3-dimensional ct versus angiography guided pci for ostial rca lesions

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Background: Geographical stent-ostium mismatch is an important predictor of target lesion failure (TLF) after PCI of an aorto-ostial right coronary artery (RCA) lesion.

Purpose: We hypothesize that a pre-procedural 3-dimensional coronary CT angiography (3DCT) to determine the optimal C-arm angle of the X-ray system with the most accurate visualization of the aorto-ostial angle could allow optimal stent implantation at the level of the ostium and avoid excessive use of radiation and contrast.

Methods: This is a single centre trial randomizing 30 patients with an indication for non-emergent PCI of an ostial RCA lesion between 3DCT (intervention group) versus angiography guided strategy (control group). While in the control group the C-arm angle was at the operators’ discretion, in the intervention group the angle was determined based on a pre-PCI CT scan with 3D reconstruction using Materialise Mimics Innovation Suite software.

A pre- and post-PCI IVUS is performed in all patients and analyzed by a blinded core lab. The primary endpoint is absence of geographical mismatch on IVUS defined as full stent coverage of the ostium and maximal aortic protrusion equal or less than 3mm. Secondary, we also aim to investigate whether a pre-procedural 3DCT may reduce procedural radiation, contrast use, may predict IVUS parameters (minimal luminal area (MLA), calcification), stent sizing and may promote stent expansion. Finally, MACE rate is evaluated at 1 month.

Results: The full patient dataset (n=30) including primary and all secondary endpoints will be available for presentation at the ESC congress. Currently, 27 patients were randomized. An interim analysis shows the following findings.

There is significant patient heterogeneity considering the optimal angle for stent implantation, underscoring the potential benefit for individualized pre-procedural CT planning. In general, more extreme LAO angles were used in patients randomized to the intervention group (picture 1).

While the stent was implanted in optimal position in 13/13 (100%) patients randomized to the intervention group, geographical stent mismatch was present in 5/14 (36%) patients randomized to the control group (interim p-value 0.07) (picture 2).

The number of cine acquisitions performed before stent implantation (1±1.87 vs. 3.5±0.60; p=0.0007), the amount of contrast used (60±24.5 vs. 114±37.8 mL; p=0.0002), radiation dose (209 [186,315] vs. 497 [411,678] mGy; p=0.01) and procedure time (30 [20,38] vs. 50 [39,66] min; p=0.005) were significantly lower in patients randomized to the intervention group.

There was a highly significant correlation between the calcium arc determined by CT and IVUS (R² = 0.84). No MACE occurred at 1 month.

Conclusion: We showed that pre-procedural CT planning for PCI of aorto-ostial RCA lesions allowed for optimal stent positioning while reducing procedure time, contrast and radiation use.
Figure 1. C-arm angles during PCI.
RAO = Right Anterior Oblique; LAO = Left Anterior Oblique; CRAN = cranial, CAUD = caudal

Picture 1
Picture 2. Geographical ostium-stent mismatch - intervention group (red) and control group (blue). Grey zone is correct stent placement.