thoracic aorta and can necessitate further intervention. This is the first volumetric analysis of type B aortic dissections comparing patients with and without false lumen thrombosis (FLT) after TEVAR. We hypothesized that greater increases in postoperative true lumen volume are associated with FLT.

**Methods:** Preoperative and postoperative computed tomography angiography (CTA) images were analyzed using three-dimensional reconstruction to measure the short- and long-axis diameter and cross-sectional area of the true lumen, false lumen, and total aorta. Measurements were taken at 5 cm intervals perpendicular to the centerline from the left subclavian artery to the aortic bifurcation. Pre- and postoperative volumetric data were calculated and compared in patients with and without postoperative FLT.

**Results:** Between 2006 and 2010, 132 patients underwent thoracic aortic stent grafting. Of these, 31 (23%) had thoracic endografting for acute complicated (n = 14, 45%) and chronic (n = 17, 54%) type B aortic dissection. Pre- and postoperative CTAs were available in 23 patients (17 men, 8 women, mean age 59.6 years) and mean follow-up imaging was 11 months (range 1-39 months). Thirteen patients (56%) had postoperative FLT and 10 (43%) had persistent false lumen filling. Nineteen (82%) had extensive dissections involving the left subclavian artery (n = 12), visceral arteries (n = 14), renal arteries (n = 16), and iliac arteries (n = 15). The left subclavian artery was covered in 15 (65%) patients. There were no significant differences in age, acute vs chronic dissection, branch vessel involvement, coverage of the left subclavian artery, or distal extent of the endograft between patients with and without postoperative FLT. Patients with FLT had significantly smaller preoperative true lumen volume (141.3 ± 68 vs 230.5 ± 92 cm³, P < 0.01) but no difference in false lumen volume (224.6 ± 139 vs 206.2 ± 239 cm³, P = .33). The maximum preoperative true lumen diameter was significantly larger in patients that had continued filling of the false lumen after endografting (6.30 ± 1.4 vs 5.05 ± 1.0 cm, P < .02), and this difference persisted during the postoperative period (6.23 ± 1.2 vs 4.82 ± 1.2 cm, P < .01). After stent graft repair, patients with FLT had significantly smaller false lumen volume (158.4 ± 114 vs 341.6 ± 244 cm³, P < .02). A mean postoperative increase of 45.8% in true lumen volume, compared to 10.9%, was seen in patients with FLT (P = .02).

**Conclusions:** This volumetric study of 31 type B aortic dissections treated with TEVAR identifies three fundamental findings: (1) nonaneurysmal aortas with smaller preoperative true lumen volume have a significant increase in true lumen volume with associated FLT; (2) smaller preoperative aortic volume trended toward greater decreases in postoperative aortic diameter; and (3) aortas with larger preoperative aneurysmal dilatation have a higher risk of persistent false lumen filling following TEVAR. These findings suggest earlier treatment of type B dissections at a smaller size may lead to increased postoperative FLT and minimize the need for further operative intervention.

A Longitudinal Study of the Positional Stability of TEVAR Using Computational Fluid Dynamics

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**Background:** Positional instability of thoracic endografts can result in adverse events such as endoleaks, device migration, and modular disjunction of thoracic aorta. Currently, there are no validated techniques to predict endograft stability on a patient-specific basis. We have performed a longitudinal analysis of the displacement forces (DF) acting on a thoracic endograft in a patient with a history of multiple secondary procedures following TEVAR. We have compared the orientation of the DF following each procedure with the observed clinical outcome.

**Methods:** We have constructed 3D computer models of a thoracic endograft using longitudinal follow-up CT data. Computational fluid dynamics (CFD) techniques were then used to quantitate the DF in Newtons (N) acting on the entire endograft as well as on the different modules of the device. The DF data correspond to the following four time points: the pre-TEVAR of a 57 × 80 TAA using a type Ib endograft; a 2.5-year follow-up showing a type Ib endograft and its corresponding secondary procedure to add an extender cuff; and finally a 6.5-year follow-up showing a type III endoleak due to disjunction between the proximal and distal modules.

