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Intravascular ultrasound guidance to minimize the use of contrast in percutaneous coronary interventions in diabetic patients with chronic stable angina

Thesis

Submitted for Partial Fulfillment of Master Degree in Cardiology

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Abb.	Full term
AKI:	Acute kidney injury
BMI:	Body mass index
CABG:	Coronary artery bypass grafting
CHF:	Chronic heart failure
CI-AKI:	Contrast-induced acute kidney injury
CKMB:	Creatine kinase-MB
CrCL:	Creatinine clearance
D1:	Diagonal
ESC:	European Society of Cardiology
FENa:	Fractional excretion of sodium
IQR:	Interquartile range
IVUS:	Intravascular ultrasound
LAD:	Left anterior descending artery
LCx:	Left circumflex artery
LM:	Left main coronary
MLA:	Minimal lumen area
MSA:	Minimal stent area
NIRS:	Near-infrared spectroscopy
OCT:	Optical coherence tomography
OM:	Obtuse marginal
PCI:	Percutaneous coronary interventions
RCA:	Right coronary artery
ROS:	Reactive oxygen species

INTRODUCTION

Intravascular ultrasound (IVUS) was largely used to guide percutaneous coronary interventions (PCIs)[1]. Because of its ability to accurately measure lumen, plaque, and vessel dimensions, it is possible that IVUS might serve as an adjuctive tool to angiography in many steps during PCI, therefore it is hypothesized that IVUS imaging during coronary angioplasty may lead to a reduced use of contrast media.

Contrast-induced acute kidney injury (CI-AKI) is a potential complication of diagnostic and therapeutic angiographic procedures. Almost unanimously, previous studies have shown that CI-AKI is associated with worse clinical outcomes[2]. It remains debatable, however, whether CI-AKI is solely a marker for future morbidity and mortality or, conversely, it is also causally implicated in the occurrence of adverse events [2,3].

A number of strategies have been tested to reduce the incidence of CI-AKI. Vigorous fluid administration before and after the procedure is considered the most important prophylactic scheme for patients at risk of CI-AKI[4,5]. Multiple other preventive measures have been evaluated in clinical studies, but none has been widely adopted, and, in practice, CI-AKI persists as a major clinical problem for patients undergoing angiographic procedures [5,6].

Although the incidence of CI-AKI is modulated by several clinical characteristics, the volume of iodine contrast seems to be a major factor leading to CI-AKI, independently of the baseline risk profile[4,7]. Curiously, thus far, few approaches have been described to reduce the primary cause of CI-AKI after PCI, namely, the contrast agent dose [8,9].

The contrast volume to creatinine clearance ratio is a pharmacokinetic risk factor for an early abnormal increase in serum creatinine (i.e., within 24 to 72 hr) after PCI. Contrast media is renally excreted in an unmetabolized state, their systemic clearance can be approximated by the creatinine clearance (CrCl). Thus, the area under the blood concentration versus time curve can be approximated by the total volume of contrast given divided by the CrCl[10]. Therefore, C/CrCl cut-off value is relatively safe to avoid CIN in patients following percutaneous coronary intervention (PCI).[11]

AIM OF THE WORK

To evaluate the impact of intravascular ultrasound guidance on the final volume of contrast agent utilized in diabetic patients undergoing PCI for chronic stable angina and its clinical implications.

The primary endpoints:

- The total volume of contrast agent used.

The secondary endpoints:

- The in-hospital and 6 months follow up / MACE:

IN- hospital:

- Death.
- Acute myocardial infarction.
- Unplanned revascularization.
- Stent thrombosis.
- Serum creatinine, mg/dl.
- Peak rise in creatinine > 0.5 mg/dl.

6 months follow up:

- Death.
- Acute myocardial infarction.
- Unplanned revascularization.
- Stent thrombosis.