METHODOLOGY TO DOSE OPTIMIZATION IN CT TO THE ROUTINE OF CHEST EXAMS

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1. INTRODUCTION

Several studies were published demonstrating that clinical images appropriate for diagnosis may be obtained with a great reduction of the dose, losing significantly only the image aesthetics [1].

Is possible reduce the effective dose in CT exam, from studies of optimized techniques [2]. In this work we'll describes a methodology to dose optimization in computed tomography to the routine of chest exams. The optimization would obtained by study of the noise increase in specifics images clinics, by computational simulation, by the software ImageJ.

2. OBJECTIVES

This work describes a methodology to dose optimization in computed tomography to the routine of chest exams. The optimization would obtained by study of the noise increase in specifics images clinics, by computational simulation, by the software ImageJ.

3. METHODS

Aquilion 64 of Toshiba Medical Computed Tomography (CT), was used in this study, realized at the Avanced Diagnostic Imaging clinic (DAPI) located in Curitiba, state of Paraná.

56 CT scans in chest were selected, from June to August 2010 and April to May 2011.

The validation of the noise simulation method proposed in this study was performed by exposure of a water-filled acrylic simulator with 25 cm diameter [1]. The validation was done by comparing the mean CT number and standard deviation, showed in Figure 1, measured on the images obtained by the scanner in each of the actual selected noise and in the images obtained by ImageJ in each of the simulated noise levels.

ImageJ has a function that adds noise to the image by means of a Gaussian distribution (mean 0 and standard deviation = 25) that is applied randomly to the original image data [2]. The addition of noise must be performed in all images that will be analyzed by radiologists to verify the possibility to diagnose them.

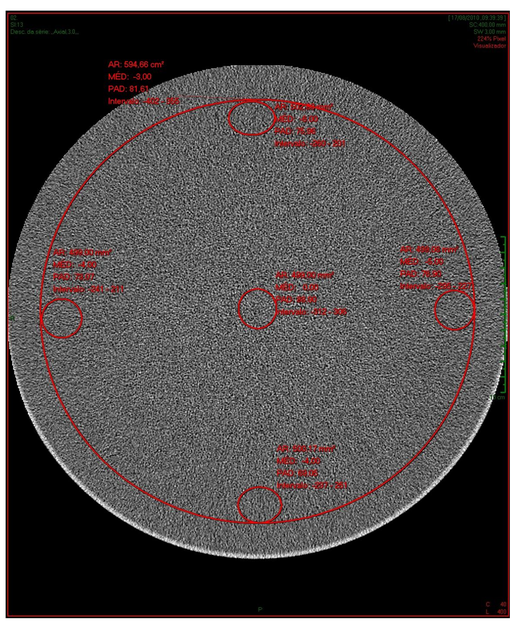

Figure 1. Water phantom image with the ROI's by Picture Archiving and Communication System (PACS).

4. RESULTS

Among which 54 were adults over 18 years. The Figure 2 shows that the CT of chest showed 16.7% compliance in relation to the reference value of DLP. Already the figure 3 shows us that the tests performed with two scans, one in low dose and another in standard, showed 50% compliance. The analyze of phantom images with the ImageJ software began with a center ROI of 500 mm2 in center image of phantom in each noise level, so as to verify whether it was increasing as it should, because the levels were changed of 12 at 18. Analysis of the clinical exams with simulated noise has not been realized by doctors

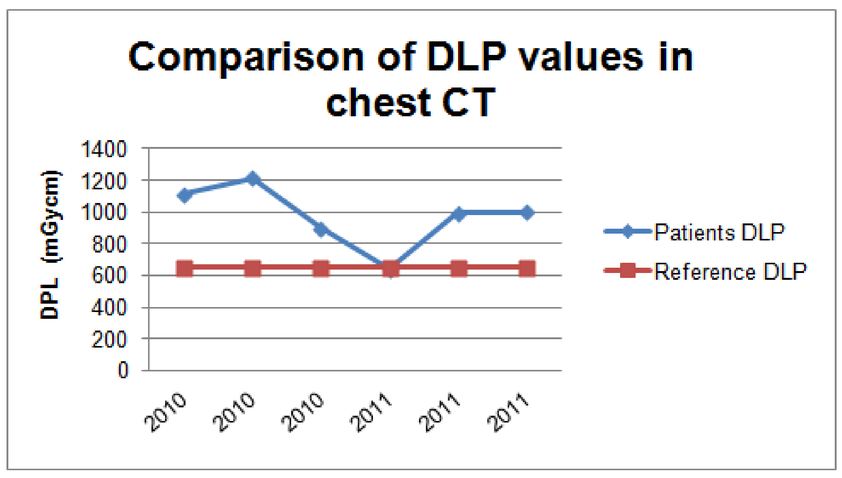

Figure 2. Comparison of DLP of qualified patients, with an estimated value of 650 mGycm, according to EUR 16262 [5].

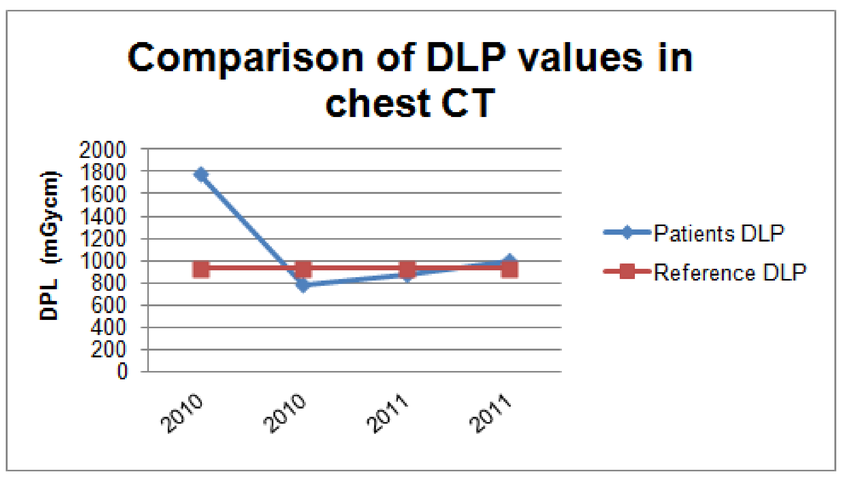

Figure 3. Comparison of DLP of qualified patients, with an estimated value of 930 mGycm.

The 53th patient was only of the examination at high resolution, the DLP provided by the equipment was 917 mGycm, value is above 280 mGycm estimated by EUR 16262 [3].

5. CONCLUSION

It was observed that 62,9% of patients were overweight or were obese, which justifies increasing of the DPL effectives values informed by the equipment for qualified patients evaluation, which are different compared to the reference level of EUR 16262.

We also concluded that we must continue the study on the optimization of dose to routine of chest exam in clinic, because the data of exams collected were send to the doctors, important fact in this work, because they realized the need to evaluate the clinical protocols according the clinical requisition.

6. REFERENCES

1.FRUSH, Donald P. et al. nov 2002. Computed - Simulated radiation dose reduction for abdominal multidetector CT of pediatric patients. AJR., Vancouver, n. 179, p. 1107 – 1113

2. IMAGEJ Image Processing and Analysis in Java at http://rsb.info.nih.gov/ij/index.html

3. EUR 16262. 2010. European guidelines on quality criteria for computed tomography at http://www.drs.dk/guidelines/ct/quality/index.htm

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