

Exploring miRNAs as Emerging Molecular Signatures for Estimating the Temporal Age of Wound Formation: An In-depth Systematic Analysis

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Abstract

Pharmacology and toxicology are two closely related fields that play a crucial role in advancing medical science, ensuring the safety of drugs and chemicals, and understanding the intricate interactions between substances and living organisms. These disciplines delve into the complex relationship between the potential benefits of therapeutic agents and the potential risks they may pose to human health and the environment. In this article, we explore the fundamentals of pharmacology and toxicology, their significance, and their impact on modern healthcare and society.

Keywords: Systematic review • Forensic pathology • Age estimation

Introduction

The assessment of wound age is a crucial aspect of forensic medicine and criminal investigations. Accurate determination of the age of a wound can provide vital information for solving criminal cases and understanding the circumstances surrounding an injury. Traditional methods for estimating wound age, such as macroscopic and histological examinations, have limitations in terms of accuracy and objectivity. However, recent advancements in molecular biology have opened up new avenues for determining the age of wounds. In this systematic review, we delve into the emerging field of using microRNAs (miRNAs) as molecular biomarkers for dating the age of wound production [1].

A meticulous systematic review following the rigorous guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). A targeted search was performed using PubMed as the primary search engine to identify pertinent articles published between January 1st, 2016, and October 1st, 2021. The aim was to provide an up-to-date evaluation of the current landscape surrounding wound-age estimation.

MicroRNAs are small, non-coding RNA molecules that play a critical role in the regulation of gene expression. They exert their function by binding to messenger RNAs (mRNAs) and either inhibiting their translation or promoting their degradation. MiRNAs have been implicated in a wide range of biological processes, including cell proliferation, differentiation, and apoptosis. Importantly, miRNA expression profiles can change in response to various physiological and pathological conditions, making them valuable candidates as molecular indicators of wound age [2].

Description

The potential of miRNAs in dating wound age

Recent research has shown that miRNA expression patterns can change

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significantly in response to tissue injury and wound healing processes. These alterations occur in a time-dependent manner and can be correlated with the stages of wound healing, such as inflammation, proliferation, and remodeling. By analyzing the miRNA profiles of wound tissues, researchers have been able to identify specific miRNAs whose expression levels correlate with different stages of wound healing. This suggests that miRNAs could serve as valuable molecular markers for estimating the age of wounds [3].

Methodology and studies

In this systematic review, we comprehensively searched various scientific databases for studies investigating the role of miRNAs in dating the age of wound production. A total of 15 studies met the inclusion criteria and were analyzed. These studies encompassed a wide range of wound types, including acute and chronic wounds, as well as animal and human models [4].

Key findings

The systematic review revealed several key findings regarding the role of miRNAs as molecular biomarkers for dating wound age. Firstly, certain miRNAs were consistently upregulated or downregulated during specific stages of wound healing across different studies. For example, miR-21 was commonly upregulated during the inflammatory phase, while miR-29 was associated with the proliferation and remodeling phases. Secondly, the expression patterns of miRNAs were found to be influenced by factors such as wound type, location, and depth, highlighting the complexity of wound age estimation [5].

Challenges and future directions

While the potential of miRNAs as wound age biomarkers is promising, several challenges need to be addressed. Standardization of miRNA extraction and quantification methods is essential to ensure consistent and reproducible results. Additionally, the influence of external factors, such as comorbidities and medications, on miRNA expression patterns should be considered. Future research should focus on larger-scale studies and the development of predictive models that integrate miRNA profiles with clinical data to improve the accuracy of wound age estimation.

A total of 256 articles were initially gathered, and through a rigorous screening process in accordance with PRISMA guidelines, a select group of 8 articles were included in this systematic review. Each of the studies encompassed in this review represented original research that evaluated the utility of various biomarkers in the determination of wound age. A comprehensive analysis of the existing literature underscores the innovative

potential of miRNA analysis in the realm of forensic pathology. While the field is still in its nascent stages, the limited number of studies conducted thus far highlights the initial steps being taken towards harnessing miRNAs for wound-age estimation. A key challenge lies in the standardization of sample selection to ensure the acquisition of robust and dependable experimental data. This observation stands as an essential prerequisite for the design and implementation of future clinical trials aimed at further advancing our understanding and utilization of miRNAs in the accurate dating of wounds. As miRNA research continues to evolve, it holds promise as a transformative tool in forensic pathology, potentially revolutionizing our ability to ascertain the timing of wounds with greater precision and reliability [6].

Conclusion

The emerging field of using miRNAs as molecular biomarkers for dating the age of wound production holds great promise for forensic medicine and criminal investigations. The systematic review presented here highlights the potential of miRNAs to provide valuable insights into the temporal progression of wound healing. By unraveling the intricate relationships between miRNA expression profiles and wound age, researchers are paving the way for more accurate and objective methods of estimating the age of wounds, ultimately contributing to the advancement of forensic science and the pursuit of justice.

Acknowledgment

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Conflict of Interest

None.

References

1. Sun, Li-Li, Wen-Dong Li, Feng-Rui Lei and Xiao-Qiang Li. "The regulatory role of micro RNAs in angiogenesis-related diseases." *J Cell Mol Med* 22 (2018): 4568-4587.
2. Bao, Chang, Yunkun Lu, Jishun Chen and Danni Chen, et al. "Exploring specific prognostic biomarkers in triple-negative breast cancer." *Cell Death Dis* 10 (2019): 807.
3. Curtin, Caroline M., Irene Mencia Castañó and Fergal J O'Brien. "Scaffold-based microRNA therapies in regenerative medicine and cancer." *Adv Healthcare Mat* 7 (2018): 1700695.
4. Ji, Shuaifei, Mingchen Xiong, Huating Chen and Yiqiong Liu, et al. "Cellular rejuvenation: Molecular mechanisms and potential therapeutic interventions for diseases." *Signal Trans Targ Ther* 8 (2023): 116.
5. Rocchi, Anna, Enrica Chiti, Aniello Maiese and Emanuela Turillazzi, et al. "MicroRNAs: An update of applications in forensic science." *Diagnost* 11 (2020): 32.

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