AbstractID: 3597 Title: Reproducibility of guidewire positioning and stent path for endovascular interventions

Purpose: Clinicians often have difficulty passing guidewires and stents during endovascular interventions. As a first step toward facilitating guidewire and stent guidance, we have investigated the reproducibility of paths that guidewires and stents take as they pass through the access vessels.

Method and Materials: An internal carotid vessel phantom having tortuousity similar to the carotid siphon was constructed from 3 mm tubing and encased in Sylgard elastomer. A guidewire was repeatedly passed through the phantom. Each time, images were acquired for several views (9" II mode, 225 micron pixel size). In addition, an undeployed stent (length 30 mm, diameter 1.3 mm) was repeatedly passed over the guidewire while images were acquired at 10 fps again using different views, without repositioning of the guidewire. Pairs of views (0° LAO, 82° LAO) were selected for biplane reconstruction. The centerlines of the guidewire were manually indicated and fit with a spline in each image. The correspondence between the indicated centerlines is established using the epipolar constraints, and 3D centerline of the guidewire and stent path were reconstructed. The reproducibility of the guidewire and stent positions were then determined after aligning the images (to remove jitter) and the 3D centerlines.

Results: The average repeated-indication difference for the guidewire was 0.4 ± 0.1mm (2D) and 0.5 ± 0.1mm (3D). The average repeated-positioning difference for the guidewire was 0.4 ± 0.2mm (2D) and 0.4 ± 0.1mm (3D). The average guidewire-versus-stent-path difference was 0.5 ± 0.2mm (2D) and 0.4 ± 0.04mm (3D).

Conclusion: Guidewire positions are very stable, and stent passage appears to affect guidewire position near the vessel wall, indicating that physical/mechanical models may be used to determine guidewire and stent-pathways.

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