

Introduction.

Mortality post- type-B aortic dissection is influenced by the patency of the false lumen (FL). The principal aim of endovascular treatment of type-B dissections with a thoracic stent graft is to stop inflow from the true lumen (TL) to the FL, inducing thrombosis of the FL and remodeling of the aorta. Hemodynamically, patency of the FL does not only depend on inflow, but on the net balance between in- and outflow. Here, we investigated to what extent the number of major and minor branches emanating from the FL contributes to its hemodynamic state.

Methods. Contrast computed tomography angiograms (CTA) of patients with type B aortic dissections from two centers (n=52, n=40) were analyzed retrospectively. CTA's of all patients were analyzed at the time of diagnosis (baseline, n = 92). Scans of patients treated conservatively, were also analyzed at 3 months (n = 44), 12 months (n = 18), 2 years (n = 16) and 4 years (n = 5) of follow-up. Scans from patients treated with TEVAR were analyzed at the last CT scan before intervention (n = 41) and at similar follow-up time points. 3D reconstructions (Mimics, Materialise, Belgium) were made, and the number and size of intimal tears, as well as the number of major side branches (celiac, superior and inferior mesenteric, left and right renal arteries) in TL and FL, the number of minor side branches (intercostal, lumbar, gonadal arteries) in TL and FL and the length of fully patent, fully thrombosed and partially thrombosed segments of the FL were quantified from the axial views (see Figure 1). Based on the in- and outflow of the FL, several metrics were calculated.

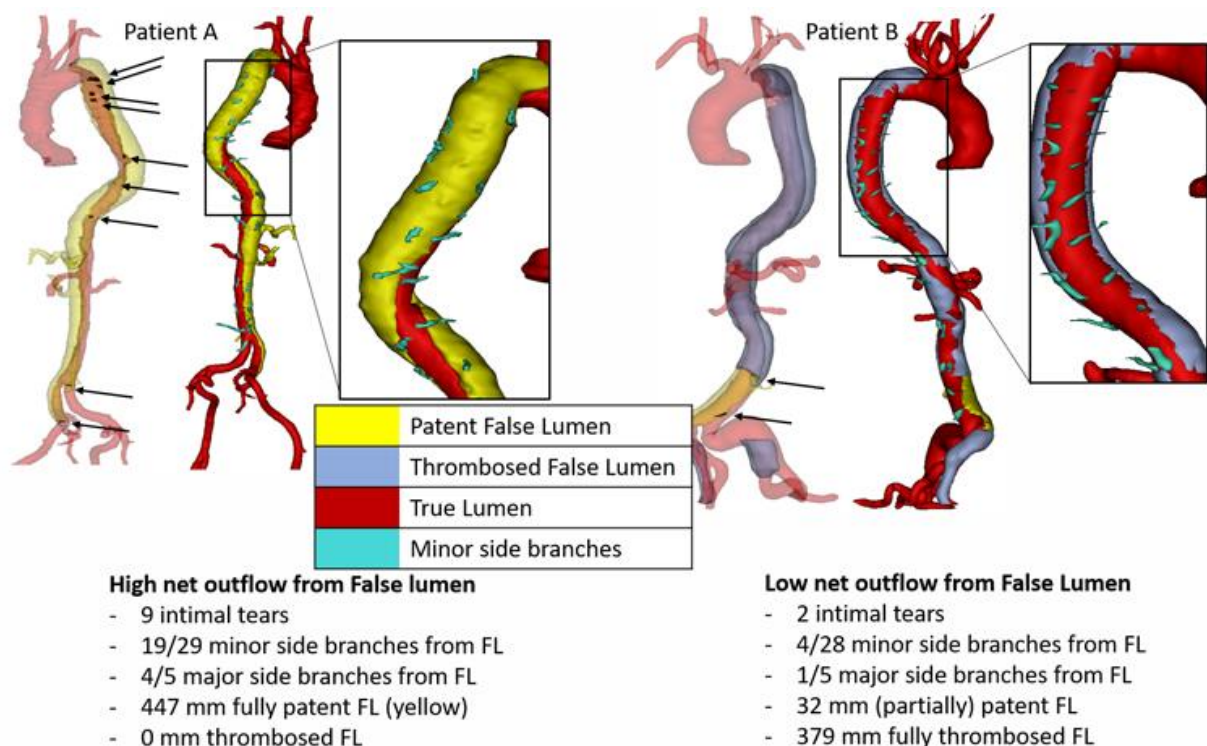


Figure 1: High net outflow vs low net outflow from FL in 2 patients. Arrows: intimal tears.

