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IMMUNOREHABILITATION STRATEGY AND TACTICS IN PATIENTS AFTER SURGICAL OPERATIONS – A LITERATURE REVIEW

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იმუნორეაბილიტაციის სტრატეგია და ტაქტიკა პაციენტებში ქირურგიული ოპერაციების შემდეგ - ლიტერატურული მიმოხილვა

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რეზიუმე

თანამედროვე სამყაროში იმუნური სისტემის ფუნქციების დარღვევას ხელს უწყობს მრავალი ფაქტორი, მათ შორის: ქრონიკული სტრესი, ძილის დეფიციტი, არაბალანსირებული კვება, მიკრობიომის დარღვევა, გარემოს დაბინძურება, ფიზიკური აქტივობის ნაკლებობა, მზის სინათლის ნაკლებობა, ტოქსინების ზემოქმედება, ანტიბიოტიკების ჭარბი გამოყენება და სოციალური იზოლაცია. ამ ფაქტორების გათვალისწინება განსაკუთრებით მნიშვნელოვანია პაციენტის პრეოპერაციულ მომზადებაში, რადგან ოპერაციული ჩარევა ხშირად იწვევს იმუნოსუპრესიას და სხვადასხვა გართულებას.

Introduction. The modern surgical patient often faces surgery with a pre-compromised immune system. Chronic stress sleep deficit, poor nutrition, environmental pollution, lack of physical activity, insufficient sunlight, overuse of antibiotics, and social isolation contribute to a state of immune dysregulation that increases the risk of postoperative complications [1,2,3].

The Stress-Immune Axis: Chronic stress activates the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system, leading to elevated cortisol and catecholamine levels. While acute stress can be immunoprotective, chronic exposure results in immune suppression, characterized by reduced T-cell proliferation and impaired immune cell function [1,3].

Environmental Insults: Exposure to environmental toxicants, including persistent organic pollutants, heavy metals, and endocrine disruptors, can cause immune dysregulation, promote oxidative stress, and alter T-cell function, thereby increasing susceptibility to infections and disrupting immune tolerance [4].

Nutritional Deficits: Poor nutritional status is prevalent among surgical patients and is a critical determinant of outcomes. Malnutrition impairs immune function, wound healing, and muscle preservation, creating a vulnerable state for surgical stress [5].

Surgical intervention, while therapeutic, triggers a profound systemic inflammatory response and subsequent "immune paralysis." From the standpoint of immunorehabilitology, the postoperative period should be viewed as a critical window for restoring immune homeostasis. Traditional perioperative care often overlooks the long-term functional capacity of the immune system, leading to chronic secondary immunodeficiency and increased risk of relapse or infection.

Historical Stages of Immunorehabilitation Development. The scientific evolution of immune regulation approaches has progressed through several stages:

1. **Immunotherapy:** The initial step, exemplified by the use of diphtheria antitoxin.
2. **Immunosuppression:** Became necessary for autoimmune diseases and organ transplantation.

3. **Immunostimulation:** Emerged later in the context of secondary immunodeficiency; however, its generalized nature failed to provide targeted correction of specific immune components.
4. **Immunocorrection:** Offered a more differentiated approach to targeting individual components of the immune system.
5. **Immunomodulation:** Involves the use of immunomodulators that act on the functional system of immune homeostasis.

As a result of this progression, the concept of **Immunorehabilitation** was formulated, with Professor Revaz Sephashvili considered its founder. In the 1980s, the fundamental principles and methodologies of immunorehabilitation were developed at the Scientific Research Institute of Allergology, Asthma, and Clinical Immunology in Tskhaltubo [6].

Definition and Directions of Immunorehabilitation. Immunorehabilitation is a science that studies the processes of restoring the functional activity of the immune system to physiological norms through a complex of therapeutic and prophylactic systemic measures (including pharmacological, such as immunomodulator drugs, and non-pharmacological means). The goal is to achieve the patient's full recovery (in acute disease phases) or long-term clinical-immunological remission, and to minimize relapses in chronic conditions.

