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Hybrid Approach for Complex Thoracic Aortic Pathology

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Introduction

Open surgical reconstruction of aortic arch pathologies, a complex surgery for arch aneurysms or dissections, remains to be associated with significant morbidity and mortality,^{1,2)} as it often requires large incisions and cardiopulmonary bypass with risks of hemorrhage, stroke, renal impairment and paraplegia.

Since Dake et al.³⁾ reported the first thoracic endovascular aortic repair (TEVAR) in 1994, endovascular aortic repair technologies have rapidly evolved and are now more often recommended than open reconstructions as a treatment for descending thoracic aortic pathologies.

More complex endovascular techniques are required, however, when the arch vessels are involved in lesions, leaving an inadequate proximal or distal landing zone. In such cases, adjunctive open surgical bypasses can be utilized to provide adequate landing zones and increase the feasibility of endovascular repairs of thoracic aortic disorders.

Hence, the 'hybrid' technique, which combines endovascular exclusion of aortic arch pathologies with an open surgical component, has recently been introduced in an attempt to treat complex cases with reduced morbidity and mortality.⁴⁾

The hybrid approach usually involves surgical "debranching" with various bypasses, such as carotid-subclavian, carotid-carotid and ascending aorta-innominate/carotid bypass,

followed by a either concomitant or second-stage TEVAR.

In contrast to the conventional open arch repair, this hybrid procedure has potential advantages of avoiding or minimizing hypothermic circulatory arrest and cardiopulmonary bypass and reducing the perioperative morbidity and mortality.

In addition, it is an alternative option for the patients with an aortic arch disease who were previously regarded a high risk group for conventional open repairs.

Endoleaks, however, remain as the primary limitation of endovascular stent-grafting of the aortic aneurysm or dissection. Earlier reports on stent graft repairs of thoracic aortic aneurysms have shown that endoleaks occurred in 5% to 20% of patients, which is comparable to rate of the incidences observed after endovascular repair of abdominal aortic aneurysm (EVAR).⁵⁻⁸⁾ Hence, patients undergoing endovascular repair require careful and prolonged monitoring and-for some patients-there are needs for re-intervention. Generally, management has consisted of endovascular repair of type I or type III endoleaks, with observation of type II endoleaks.

As this hybrid approach has just begun, there is neither much information available on perioperative and long-term outcomes nor a single center that has gained significant operative experiences in such a practice.

In this issue of the Korean Circulation Journal, Kang et al.⁹⁾ reported their experiences of employing the hybrid approach in patients with aortic arch pathologies. Although they concluded that combining open reconstruction and endovascular repair for aortic arch pathologies was safe and effective with few complications, the study is limited by its retrospective design, a small sample size (n=7), the diversity of thoracic aortic pathologies and a short follow-up duration.

The hybrid approach to aortic arch disorders continues to evolve as stent-graft technology advances. Up to date, they have appeared to be favorable when adopted in selective high-risk patients with a variety of thoracic aortic diseases. Total endovascular approaches using custom-made fenestrated or branched grafts are now at an early development stage and have been performed in certain specialized centers.^{10,11)} With fur-

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ther innovation, total endovascular repair of complex aortic arch disorders may soon be feasible and TEVAR may become a preferable therapeutic option for most of the thoracic aortic pathologies.

As branched stent-grafts become more widely available for the aortic arch in the future, this hybrid arch procedure will likely to have further limitations in its role. Until then, however, the hybrid procedure may as well play an important role in treating patients with aortic arch diseases in a less invasive and potentially safer way. Further technological development and extensive clinical trials for long-term data are clearly needed before widespread practice of this approach in lower risk patients.

REFERENCES

- 1) Cambria RP, Clouse WD, Davison JK, Dunn PF, Corey M, Dorer D. *Thoracoabdominal aneurysm repair: results with 337 operations performed over a 15-year interval. Ann Surg* 2002;236:471-9.
- 2) Sundt TM 3rd, Orszulak TA, Cook DJ, Schaff HV. *Improving results of open arch replacement. Ann Thorac Surg* 2008;86:787-96.
- 3) Dake MD, Miller DC, Semba CP, Mitchell RS, Walker PJ, Liddell RP. *Transluminal placement of endovascular stent-grafts for the treatment of descending thoracic aortic aneurysms. N Engl J Med* 1994;331:1729-34.
- 4) Kato M, Ohnishi K, Kaneko M, et al. *New graft-implanting method for thoracic aortic aneurysm or dissection with a stented graft. Circulation* 1996;94(9 Suppl):II188-93.
- 5) Bortone AS, De Cillis E, D'Agostino D, de Luca Tupputi Schinosa L. *Endovascular treatment of thoracic aortic disease: four years of experience. Circulation* 2004;110(11 Suppl 1):II262-7.
- 6) Leurs LJ, Bell R, Degrieck Y, Thomas S, Hobo R, Lundbom J. *Endovascular treatment of thoracic aortic diseases: combined experience from the EUROSTAR and United Kingdom Thoracic Endograft registries. J Vasc Surg* 2004;40:670-9; discussion 679-80.
- 7) Makaroun MS, Dillavou ED, Kee ST, et al. *Endovascular treatment of thoracic aortic aneurysms: results of the phase II multicenter trial of the GORE TAG thoracic endoprosthesis. J Vasc Surg* 2005;41:1-9.
- 8) Gleason TG. *Endoleaks after endovascular aortic stent-grafting: impact, diagnosis, and management. Semin Thorac Cardiovasc Surg* 2009;21:363-72.
- 9) Kang WC, Shin EK, Ahn TH, et al. *Combined open endovascular repair for aortic arch pathology. Korean Circ J* 2010;40:399-404.
- 10) Ricotta JJ 2nd, Oderich GS. *Fenestrated and branched stent grafts. Perspect Vasc Surg Endovasc Ther* 2008;20:174-87; discussion 188-9.
- 11) Monahan TS, Schneider DB. *Fenestrated and branched stent grafts for repair of complex aortic aneurysms. Semin Vasc Surg* 2009;22:132-9.