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# To Study the Comparative Characteristics of Morphological and Morphometric Parameters of the Spleen in Chronic Renal Failure

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**Abstract** To study the comparative characteristics of morphological and morphometric parameters of the spleen in chronic renal failure. A comparative analysis of the morphological and morphometric parameters of the spleen lymphoid structures of 3-6-9-month-old white outbred rats under the influence of normal, chronic renal failure and correction with cinquefoil root powder was conducted and the results were substantiated; an increase in the total area of red and white pulp of the spleen of white outbred rats, periarterial lymphatic couplings, germinative centers of lymphatic follicles, mantle and marginal zones in the diameter of the spleen in experimental chronic renal failure was substantiated; for the first time it was proven that in chronic renal failure the number and activity of T, B-lymphocytes, macrophages in the spleen increased, and the use of cinquefoil root powder effectively affected the functional activity of the spleen of white outbred rats; The immunohistochemical characteristics of morphological changes in the spleen of white outbred rats under the influence of experimental chronic renal failure and ginseng root powder were studied and evaluated in the experiment.

**Keywords** B-lymphocytes, Method of G. Greven, Lymphoid follicle, T-lymphocytes

## 1. Introduction

Chronic renal failure remains relevant in the world not only for medical, but also for social and economic reasons.

In the early stages of CKD, changes in the microcirculation of the capillaries occur, and in the late stages of the disease, in all vascular systems, the main criterion leading to further deepening, worsening and acceleration of these processes is undoubtedly nephroangiosclerosis due to hypercoagulation and microthrombosis caused by impaired microcirculation in the capillaries [1,2].

Chronic renal failure (CRF) is an irreversible syndrome of renal dysfunction, which lasts a long time and is accompanied by clinical signs of impaired water, electrolyte and nitrogen metabolism in the kidneys. It is a complication of various kidney diseases, culminating in sclerosis of the kidney tissue [3,4].

CRF is a disease characterized by a violation of the structure and function of the kidneys for a period of 3 months or more and a negative impact on the human body. SBE is classified according to the cause of the disease (Cause), GFR and albuminuria (Albuminuria - (CGA) category) [5,6].

SBE is classified as follows: cause of the disease, GFR and albuminuria. The causes of SBE are determined based on the presence of systemic diseases in the observed organism, the presence and expected pathoanatomical changes in the kidneys [7,8].

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## 2. Materials and Methods

For experimental studies, 170 male white outbred rats weighing 160-180 g, aged 3-6-9 months, were selected. All laboratory animals were obtained from the same vivarium and were of the same age [9,10].

The first group of rats (intact) was the control group, and the scientists fed them a standard diet with a normal salt content so that they could compare the results with other groups [11,12].

In the second group of rats, the rats were kept without food for 24 hours according to the method of G. Greven, and then they received 0.5 ml of concentrated glycerin per day m / i. This corresponds to 100 g of body weight. This solution was given for 1 month. This shows that during the experiments the animals became lethargic and lost weight [13,14].

The third group of rats also received the same dose of concentrated glycerin 0.5 ml m / i, but in this case they received 2 mg of ginseng root powder in their diet once a day in the morning with food for 1 month. Ginseng root powder is known for its antioxidant, immunomodulatory properties and ability to reduce inflammation in the body [15,16].

## 3. Result and Discussion

The spleen of 3-month-old white outbred rats is elongated and dark red in color due to its blood filling. It is surrounded by a serous membrane and a thin fibrous capsule on the outside. Trabeculae grow into the spleen from the capsule. The trabeculae are very thin (when stained with Van Gieson, we can see a slightly light pink area). The trabeculae divide the spleen into poorly defined segments. Between the trabeculae there is white and red pulp. The volume of the white pulp is small, and the volume of the red pulp is 3-4 times larger than the white pulp.

In the development, T-lymphocytes first accumulate around the artery (T-PALS area - small in size). Then B-lymphocytes also accumulate here, forming the white pulp of the spleen. Among them, the reticular tissue together with large sinusoidal blood vessels forms the red pulp.

The white pulp of the spleen consists of lymphatic follicles (Malpighian corpuscles). The central part of the lymphoid follicle is its reproductive center or reactive center, the mantle-covering and marginal-marginal zones are distinguished. The central part is large in volume, and the mantle zone consists of B lymphocytes, B lymphoblasts, macrophages and plasma cells, this zone is called the B zone. The marginal zone also has a small volume of T and B lymphocytes and a large number of macrophages - it performs the function of capturing and digesting antigens that have entered the blood, and lymphocytes and lymphoblasts are located. This zone is an important immune zone.

