Improved Image Guidance for Coronary Stent Deployment

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Technology description

Introduction

Increasing numbers of percutaneous transluminal coronary angioplasties (PTCAs) are being performed in the United States. Unfortunately, restenosis, or narrowing, of the dilated segment occurs in a large percentage of patients who undergo a PTCA. Coronary stent placement after PTCA provides a luminal scaffolding that has been shown to significantly reduce the likelihood of restenosis. In such procedures, cardiologists frequently deploy multiple adjacent stents in an artery to treat extended lesions or dissections. Since it is important to accurately align the stent ends, the cardiologist must adjust the position of the catheter head relative to a previously deployed stent, which requires that the first stent and the catheter head be visualized well enough that their relative stent positions can be accurately determined. This has not been possible in conventional coronary stent deployment techniques. As a result, a subsequently placed stent often cannot be placed precisely in relation to a previously placed stent, resulting in either an overlap or a gap between the two stents. Gaps between stents are significant because of the risk of residual dissections and restenosis. In addition, studies with intravascular ultrasounds (IVUS) imaging of deployed stents revealed that a high percentage of stents may be insufficiently dilated despite an apparently angiographically successful deployment. There is a need for improved angiographic guidance and evaluation of stent deployment yet proposed methods have not satisfied this need.

Technology Description

Dr. Close from Cedars-Sinai Medical Center proposes improved image guidance for coronary stent deployment. This new method is based on two techniques:

• an image processing method known as “moving layer decomposition”; and

• coronary stent deployment methods using marked delivery guidewires or balloons.

Moving layer decomposition is an image processing method for analyzing a time-series of images, such as coronary angiograms, to obtain an image of the object of interest with an improved signal-to-noise ratio. The method focuses on an identifiable feature in the angiograms (a “layer”), such as a coronary vessel, that moves or rotates with respect to a background across a series of images. It tracks the motion of the feature and averages the image intensity of the feature using several images of the time-series taking into account the movement of the feature. As a result, the feature is more visible in the processed image.

The present invention provides a method for precisely evaluating coronary stent deployment by marking the stent guidewire or delivery balloons using a radiopaque marker. By tracking the movements of the markers and performing time averaging based on the tracking, the visibility of the stent or stented lumen can be enhanced.

Application area

Improved coronary stent deployment

Advantages

• Combination of tracking radioplaque markers and moving layer decomposition
• Improved stent placement and assessment of stent dilation

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