Impact of the employment of a new model of computed tomography in the radiation dose of head CT scans. Preliminary results in a series of 30 patients

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Aims and objectives

Background

A large number of computed tomography scans are performed in everyday clinical practice nowadays; hence this technique has become the largest source of medical radiation.

The benefits of a computed tomography scan outweigh the risks provided that the exam is indicated and that it is optimized to get a good image quality with the lowest possible dose of radiation.

Our study

Recently, our hospital incorporated a new single-source CT equipment with a **high sensitivity detector**.

The high sensitivity detector consists of the integration of analog-digital converters with the photodiodes of the CT detectors. This implies a reduction of the electronic noise in the image acquisition, entailing the possibility of **lowering the radiation dose**.

Therefore, the purpose of this study was to estimate the impact of employing a new single-source CT model with a high sensitivity detector in the radiation dose produced by a head CT scan.

Methods and materials

We performed a **retrospective** analysis of the radiation dose received by patients in two consecutive head CT scans.

We selected those patients who had a head CT scan in the new model and had another one performed in a different CT scanner. We wrote down the doses (DLP) from each exam registered in our PACS.

There were 30 patients registered (18 males and 12 females between 20 and 94 years old).

The presenting complaints were: cranioencephalic trauma, syncope, focal neurologic deficit, cephalea, postoperative follow-up, ictus follow-up, and subarachnoid hemorrhage follow-up.

For statistical analysis, we compared the doses with **paired sample t-test**, considering a **significance level of 0.05**.

Results

The radiation doses in the single source CT model with a high sensitivity detector varied between 560 and 760 mGy.cm (650.6 ± 61.3).

The doses of the other scanners varied between 735 and 1344 (889.3 ± 137.8) (Figure 1).

The difference between both values was **statistically significant ($p<0.0001$)**.

The doses of the head CT scan in the new model were lower in all the patients (Figure 2), with a mean of 37% (between 5% and 110%) higher in the other CT scanners.

Figure 3 shows example images of one patient both head CT scans, showing lower radiation dose in the new model.

Images for this section:

