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The Future of Stroke Management: CRISPR and Gene Editing in Cerebrovascular Research

Ramli Haoran*

Department of Hematology and Medicine, The University of Wolverhampton, Wolverhampton, UK

Introduction

Stroke, a leading cause of death and disability worldwide, presents formidable challenges to healthcare systems and families alike. Despite advancements in acute management and rehabilitation, long-term outcomes remain suboptimal for many patients. However, the advent of cutting-edge genetic technologies, such as CRISPR-Cas9, is poised to revolutionize our understanding and treatment of cerebrovascular diseases. This article explores the transformative potential of gene editing in stroke research and management [1]. Stroke is a multifactorial condition influenced by both genetic and environmental factors. Advances in genomic research have identified several genetic variants associated with increased stroke risk, such as those influencing lipid metabolism, coagulation pathways and blood pressure regulation. Moreover, certain monogenic disorders, like CADASIL (Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy), directly predispose individuals to stroke. Understanding these genetic underpinnings has laid the foundation for personalized medicine approaches in stroke prevention and therapy [2].

Description

CRISPR and gene editing are ushering in a new era in cerebrovascular research, with the potential to revolutionize stroke prevention, treatment and recovery. By harnessing the power of these technologies, we can move closer to a future where the devastating impact of stroke is significantly diminished, offering hope to millions worldwide. These include hypertension, diabetes and obesity, which are prevalent due to lifestyle factors, limited access to healthcare and inadequate public health education. The lack of preventive measures exacerbates the incidence of cerebrovascular diseases. Limited healthcare infrastructure LICs often grapple with inadequate healthcare facilities and resources. This limitation affects the ability to provide timely and effective treatment for cerebrovascular diseases. Diagnostic tools such as CT scans and MRIs may be scarce and access to specialized neurological care is often limited. Consequently, patients may receive delayed diagnoses and treatments, leading to poorer outcomes [3].

Economic barriers the financial strain on individuals and families affected by CVDs in LICs is considerable. Treatment costs, including hospitalization, medication and rehabilitation, are often prohibitive. Additionally, the loss of productivity due to illness can have severe economic repercussions for families and communities. Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) and associated Cas9 proteins have transformed the field of genetic engineering. This technology enables precise editing of specific DNA sequences, allowing scientists to correct mutations, silence deleterious genes, or insert protective ones. The simplicity, efficiency and versatility of CRISPR make it a powerful tool for studying complex diseases like stroke. Lack of public awareness and understanding of cerebrovascular diseases and their risk factors are often low in LICs. This lack of awareness can lead to delays in seeking medical care, as well as insufficient preventive practices and health education. Inadequate research and data research on cerebrovascular diseases in LICs is limited and data on the prevalence, incidence and outcomes of these conditions are often incomplete. This lack of data hinders the development of targeted interventions and policies. Strengthening healthcare systems investing in healthcare infrastructure and increasing access to diagnostic and treatment services can improve outcomes for patients with cerebrovascular diseases. Developing primary healthcare networks that include stroke units and specialized care facilities can make a significant difference [4,5].

Conclusion

Integrating CRISPR and gene editing into stroke management is still in its infancy, but the prospects are promising. Collaborative efforts among geneticists, neurologists, bioethicists and policymakers are essential to translate these advancements from bench to bedside. Future research should focus on refining the technology, addressing safety concerns and developing scalable therapeutic approaches. Promoting preventive measures enhancing public health campaigns to educate populations about the risk factors for cerebrovascular diseases and the importance of early detection can help reduce incidence rates. Implementing community-based programs to promote healthy lifestyles and regular health check-ups can also be beneficial. Improving access to medications ensuring that essential medications for managing risk factors such as hypertension and diabetes are available and affordable is critical. Partnerships with pharmaceutical companies and international organizations can help address the issue of medication accessibility.

Acknowledgement

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Conflict of Interest

None.

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***Address for Correspondence:** Ramli Haoran, Department of Hematology and Medicine, The University of Wolverhampton, Wolverhampton, UK; E-mail: horanramli777@gmail.com*

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