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Nailfold Microvascular Remodelling Under Continuous Flow Left Ventricular Assist Device Support Correlates With Adverse Events

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Aim: Morbidity in continuous-flow left ventricular assist device (cfLVAD) supported patients is due to adverse events related to both hemocompatibility and microvascular remodelling. Using nailfold capillaroscopy (NFC), we assessed longitudinal changes to microvasculature under continuous flow, correlating changes with adverse events. In addition, we compared changes in an end-stage heart failure (ESHF) cohort not supported by cfLVAD.

Method: NFC was performed using a digital video capillaroscope in cfLVAD-supported and ESHF control patients. Parameters such as capillary density, apical diameter, morphology and microhaemorrhage were analysed. Microvascular changes were compared between cohorts and assessed in parallel with the incidence of adverse events.

Results: We analysed 544 images from 46 patients (n=25 cfLVAD, n=21 ESHF, mean age 56.6±11.3 years, 80.4% male). Using generalised linear mixed models, we found decreased loop diameter (B = -0.373, 95% CI: -0.273–1.020, p=0.002) and increased microhaemorrhage (IRR=29.400, 95% CI: 6.750–128.000, p=< 0.001) in cfLVAD patients relative to ESHF control patients (**Table**). Loop diameter was associated with gastrointestinal bleeding (B=-0.250, 95% CI: - 0.414–-0.087, p=0.003) and other bleeding events (B=-0.198, 95% CI: -0.349–-0.047, p=0.010) in the cfLVAD cohort.

Conclusions: Microvascular remodelling detected by NFC in cfLVAD-supported patients is significantly associated with both gastrointestinal bleeding and the risk of bleeding events. Further study of NFC using this non-invasive, simple tool may allow prediction and/or prevention of adverse events.

Table. Associations between nailfold capillaroscopy parameters between continuous-flow left ventricular assist device supported patients and end-stage heart failure controls

Parameter	B [95% confidence interval]	p-value
Capillary density (average)	-0.373 [-0.273–1.020]	0.257
Loop diameter (average, microns)	-0.151 [-0.245–-0.0560]	**0.002**
	IRR [95% confidence interval]	
Enlarged capillaries (20–50 microns)	0.757 [0.347–1.65]	0.484
Giant capillaries (>50 microns)	0.031 [0.000–315.0]	0.462
Haemorrhages	29.400 [6.750–128.000]	**<0.001**
Abnormal morphology	1.010 [0.591–1.740]	0.959

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Prediction of Early and Long-Term Mortality After Transcatheter Aortic Valve Implantation in Australia: A Machine Learning Based Risk Prediction Model (PREDICT-TAVI)

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Aim: Transcatheter aortic valve implantation (TAVI) has transformed severe aortic stenosis treatment, but outcome prediction remains challenging due to complex patient factors. Current risk models are limited by their focus on short-term outcomes or restricted applicability. We aimed to develop a machine-learning based risk score for prediction of early and long-term mortality following TAVI.

Method: We analysed data from the Australasian Cardiac Outcomes Registry (ACOR) TAVI Registry (February 2018–June 2023) to develop seven supervised machine-learning based survival analysis models: Cox proportional hazards (standard, LASSO, ridge, elastic), survival tree, random survival forest, and gradient boosted survival tree (GBST). Key variables were determined through advanced feature selection and grouped for consideration. Model performance was assessed using mean area under the curve (AUC), C-index, and integrated Brier score.

Results: The study included 16,123 patients (mean age 81.6±7.1 years, 61.4% male) with mean follow-up of 386±91 days. During follow-up, 875 patients (5.4%) died. In-hospital, 30-day, and 1-year mortality rates were 0.9%, 1.8%, and 4.6%, respectively. The best-performing model (GBST) achieved an AUC of 0.704 using 12 variables: KCCQ summary score, age, haemoglobin, creatinine, weight, albumin, prior atrial fibrillation, left ventricular ejection fraction, aortic valve area, prior peripheral arterial disease, and prior moderate/severe chronic lung disease. We developed a web