Commentary on “A Feasibility Study of a New Unibody Branched Stent Graft Applied to Reconstruct the Canine Aortic Arch”

Adeline Schwein, Yannick Georg, Nabil Chakfé
Department of Vascular Surgery and Kidney Transplant, University Hospital of Strasbourg, Strasbourg, France

In their paper, Li et al. have presented a new device for treating thoracic aortic pathologies involving the arch, which has demonstrated promising results on a canine model in terms of feasibility and ease of deployment. Aortic arch device development is currently a major research topic for innovative designs to meet the challenges of treatment in this area: mainly the risk of stroke and patient specific complex 3D anatomy. The ideal device should feature conformability, simplicity of deployment, durability, low profile delivery system, and short- and long-term safety. The last point is extremely important because of the major displacements and stresses applied to the arch and supra-aortic trunks (SAT) during the cardiac cycle. The branched thoracic stent graft design can be categorised into two configurations: modular (assembled in vivo) and unibody (implanted as a whole) devices. Usually, modular devices consist of a main body with inner or small outer branches acting as landing zones for bridging stents connected to the SAT. Only this configuration has been evaluated in clinical practice. Spear et al. published mid-term results of a double branched thoracic device in 27 patients, showing 100% technical success rate, 30 day and 1 year mortality rates of 0% and 3.7%, respectively, 30 day and 1 year secondary intervention of 14.8% and 22.2%, respectively, and 30 day stroke rate of 11.1%. Although modular devices offer increased maneuverability for navigation and positioning, highly stressed bridging stents are theoretically at more risk for disconnection over time. Thus, Li et al. developed unibody branched stent grafts as initially proposed by Dr. Inoue. The branches are sewn to the aortic body, which should theoretically offer greater durability and safety over time. They developed an ingenious delivery system to make deployment easier. However, delivering the stent graft requires multiple manoeuvres with the potential to cause lesions of the arterial luminal surface and to dislodge atheromatous debris in pathological human aortas.

Li et al. used 20—25 mm diameter stents for the main body and 10—15 mm diameter stents for the branches. The device was delivered through a 20F sheath. Using larger devices according to human anatomies (mostly 40—45 mm diameter stents in clinical practice) will require much larger delivery systems. Moreover, having one to possibly three branches already sewn to the principal stentgraft also raises problems regarding delivery. Such a unibody device will have to be additionally compressed to fit inside the delivery system, especially when pursuing the current global trend to reduce size. Bussmann et al. published results on textile ageing characteristics of explanted thoracic and abdominal stentgrafts. They demonstrated that more than 40% of the specimens presented compression damage because of kinking of the fabric and indentation of stitches and stent segments on the fabric surface. Such damage can lead to further lesions resulting from tears and holes in the fabric. Translation of the concept proposed by Li et al. to clinics with stent grafts fitting human arch diameter and morphology is necessary for further validation.

REFERENCES

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* Corresponding author. University Hospital of Strasbourg, Department of Vascular Surgery and Kidney Transplant, 1 Place de l’Hôpital, 67091 Strasbourg, France.
E-mail address: nabila.chakfe@chru-strasbourg.fr (Nabil Chakfé).
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