Platelet Reactivity ExpreSsion Score (PRESS): A Novel Biomarker for Platelet Hyperreactivity and Cardiovascular Risk

A reliable, scalable, and non-invasive diagnostic tool for the early detection of platelet hyperreactivity and associated cardiovascular risk.

Technology

The NYU investigators have developed a novel diagnostic tool, coined Platelet Reactivity ExpreSsion Score (PRESS), which can discriminate platelet hyperreactivity and identify patients at increased cardiovascular risk. PRESS is derived from the weighted expression values of 76 genes, identified through platelet RNA sequencing of samples collected from 129 patients with symptomatic peripheral artery disease (PAD) before receiving lower extremity revascularization (LER) in the well-phenotyped PACE-PAD clinical study. This gene signature is significantly correlated with the current gold standard measure of platelet reactivity, platelet aggregation in response to submaximal epinephrine. PRESS demonstrated high accuracy, sensitivity, and specificity in discriminating platelet hyperreactivity across disease states and was associated with acute myocardial infarction. Additionally, patients with a higher PRESS are at increased risk for future cardiovascular events. Further validation in two additional patient cohorts, including healthy subjects not on antiplatelet therapy, confirmed the predictive ability to identify individuals with platelet hyperreactivity and prognostic value of PRESS in both cardiovascular disease patients and healthy individuals, regardless of antiplatelet therapy status. This innovative tool overcomes the technical barriers limiting routine clinical assessment of platelet aggregation responses and opens the possibility for a personalized approach to antithrombotic therapy for cardiovascular risk reduction.

Background

Platelets play a crucial role in atherogenesis and thrombosis, with hyperreactive platelets being associated with increased cardiovascular risk. Current methods for assessing platelet activity are labor-intensive, costly, and subject to significant pre-analytical variation, making them unsuitable for large-scale use. The development of PRESS addresses this unmet need by providing a transcriptomic signature that can accurately discriminate platelet hyperreactivity and predict cardiovascular risk. This approach could revolutionize the management of diseases associated with platelet hyperreactivity, such as cardiovascular disease, by enabling early detection and intervention.

Development Stage

PRESS has been validated in multiple clinical cohorts representing diverse patient populations. NYU now seeks a commercial partner to develop this tool into an *In Vitro* Diagnostic for platelet hyperactivity and cardiovascular risk.

Applications

Technology ID

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Category

Life Sciences/Diagnostics

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Learn more

- Early detection and risk stratification in diseases associated with platelet hyperreactivity, such as atherosclerosis, PAD, and coronary artery disease.
- Guiding personalized therapeutic interventions in patients at increased cardiovascular risk.
- Potential application in other conditions associated with platelet hyperreactivity, such as systemic lupus erythematosus (SLE) and COVID-19.

Advantages

- **Established precedent:** PRESS indirectly measures platelet aggregation, a recognized biomarker of cardiovascular risk.
- **Broad applicability:** PRESS consistently detects platelet hyperreactivity across diverse patient subgroups, including by age, sex, race/ethnicity and antiplatelet therapy.
- **Enhanced predictive value:** PRESS provides additional predictive value beyond traditional perioperative risk assessments.
- **Scalable:** PRESS can be integrated into routine clinical practice, overcoming the limitations of current platelet activity assays.
- **High accuracy:** PRESS accurately discriminates platelet hyperreactivity in healthy individuals and across disease states.

Intellectual Property

NYU has filed a provisional patent application covering the method of calculating PRESS to determine patient platelet hyperactivity and cardiovascular risk.

References

1. Berger, J.S., Cornwell, M.G., Xia, Y. et al. , https://doi.org/10.1038/s41467-024-50994-7