Journal of NeuroInterventional Surgery

Journal of NeuroInterventional Surgery
jnis.bmj.com
J NeuroIntervent Surg 2015;**7**:A37-A38 doi:10.1136/neurintsurg-2015-011917.69

Oral poster abstracts

P-030 high fidelity simulations of endovascular cerebral aneurysm treatments

Y Kalani[1], **H Babiker**[2], **M Levitt**[1], **C McDougall**[1], **B Chong**[2], **D Frakes**[2], **F Albuquerque**[1]

Author Affiliations

[1]Barrow Neurological Institute, Phoenix, AZ, USA
[2]Endovantage, Scottsdale, AZ, USA

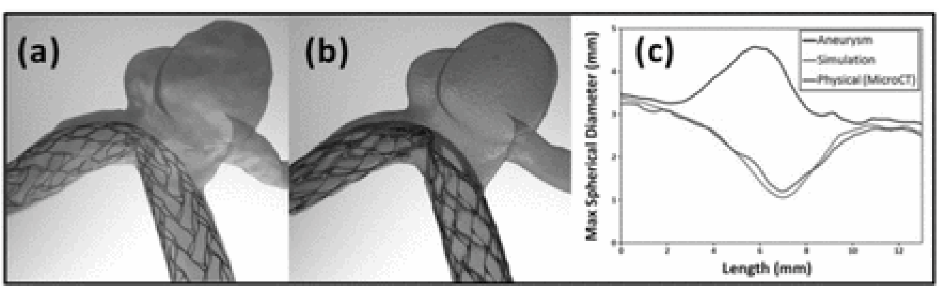
Abstract

Introduction We present a novel computational approach that considers the structure and deployment mechanics of endovascular devices to simulate patient-specific cerebral aneurysm treatments. The approach can be used to examine potential undesirable treatment consequences (e.g., poor device apposition and improper sizing) in a specific patient anatomy. Validation of the approach was performed using mechanical tests and both bench-top and clinical deployments in patient anatomies.

Methods Finite element (FE) computational models of the Enterprise stent and pipeline embolization device (PED) were first modeled using micro CT. Mechanical bench-top measurements of the physical devices were then used to inform and validate each computational model's material properties and structural behavior. The computational deployment technique (e.g., the device pusher and microcatheter unsheathing) was modeled according to the device's standard clinical deployment strategy. Simulated deployments and fluid dynamics were then validated against physical deployments and flow measurements in anatomical urethane models. Validation against clinical deployments will also be presented.

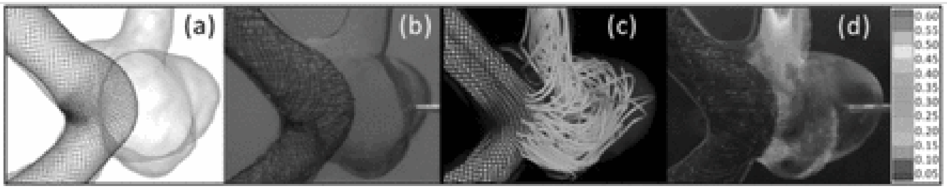
Results Results showed good agreement between simulated and physical deployments in the urethane models. Less than an 11% difference was observed between post-deployment computational and physical device diameter and cross-sectional area along the stent centerline. Deployment simulations were also found to correctly predict regions where the physical device stenosed, bulged, and poorly apposed to the vessel wall, as shown in Figures 1 and 2. Good agreement was also observed between simulated and measured fluid dynamics.

Conclusions The developed approach has great potential for enhancing clinical capabilities for endovascular treatment planning and can lead to improved treatment outcomes. Clinical validations of the approach are currently underway and initial results will be presented.



Abstract P-030 Figure 1

Simulated (a) and physical (b) deployment of the enterprise stent in an anatomical urethane model. The deployed physical stent and anatomical model were reconstructed using micro CT. The diameter of both the simulated and physical stents along the vessel centerline length are shown in (c)



Abstract P-030 Figure 2

Stimulated (a) and physical (b) deployments of the PED in an anatomical urethane model. Stimulated (c) and measured (d) fluid dynamics in the anatomical urethane model

Disclosures Y. Kalani: 1; C; National Institues of Health. H. Babiker: None. M. Levitt: None. C. McDougall: None. B. Chong: None. D. Frakes: None. F. Albuquerque: None.