**Please nominate 1 category that best fits your submitted abstract:**

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| Paediatric and/or congenital diseases  Maternal and/or prenatal health  Cardiometabolic diseases  Chronic diseases  Healthy aging  Cancer  Neurodegenerative diseases  Public health  Other |

**Please nominate 2-5 subject areas relevant to your submitted abstract:**

|  |  |
| --- | --- |
| Aged care  Allied health  Animal models  Biochemistry  Bioinformatics  Biomarker research  Biotechnology  Cardiovascular research  Cancer  Cell biology  Clinical research  Commercialisation  Computational biology and/or statistics  Consumer advocacy  Dentistry  Developmental biology  Drug discovery  Drug target identification and validation  Education and training  Endocrinology  Environment  Epidemiology  Genetic counselling  Genetics, epigenetic or small RNAs  Healthcare | Health economics  Health policy  Health promotion  Imaging and computing  Immunology  Indigenous health  Industry  Invisible illnesses  Medicinal chemistry  Microbiology  Molecular biology  Neuroscience  Nutrition  Pain management  Pathology  Personalised Medicine  Rare diseases  Physiology  Psychology  Public health  Reproductive biology  Technology  Tele-health  Virology  Other (please specify): |

**Microvasculature‐on‐a‐Post Chip That Recapitulates Prothrombotic Vascular Geometries and 3D Flow Disturbance**

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**Background and Aims:** Stenosis, characterized by partial vessel narrowing, alters blood hemodynamics and can lead to unpredictable thrombosis. Existing models struggle to accurately represent the complex vascular geometries and hemodynamics. To address this challenge, a microvasculature-on-a-post chip is developed to mimic partially stenotic vascular geometries. The innovative model offers valuable insights into stenosis-induced thrombosis and endothelial behaviour, paving the way for improved assessment of thrombotic risks associated with stenotic vessels. This advanced microfluidic platform also offers new approaches for evaluation of prothrombotic phenotypes and cardiovascular risk assessment in the future.

**Methods:** To emulate diseased vessel, the endothelialised post microfluidics chips were treated with PMA drug. Subsequently, recalcified human blood that is stained with anti-CD41-Atto555 and with antifibrin-647 were perfused through the post chips, observing the temporal and spatial thrombotic response governed by Virchow's triad, including vessel wall injury, hemodynamic disturbance, and hypercoagulability. The stimulated endothelial and thrombosis biomarkers were furthered examined.

**Results:** Healthy endothelium led to a few micro-thrombi formations and did not induce large, stabilized fibrin clots, which are prone to be washed away and travel to major distant organs. For inflamed endothelium with elevated shear on the post area aggravates platelet aggregation followed by formation a fibrin network that can stabilize the blood clot by providing mechanical stability and fibrinolysis resistance.

**Conclusions and Significance/Impact:** Insights into thrombus formation and constituents regulated by 3D blood flow disturbances and vessel injury may serve as novel predictors of thrombosis and the development and progression of blood clots towards developing new, more effective diagnosis and therapeutic strategies to improving clinical outcomes of thrombotic therapy. More importantly, with high efficiency and small amount of blood sample, our endothelialized microfluidic post chip can be used to screen the proper choice of anticoagulant or antiplatelet drugs in patients with stenotic vessels.

**Lay Title: Microvasculature‐on‐a‐Post Chip That Recapitulates Prothrombotic Vascular Geometries and 3D Flow Disturbance** (100 characters max.)

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**Lay Summary:** Cardiovascular diseases are responsible for over 17 million deaths each year, and thrombosis is a leading cause of the cardiovascular mortality. Our new endothelialized microfluidic post (Endo-Post) chip that reflect stenotic vascular environment such as inflammatory vascular lesion and blood flow dynamics could support investigation of thrombus structure, composition and its risk of thromboembolism by perfusing human blood. Taking advantages of our Endo-Post model, mechanisms behind the blood clot formation and fate of the clot are future intriguing areas of explore to predict the risk of thrombus complications (prognosis) as well as to improve efficiency of thrombosis intervention (prophylaxis).

(100 words max.)