First Latin-American Congress
on Solid State Dosimetry and Radiation Measurements
13-17 September, 2021

ASSESSMENT OF RADIATION DOSE LEVELS WITH DIFFERENT C-ARC FLUOROSCOPY EQUIPMENT

Allan F. F. Alves [1], Matheus Alvarez1[1,2], Raul Lopes Ruiz Jr[3], José Carlos de Souza Trindade Filho[4], Samara Pavan Souza[5], Ana Luiza Milani[5], Diana Rodrigues Pina[6]

[1]Núcleo de Física Médica e Radioproteção. Hospital das Clínicas da Faculdade de Medicina de Botucatu, UNESP, 18.618-687, Botucatu, São Paulo, Brasil

[2] Consult Medicina Radiometria e Qualidade, 15.990-635, Matão, São Paulo, Brasil

[4]Departamento de Cirurgia e Ortopedia, Faculdade de Medicina de Botucatu, UNESP, 18618-687, Botucatu, São Paulo, Brasil

[4]Departamento de Urologia, Faculdade de Medicina de Botucatu, UNESP, 18618-687, Botucatu, São Paulo, Brasil

[4]Residência em Física Médica, Faculdade de Medicina de Botucatu, UNESP, 18618-687, Botucatu, São Paulo, Brasil

[6]Departamento de Doenças Tropicais e Diagnóstico Por Imagem, Faculdade de Medicina de Botucatu, UNESP, 18618-687, Botucatu, São Paulo, Brasil

Introduction: Fluoroscopy equipment are used in surgery rooms to guide invasive procedures. Technological advances have enabled improvements in image quality, which can cause increased radiation doses in the clinical staff. The correct use of personal protective equipment and monitoring of dose levels are necessary for a safe practice. The objective of this research was to evaluate the levels of exposure to which professionals who work with C-arc X-ray equipment are submitted during surgery procedures.

Material and method: Three fluoroscopy equipment were used, GE® OEC ONE; Siemens® Siremobil Compact L and Phillips® BV Pulsera.. Kerma measurements were performed with a Radcal 9015 dosimetric kit, with an 1800 cc ionization chamber (Radcal Co®, Monrovia, CA, EUA) in air kerma rate mode (uGy/min). A water-filled acrylic analytic phantom was placed in the patient's position in order to scatter the radiation beam. Measurements were performed according to Figure 1 at three different radial distances (0.6; 1.0 and 2.0 meters) from the scattering objects. We also estimated the maximum dose that a clinical staff member could receive per procedure according to the routine of our institution.

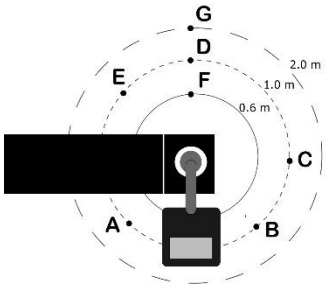

Figure 1: Schematic of the experimental setup, in which air kerma rate measurements were performed at points A, B, C, D, and E.

The parameters selected in the equipment were the maximum voltage, kVp = 100, and the maximum current, mA = 5.0. All measurements were performed at the largest avaible field in each equipment

Results: The measured air kerma rates values at the largest radiation field with the maximum kVp and mA, with all data points are shown in Table 1.

Measrument points						
A	**B**	**C**	**D**	**E**	**F**	**G**
Equipment 1 – air kerma (uGy/min)						
15.4	14.0	10.6	7.58	15.1	21.0	1.89
Equipment 2 - air kerma (uGy/min)						
20.1	18.3	15.1	16.7	19.8	46.4	4.17
Equipment 3 - air kerma (uGy/min)						
43.8	39.5	37.8	44.3	42.8	122	11.1

The highest air kerma rates were found for the equipment 3, with 122uGy/min in the position F at 0.6 meters from the radiation scaterring source. Considering the routine of procedures in our institution, we estimated that the average fluorosocpy time was 0.5 minutes per procedure, with some vascular procedures lasting up to 6.5 minutes. Considering those estimates, the clinical staff receives in average 31.5 uGy per procedure in average of the three equipments when positioned 0.6 meters away from the patient.

Conclusions: The amount of dose on the clinical staff depends on additional factor such as average time of procedures, distance from the radiation source, presence of additional shielding barriers, radiation field size, and radiological protocols. However, our measurements can be used to estimate the occupational doses to the clinical staff, under general conditions. This type of

study helps to determine radiation protection measures with the use of C-arc fluoroscopy.