

PATHOPHYSIOLOGICAL AND CLINICAL-STATISTICAL ANALYSIS OF PROTEIN METABOLISM DISINTEGRATION

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Relevance: According to modern hospital statistics, 25–40% of patients hospitalized with somatic diseases exhibit varying degrees of protein-energy malnutrition (PEM). In intensive care units (ICU), this figure rises to 60–80%, reducing treatment efficacy by 1.5–2 times and increasing the risk of hospital mortality by 30%. Protein metabolism dysfunction is not merely a consequence of organ failure but is an independent prognostic factor determining the aggressive course of the pathological process.

Objective: To provide a quantitative and qualitative analysis of the imbalance between protein anabolism and catabolism, and to systematize the clinical indicators of nitrogen balance deficiency.

Research Results and Clinical Statistics: Hypercatabolism and Nitrogen Balance Determination: Under acute stress (severe burns, sepsis), daily nitrogen excretion reaches 25–30 grams (normal: 10–12 g). Losing more than 15 grams of nitrogen per day is classified as "critical catabolic pressure." In such cases, muscle mass destruction reaches 0.5–1.0 kg per week, leading to respiratory muscle paresis and a 40% decrease in pulmonary ventilation. Hypoproteinemia and Hemodynamic Imbalance: Clinical observations confirm that when total plasma protein falls below 52 g/l (the critical threshold), interstitial fluid volume increases by 15–20%. A drop in albumin levels below 25 g/l causes oncotic pressure to fall below 20 mmHg, increasing the risk of alveolar edema by 3.5 times and necessitating increased inotropic support. Diagnostic Validity of "Acute Phase" Proteins: In Systemic Inflammatory Response Syndrome (SIRS), C-reactive protein (CRP) concentration increases 20–100 times above normal. Statistics show that CRP levels exceeding 150 mg/l predict bacterial complications with 85% accuracy. Meanwhile, prealbumin levels below 0.1 g/l serve as the most sensitive "early marker" of profound protein synthesis suppression. Endogenous Intoxication and Azotemia Indicators: A drop in renal filtration fraction below 30 ml/min leads to the accumulation of residual nitrogen (40–60 mmol/l). Uremic intoxication resulting from production azotemia was clinically verified to cause a 25% inhibition of erythropoiesis and neurotoxic cognitive dysfunction. Amino Acid Profile and Hepatocerebral Insufficiency: In liver failure, the Fischer ratio (branched-chain amino acids to aromatic amino acids) drops from the normal 3.0–3.5 to 1.0 or lower. This metabolic shift accelerates the synthesis of neurotoxic "false neurotransmitters" (octopamine, phenylethanolamine) fourfold, leading to Grade III–IV hepatic encephalopathy in 72% of cases.

Conclusion: Monitoring the quantitative and qualitative indicators of protein metabolism allows for an objective assessment of the pathological process. Timely nutritional correction of negative nitrogen balance and hypoalbuminemia is a key factor in reducing hospital stays by an average of 4.5 days and minimizing ICU complications.