

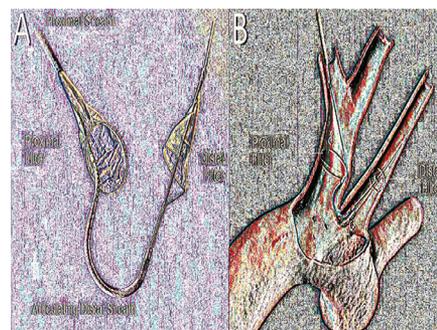
Cerebral Embolic Protection in Ascending Aortic Stenting—An Emerging Neuroprotective Paradigm



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Despite the ongoing advances in thoracic aortic interventions, cerebral embolization and stroke remain common and important determinants of clinical outcomes, especially in the elderly.^{1,2} The significant role of embolization in clinical stroke prompted the emergence of cerebral embolic protection during transcatheter aortic valve replacement and descending thoracic aortic stenting.^{2,3} The report by Dr George and colleagues in this issue of the journal sheds light on the application of this technology in ascending aortic stenting, a major frontier for thoracic endovascular repair.⁴

In this report, an 85-year-old lady underwent successful stenting of her ascending aortic pseudoaneurysm.⁴ The heart team selected the Sentinel device (Claret Medical, Santa Rosa, CA) for cerebral embolic protection, given the high stroke risk in this case (see Central Picture).^{3,4} This device has 2 filters, with the proximal filter covering the origin of the innominate artery and the distal filter covering the origin of the left common carotid artery after final deployment, as described in this report.^{3,4} Although there was no embolic debris noted in the Sentinel device from this case, this device has frequently trapped macroemboli.^{2,3} An important practical point with the Sentinel device is its deployment via the right radial artery.^{3,4} Consequently, significant arterial disease in the right upper extremity arterial territory would likely contraindicate the application of this device. Furthermore, the heart team must designate a dedicated arterial site for invasive blood pressure monitoring, given the requirements for deliberate hypotension in this complex procedure, for example the periods of rapid pacing for stent deployment.^{4,5}



The sentinel cerebral embolic protection device.

Central Message

Stroke remains a common and important outcome determinant in thoracic aortic stenting, particularly in the elderly. Therapeutic solutions may include thoughtful application of cerebral embolic protection.

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There has been a focus on embolic protection in transcatheter aortic valve replacement, given the ongoing stroke risk during the rapid maturation of this technology.³ The successful clinical application of the Sentinel system in this setting has prompted its adoption in thoracic aortic stenting for mitigation of stroke risk, particularly in the descending thoracic aorta.^{1,2} Dr George and colleagues have highlighted the selective application of this technology in high-risk stenting procedures proximal to the aortic arch.⁴ Despite the attractive properties of the Sentinel system for embolic capture, it also has a risk of cerebral embolization with advanced atheromatous disease in the innominate or left common carotid arteries.^{3,4} Furthermore, it also does not protect the left subclavian arterial territory from atheromatous embolization, and so does not offer embolic protection for the posterior circulation of the left brainstem and cerebral hemisphere.^{3,4} It is likely that further advances in the family of cerebral embolic protection devices will overcome these limitations with refinements in methods for embolic capture and/or embolic deflection.²⁻⁴

In conclusion, Dr George and colleagues are to be congratulated for extending the concept of cerebral embolic protection to aortic stenting of the proximal thoracic aorta in their hypothesis-generating report. Embolic protection will likely be another paradigm shift in thoracic endovascular aortic repair, as part of a multimodal neuroprotective strategy. The opportunities to protect the brain may be further optimized with careful perioperative assessment of aortic atheroma burden and embolic protection in higher-risk patients. Future trials will likely focus on these possibilities, emphasizing the importance of aortic atheroma severity that was articulated just over a decade ago.⁶ Clinical success in this setting will require not only further refinements in the embolic protection devices but ongoing inquiry to translate these advances into maximal freedom from stroke for all our patients.

REFERENCES

1. Yaffee DW, Williams MR: Cardiovascular surgery in the elderly. *Semin Thorac Cardiovasc Surg* 28:741–747, 2016
2. Crover C, Perera AH, Hamady M, et al: Cerebral embolic protection in thoracic endovascular repair. *J Vasc Surg* 2018. [Epub ahead of print]
3. Patel PA, Patel S, Feinman JW, et al: Stroke after transcatheter aortic valve replacement: Incidence, definitions, etiologies and management options. *J Cardiothorac Vasc Anesth* 32:968–981, 2018
4. Kossar AP, Takayama H, Patel V, et al: Novel implementation of a cerebral protection system during ascending thoracic endovascular aortic repair (TEVAR). *Semin Thorac Cardiovasc Surg*. <https://doi.org/10.1053/j.semtcvs.2018.09.026>
5. Tagarakis GL, Whitlock RP, Gutsche JT, et al: New frontiers during aortic therapy: Focus on deliberate hypotension during thoracic aortic endovascular interventions. *J Cardiothorac Vasc Anesth* 28:843–847, 2014
6. Gutsche JT, Cheung AT, McGarvey ML, et al: Risk factors for perioperative stroke after thoracic endovascular aortic repair. *Ann Thorac Surg* 84:1195–1200, 2007