Challenges to be met

In 1994 a Study Group was established and a Working Document on Quality Criteria for CT was produced. This was sent for consultation to outside experts, competent authorities and professional bodies in the Member States. It has been one of the main tasks of the project to analyse, unify and incorporate over 50 responses to produce a final document. In parallel with this consultation, trials of the procedures in the working document have had to be carried out in clinical departments. One of the proposals in the Working Document was to use Dose-Length-Product (DLP) as a method for specifying reference doses for CT. This proposal had to be evaluated. A means of allowing ready access to technical information had to be established and finally the results of the project had to be disseminated.

Achievements

The usability in clinical practice of the image quality criteria proposed in the working document was evaluated in a pilot multicentre study for five types of examinations: 1) face and sinuses, 2) vertebral trauma, 3) HRCT of the lung, 4) liver and spleen, and 5) osseous pelvis. CT examinations from four countries were evaluated by two groups of radiologists. For each examination the radiation dose was evaluated based on Computed Tomography Dose Index (CTDI) measurement in the centre and periphery of a CT dosimetry phantom and recorded as DLP. It was concluded that the highest dose does not always imply the best diagnostic image and that dose reduction could be achieved without loss of diagnostic image quality. These results as discussed at a workshop in Malmo in June 1999 have been published (Rad. Prot. Dos. 90, 47-52, 2000).

The CTDI is a well-defined and useful dose descriptor of the dose to the patient from CT. It is easy to measure and thus practicable for defining reference doses. It has been recommended by the International Electrotechnical Commission that values of CTDI should be displayed on the operator’s console of the CT scanner, reflecting the conditions of operation selected. Monitoring of CTDI for the head or body CT dosimetry phantom provides control on the selection of exposure settings, such as mAs. Monitoring of the DLP where the number of slices and sequences are taken into account provides control on the volume irradiated and the exposure from the irradiation as a whole. During the project a pilot study provided some preliminary data on appropriate values for DLP. These data together with some from a separate UK survey enabled initial reference dose values to be proposed; however these will need further checking by means of a wider trial. Effective dose to the patient can be calculated from the operational dose quantities CTDI or DLP thus enabling the different examinations to be compared meaningfully taking into account the non-uniform exposure of the body.

A reference database for CT dosimetry has been established at ImPACT in the UK. This can be accessed at www.impactscan.org.
Implications

This initiative in CT should continue with a view to ensuring compliance with the Council Directive on health protection of individuals against dangers of ionising radiation in relation to medical exposure (97/43/EURATOM). The quality assurance criteria required by the Directive and established in preliminary form during this project should be tested by regular repeated surveys which include the appropriateness of the initially selected reference dose values. Emerging techniques such as multislice and fluoro-CT have not been addressed in this project and with the continuing evolution of CT technology there will be a need for regular updating of the guidelines.

A workshop was organised in November 1998 in Århus, Denmark to discuss all of the responses to the Working Document. There were no fundamental critical comments but some discussion was needed to arrive at a general agreement to and support for the application of the dosimetric quantities CTDI and DLP, which were introduced into the document. The document was then finalised as an official publication of the Commission [European Guidelines on Quality Criteria for Computed Tomography, EUR 16262 EN, May 1999]. This document can also be found at www.drs.dk/guidelines/ct/quality.