Objectives

Computed tomography (CT) is a procedure that involves relatively high radiation exposure of the patient and for which dosimetric field surveys have revealed large variations in exposures between hospitals. The objective of the European Working Group on Computed Tomography (EWGCT) is to stimulate optimisation of applications of CT. To achieve this, insight in the clinical application of CT in European countries will be obtained and further guidance on imaging technique, patient dose and diagnostic accuracy will be provided. Information will be collected with regard to CT technique and to patient dose in relation to a large variety of clinical problems. A European evaluation of image quality will be performed for a limited number of CT procedures. New data for calculating effective doses for new types of CT scanners will be provided. Finally, the new insights will be incorporated in a revision of the European Quality Criteria for CT.

Challenges to be met

In Europe, CT is estimated to be responsible for up to 40% of the collective dose due to diagnostic radiology. In recognition of this, professional groups, governments and manufacturers as well as individual medical specialists, radiographers and physicists have become more involved in radiation protection, in the optimisation of CT protocols and in clinical patient dosimetry. This is also partly due to recent European legislation, which puts specific requirements on quality assurance programmes in CT and on the assessment of patient dose in CT (Council Directive 97/43/EURATOM).

Computed tomography – techniques, image quality and patient dose (CT-TIP)

A radiologist might decide to use CT as the most appropriate diagnostic imaging modality. In this case it is expected that the diagnostic accuracy of the CT scan will contribute to the health benefit of the patient, e.g. through treatment of the detected disease. The radiation exposure associated with the CT scan will however give rise to a health detriment, i.e. an increased probability of tumour induction or hereditary effects. After clinical justification a potential for optimisation of CT can often be found in the actual imaging technique, especially in the choice of tube current, pitch, number of sequences and volume of the scan. The imaging technique determines to a large extent the absorbed dose and the diagnostic accuracy. It is a challenge for the EWGCT to achieve optimisation of imaging techniques in CT by stimulating structured evaluations of absorbed dose and diagnostic accuracy.

Recent developments in CT have been fuelled by new technologies such as subsecond multislice CT and fluoroscopic CT and by novel clinical insights. It is another challenge for the EWGCT to incorporate these developments in their new recommendations.
A European field survey of the clinical application of CT with a focus on the evaluation of CT protocols and assessment of patient dose will be organised. This survey is based on more than 10 relevant clinical indications for CT examinations and comprises scans of the skull, chest and abdomen. The survey involves four hospitals in at least 5 countries. The results of the survey will be evaluated with regard to optimisation of CT technique and patient dose. Results will also be relevant for the further development of the diagnostic reference dose levels in Europe and for the revision and extension of the European Guidelines.

Subsequently a field survey focused on image quality in CT for a selected group of clinical problems and hospitals will be organised. From the results of the broad survey described some indications will be selected for further evaluation. This selection will be based on the variations in the CT protocols or in patient dose that are found during the broad survey of the standard protocols or on the deviations from the ‘Examples of Good Imaging Technique’ in the European Guidelines. The evaluation involves patient dose but a special effort will also be made in evaluating clinical image quality. To achieve this, the set of collected clinical CT images are to be evaluated during a joint session of the radiologists.

A revision and extension of the CT Quality Criteria aimed at the preparation of a general update of the Guidelines will be prepared at the end of the contract period. Rapid development of clinical applications of CT will necessitate a revision of this document. A method for characterising the dosimetric performance of the latest types of CT scanner will be developed so that appropriate conversion factors can be derived and effective doses calculated for current clinical CT practice. Special attention will be paid to the evaluation of the relation between dose length product (DLP) and effective dose. The results of these studies will be applied for dose assessment during the two field surveys.