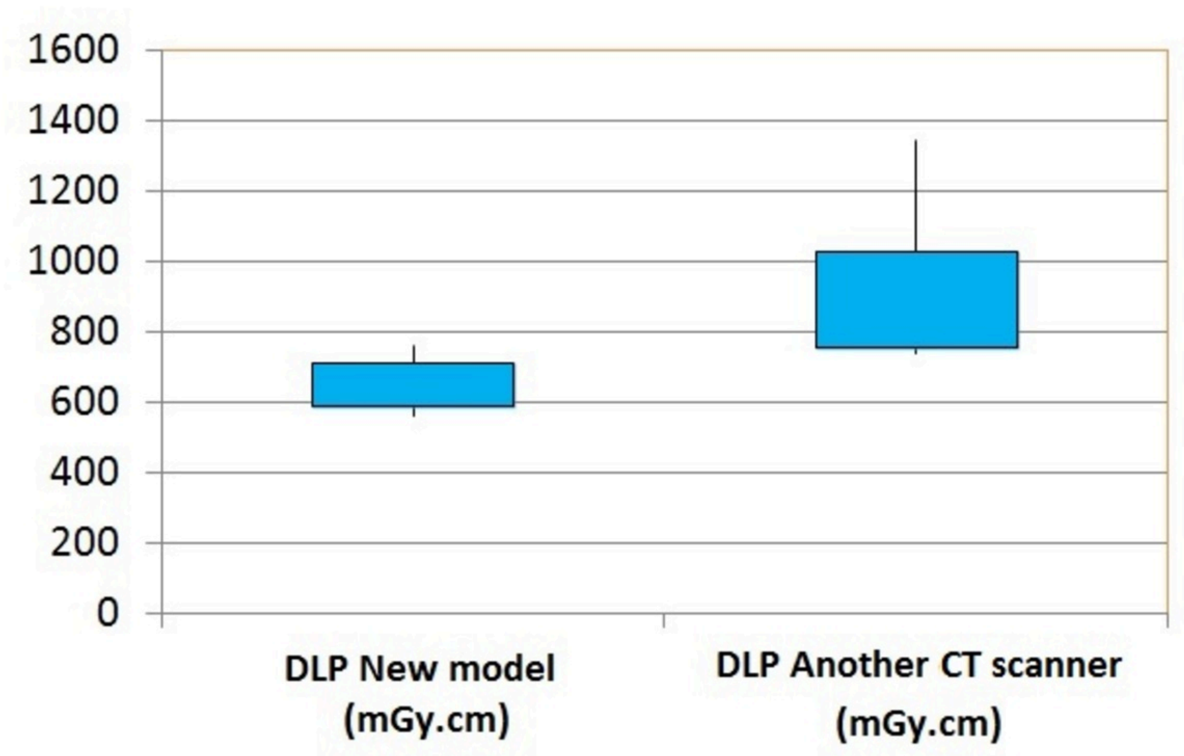

Fig. 1: Comparison between radiation doses of the new CT model and a different CT scanner.

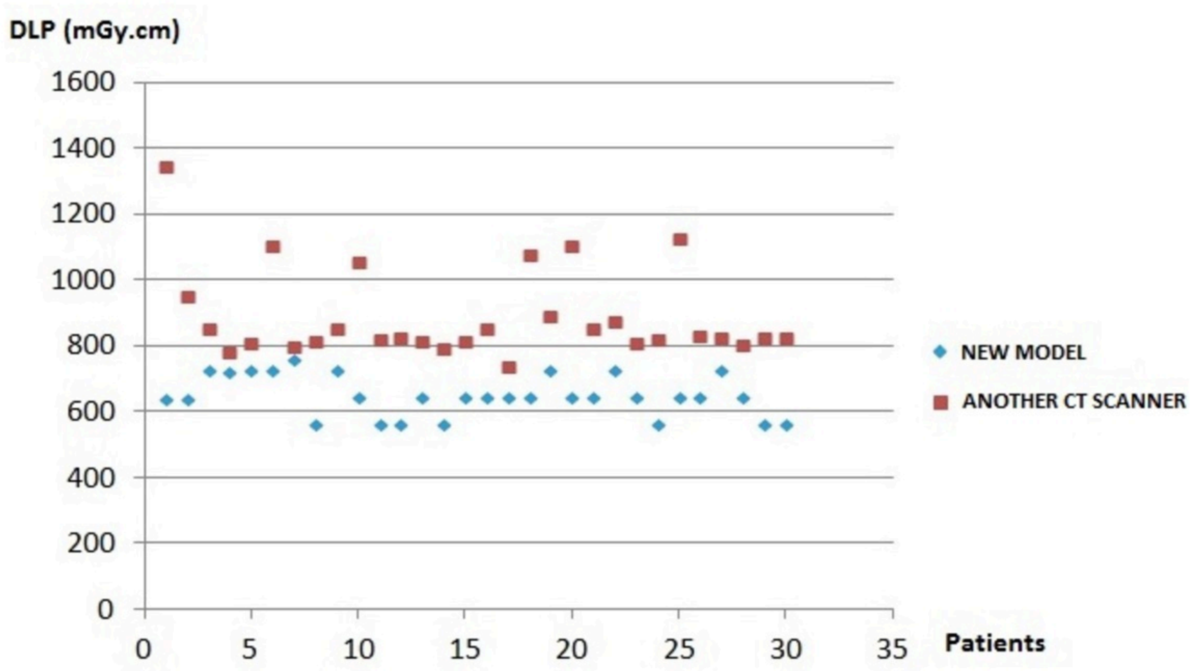

Fig. 2: Dispersion diagram of the radiation dose (mGy.cm) of each patient head CT scan in the new model (blue diamonds) and another CT scanner (red squares).

