



Immersive virtual reality surgical planning of minimally invasive coronary artery bypass for Kawasaki disease

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We present the rendering of a computed tomography (CT) scan in an immersive virtual reality (VR) environment for reviewing anatomy and preoperative planning of minimally invasive direct coronary artery bypass (MIDCAB). An 18-year-old man with a history of Kawasaki disease and associated left anterior descending (LAD) and right coronary artery (RCA) aneurysms, was referred to our multidisciplinary heart meeting to evaluate the necessity of coronary revascularization. The patient had no complaints, the electrocardiogram was normal and echocardiogram showed no resting regional wall motion abnormalities. Stress cardiac magnetic resonance

imaging established subendocardial hypoperfusion defects in the LAD region without signs of myocardial fibrosis. A coronary angiography revealed a proximally calcified aneurysm and an occlusion of the LAD with collateral retrograde filling from the RCA and no abnormalities in the left circumflex (Cx) artery (Panels A and B, [Supplementary material online, Videos S1 and S2](#)). Aneurysm formation of the left internal mammary artery (LIMA) was ruled out with angiography (Panel F). The patient was accepted for MIDCAB, LIMA to LAD coronary revascularization. To prepare for surgery, reconstructions of a CT scan were made by rendering 3D-VR images on our MedicalVR workstation (MedicalVR, Amsterdam, The Netherlands) (Panel C). An interactive reconstruction of the CT scan was made that enabled immersive-360° review of coronary anatomy in a head-mounted VR device (Panels D and E, [Supplementary material online, Video S3](#)). In addition, immersive VR was used to plan for the insertion location of thoracoscopic ports (for LIMA harvesting) and for determining the ideal location for anterior mini-thoracotomy (Panels G–J, [Supplementary material online, Videos S4–S6](#)) and direct off-pump MIDCAB using soft-tissue retractor. Cx, left circumflex artery; LAD, left anterior descending; LIMA, left internal mammary artery; RCA, right coronary artery.

[Supplementary material](#) is available at *European Heart Journal* online.

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