There are two main directions of Immunorehabilitation:

1. **Specialized Immunorehabilitation:** Conducted in specialized institutions by immunology specialists for pathologies where immunopathological symptoms dominate the pathogenesis, such as organ transplantation, allergic, and autoimmune diseases.
2. **Applied Immunorehabilitation:** Has broader application in the context of various other diseases.

The Three-Stage Model of Immunorehabilitation:

1. **Clinical Stage (14-45 days):** Conducted in a hospital. The goal is to establish a definitive clinical diagnosis, assess the degree of immune pathology, and implement complex treatment, including immunocorrection, plasmapheresis, and hemadsorption.
2. **Ambulatory Stage (up to 3 years):** Takes place in an outpatient setting. It involves restorative immunorehabilitation and may incorporate psychological support, physiotherapy, massage, and other rehabilitative measures.
3. **Maintenance Stage (minimum 24 days annually):** Aims to sustain clinical-immunological remission and prevent relapses.

This review aims to synthesize current literature through the lens of Sepiashvili's three-stage immunorehabilitation framework to define the optimal "tactics" for restoring immunological status in surgical patients.

The Importance of Immunorehabilitation After Surgical Operations. Immunorehabilitation is critical post-surgery because it directly addresses the immune dysfunction caused by both modern lifestyle factors and the physiological trauma of the operation itself. A properly functioning immune system is fundamental for successful recovery, as it:

- **Prevents Complications:** It reduces the risk of postoperative infections, poor wound healing, and other sequelae of immunosuppression.

- Promotes Efficient Healing: By actively cleansing necrotic tissue, controlling inflammation, and fighting pathogens, it creates an optimal environment for tissue regeneration and scar minimization.
- Ensures Sustainable Outcomes: Through a structured, multi-stage model, it moves beyond acute care to establish long-term immune balance, securing durable clinical results and improving the patient's overall quality of life.

Conclusion. Immunorehabilitation following surgical intervention must transcend episodic treatment, evolving into a continuous, personalized strategic framework rather than a singular intervention. This review underscores that the transition from isolated "immunocorrection" which often addresses only transient laboratory anomalies (Table1), to a comprehensive "immunorehabilitation strategy" is foundational for achieving the total functional recovery of the surgical patient. By utilizing a rigorous three-stage model (clinical, ambulatory, and sanatorium-resort), this multidisciplinary approach ensures the restoration of immune homeostasis and the maintenance of long-term remission. The efficacy of this paradigm shift lies in its integrative nature, combining pharmacological modulation with systemic detoxification and lifestyle optimization. Ultimately, adopting these multi-spectral tactics is essential for mitigating postoperative secondary immunodeficiencies and significantly enhancing the patient's long-term quality of life.

Table 1.

Feature	Traditional Immunocorrection	Sepiashvili's Immunorehabilitation
Focus	Short-term lab values (e.g., T-cell count)	Long-term functional homeostasis
Duration	Acute/Perioperative only	Continuous (Multi-stage/Multi-year)
Tactics	Monotherapy (usually pharmacological)	Multidisciplinary (Complex & Systematic)
Goal	Treating a deficiency	Preventing relapse & restoring life quality

Summary: Immunorehabilitation after surgical intervention enables the restoration of immune system functions through a comprehensive, multidisciplinary approach. It includes three stages (clinical, ambulatory, and maintenance), an individualized approach, and combined therapeutic measures. Successful immunorehabilitation helps reduce postoperative complications, accelerates the recovery process, and ensures sustainable clinical outcomes.

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SUMMARY

This literature review examines the strategy and tactics of immunorehabilitation for patients following surgical operations. The modern lifestyle, characterized by chronic stress, poor nutrition, and environmental toxins, often leads to immunosuppression, increasing the risk of postoperative complications. The article traces the evolution of immunology from generalized immunotherapy to the modern concept of immunorehabilitation - a systematic, multidisciplinary approach aimed at restoring immune function to a physiological norm. A central focus is the three-stage model (clinical, ambulatory, and maintenance) that ensures comprehensive care. The review concludes that a personalized immunorehabilitation strategy is crucial for preventing complications, accelerating tissue regeneration, and achieving successful long-term outcomes in surgical patients.

Keywords: immunorehabilitation, surgery, literature review

