



Establishing Diagnostic Radiation Dose Levels in Pediatric Osseous Survey Studies in Mississippi

H. Khosravi 1, J Storrs 1 A. Fatemi 1,2
Department of Radiology, University of Mississippi Medical centre (UMMC)
Department of Radiation Oncology, University of Mississippi Medical centre (UMMC)



INTRODUCTION

The fractures and traumas which is not related to accidents will categorised in child abuse fractures. Mostly happening in the age range less than 3 years. An skeletal survey will request by physicians as the young children can't identified the location of fractures and trauma by themselves. Usually, a total of 20-25 x-ray views will be provided for this kind of survey. In this study we have evaluated the received radiation dose by children in these kind of surveys.

AIM

To survey the exposure parameters associated with osseous survey in child suspected abuse and to identify which of the views account for the greatest dose burden and establish the diagnostic reference level in the state of Mississippi.

METHOD

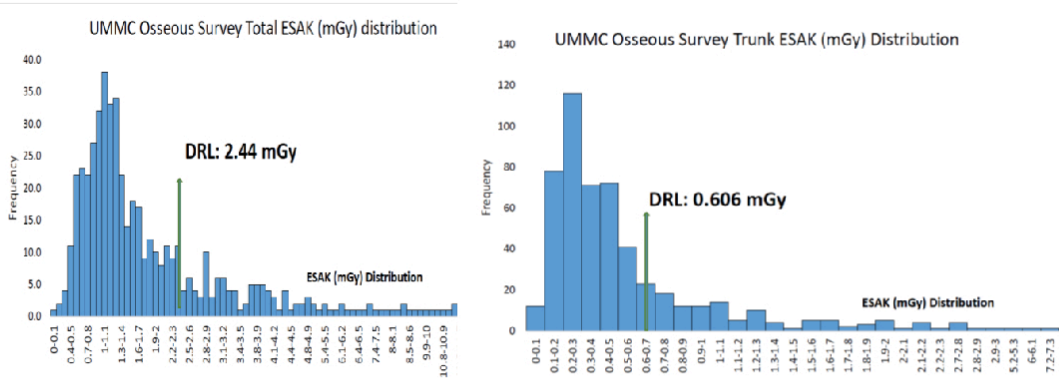
An audit of osseous surveys over 3 year's period were performed by accessing the Radiation Dose Structured Report (RDSR). 524 cases were acquired in pediatric radiology department of University of Mississippi Medical Center (UMMC); some techniques were manual but most majority of them were photo timed. For each of the 20-25 views comprising the Osseous Survey the Entrance Skin Air KERMA (ESAK) & Dose Area Product (DAP) were recorded and were normalized to the patient entrance surface. Minimum, maximum, median and average ESAK & DAP were calculated for all of the cases.

RESULTS

The average age of patients were categorized in 6 sub-sets of 0.5 years to 3 years-old were %44,%36, %10,%5, %3 and %2 of total patients, respectively. The total number of 11233 views were evaluated. In each patients sub-set a variety of views were done and the average number of events was 23.35 for each patient. The total ESAK for same age categories were 1.37, 1.93, 2.40, 2.59, 3.63 and 3.21 mGy, respectively. It was concluded that those of the trunk account for %22 of the total dose burden (0.56/2.54 mGy). On the trunk views, by far those of the Lumbar Thoracic spine [AP-Lateral] impart the largest dose. The DRL were 2.44 and 0.606 mGy for total body and trunk, respectively. The results were compared to a Canadian healthcare provider as well.

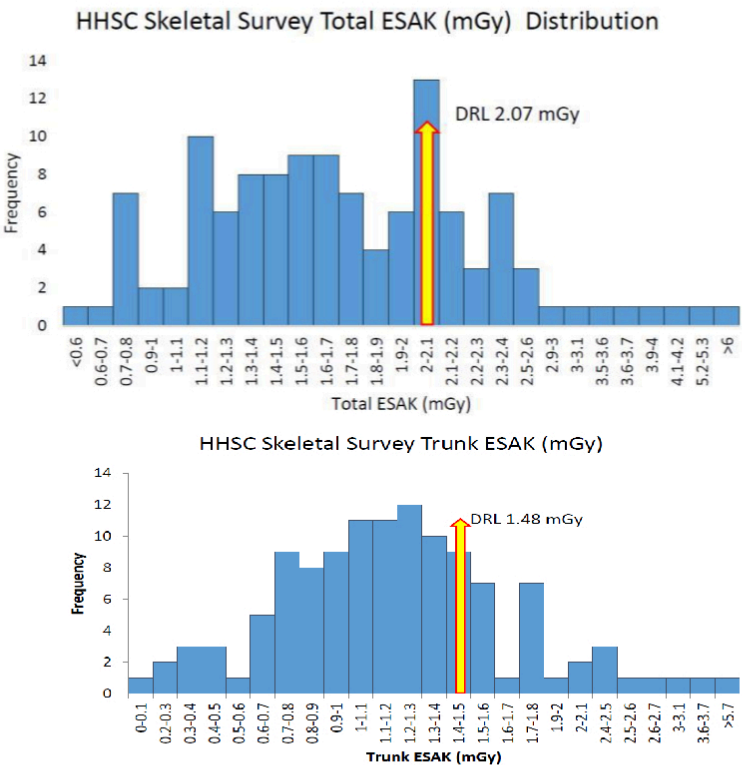
DISCUSSION

The Canadian Total ESAK values (and subsequently derived DRL) are a bit smaller than American ones which is due to fewer number of events in Canadian to American skeletal survey studies (17.2 /23.4). Trunk ESAK values (and related DRL) are (is) fewer in American side due to less number of acquired trunk views in compare with Canadian side (4.5/12). The most majority of UMMC pediatric osseous studies were belonging to age group under 6 months-old kids while for HHSC side, age group 1 to 1.5 years old have had the most majority of studies hence, increasing the exposure parameters and related ESAKs for older and bigger kids were obvious.



Figures 1,2: (top row, left and right, respectively) Total and Trunk ESAK distribution in pediatric Osseous Survey in University of Mississippi Medical Center (UMMC)

Figures 3,4: (Button row, up & down) shows Total and Trunk ESAK distribution in Hamilton Health Sciences Corporation (HHSC) as American and Canadian healthcare providers, respectively.



CONCLUSIONS

The total dose increases with age. Torso views account for ~%22 of total dose, due to fewer torso views in UMMC, consideration should be given to optimizing the total number of views first, to ensure optimal patient compliance. Clinical Application: This study has defined Diagnostic Reference Levels (DRL) for osseous surveys in the major healthcare provider in Mississippi.

ACKNOWLEDGEMENTS

This project is supported by Radiology Departments of McMaster university, Hamilton Health Sciences Corporation (HHSC) Hamilton, ON, Canada. and The University of Mississippi Medical Centre (UMMC) - Jackson, MS, USA

REFERENCES

kemp A-M et al. Which radiological investigations should be performed to identify fractures in suspected child abuse? *Clinical Radiology* (2006) 61, 723e736

Louwens E et al. Detection of child abuse in emergency departments: a multi-centre study. *Arch Dis Child* 2011 96: 422-425

Khosravi H et al. Radiation Dose Levels in Pediatric Skeletal Survey for Suspected Child Abuse: A Preliminary Study *AAPM meeting* 2018

CONTACT INFORMATION

Hamid Khosravi, PhD, MCCPM Phone: 601-984-2474 email: hkhosravi@umc.edu