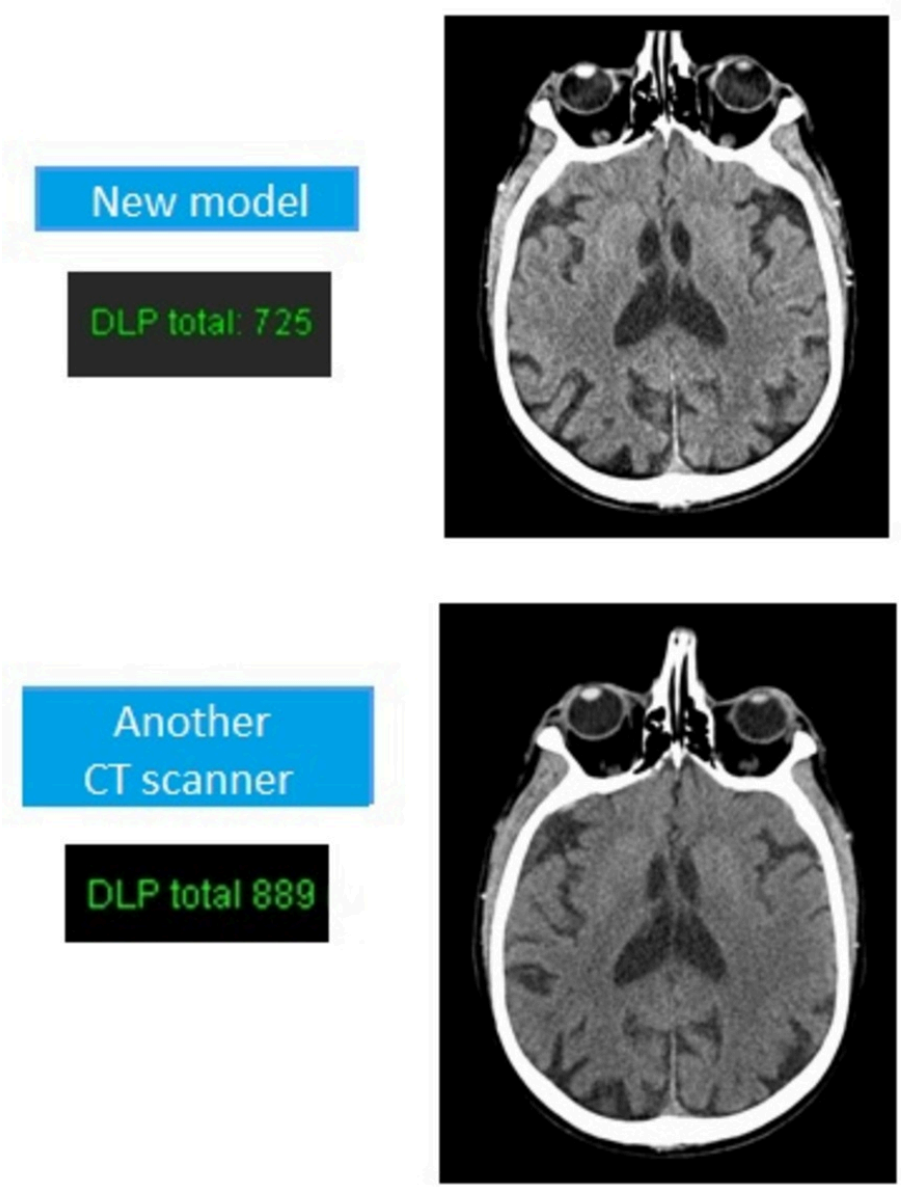

Fig. 3: Image of one of the patients head CT scan performed in the new model, in comparison with the same patient head CT scan performed in a different CT scanner. In this case, the new model DLP is 164 mGy.cm lower than the other scanner, without loss of image quality.

Conclusion

The employment of a new single-source CT model with a high sensitivity detector reduced the radiation dose of the head CT scans performed in all the evaluated patients, preserving the image quality.

References

1. Brenner DJ, Hall EJ. Computed tomography: an increasing source of radiation exposure. *N Engl J Med 2007; 357:2277-2284*
2. Costello JE, Cecava ND, Tucker JE, Bau JL. CT Radiation Dose: Current Controversies and Dose Reduction Strategies. *AJR 2013; 201:1283-1290*
3. Christe A, Heverhagen J, Ozdoba C, Weisstanner C, Ulzheimer S, Ebner L. CT dose and image quality in the last three scanner generations. *World J Radiol 2013 November 28; 5(11): 421-429*
4. Ulzheimer S, Freund J. The Stellar Detector. First fully integrated detector.