Editorial on the article entitled "the impact of intimal tear location and partial false lumen thrombosis in acute type b aortic dissection"

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The experimental study analyzing the most likely clinical scenarios in acute type B aortic dissection (ATBAD) with regards to the false lumen (FL) thrombus status by Girish et al. (1) provides valuable information and new insights regarding the prognostic implications and mechanisms of partial FL thrombus formation. While medical therapy remains the treatment of choice for non-complicated ATBAD with early survival rates reaching 90%, surgery and increasingly, thoracic endovascular aortic repair (TEVAR) options remain reserved for urgent life threatening complications such as aortic rupture, enlarging aneurysms, and or evolving organ malperfusion (2,3). Despite the favorable outcomes with medical treatment however, the intermediate to late survival remains concerning with 3 years post discharge mortality rate approximating 25% during the chronic phase (4). Studies to identify risk factors for poorer outcome in ATBAD showed completely patent FLs to be associated with higher rupture and mortality rates than completely thrombosed FLs (5-7). A more recent IRAD study suggested a third entity, partially thrombosed FL to be a significant predictor of increased mortality after ATBAD with all-cause mortality being greater by a factor of 2.7 compared to complete thrombosis (8). Partial FL thrombus formation with a proximal entry and distal tear occlusion was postulated to create a situation analogous to intra-aneurysmal pressure elevation occurring with incomplete endovascular stent graft exclusion. It was shown experimentally that in the presence of an endoleak, a linear correlation occurred between increasing endoleak size and sac pressure (9).

Thus far, partially thrombosed FL formation was viewed as being the result of flow entering the FL without recourse for pressure relief leading to pressure build up and progressive enlargement. However, despite the suggested

negative implications for adverse remodeling, individual reports did not consistently show accelerated growth with FL partial thrombosis. This may be due to the limited scientific evidence regarding the hemodynamic impact of the various manifestations of partially thrombosed FLs and the differences in presentation and circumstances relating to its formation (8,10-15). Suevoshi et al. reported partially thrombosed FL to not be a significant risk factor for aneurysm progression. However, given the significantly faster growth rate in the sac (n=3) versus non-sac type FL (n=17) and the significantly fewer sac type FL patients in their study cohort, the conclusions drawn from this study cannot be applied to the broader type B aortic dissection population. Using extracted porcine aortic segments (n=25), Girish et al. (1) experimentally recreated 5 subtypes of ATBAD models depending on the number and location of intimal tears and thrombosis status of the FL (simulated patent versus partial thrombosis). The simulated models of partially thrombosed FL showed divergent hemodynamic profiles depending on the intimal opening location and FL flow direction. The model of partial FL thrombosis with a proximal entry and occluded distal reentry best mimicked a blind sac resulting in significantly higher FL systolic, diastolic, and mean pressure levels compared with the true lumen (TL). Furthermore, the FL pressures increased in parallel with increasing systemic pressures. In the model with FL proximal occlusion and distal entry as would occur in post TEVAR, the FL flow direction was retrograde and all systolic, diastolic, and mean pressure levels in the FL were significantly lower than in the TL; even with stepwise systemic pressure elevation. Based on these findings, the data supported the expectation that proximal entry tear occlusion with TEVAR would lead to

FL decompression and subsequent favorable remodeling after ATBAD. Indeed, in a previous study (16) which corroborated the hemodynamic implications of this study along with an earlier report by Kaji *et al.* (17), we showed that acute spontaneous retrograde type A dissection was associated with a more favorable prognosis than aortic dissection with antegrade flow. In this context, the insights provided by Girish *et al.* (1) and the experimental design that was used may serve as a solid foundation for continuing related research that will ultimately help in expanding our understanding and efforts to treat this difficult disease.

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Footnote

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References

- Girish A, Padala M, Kalra K, et al. The Impact of Intimal Tear Location and Partial False Lumen Thrombosis in Acute Type B Aortic Dissection. Ann Thorac Surg 2016. [Epub ahead of print].
- Elefteriades JA, Hartleroad J, Gusberg RJ, et al. Longterm experience with descending aortic dissection: the complication-specific approach. Ann Thorac Surg 1992;53:11-20; discussion 20-1.
- Scott AJ, Bicknell CD. Contemporary Management of Acute Type B Dissection. Eur J Vasc Endovasc Surg 2016;51:452-9.
- 4. Tsai TT, Fattori R, Trimarchi S, et al. Long-term survival in patients presenting with type B acute aortic dissection: insights from the International Registry of Acute Aortic Dissection. Circulation 2006;114:2226-31.
- 5. Bernard Y, Zimmermann H, Chocron S, et al. False lumen

patency as a predictor of late outcome in aortic dissection. Am J Cardiol 2001;87:1378-82.

- Erbel R, Oelert H, Meyer J, et al. Effect of medical and surgical therapy on aortic dissection evaluated by transesophageal echocardiography. Implications for prognosis and therapy. The European Cooperative Study Group on Echocardiography. Circulation 1993;87:1604–15.
- Prêtre R, Von Segesser LK. Aortic dissection. Lancet 1997;349:1461-4.
- 8. Tsai TT, Evangelista A, Nienaber CA, et al. Partial thrombosis of the false lumen in patients with acute type B aortic dissection. N Engl J Med 2007;357:349-59.
- Parodi JC, Berguer R, Ferreira LM, et al. Intra-aneurysmal pressure after incomplete endovascular exclusion. J Vasc Surg 2001;34:909-14.
- De León Ayala IA, Yang YH, Chien TM, et al. Partially patent false lumen does not exhibit the highest growth rate. Int J Cardiol 2014;175:385-8.
- Sueyoshi E, Sakamoto I, Uetani M. Growth rate of affected aorta in patients with type B partially closed aortic dissection. Ann Thorac Surg 2009;88:1251-7.
- 12. Fattori R, Bacchi-Reggiani L, Bertaccini P, et al. Evolution of aortic dissection after surgical repair. Am J Cardiol 2000;86:868-72.
- Tsai MT, Wu HY, Roan JN, et al. Effect of false lumen partial thrombosis on repaired acute type A aortic dissection. J Thorac Cardiovasc Surg 2014;148:2140-2146.e3.
- Song SW, Chang BC, Cho BK, et al. Effects of partial thrombosis on distal aorta after repair of acute DeBakey type I aortic dissection. J Thorac Cardiovasc Surg 2010;139:841-7.e1; discussion 847.
- Kim JB, Lee CH, Lee TY, et al. Descending aortic aneurysmal changes following surgery for acute DeBakey type I aortic dissection. Eur J Cardiothorac Surg 2012;42:851-6; discussion 856-7.
- 16. Kim JB, Choo SJ, Kim WK, et al. Outcomes of acute retrograde type A aortic dissection with an entry tear in descending aorta. Circulation 2014;130:S39-44.
- Kaji S, Akasaka T, Katayama M, et al. Prognosis of retrograde dissection from the descending to the ascending aorta. Circulation 2003;108 Suppl 1:II300-6.

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