Volume : 5 | Issue : 7 | July 2016 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 69.48

Original Research Paper

Calculation of Radiation Dose Received in Cervical Vertebrae (C/S) Examination

Medical Science

KEYWORDS : Radiation Dose; Cervical vertebrae; X-rays

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ABSTRACT

Reference dose levels provide a framework to reduce doses variability and aid in the optimization of radiation protection. This study conducted to calculate the dose which patients were got from received by Cervical Vertebrae radiographic examination. The sample of this study was 50 patients. The patients' characteristics and examination factors were documented. The dose was calculate for both AP and lateral cervical vertebrae projections. The computed dose were compared with standard dose limits which determined by the international organizations (4 mGy). The results were 1.89 + 0.02 ($p > 0.005$) and 2.15 + 0.11 mGy ($p > 0.005$) for both projections, correspondingly. More studies are suggested with more number of patients Dose should measure continuously to reduce patients' excessive exposure.

INTRODUCTION

The rudimentary projections for diagnosis the pathology of cervical backbones included Anteroposterior (AP) and Lateral soft radiograph. In the emergency, modified techniques used with patient's body fixation [1]. The side view of spine must demonstrate all the vertebras starting from C1 to C7. In some special condition when the C7 does not appear in radiograph, an additional view will use by pushing the arms downwards. If patients does not get vertebral, hurt, other technique such as Swimmer will use [2] [3]. The swimmer's view frequently demonstrates the arrangement of the cervicothoracic vertebra, nonetheless does not offer complete imagining of the C7 vertebra. Computed tomography scan of the neck and thorax connection must achieve in patients at danger for injury [4] [5]. The lateral projection discloses about eighty percent of all neck radiographs and would so never be used unaided to show the vertebrae. Most of the residual percentage of injuries can identify on through mouth view. There are many minor injuries are observable merely on the AP projection. In some radiology departments, tilted projections comprised in the cervical series. Nevertheless, the occurrence that tilted projections perceive an injury not realized on the three typical projections is very rare. Tilted projections used to diagnosis the laminar fractures, and one-sided facet displacements [6] [7] [8]. The energy of ionizing radiation deposits inside the human body when it had exposed. Once ionizing radiation enters the human body, it credits energy. The energy rapt from exposure to radiation is named as dose. Radiation amounts are defined in three ways: absorbed, correspondent and actual. The quantity of energy dropped in a material (e.g., humanoid flesh), is entitled the absorbed radiation amount. This amount assessed in the gray. A quantity of one gray is corresponding to a unit of energy (joule) dropped in a kilogram of a material. Once radiation is wrapped in alive material, a living result might be experiential. However, equivalent rapt doses will not essentially produce equal biological possessions [9] [10]. The result of radiation be contingent on the kind of radiation and the structure getting the radiation. The weighting influence used toward associate diverse kinds of radiation with various biological efficiency. This weighted amount quantified in Sievert (Sv). Since doses to employees and the public are very little, furthermost recording and dose quantities use millsievert and microsieviert, correspondingly. These lesser parts of the Sievert are more suitable to apply in work-related and public settings. To get the correspondent dose, the immersed dose multiplies by specified coefficients. The correspondent dose offers a unit, which interpretations for the grade of damage of various kinds of radiation [11].

MATERIALS AND METHODS

This study included patients undertaking cervical vertebrae radiographic investigations at Khartoum Hospital. A single exposure controller system was existing for use in examination table. Initial work started with lateral examinations, which carried out in two various methods contingent on the clinical state of the patient. Patients with good mobility was lying on their side on the examination bench with the X-ray beam vertically above them. Immobile patients was lying supine on a trolley in front of a vertical bucky with the X-ray beam horizontal. Both techniques used exposure control and a tube potential range of between 85 kV and 100 kV depending on the patient size. Average tube potential for both techniques will be in the region of 93 kV. With dose audit, there were difficulties in complying with the requirement to collect dose data for patients of a particular weight range (50–90 kg) within the full workload situation in the department. T-test was used to check the significant of the dose with body parameters and dose.

In this paper, the decision took approximately 50 patients (26 male and 24 female). The patients' characteristics and exposure elements were collected. The exposure to the skin of the patient throughout the radiographic investigation was valued using exposure elements that applied.

RESULTS AND DISCUSSIONS

The results of this study were tabulated in the Tables. The estimated dose values were small. For the group of patients where age distribution was measured, 24 % of patients were within the 15-25 years age range, 12 % of patients were within the 26-35 years age range, 16 % of patients were within the 36-45 years age range, 28 % of patients were within the 46-55 years age range, 20 % of patients were within the 56-65 years age range (figure 1).

