal@gmail.com