**Results:** The orientation and magnitude of the DF varied depending on the anastomosis, tortuosity, and hemodynamic state of the patient. The total postoperative DF acting on the device was 25 N, with a component of 5.9 N in the cranial direction (Fig 1, a). This component of the DF correlates with the observed endograft cranial motion of 16 mm that resulted in luminal expansion 2.5 years later. At this point, the total DF was 30.5 N, a change due to an increase in device tortuosity and blood pressure. Furthermore, the DF on the proximal and distal modules of the endograft were 16.5 and 25.2 N, respectively (Fig 1, b). The type Ib extender was then replaced with an extender cuff. Figure 1, c shows how the addition of the distal extender cuff changed the cranial component of the DF acting on the proximal and distal modules of the device. At this point, the proximal module had a DF of 12.5 N whereas the distal module had a DF of 10.3 N with a significant (3.8 N) component in the cranial direction (Fig 1, c). This change induced a concentration of stresses at the junction between the proximal and distal modules of the device leading to a significant lateral movement of the distal module. This resulted in a type III endoleak at that location 6.5 years after TEVAR.

**Conclusions:** We have quantitated the magnitude and direction of the DF acting on the modules of a thoracic endograft. The orientation of the DF correlated with the observed changes in the configuration of the endograft components over time. Computational analysis of patient-specific postoperative TEVAR data can provide useful information to assess the positional stability of thoracic endografts.

<table>
<thead>
<tr>
<th>Volume measurements</th>
<th>Postoperative</th>
<th>Postoperative</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL filling</td>
<td>230.4 ± 92.6</td>
<td>141.3 ± 68.1</td>
<td>.01</td>
</tr>
<tr>
<td>FLT volume (cm³)</td>
<td>302.6 ± 239.9</td>
<td>224.6 ± 129.8</td>
<td>.34</td>
</tr>
<tr>
<td>False lumen volume (cm³)</td>
<td>225.8 ± 58.6</td>
<td>206.1 ± 66.4</td>
<td>.09</td>
</tr>
<tr>
<td>True lumen volume (cm³)</td>
<td>341.5 ± 244.5</td>
<td>155.4 ± 114.9</td>
<td>.02</td>
</tr>
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</table>

Aortic to Meandering Mesenteric Artery Bypass in Chronic Mesenteric Ischemia: A Case Report

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**Background:** Despite the relatively high prevalence of atherosclerotic disease affecting the mesenteric vessels, symptomatic chronic mesenteric ischemia (CMI) is uncommon. We present a case of a woman with CMI who was not a candidate for endovascular repair or traditional surgical bypass. Instead, a supraceliac aortic to meandering mesenteric artery bypass was performed.

**Methods:** The patient is a 61-year-old female who presented with claudication, postprandial intestinal angina, and an unintentional 25 pound weight loss. Recent esophagogastroduodenoscopy revealed multiple gastric ulcers. On examination, she appeared cachectic and had only audible Doppler signals at her femoral arteries and pedal vessels bilaterally. Ankle-brachial index was 0.3 bilaterally. Computed tomography angiography (CTA) of the abdominal aorta demonstrated complete occlusion of the celiac, superior, and inferior mesenteric arteries. A diagnostic aortogram demonstrated similar findings but late filling of a prominent meandering mesenteric artery (Fig 1). The patient’s anatomy is not adequate for endovascular revascularization, therefore, a surgical bypass was performed. The preoperative plan was to complete a supraceliac aorta to SMA bypass assuming that, although not visualized on CTA or angiogram, a distal target will be found by exploring her SMA or her celiac arteries. Intraoperatively, the SMA and hepatic artery were dissected free and were too small to serve as target vessels for bypass. Only the meandering mesenteric artery was suitable for an anastomosis. The proximal anastomosis was performed in the supraceliac aorta. The graft was tunneled ante-pancreatic and retro-colic using a 12 × 6 mm bifurcated polytetrafluoroethylene (PTFE) graft. The contralateral limb was removed and oversewn.

**Results:** At 5 months postoperatively, she reported complete resolution of her postprandial abdominal pain and a 10-pound weight gain. MRA was performed and showed patency of the graft (Fig 2). Subsequently, an axillo-bifemoral bypass was done for progression of her LE symptoms from severe claudication to rest pain.