Multi-omics Techniques Analysis of Ganfule Capulses in Improving Nonalcoholic Fatty Liver Disease

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Abstract

(*Background*) Compound Chinese medicines exhibit holistic regulatory advantages with multiple targets and pathways in treating nonalcoholic fatty liver disease (NAFLD). This study aims to clarify the key components and mechanisms of Ganfule (GFL) in treating NAFLD using multi-omics techniques. (*Methods*) Firstly, untargeted metabolomics (LC-MS) was used to identify differential metabolites in the feces of NAFLD rats treated with GFL and the metabolic pathways involved. Subsequently, high-throughput sequencing (HTS) combined with bioinformatics techniques analyzed differentially expressed genes (DEGs) in the livers of NAFLD rats. Immunobiochemical techniques such as HE, IHC, RealTime-qPCR, and Western Blot were employed to validate morphological changes in the liver and variations in key DEGs. Finally, network pharmacology was applied to dissect the key herb combinations, active ingredients, and core targets of GFL in treating NALFD. (*Results*) The GFL treatment group significantly improved lipid levels and pathological morphology in the livers of NAFLD rats. Seven herbs, including rhubarb, bupleurum, capillaris, poria, codonopsis, astragalus, and eaglewood, may constitute the core effective formula. We identified 87 differential metabolites, 9 core DEGs, 12 chemical components, and 16 core targets. GFL can also regulate the expression of key proteins such as PPARA, PPARD, PRKACA, and PIK3CG, involving seven pathways including lipid metabolism, immune regulation, inflammation inhibition, JAK-STAT, leptin-insulin signaling, and apoptosis. (*Conclusions*) The key targets and pharmacological components of GFL in improving liver steatosis in NALFD rats hold promise as potential biomarkers for targeted drug design in clinical NAFLD treatment.

Keywords

Multi-omics Techniques, Multiple Validations, Ganfule (GFL), Nonalcoholic Fatty Liver Disease (NAFLD), Pharmacological Mechanism

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