INVITED COMMENTARY

New Technologies, Novel Treatments, Advanced Evidence Synthesis in Vascular and Endovascular Research

George A. Antoniou [a,b,*], Stavros A. Antoniou [c,d]

[a] Department of Vascular & Endovascular Surgery, The Royal Oldham Hospital, Pennine Acute Hospitals NHS Trust, Manchester, UK
[b] Division of Cardiovascular Sciences, School of Medical Sciences, University of Manchester, Manchester, UK
[c] Department of Surgery, Mediterranean Hospital of Cyprus, Limassol, Cyprus
[d] Department of Surgery, School of Medicine, European University Cyprus, Nicosia, Cyprus

Healthcare is a constantly evolving environment. As technology and medicine go hand in hand, health technologies encompass medical devices and procedures designed to streamline healthcare operations and enhance quality of care. Technological advances augment doctors' and researchers' abilities to develop new treatments for vascular diseases, which have the potential of conferring improved outcomes. Novel endovascular procedures, such as drug coated balloon and covered stent angioplasty, reflect seminal advances in vascular and endovascular surgery. Promising new vascular devices and treatments are being validated in clinical research. Increasing research output has resulted in emerging mechanisms that help us compile, appraise, and analyse the best, most compelling, and most current research evidence. An example of such mechanisms is network meta-analysis, which synthesises networks of direct and indirect comparisons of interventions.

Advanced meta-analytical techniques have been applied in a network meta-analysis investigating the comparative effectiveness of several treatment strategies for thrombosed or failing arteriovenous grafts in patients with end stage renal disease.[1] The authors identified 16 randomised clinical trials assessing outcomes of six different treatments to salvage thrombosed or failing prosthetic arteriovenous grafts, including surgical repair; plain, cutting, or drug coated balloon angioplasty; and treatment with bare or covered stents. They found that, in a star network geometry with plain balloon angioplasty as the common comparator, treatment with covered stents significantly reduced the risk of failure at three months compared with plain balloon angioplasty and the best interventions in this setting were drug coated balloon angioplasty and treatment with a covered stent.

The meta-analysis is limited by the fact that the primary outcome (primary patency) was assessed at one time interval only (three months), thereby providing no medium or long term comparative outcome data. Furthermore, the authors converted time to event data for primary patency to dichotomous data, which is not the optimal practice, especially when it's not only whether the event occurred but also the time taken for the event to occur that is of interest, as is the case for primary patency in arteriovenous grafts. The star network configuration does not allow assessment of consistency between direct and indirect evidence, which results in uncertainty in the credibility of comparative outcomes.

The authors correctly identified areas for future research, which should focus on studies directly comparing drug coated balloon with covered stent angioplasty. Such studies would provide an evidence base to inform decision making in the management of arteriovenous access for haemodialysis and create closed loop network configurations allowing synthesis of direct and indirect evidence for all pairs of competing interventions to produce more precise and powerful estimates. Emerging methods help researchers to plan future studies on the basis of parameters of an existing network meta-analysis.[2]

The present era is marked by new technologies and novel treatments in vascular and endovascular surgery creating the need for advanced methods of evidence synthesis. Production of high quality synthesised research evidence in the field of vascular access for haemodialysis is an excellent example demonstrating the importance of promoting communication of knowledge, improving decision making, enhancing patient care, and identifying implications for future research.

https://doi.org/10.1016/j.ejvs.2019.07.024

REFERENCES

1 Nikolopoulos GK, Yiallourou AI, Argyriou C, Bonovas S, Georgiadis GS, Lazarides MK. Short- term comparative assessment of treatments to salvage thrombosed or failing arteriovenous grafts in end-stage renal disease: a systematic review and network meta-analysis. Eur J Vasc Endovasc Surg 2019;58:921–8.
2 Nikolakopoulou A, Mavridis D, Salanti G. Using conditional power of network meta-analysis (NMA) to inform the design of future clinical trials. Biom J 2014;56:973–90.