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TOPIC HIGHLIGHT

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Coronary CT angiography: State of the art

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Core tip: This article provides an overview of a series of articles that focus on individual topic highlight related to coronary computed tomography (CT) angiography. In particular, use of beta-blocker protocol, radiation dose measurements, dose-reduction strategies, diagnostic and prognostic value of coronary CT angiography will be described in detail in each series. Furthermore, potential applications of coronary CT angiography beyond luminal visualization and future directions will also be discussed.

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Abstract

Coronary computed tomography (CT) angiography has been recognized as the most rapidly developed imaging technique in the diagnosis of coronary artery disease due to the emergence and technological advances in multislice CT scanners. Coronary CT angiography has been confirmed to demonstrate high diagnostic and predictive value in coronary artery disease when compared to invasive coronary angiography. However, it suffers from high radiation dose which raises concerns in the medical field. Various dose-reduction strategies have been proposed with effective outcomes having been achieved to reduce radiation exposure to patients. This article provides an introduction and overview of the series of articles that will focus on each particular topic related to coronary CT angiography.

Key words: Coronary artery disease; Coronary computed tomography angiography; Radiation dose; Diagnostic value; Predictive value

CORONARY CT ANGIOGRAPHY

Over the last decade a great deal of interest has been focused on imaging and diagnosis of coronary artery disease (CAD) using coronary computed tomography (CT) angiography due to its less invasive nature and improved spatial and temporal resolution. With latest multislice CT scanners (64- and post-64 slice CT), coronary CT angiography has been reported to have high diagnostic value, and it can be used as a reliable alternative to invasive coronary angiography in selected patients[1-7]. In addition to the diagnostic value, coronary CT angiography has demonstrated the ability to assess coronary plaques in terms of morphology and plaque characterization, thus providing prognostic information for prediction of major adverse cardiac events[8-11].

Despite these promising reports and increasing studies available in the literature, coronary CT angiography suffers from a major limitation, which is high radiation dose. This has raised serious concerns in the medical field, as radiation-induced cancer is not negligible. Awareness of this issue plays an important role in ensuring that use of

coronary CT angiography is medically justified, and dose-reduction strategies are implemented whenever possible, while diagnostic image quality is still acceptable[12].

This series consists of 5 articles on the clinical applications of coronary CT angiography in CAD. Part I deals with beta-blocker administration protocol as beta-blocker is the most commonly used drug to achieve heart rate control during coronary CT angiography. It has become a routine protocol to use beta-blocker to slow down heart rate in patients with heart rate more than 70 beats/min prior to coronary CT angiography, thus, understanding the preparations and patient care is important for clinicians (in particular for those who are inexperienced in performing the coronary CT angiography) to effectively utilize this imaging technique.

Part II focuses on radiation dose measurements in coronary CT angiography. As mentioned above, coronary CT angiography is associated with high radiation dose, therefore, awareness of the basic dosimeters for dose measurement will help clinicians to understand the radiation risks. Part III is about dose-reduction strategies in coronary CT angiography. This part contributes to an overview of different dose-saving methods that are currently recommended in the clinical practice.

Part IV focuses on the diagnostic and prognostic value of coronary CT angiography in CAD. A systematic review of the literature on these two aspects will provide readers with updated information with regard to the current status of coronary CT angiography in terms of diagnostic accuracy and prediction of disease outcomes.

Part V is the last article of this series presenting information on the emerging diagnostic value of coronary CT angiography in CAD, which is entitled coronary CT angiography: beyond luminal visualization. In addition to the evaluation of coronary wall morphology and plaque assessment, coronary CT angiography is able to provide functional information such as assessment of myocardial ischemia which is available with dual-energy CT; hemodynamic analysis of coronary stenosis and plaque, as well as determination of patient-specific lesions (CT-derived fractional flow reserve) with use of computational fluid dynamics. This research area represents some novel applications of coronary CT angiography, although its applications are still at infancy.

In summary, this series provides a comprehensive coverage of different topics related to the coronary CT angiography in CAD, ranging from the patient preparation of heart rate control to dose measurements, dose reduction to the diagnostic and prognostic value. Finally, future research directions of coronary CT angiography are discussed and highlighted in the last part. We believe these articles contribute to improving our knowledge and understanding on coronary CT angiography and its corresponding clinical value.

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