SUPPLEMENTARY METHODS

Image post-processing

VasoCT

First, the outer surface representing the vessel wall was obtained from a level-set segmentation (curvature/advection scaling = 0.75/0.25) that was initialized on a smoothed image (Perona-Malik diffusion; 50 iterations; conductance scaling = 50), using a colliding fronts-algorithm with manually defined seed points proximal and distal to the device. After mesh decimation (1/3 reduction) and re-meshing (target triangle area = 67 μm^2), the central axis of the surface model was identified and interpolated at the level of the aneurysm by manually placing endpoints at the aneurysm dome. Next, a deformable surface model was fitted to minimize the Euclidean distance to potential stent strut locations as defined by voxel intensities >20000. A tensor product B-spline surface was constructed and its parameters optimized to capture the distance to the vessel centerline by placing 100 control points along a parameterized and smoothed central axis and 45 control points in a circumferential direction as defined by the locally determined Frenet frame [1]. Smooth surfaces were obtained by penalizing high local derivatives during optimization.

OCT

Semi-automatic algorithms were developed for slice-by-slice detection of potential locations of wire, catheter, stent struts, and vessel wall. Line-based detection of device and wall features was achieved using intensity-based peak detection on smoothed values with thresholds on peak properties (e.g., Gaussian, width) and shadow cast by the metal wires. For each line, the first Gaussian-shaped peak with intensity >200 was probed as a stent strut candidate and accepted if it was at most 5 pixels wide. If no stent was detected, the vessel wall candidate was determined by a wide peak (>40 pixels) starting at its maximum slope (≥0.03) and ending when the signal dropped below a pre-defined noise level (25), and which was followed by a sustained shadow through the remainder of the line (integral value <200, at most 10 points above the noise level). Occasional areas in the field-of-view that exhibited artifacts from insufficient blood clearance were manually delineated and excluded from the line detectors.

Subsequently, separate tensor product B-spline surfaces (80 × 80 control points) were fitted to potential vessel points and stent strut points. The surface reconstruction adjustments were similar to the post-processing steps for VasoCT surfaces described above, including re-meshing (target triangle area = 0.01 mm^2) and central axis extraction.

REFERENCES

1 Yim PJ, Cebral JJ, Mullick R, *et al.* Vessel surface reconstruction with a tubular deformable model. *IEEE Trans Med Imaging* 2001;**20**:1411–21. doi:10.1109/42.974935