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Correlational analysis of PLIN1 with inflammation in diabetic foot ulcer wounds

Mengting Wang [a,b,1], Xiaoliang Cao [a,b,1], Yanxing Shang [c,1], Yasu Jiang [b], Peng Chen [b], Chengwei Duan [c], Dongmei Zhang [c], Ping Wang [d,*], Jianfeng Ji [b,*], Zhenhua Gong [a,b,e,*]

[a] Medical School, Nantong University, Nantong 226001, China
[b] Department of Burn and Plastic Surgery, Affiliated Hospital 2 of Nantong University, The First People's Hospital of Nantong, Nantong 226001, China
[c] Medical Research Center, Affiliated Hospital 2 of Nantong University, The First People's Hospital of Nantong, Nantong 226001, China
[d] Department of Radiology, Affiliated Hospital 2 of Nantong University, The First People's Hospital of Nantong, Nantong 226001, China
[e] Nantong Clinical Medical College, Kangda College of Nanjing Medical University, Nantong 226001, China

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ABSTRACT

Background: The persistent presence of inflammation is a recognized pathogenic mechanisms of diabetic foot ulcers (DFUs). We aimed to investigate the expression of PLIN1 in tissues from DFU patients and assess its potential association with inflammation-induced damage.
Methods: We performed transcriptome sequencing and correlation analysis of the foot skin from patients with or without DFUs. Additionally, we examined the correlation between PLIN1 and related inflammatory indicators by analyzing PLIN1 expression in tissue and serum samples and through high-glucose stimulation of keratinocytes (HaCaT cells).
Results: PLIN1 is upregulated in the tissue and serum from DFU patients. Additionally, PLIN1 shows a positive correlation with leukocytes, neutrophils, monocytes, C-reactive protein, and procalcitonin in the serum, as well as IL-1β and TNF-α in the tissues. Experiments with Cells demonstrated that reduced expression of PLIN1 leads to significantly decreased expression of iNOS, IL-1β, IL-6, IL-18, and TNF-α. PLIN1 may mediate wound inflammatory damage through the NF-κB signaling pathway.
Conclusion: Our findings suggest that PLIN1 mediates the inflammatory damage in DFU, offering new prospects for the treatment of DFU.

1. Introduction

Diabetes mellitus is a metabolic disorder resulting from the interplay of genetic factors and environmental influences, characterized by consistently elevated plasma glucose levels [1–3]. Diabetic foot ulcer (DFU) is among the most severe complications of diabetes. Prolonged uncontrolled blood glucose levels in individuals with diabetes lead to excessive glycation in a high-glucose microenvironment, thereby triggering hypoxia and persistent infection in DFU. Consequently, this hinders the healing of ulcers and may culminate in amputation or even fatality [4,5]. There are diverse treatment methods for DFU wounds, with the majority relying on multidisciplinary approaches [6]. However, effective treaments for DFU are still lacking, resulting in amputation and mortality rates that exceed expectations.

The persistent presence of inflammation is considered one of the pathogenic mechanisms of DFU [7]. According to relevant reports, approximately 50% of DFU patients are infected, and about 20% of patients with moderate to severe infections require lower limb amputation [8]. Therefore, controlling wound infection and reducing inflammation have become one of the main treatment strategies. Early studies showed that the presence of chronic wounds in diabetic patients is due to the disruption of various stages of the healing process. Specifically, this dusruption is caused by an interruption in the transition from the inflammatory phase to the proliferative phase, resulting in significant damage to macrophages and imbalanced neutrophil function in the wound bed. These issues lead to the release of various pro-

* Corresponding authors at: Department of Burn and Plastic Surgery, Affiliated Hospital 2 of Nantong University, The First People's Hospital of Nantong, Nantong 226001, China (Z. Gong).
E-mail addresses: wangping8527@163.com (P. Wang), jjf1971@ntu.edu.cn (J. Ji), gzhua@ntu.edu.cn (Z. Gong).
[1] These three authors contributed equally to this work.

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