

## INVITED COMMENTARY

## Arterial Occlusion Is Not Just About Length: There's More than Meets the Eye!

Anne Lejay <sup>a,\*</sup>, Mickaël Ohana <sup>b</sup>, Nabil Chakfe <sup>a</sup>

<sup>a</sup> Department of Vascular Surgery and Kidney Transplantation, University Hospital of Strasbourg, France

<sup>b</sup> Department of Radiology, University Hospital of Strasbourg, France

In their study, He et al.<sup>1</sup> evaluated a computed tomography angiography (CTA) based method of plaque quantification and rational parameters for stent oversizing in the femoropopliteal artery and their influence on clinical outcomes following femoropopliteal stenting. They showed that high calcified plaque burden and excessive stent oversizing were associated with unfavourable outcomes.

These promising results could directly influence clinical practice, since pre-operative CTA, now considered one of the reference imaging modalities in peripheral arterial disease, is available for most patients scheduled for femoropopliteal procedures, and the exquisite amount of detail it gives is far from being used to its fullest potential.<sup>2,3</sup> However, all the CT quantification techniques used in these types of studies require complex and time-consuming post-processing, incompatible with routine clinical workflow.<sup>1,4,5</sup> One could imagine that this major practical limitation might soon be waived with the recent advances in the field of artificial intelligence. Deep learning methods applied to a big CTA dataset<sup>3</sup> could have the power to easily and comprehensively synthesize complete functional and morphological assessment from the anatomy (i.e. the CTA), correlate it with various outcomes following endovascular treatment and guide our choices in the way the procedure is done.

Another important point is that He et al. only focused on calcified plaques.<sup>1</sup> CTA analysis allows the evaluation of the whole atherosclerotic plaque based on the Hounsfield unit attenuation profiles of the different plaque components, as already established in the carotid, coronary, and peripheral arteries.<sup>5</sup> It would therefore have been interesting to evaluate the whole plaque, analysing calcified but also necrotic or fibrous areas, as done by Patel et al.<sup>5</sup> They have demonstrated that only the amount of calcification was related to the outcomes, but their study was lacking power and one could still think that different plaque characteristics and composition, beyond simple calcification quantification, might also affect prognosis and outcomes.

It has been shown that different vascular territories have different atherosclerotic plaque composition. The explanation for different atherosclerotic plaque phenotypes in different vascular beds is not clear but may be related to differences in haemodynamic forces and shear stress profiles, the impact of traditional atherosclerotic risk factors and therapies on different vascular beds, elastic and muscular components of the arterial wall structure, and different pathways for atherosclerotic plaque initiation and progression.<sup>6</sup> The role of CTA quantification to describe the composition of the atherosclerotic plaque and predict its natural evolution is yet to be established.

In conclusion, this study highlights that CTA plaque analysis may be considered as a risk stratification tool before femoropopliteal stenting. Whether this time-consuming approach will translate into practice or will be wiped out by artificial intelligence, the near future will for sure be quantitative, and the time when the length of the arterial occlusion was the only CTA information to take into account will soon be history.

### REFERENCES

- 1 He HP, Weng JC, Zhao Y, Cai SH, Zhang XL, Yin HH. The impacts of plaque calcification and stent oversizing on the clinical outcomes of atherosclerotic femoropopliteal arterial occlusive disease following stent angioplasty. *Eur J Vasc Endovasc Surg* 2019;58:215–22.
- 2 Ohana M, Georg Y, Lejay A, Girsowicz E, Gaertner S, Labani A, et al. Current optimal morphological evaluation of peripheral arterial diseases. *J Cardiovasc Surg* 2015;56:287–97.
- 3 Aboyans V, Ricco JB, Bartelink MEL, Björck M, Brodmann M, Cohnert T, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial diseases, in collaboration with the European Society for Vascular Surgery (ESVS). *Eur J Vasc Endovasc Surg* 2018;55:305–68.
- 4 Von Knebel Doeberitz PL, De Cecco CN, Schoepf UJ, Duquay TM, Albrecht MH, Van Assen M, et al. Coronary CT angiography-derived plaque quantification with artificial intelligence CT fractional flow reserve for the identification of lesion-specific ischemia. *Eur Radiol* 2019;29:2378–87.
- 5 Patel SD, Zymvragoudakis V, Sheehan L, Lea T, Modarai B, Katsanos K, et al. Atherosclerotic plaque analysis: a pilot study to assess a novel tool to predict outcome following lower limb endovascular intervention. *Eur J Vasc Endovasc Surg* 2015;50:487–93.
- 6 Abbas AE, Zacharias SK, Goldstein JA, Hanson ID, Safian RD. Invasive characterization of atherosclerotic plaque in patients with peripheral arterial disease using near-infrared spectroscopy intravascular ultrasound. *Catheter Cardiovasc Interv* 2017;90:461–70.

DOI of original article: <https://doi.org/10.1016/j.ejvs.2019.01.025>

\* Corresponding author. Department of Vascular Surgery and Kidney Transplantation, Nouvel Hôpital Civil, 1 Place de l'hôpital, 67091 Strasbourg Cedex, France.

E-mail address: [anne.lejay@chru-strasbourg.fr](mailto:anne.lejay@chru-strasbourg.fr) (Anne Lejay).

1078-5884/© 2019 European Society for Vascular Surgery. Published by Elsevier B.V. All rights reserved.

<https://doi.org/10.1016/j.ejvs.2019.02.001>