TEVAR for complicated thoracoabdominal aortic dissections with multilayer stents

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Background: To report a single-center series of patients with type B aortic dissection (TBAD) treated endovascular (TEVAR) with the Multilayer Flow-Modulator (MFM), with up to 3 years clinical, imaging and Computational Fluid Dynamics (CFD) data.

Primary endpoints were freedom from rupture, freedom from dissection-related death, overall mortality and freedom from reintervention.

Secondary outcomes included technical success, adverse events and aortic remodeling.

Patients

23 patients with complicated thoracoabdominal aortic dissection were treated with new generation MFM stents since April 2014 with a maximum follow-up of 36 months.

All patients (mean age = 51.1 ± 12.8 years, 78.3 % males) had either type B aortic dissection (N=14) or residual thoracoabdominal dissection after surgery for type A (N=9)

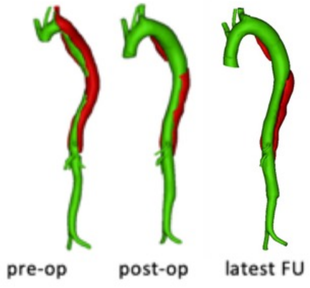
All patients presented with multiple comorbidities and were all considered high surgical risk

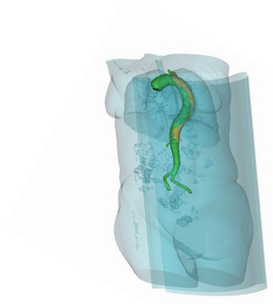
Methods

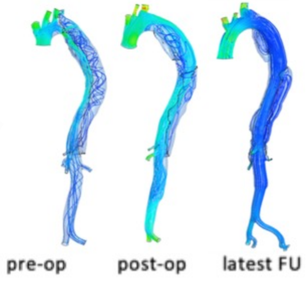
This study is a prospective single center analysis of patients with TBAD. Clinical and imaging data were collected preoperatively, direct postoperatively and annually to 36 months for analysis using CFD.

Each CT scan was used for morphological CFD analysis performed with MIMICS (Materialise, Belgium) while flow and shear stress CFD were performed with ANSYS (Ansys Inc., Southpointe USA).

Aortic remodeling was measured for each patient and at each follow up, by calculating False Lumen Index (FLI), true and false lumen volumes.







Results

With a maximum follow-up of 36 months, initial technical success was 100%, freedom from ruptures or aortic-related deaths was 100%,

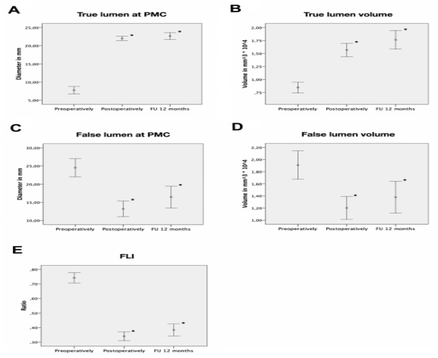
A total of 144 arterial branches completely covered by the multilayer stents during endovascular treatment remained patent.

Morphologic analysis of the aorta dissection showed progressive true lumen volume increase (75.9%, p<0.001) with concomitant false lumen volume decrease (42.8%, p< 0.001).

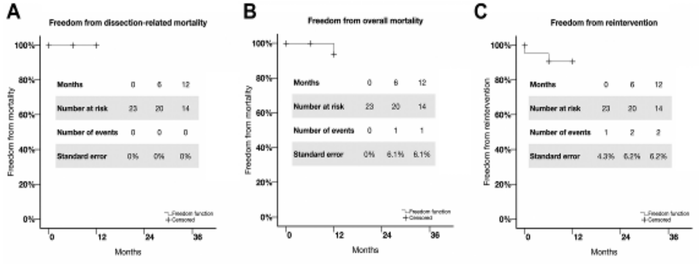
The CFD flow analysis showed increased laminar flow.

Positive aortic remodeling was demonstrated by an increase in true lumen volume and a decrease in false lumen and false lumen index (FLI).

. Median values and error bars of the true lumen (TL) and false lumen (FL) measurements in 3-dimensional reconstructions. (A) A statistically significant increase of the TL diameter was observed at the plane of maximum compression (PMC). (B) A statistically significant increase of the TL volume was observed on the first postoperative and 12-month follow-up (FU) scans. Concomitantly, a statistically significant decrease was observed for the FL diameter at (C) the PMC. (D) The FL volume and (E) the false lumen index (FLI) at the first postoperative and latest follow-up scans. The asterisk indicates p<0.001 compared to the preoperative values.



Kaplan-Meier estimates of freedom from (A) dissection-related mortality, (B) overall mortality, and (C) reintervention



Conclusions

- In the current study, the MFM stents for complicated thoracoabdominal dissections provide a safe and feasible treatment option with high technical success, low mortality and active aortic remodeling.
- Further studies should elucidate the long –term safety of this promising technology and the effectiveness in a larger patient populations.

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