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Perspective

The Development and Evaluation of Novel Biomarkers for Stroke Diagnosis and Prognosis

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DESCRIPTION

Millions of individuals are impacted by stroke each year, making it one of the major causes of mortality and disability in the world. A stroke occurs when there is an interruption in the blood supply to a part of the brain, which causes the death of brain cells. For prompt and successful treatment as well as for estimating the likelihood of complications and recurrence, it is essential to determine the diagnosis and prognosis of a stroke. But existing approaches to stroke diagnosis and prediction mostly rely on clinical signs, imaging exams, and traditional blood biomarkers, all of which have drawbacks in terms of accuracy, sensitivity, specificity, and accessibility. Finding innovative biomarkers that can enhance stroke diagnosis and prognosis is therefore required.

The biological or pathological status of an organism is reflected by biomarkers, which are quantifiable compounds or indicators. Different substances, including blood, cerebrospinal fluid, urine, saliva, or tissue, can be used to create biomarkers. A stroke's pathophysiology, severity, prognosis, and response to treatment can all be determined with the help of biomarkers. Biomarkers can also be used to distinguish between different types of stroke, such as ischemic or hemorrhagic stroke, and their underlying causes, such as cardio embolic disease or atherosclerosis of the major arteries.

The identification and validation of novel biomarkers for stroke have been made possible in recent years by developments in molecular biology, genomics, proteomics, metabolomics, and bioinformatics. These biomarkers comprise genes, proteins, microRNAs, metabolites, and other substances that have a role in a number of stroke pathogenesis processes, including inflammation, oxidative stress, apoptosis, neurogenesis, angiogenesis, neuroprotection, and neurorepair.

Tau protein is mostly expressed in neurons and is a microtubule-associated protein. After neuronal injury, tau is released into the blood and can indicate the degree of brain damage. Patients with acute ischemic stroke have been shown to have higher tau levels, which are connected with the severity and prognosis of the stroke.

The neuronal cytoskeleton's Neurofilament Light Chain (NFL), which is also released into the blood following neuronal damage. NFL has been shown to be higher in those who have had an acute ischemic stroke and to be associated with the severity, size, and prognosis of the stroke.

The intermediate filament protein known as Glial Fibrillary Acidic Protein (GFAP) is mostly expressed in astrocytes. After an astrocytic injury, GFAP is released into the blood and can indicate the degree of brain damage. Patients with acute ischemic stroke have been shown to have higher levels of GFAP, which are connected with the severity and prognosis of the stroke.

Rigid procedures and standards are needed for the creation and assessment of new biomarkers for stroke diagnosis and prognosis. High levels of sensitivity, specificity, precision, repeatability, stability, availability, cost, and clinical value should characterize the ideal biomarker. Additionally, the novel biomarker ought to offer extra or complementary data to the existing approaches and biomarkers. It is important to validate the novel biomarker in several, diverse stroke patient cohorts and in a variety of clinical contexts, including pre-hospital, emergency, and rehabilitation. Randomized controlled trials should be conducted to examine the novel biomarker's effects on clinical judgment and patient outcomes.

CONCLUSION

In conclusion, stroke remains a significant global health concern, necessitating improved diagnostic and prognostic methods. The search for novel biomarkers has gained momentum, offering a promising avenue to enhance accuracy and refine patient care. Recent advancements in molecular fields provide opportunities to identify critical indicators like tau protein, Neurofilament Light Chain (NFL), and Glial Fibrillary Acidic Protein (GFAP),

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shedding light on stroke severity and prognosis. Developing rigorous standards for validation and conducting diverse trials are pivotal steps towards integrating these biomarkers into clinical practice, ultimately enhancing stroke management and outcomes.