



TCT@ACC-i2: The Interventional Learning Pathway

ASSOCIATION OF WALL SHEAR STRESS WITH VASCULAR HEALING RESPONSE BY OCT 5 YEARS AFTER BIORESORBABLE SCAFFOLD IMPLANTATION.

Poster Contributions

Hall C

Saturday, March 29, 2014, 3:45 p.m.-4:30 p.m.

Session Title: IVUS and Physiology

Abstract Category: 35. TCT@ACC-i2: IVUS and Intravascular Physiology

Presentation Number: 2103-288

Authors: *Antonios Karanasos, Johan Schuurbiens, Muthukaruppan Gnanadesigan, Nienke van Ditzhuijzen, Jouke Dijkstra, Gijs Van Soest, Felix Zijlstra, Robert van Geuns, Jolanda Wentzel, Evelyn Regar, Erasmus Medical Center, Rotterdam, The Netherlands*

Background: The association between rheological factors and the in vivo long-term vascular healing response after bioresorbable vascular scaffold (BVS) implantation is currently unknown. We examined a possible association of wall shear stress (WSS) 2 years after BVS implantation with vascular healing response 5 years post implantation by optical coherence tomography (OCT).

Methods: Seven patients enrolled in the Thoraxcenter Rotterdam cohort of the ABSORB A study, underwent additional OCT imaging five years post BVS implantation. OCT analysis was performed in every frame within the scaffolded segment. OCT analysis included luminal measurements, and quantitative measurements of minimum fibrous cap thickness and maximal necrotic core arc within the scaffolded plaque. Fusion of 2-year computed tomography and intravascular ultrasound (IVUS) studies was performed in order to generate a 3D mesh used for computational fluid dynamics providing the 2 year WSS. The association of 2-year WSS with the 5-year vascular healing response of the BVS by OCT was then examined.

Results: Seven scaffolded segments in 7 patients were assessed. WSS values were not different for scaffold regions that contained necrotic core vs. non-necrotic core containing regions (1.33 ± 0.92 Pa vs. 1.57 ± 1.08 Pa; $p=0.20$). Subsequently, the average shear stress and cap thickness were calculated for the proximal and distal half of the scaffold. Within a scaffold, the relative difference in WSS proximally vs. distally was negatively correlated to the difference in minimum cap thickness ($r^2=0.74$, $p=0.03$), while there was only a trend for positive correlation with differences in maximum necrotic core arc ($r^2=0.39$; $p=0.13$). However, no significant association was found between relative WSS differences in proximal versus distal segments and corresponding differences in lumen area changes from 2 to 5 years.

Conclusions: The vascular healing response 5 years after BVS implantation by OCT is associated with the wall shear stress 2 years after implantation. Specifically, within a scaffold, regions with higher wall shear stress were associated with thinner fibrous cap.