Results. At baseline, and all subsequent time intervals, the total length of the partially and fully patent segments of the FL was correlated to the number of major side branches emanating from the FL ($r^2=0.63$ for baseline, Figure 2). This correlation further increased when the number of minor side branches ($r^2=0.84$), and size and number of intimal tears ($r^2=0.85$) were considered. After TEVAR treatment, the axial length of partially and fully patent FL dropped significantly (Figure 2). Correlation between the

patency of the false lumen and in- and outflow initially increased ($r^2= 0.92$ right after TEVAR placement) but gradually declined afterwards (e.g. $r^2= 0.76$ at 3 months and $r^2= 0.30$ at 1 year after treatment).

Conclusion. Our data suggest that both major and minor side branches emanating from the FL play a pivotal role in the patency of type-B aortic dissection. We hypothesize that outflow from these branches can maintain flow and prevent thrombosis in the FL, especially if there is no re-entry from FL to TL. When discussing treatment modalities, the number of major and minor side branches emanating from the FL may be an important criterion and should be studied further.

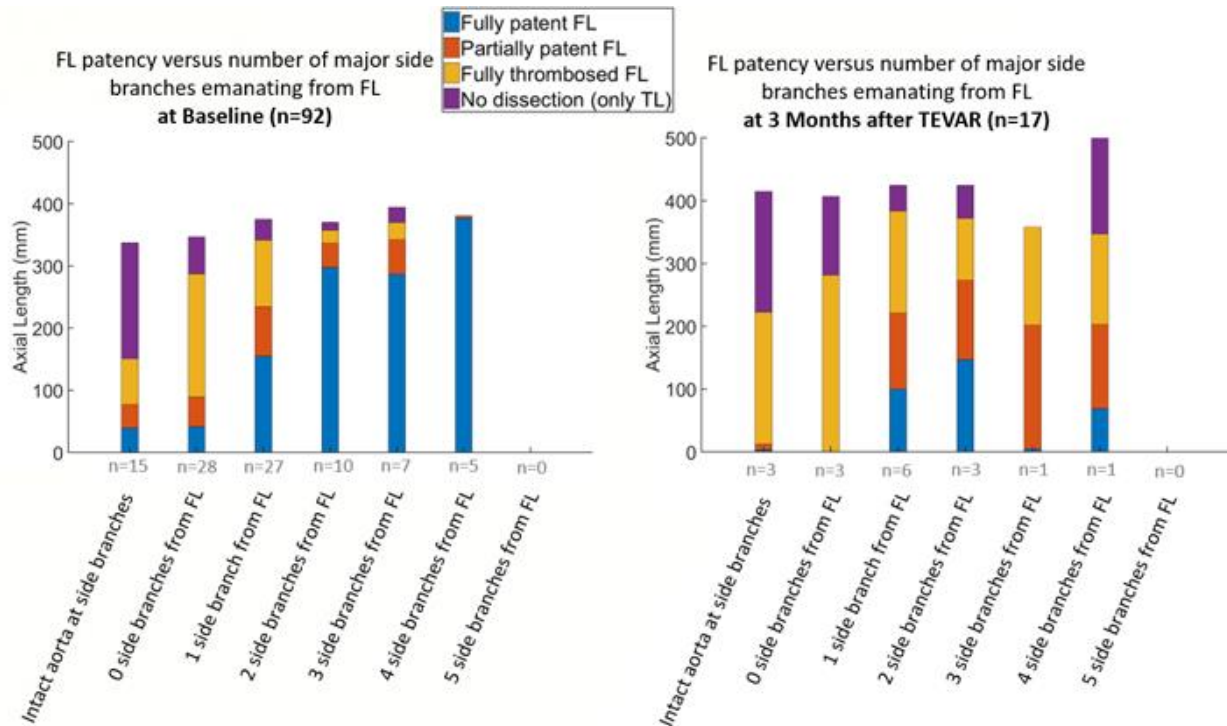


Figure 2: Mean axial lengths according to the amount of major side branches emanating from FL.

References

1. Tsai, T. T. *et al.* Partial Thrombosis of the False Lumen in Patients with Acute Type B Aortic Dissection. *N. Engl. J. Med.* **357**, 349–359 (2007).
2. Nienaber, C. A. *et al.* Endovascular repair of type B aortic dissection: long-term results of the randomized investigation of stent grafts in aortic dissection trial. *Circ Cardiovasc Interv.* **6** (4) 407–416 (2013).