

MORPHOFUNCTIONAL CHANGES IN THE INGUINAL LYMPH NODES OF OUTBRED WHITE RATS UNDER CONDITIONS OF RHEUMATOID ARTHRITIS

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Introduction

Rheumatoid arthritis is a chronic inflammatory disease primarily affecting the joints and the lymphoid system. Lymph nodes play a central role in the organism's immune defense mechanisms and undergo morphofunctional changes in response to inflammatory processes. Previous studies have shown that under conditions of rheumatoid arthritis, the number of lymphoid follicles, thickness of cortical and paracortical zones, stromal components, and the proportion of germinal centers in lymph nodes change significantly. Age is also an important factor influencing structural and immunoactive alterations in lymph nodes.

The aim of this study was to investigate age-related morphofunctional changes in inguinal lymph nodes of outbred white rats under experimental rheumatoid arthritis conditions, to assess the proliferative and differentiation activity of lymphoid tissue, and to study the processes of structural remodeling.

Aim

To determine age-related morphofunctional changes in peripheral lymph nodes of outbred white rats under experimental rheumatoid arthritis conditions.

Objectives

1. To assess morphometric parameters of lymph nodes in rats aged 3, 12, and 18 months.

2. To analyze age-related changes in lymphoid follicles, germinal centers, and stromal components.
3. To compare results from experimental and correction groups with the control group.

Materials and Methods

The study involved 195 male outbred white rats aged 3, 12, and 18 months, with body weights ranging from 350 to 370 g. All animals were maintained under identical vivarium conditions (temperature 19–22°C, relative humidity 50–60%, 12/12-hour light/dark cycle).

Animals were divided into three groups:

Control group (n=48): healthy rats maintained on a standard diet.

Experimental group (n=70): rheumatoid arthritis was induced using Freund's adjuvant. The preparation was administered as a single 0.1 ml subcutaneous injection at the tail base.

Correction group (n=77): after induction of experimental arthritis, rats received milk thistle extract at a dose of 100 mg/kg via intragastric gavage for 4 weeks.

At the end of the experiment, animals were euthanized according to bioethical requirements, and peripheral lymph nodes were isolated. Morphometric analysis included total lymph node diameter, thickness of cortical and paracortical zones, number and diameter of lymphoid follicles, proportion of germinal centers, relative area of the medullary zone, and stromal volume fraction.

Results

In 3-month-old rats, lymph node diameter, cortical and paracortical zone thickness, number and diameter of lymphoid follicles, and proportion of germinal centers were significantly higher compared to the control group, indicating initial proliferative activity.

In the 12-month-old group, lymph nodes exhibited maximal proliferative and immune response activity, with the highest values observed in cortical and paracortical zones, lymphoid follicles, and stromal components.

In 18-month-old rats, lymphoid component activity persisted, but structural remodeling associated with increased stromal components and decreased medullary zone was observed, reflecting involutional changes.

These findings indicate that morphofunctional changes in lymph nodes are progressive and age-dependent.

Discussion

The results are consistent with previous studies, confirming that under rheumatoid arthritis conditions, lymph node hyperplasia, increased stromal components, and expansion of immunoactive centers occur. Proliferative activity observed at 3 months reflects the initial stage of inflammation, maximal immune response occurs at 12 months, and structural remodeling begins at 18 months. Results from the correction group demonstrated that milk thistle extract stabilizes immunoactive activity and reduces inflammatory processes.

Conclusions

1. In 3-month-old rats, initial proliferative activity of lymphoid tissue was observed.
2. In 12-month-old rats, lymph nodes demonstrated maximal immune response and compensatory mechanisms.
3. At 18 months, structural remodeling of lymph nodes began, characterized by increased stromal components and reduced medullary zones.

Thus, morphofunctional changes in lymph nodes are age-dependent and progressive, reflecting the chronic development mechanism of rheumatoid arthritis. These parameters may serve as important diagnostic indicators in experimental immunopathological studies.