

Blood Flow in the Proximal Supra-Aortic Branches after TEVAR in the Arch

by *Theodorus van Bakel*

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T.M. van Bakel^{1,3}, R.M. Romarowski², S. Morganti², J.A. van Herwaarden³, F.L. Moll³, H.W. de Beaufort^{1,3}, M.M. Marrocco-Trischitta¹, F. Secchi¹, M. Conti², F. Auricchio², S. Trimarchi¹.

¹Thoracic Aortic Research Center, Policlinico San Donato IRCCS, University of Milan, Italy

²Department of Civil Engineering and Architecture, University of Pavia, Italy

³Department of Vascular Surgery, University Medical Center Utrecht, The Netherlands

Aim: To quantify the effects of thoracic endovascular aortic repair (TEVAR) in Zone 2 on blood flow in the proximal supra-aortic branches.

Methods: A database of patients who underwent TEVAR at our institution was retrospectively reviewed. Patients treated in Zone 2 having available preoperative and 30-day postoperative computer tomography angiography (CTA) and phase-contrast magnetic resonance imaging (PC-MRI) data were selected. Patient-specific computational fluid dynamics (CFD) simulations of aortic blood flow were made. Flow distributions and maximum flow velocities were compared before and after intervention.

Results: 4 patients were selected. Before TEVAR, flow splits through the brachiocephalic trunk (BCT), left common carotid artery (LCCA) and left subclavian artery (LSA) were 12.8 (8.5 - 20.3) %, 4.6 (2.1 - 11.0) % and 5.2 (2.9 - 7.5) % respectively. After TEVAR, flow splits through the BCT and LCCA were 14.5 (11.6 - 18.2) % (+13%, P=0.70) and 13.1 (5.1 - 16.8) % (+52%, P=0.07). Maximum flow velocity in the LCCA before TEVAR was 44.9 (27.0 - 89.3) cm/s, after TEVAR 72.6 (40.8 - 135.0) cm/s (+62%, P=0.07).

Conclusion: TEVAR in Zone 2 leads to altered blood flow in the supra-aortic branches resulting in increased flow and high flow velocities in the LCCA.