

# Evaluation of Patient Radiation Dose during Orthopedic Surgery



H. Osman<sup>1,3</sup>, A. Sulieman<sup>3</sup>, A. Elzaki<sup>1,4</sup>, A. K. Sam<sup>2</sup>

<sup>1</sup>Taif University, College of Medical Applied Science, Radiology Department, P. O. Box 2425 Postal Code 21944, Taif, KSA

<sup>2</sup>Sudan Atomic Energy Commission, Radiation Safety Institute. P.O. Box 3001, Postal Code 11111, Khartoum, Sudan

<sup>3</sup>Sudan University of Science and Technology, College of Medical Radiologic Science. P.O. Box 1908, Khartoum, Sudan.

<sup>4</sup>Alzalem Alazhari University, Faculty of Radiological Sciences and Medical Imaging, P.O. Box 1432, Khartoum North, Sudan

**Introduction** The number of orthopedic procedures requiring the use of the fluoroscopic guidance has increased over the recent years. It is now accepted that closed operative procedures are the treatment of choice in many types of complex fractures because of their lower infection, smaller incision wounds and relatively low morbidity at implant removal. Patient entrance skin dose (ESD) is significant parameter which has been used to report patient doses, and this has been studied in many parts of the world. The current study intends to; (I) evaluate radiation dose to patients in three different orthopedic centers and (II) estimate patient organs doses .

**Materials and Methods** 37 patients under went dynamic hip screw (DHS) and dynamic cannulated screw (DCS) were evaluated using calibrated Thermoluminescent Dosimeters (TLDs), under c-arm fluoroscopic machines ,in three centers in Khartoum-Sudan all machines have subjected to excessive quality control tests prior to study measurements.

**Results and discussion** The main indications for orthopedic surgery was trauma cases (75.7%),pathologic fracture (24.3%).all of the patients have examined with conventional x-ray prior to surgery procedure, and also have imaged after surgery procedure directly. And 57% have done two to three x-ray image as follow up (all pathologic fracture patients)

The mean fluoroscopic factor for both procedure was  $74 \pm 2.07$  kV,  $1.12 \pm 0.2$  mA and  $0.62 \pm 0.16$  mins. DHS showed higher exposure factor (mean  $74 \pm 2.2$  kV,  $1.15 \pm 0.2$  mA and  $0.64 \pm 0.18$  mins) compared to DCS ( $72.3 \pm 1.9$  kV,  $1.09 \pm 0.18$  mA and  $0.6 \pm 0.14$  mins). Moreover more fluoroscopic image were obtained during DHS compared to DCS, which will result in more ESD delivered to patient in DHS technique (ESD were 8.2 and 7.9 mGy for DHS and DCS procedure respectively). Bone marrow and Gonad organ showed the higher organ dose compared to other organ and about 2% and 1.2% from ESD for aforementioned organs respectively. Compared the results of Crawely et al to the current study, the current study showed higher value, and this could be attributed to varied x-ray C-arm machine used in each study and the type of practice used by different orthopedic surgeon. And the latter depend on the experience of the staff. No correlation was found between ESD and BMI. Orthopedic procedure radiation dose depend mainly on orthopedist surgeon procedure, and delivered less radiation doses to patients than cardiac or hysterosalpingography procedures. More study should be implemented to follow radiation dose before surgery and after surgery



Author: [hamidssan@yahoo.com](mailto:hamidssan@yahoo.com)