CARBOHYDRATE METABOLISM AND IMMUNE-INFLAMMATORY INTERACTIONS IN DELAYED FRACTURE HEALING AFTER COVID-19

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Annotation Metabolic disorders such as insulin resistance and hyperglycemia have become increasingly common in post-COVID patients. These alterations are known to influence immune function and inflammation, both of which are critical in bone tissue repair. Analyzing how carbohydrate metabolism affects immune markers can improve diagnostic and therapeutic approaches for delayed consolidation. This article provides scientific research information about carbohydrate metabolism and immune-inflammatory interactions in delayed fracture healing after COVID-19.

Keywords: bone healing, Post-COVID-19, patients, bone fractures.

Relevance: The interactions between diabetes mellitus, obesity, and SARS-CoV-2 infection are complex, involving metabolic dysregulation, chronic inflammation, and impaired immune response. Diabetes mellitus and obesity, known to impair immune function, have been identified as risk factors for severe outcomes of SARS-CoV-2 infection. These conditions are characterized by metabolic dysregulation and chronic inflammation, which may exacerbate the severity of SARS-CoV-2 infection. Understanding these interactions is important for the management of SARS-CoV-2 patients during and after active infection in these high-risk groups.

Purpose of the study: To evaluate the relationships between carbohydrate metabolism indicators and immune-inflammatory markers in patients with impaired fracture healing post-COVID-19.

Materials and Methods: The study involved 126 post-COVID patients with delayed long bone fracture healing. Glucose, insulin, HOMA-IR, and glycated hemoglobin were analyzed alongside immunoglobulins, cytokines, CRP, lactoferrin, and INF-γ. Correlations were calculated using Pearson/Spearman methods ($P < 0.05$).

Research Results: Glucose, insulin, and HOMA-IR showed strong positive correlations with IgA, IgG, IgM, IgE, CRP, and IL-1β/IL-6, indicating systemic immune activation. Lactoferrin was negatively correlated with glucose and insulin, reflecting impaired innate immunity. INF-γ levels inversely correlated with carbohydrate markers, suggesting compromised antiviral defense. IL-6, a key proinflammatory cytokine, strongly correlated with insulin resistance. These findings support the role of hyperglycemia and immune dysregulation in delayed bone healing.

Conclusion: Carbohydrate metabolism disturbances contribute to chronic inflammation and immune dysfunction, which underlie delayed fracture consolidation in post-COVID patients. Controlling glycemic parameters may improve bone healing outcomes.

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