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Letter to the Editor

Advancements in Computed Tomography Analysis for Thoracic Aortic Surgery: The Expanding Role of Automation

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Dear Editor,

We read with great interest the recent review article by Chatterjee *et al.* [1], entitled "Advancements in Computed Tomography Analysis for Thoracic Aortic Surgery: The Expanding Role of Automation" published in The Heart Surgery Forum. The authors provide a valuable overview of artificial intelligence (AI)-based applications in computed tomography (CT) imaging for thoracic aortic disease, with a focus on segmentation, software innovations, and surgical planning. As clinicians and researchers involved in the development and validation of such technologies, we commend the authors for this synthesis.

However, we wish to draw attention to a significant omission that limits the completeness of the review. Our recently published work on ARVA (Augmented Radiology for Vascular Aneurysm) [2]—a fully automated, deep learning-based pipeline for aortic segmentation and quantification—was not cited. This study was published in the Journal of Vascular Surgery, a leading peer-reviewed journal in the field.

ARVA is the first fully automated AI tool capable of segmenting the entire thoraco-abdominal aorta, including the iliac arteries, and extracting clinically relevant metrics such as maximum outer diameters and segmental volumetry. Our solution was validated on a multicenter dataset of 350 contrast-enhanced CT angiographies from 216 patients, covering a broad range of pathologies and imaging conditions (pre- and postoperative, chronic and acute dissections, variable morphologies). The dataset included over 40 different CT acquisition systems from two academic centers.

Importantly, this is not a proof-of-concept but an external validation of a CE-marked product already deployed in clinical practice.

In our study, ARVA's outputs were compared to ground truth annotations from six expert readers and validated against thirteen clinicians. It achieved a median absolute error of 1.6 mm in diameter measurements—statistically equivalent to human performance. Furthermore, over 85% of measurements fell within accepted clinical limits (±5 mm thoracic/abdominal, ±3 mm iliac). Segmentation accuracy was high, with a Dice Similarity Coefficient (DSC) of 0.94 across all segments.

These results are not only statistically robust—supported by confidence intervals, Bland–Altman plots, Lin's concordance correlation, and negative predictive values—but also clinically significant. Accurate, reproducible quantification is critical in the diagnosis and management of aortic aneurysms and dissections. ARVA provides this without any human interaction, surpassing existing semi-automated software platforms [3,4].

By contrast, tools like Mimics and 3Mensio, cited in the review, require manual input or centerline correction, limiting reproducibility. Their segmentation performance is often unreported or based on small, homogeneous cohorts. For example, in the PRAEVAorta2 external validation study [5], a DSC of 0.95 and diameter errors of 2.5–3.0 mm were reported—acceptable, but limited to the infrarenal aorta and not matching ARVA's 1.6 mm error over a larger anatomical domain.

Moreover, ARVA is already in clinical use at over 20 sites, processing more than 12,000 CT angiographies per year. This level of integration is rare among AI tools in vascular imaging and supports its maturity and scalability.

We recognize the challenge of maintaining exhaustive coverage in reviews, particularly in rapidly evolving fields like AI. Still, omitting one of the most advanced and validated tools—already published in a Q1 journal—may mislead readers about the current state of the art. The review implies no fully automated, clinically deployed solution exists for comprehensive aortic assessment, which is no longer the case.

Finally, beyond academic completeness, such reviews serve as guidance for clinicians and researchers. In this context, we believe it is important to highlight ARVA's contribution to the field.

We hope this letter helps clarify ARVA's role in advancing AI-based vascular imaging and encourages future reviews to present a more comprehensive and accurate landscape of available technologies. We thank Chatterjee *et al.* [1] for their efforts and trust this additional information will enrich the ongoing discussion.

Author Contributions

CT, CR, SH and GH conceived and designed the letter. GH, CT, SH and CR drafted the manuscript. SH and GH provided critical revision of the manuscript for important intellectual content and supervised the overall work. All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

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Conflict of Interest

The authors declare no conflict of interest. Camille Ruppli has a financial relationship with the company (Incepto-Medical). However, the company had no role in the handling or conduct of the study. The authors had full access to all data in the study and take full responsibility for the integrity of the data and the accuracy of the data analysis.

References

[1] Chatterjee D, Singh S, Shou BL. Advancements in Computed Tomography Analysis for Thoracic Aortic Surgery: The Expanding Role of Automation. The Heart Surgery Forum. 2025; 28: E644–E655. https://doi.org/10.59958/hsf.8381.

[2] Postiglione TJ, Guillo E, Heraud A, Rossillon A, Bartoli M, Herpe G, *et al*. Multicentric clinical evaluation of a computed tomography-based fully automated deep neural network for aortic maximum diameter and volumetric measurements. Journal of Vascular Surgery. 2024; 79: 1390–1400.e8. https://doi.org/10.1016/j.jvs.2024.01.214.

[3] Adam C, Fabre D, Mougin J, Zins M, Azarine A, Ardon R, *et al*. Pre-surgical and Post-surgical Aortic Aneurysm Maximum Diameter Measurement: Full Automation by Artificial Intelligence. European Journal of Vascular and Endovascular Surgery. 2021; 62: 869–877. https://doi.org/10.1016/j.ejvs.2021.07.013.

[4] Wegner M, Fontaine V, Nana P, Dieffenbach BV, Fabre D, Haulon S. Artificial Intelligence-Assisted Sac Diameter Assessment for Complex Endovascular Aortic Repair. Journal of Endovascular Therapy. 2025; 32: 1172–1181. https://doi.org/10.1177/15266028231208159.

[5] Caradu C, Spampinato B, Vrancianu AM, Bérard X, Ducasse E. Fully automatic volume segmentation of infrarenal abdominal aortic aneurysm computed tomography images with deep learning approaches versus physician controlled manual segmentation. Journal of Vascular Surgery. 2021; 74: 246–256.e6. https://doi.org/10.1016/j.jvs.2020.11.036.