

1 Introduction

Multidetector-row computed tomography (MDCT) has become the technique of choice for the study of many anatomical districts in different clinical settings, as it provides a fast, reliable, and accurate simultaneous evaluation of different organs, including parenchyma, hollow viscera, vessels, and bony structures.

Exploiting the enormous potential of this imaging modality requires thorough knowledge of the technical characteristics and performances of the different scanners currently in clinical use as well as the optimal study technique. Indeed, inappropriate patient preparation and an incorrect choice of the acquisition protocol, rather than scanner limitations, are among the most frequent causes of diagnostic error. This is particularly true with respect to protocols for contrast medium injection, which should be adapted to the contrast agent used, the acquisition protocol, and, more importantly, the patient's characteristics.

The potential risk derived from an overuse of MDCT scanners is related to dose exposure. Again, knowledge of the different systems enabling dose reduction, developed by the MDCT vendors and including software that carries out iterative reconstructions, is essential. Moreover, the radiologist must pay particular attention to the optimization of acquisition parameters as this will provide the best image quality with the lowest dose exposure.

The first part of this booklet consists of a brief overview of the different technological features of modern MDCT scanners, together with a detailed explanation of optimal contrast enhancement for both arterial and parenchymal studies. Considerable attention is then given to more sophisticated examinations requiring greater care by the radiologist in choosing the imaging protocol, whether CT-angiography, cardiac-CT, or CT-colonography.

In the second part, the application of the various imaging protocols is illustrated through a large number of clinical cases covering the different diagnostic possibilities of MDCT, including emergency radiology and neuro-imaging.