CT scan dosimetric parameters routine monitoring: first results of radiation dose optimization strategies promptly provided by a multidisciplinary team

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Background

JCI Standards and European Legislation (EURATOM 59/2013) require the implementation of patient radiation protection programs in diagnostic radiology. Aim of this study is to demonstrate the possibility to reduce patients radiation exposure without decreasing image quality, through a multidisciplinary team (MT), which analyzes dosimetric data of diagnostic examinations.

Evaluation

Data from CT examinations performed with two different scanners (Siemens Definition™ and GE LightSpeed Ultra™) between November and December 2014 are considered. CT scanners are configured to automatically send images to DoseWatch© software, which is able to store output parameters (e.g. *kVp, mAs, pitch*) and exposure data (e.g. $CTDI_{vol}$*, DLP, SSDE*). Data are analyzed and discussed by a MT composed by Medical Physicists and Radiologists, to identify protocols which show critical dosimetric values, then suggest possible improvement actions to be implemented. Furthermore, the large amount of data available allows to monitor diagnostic protocols currently in use and to identify different statistic populations for each of them.

Discussion

We identified critical values of average $CTDI_{vol}$ for head and facial bones examinations (respectively 61.8 mGy, 151 scans; 61.6 mGy, 72 scans), performed with the GE LightSpeed CT™. Statistic analysis allowed us to identify the presence of two different populations for head scan, one of which was only 10% of the total number of scans and corresponded to lower exposure values. The MT adopted this protocol as standard. Moreover, the constant output parameters monitoring allowed us to identify unusual values in facial bones exams, due to changes during maintenance service, which the team promptly suggested to correct. This resulted in a substantial dose saving in $CTDI_{vol}$ average values of approximately 15% and 50% for head and facial bones exams, respectively. Diagnostic image quality was deemed suitable for clinical use by radiologists.

Conclusion

Radiation dose reduction, while saving image quality could be easily implemented with this approach. Furthermore, the availability of a dosimetric data archive provides immediate feedbacks, related to the implemented optimization strategies.