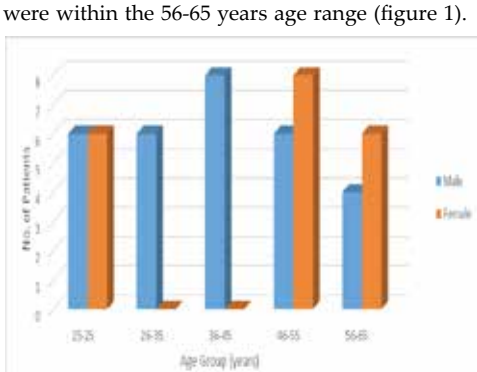

Figure 1: Age distribution in study

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TABLE 1:
THE RESULTS OF BODY MASS INDEX OF THE STUDY SAMPLE

Age group (years)	Body Mass Index (BMI) (mean± SD) (p > 0.05)	
	Male	Female
15-25	19 ± 4.4	20.7 ± 7.8
26-35	20.8 ± 5.0	21.5 ± 4.3
36-45	26 ± 3.8	26 ± 5.9
46-55	28 ±5.9	27 ± 4.1
56-65	27.4 ± 6.1	26 ± 5.3

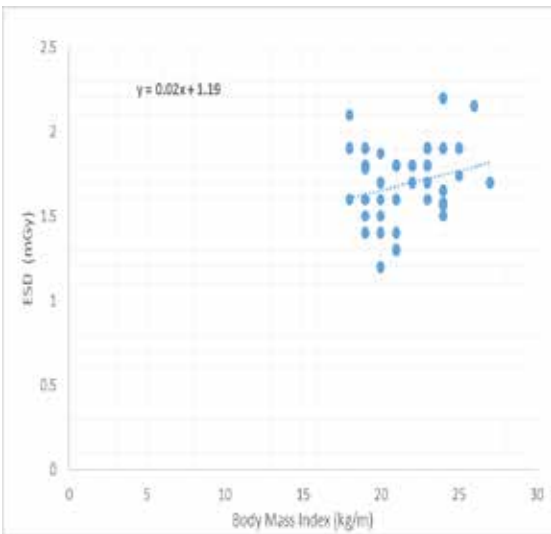

Figure 2. Relationship between entrance skin dose ESD (mGy) and body mass index BMI (Kg/m²)

TABLE 2
THE EXPOSURE FACTORS USED FOR CERVICAL SPINE EXAMINATION OF STUDY SAMPLE

Age Group (years)	X-ray Exposure Factors (Mean + Standard deviation) (p > 0.05)	
	kVp	mAs
15-25	49.0 ± 5.9	18.6 ± 7.3
26-35	47.1 ± 7.6	19.1 ± 6.2
36-45	45.6 ± 6.8	15.7 ± 5.3
46-55	47.4 ± 7.07	17.8 ± 4.8
56-65	47.1 ± 6.8	18.7 ± 5.1

TABLE 3:
EXPOSURE FACTORS, AND DOSE VALUES FOR CERVICAL SPINE X-RAYS EXAMINATION

Projection	KVp	mAs	Dose (mGy) (p> 0.05)	Reference IAEA (mSv)	Reference (UNSCEAR, 2000) (mSv)
AP	47.9	18.4	1.89 ±0.02	4	9.91 (0.4-14)
Lateral	49.7	19.5	2.15 ± 0.11	4	9.91 (0.4-14)

CONCLUSIONS

Dose measurement during cervical x-rays examination have been reported by many authors the results of this study confirm the findings of the two reported studies, i.e. that conventional radiology generally results in high ESDs in lateral projection rather than AP projection in both conventional and computed radiology. The comparison between mean ESD (mGy) in different examination and previous studies using conventional radiography. The dose values for all examinations were below the previous reported studies except few studies. This variation could be attributed to exposure factors, patient morphologic characteristics, and the sensitivity of the detectors. The limited experience with digital technology and the technologist may attempt to avoid noisy images by using milliampere-second settings higher than necessary for good image quality. Other authors who suggested the use of higher kilovolt peak settings with additional filtration have described the effect of the kilovolt peak setting on the patient entrance dose at conventional radiology and alternative projection to study cervical vertebrae pathologies with low dose and high contrast-detail detect ability. In this study, it was found that doses for knee joint for the entire examination were lower than IAEA guidelines. The image quality met the criteria of the departments for all investigation. The findings of this study are therefore neither completely unexpected nor in contradiction with those of other trials. Therefore, the importance of dose optimization during CR imaging must be considered.

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