Developments and Trends in CT Technology and Applications

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The lecture will cover recent technological developments relating to scanner mechanics, x-ray sources, and detector systems, but also to new designs such as C-arm-CT and micro-CT systems. The introduction of dual-source CT (DSCT) systems, which host two complete measurement systems and offer effective scan times of down to less than 100 ms, will be a particular focus. In the second part new applications such as cardiac CT, dual energy CT and navigated interventions will be discussed.

With rotation times below 0.5 s, modern clinical CT systems pose increasing demands on the mechanical design of the scanner and of all its components. Due to the increased rotation speed in clinical CT, demands on x-ray power levels increase accordingly to allow for unimpaired image quality and unaltered noise levels. The latest developments in x-ray source technology, so-called rotating envelope tubes, will be reviewed and explained. CT detector technology has also made remarkable progress in the past years. The development from single-slice to multi-slice systems, including detectors allowing the simultaneous acquisition of 64 slices and more, has even been viewed as the ″slice war″ in the media. The technological basis will be reviewed. In particular, the question if this development shall and will continue will be discussed. This also includes the potential role of flat panel detectors which have come into use with C-arm systems and which are now being used frequently for interventional CT and for CT angiography. A short review of dose management via automated exposure control (AEC) will be included.

Modern CT systems, in particular MSCT and DSCT, provide examination times of 10 to 30 s with excellent image quality, in particular isotropic spatial resolution of better than 0.5 mm and high temporal resolution necessary for demanding tasks like cardiac imaging, and thereby support advanced applications.

Keywords: Computed Tomgraphy, Technology, Dose