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Introduction

The optimization of radiation protection is a crucial principle to interventional cardiology procedures since it can avoid radiation injuries for patients. In order to convert it into a mandatory requirement it is necessary to know the dose reference levels.

Objective

The purpose of this work is to evaluate the patient's skin surface dose (SSD) distribution and to measure the maximum radiation doses on skin surfaces, as well as to identify potential high doses and their correlation with gender, body mass index (BMI), fluoroscopy time and type of procedure.

Methodology

We evaluated the maximum skin doses (MSD) in five facilities in Latin America: Brazil, Costa Rica, El Salvador, Mexico and Venezuela. The participants are represented by letters.

The Gafchromic film XR-RV2 was placed under the patients in such a way that allowed us to identify how the doses were distributed over a back skin area in two selected cardiac procedures, coronary angiography (CA) and angioplasty (PTCA). Three participants took pictures of Gafchromic film, as exemplified in the figure 1.

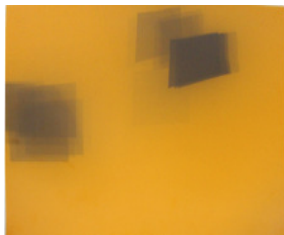


Figure 1: Photo of Gafchromic film placed under the patient during angioplasty procedure.

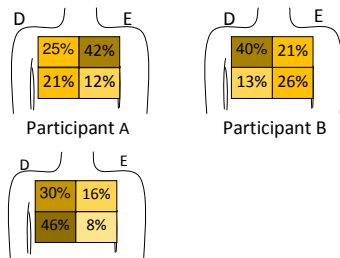


Figure 2: MSD frequency on the back skin area during the interventional procedures registered by three participant.

Results

The figure 2 shows the MSD frequency on the back skin area. Each participant collected data at least of 24 patients and the results of MSD (cGy) 3rd quartile are presented in the figures 3, 4 and 5. Considering all patients (195), 71% of them are male. Their age's median is of 61 years-old and the BMI average is superior to 27.5 kg/m² as showed in the figures 6 and 7.

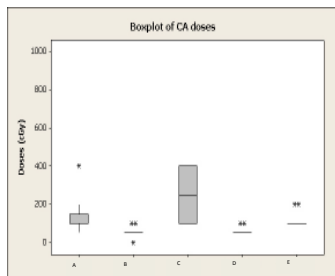


Figure 3: Doses of coronary angiography procedures

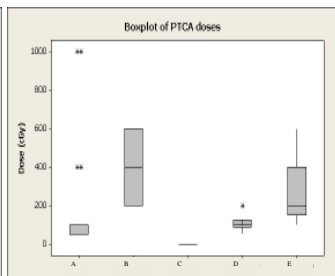


Figure 4: Doses of angioplasty procedures

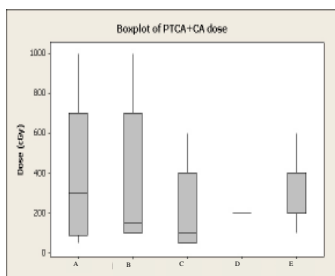


Figure 5: Doses of coronary angiography and angioplasty procedures

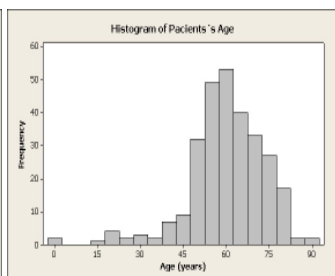


Figure 6: Histogram of patients' age

Some of the patients were submitted to previous procedures, as follow: A (43%), B (32%), C (12%) D (28%) and E (16%).

The fluoroscopy time (min) range was variable as showed in the figure 8.

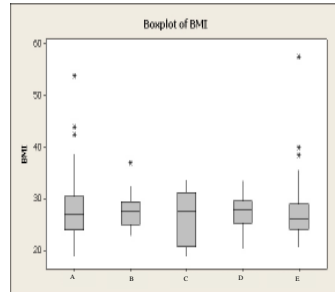


Figure 7: Body mass index value of patients

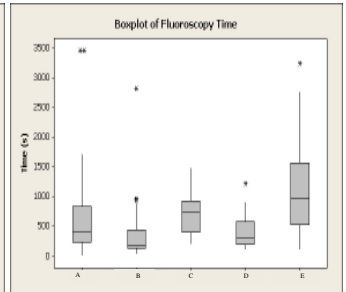


Figure 8: Fluoroscopy time of the interventional procedures

The linear correlation values (r^2) between MSD and fluoroscopy time, for each participant, and for all procedures are presented in the figure 9.

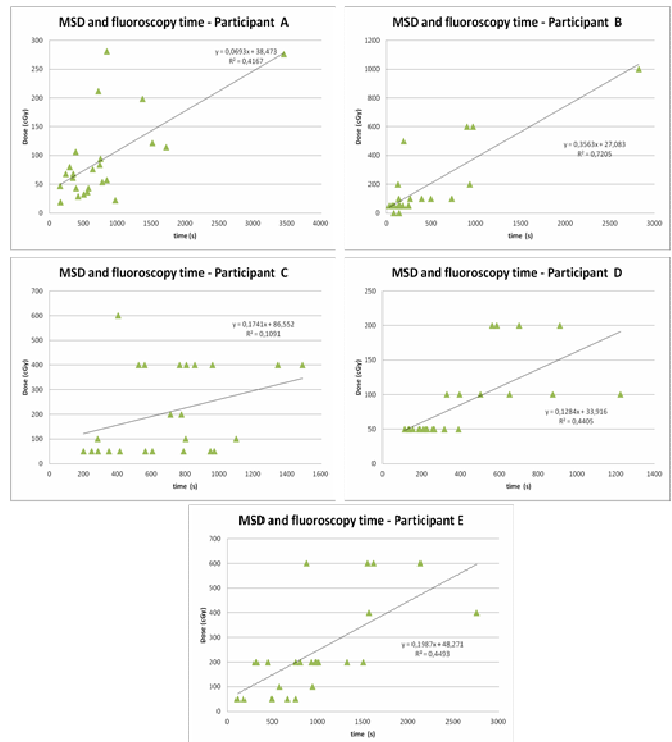


Figure 9: Correlation between maximum skin dose and fluoroscopy time of the interventional procedures for each participant.

Discussion and Conclusion

This study found a very weak correlation between BMI and MSD. It was possible to verify the variability of dosimetric measurements that can be explain by differences among patients' characteristics, type and complexity of the procedures. The results showed that 81.5% of all patients were exposure to skin doses less than 2 Gy, confirming that there is a potential risk of skin injuries in the interventional cardiac procedures.

Acknowledgement

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