The periphery of the central artery, located eccentrically relative to the white pulp, is the periarterial zone (PALS zone): T lymphocytes, macrophages and interdigitating cells.

The red pulp consists of a reticular stroma, sinusoids-blood vessels, and splenic bands located between these sinusoids. Splenic bands are B-lymphocytes and the plasma cells they produce. In the reticular stroma of the red pulp, macrophages (derived from monocytes) are cells involved in phagocytosis, that is, "splenocytes".

The spleen of 6-month-old white outbred rats is elongated and dark red in color due to its blood filling. It is surrounded by a serous membrane and a fibrous capsule on the outside. Trabeculae grow into the spleen from the capsule. The walls of the trabeculae and blood vessels are thickened (when stained with Van Gieson, we can see a slightly pink area). Trabeculae divide the spleen into poorly defined segments. Between the trabeculae there is white and red pulp. The volume of the white pulp is small, and the volume of the red pulp is 2-3 times larger than the white pulp.

As it progresses, the accumulation of T-lymphocytes around the artery continues (the T-PALS area increases in size). B-lymphocytes also continue to accumulate around it, and the white pulp of the spleen increases. Among them, the reticular tissue is enlarged by large sinusoidal blood vessels, which also enlarge the red pulp.

The white pulp of the spleen consists of lymphatic follicles (Malpighian corpuscles). The central part of the lymphoid follicle is its reproductive center or reactive center, and the mantle-covering and marginal-marginal areas are distinguished. The central part is large in volume, and the mantle area consists of B lymphocytes, B lymphoblasts, macrophages and plasma cells, this area is called the B area. The marginal area contains enlarged T and B lymphocytes and a large number of macrophages - it performs the function of capturing and digesting antigens that have entered the blood, and lymphocytes and lymphoblasts are located. This area is an important immune area.

The periphery of the central artery, located eccentrically relative to the white pulp, is the periarterial area (PALS area): T lymphocytes, macrophages and interdigitating cells are increased.

The reticular stroma of the red pulp, the sinusoid-blood vessels, and the splenic bands located between these sinusoids are enlarged. The splenic bands are B-lymphocytes and the plasma cells formed from them. In the reticular stroma of the red pulp, macrophages (formed from monocytes) are cells involved in phagocytosis, that is, "splenocytes" are increased.

In 6-month-old white outbred rats, the body weight increased by 1.93 times compared to 3-month-old white outbred rats, and the absolute weight of the organ increased by 1.52 times, and the relative area of the white pulp decreased by 8.1%.

The diameter of the LTs and KMs decreased by 10.7% and 9.42%, respectively, compared to 3-month-old white outbred rats. LTs have a round, oval, and oblong shape. The width of the mantle, border and periarterial zones increased by 2.74%, 4.64% and 5.15%, respectively. The total number of lymphocytes in LTs without a reproductive center increased by 21.0% compared to 3-month-old white rats. The total number of lymphocytes in the periarterial lymphatic ducts increased by 23.7%.

The spleen of 9-month-old white outbred rats is elongated and dark red in color due to its blood filling. It is surrounded by a serous membrane and a dense fibrous capsule on the outside. Trabeculae grow into the spleen from the capsule. The walls of the trabeculae and blood vessels are thickened and strong (when stained with Van Gieson, we can see a pink area). Trabeculae divide the spleen into poorly defined segments. Between the trabeculae there is white and red pulp. The white pulp is enlarged, the red pulp is wide, the red pulp is 1-2 times larger than the white pulp.

T-lymphocytes have accumulated in the PALS area, that is, around the artery (T-PALS area - increased in size). B-lymphocytes have also accumulated around it, the white pulp of the spleen has increased. Among them, the reticular tissue has enlarged large sinusoidal blood vessels, increasing the size of the red pulp.

The central part of the lymphoid follicle is its proliferation center or reactive center, the mantle-covering and marginal-bordering areas are easily distinguished. The central part is large in volume, and the mantle area consists of B lymphocytes, B lymphoblasts, macrophages and plasma cells, this area is called the B area. The marginal area contains enlarged T and B lymphocytes and a large number of macrophages - they perform the function of capturing and digesting antigens that

have entered the blood, and lymphocytes and lymphoblasts are located. This area is an important immune area.

The reticular stroma of the red pulp, sinusoidal blood vessels and splenic bands located between these sinusoids are enlarged. Splenic bands are B lymphocytes and plasma cells formed from them. In the reticular stroma of the red pulp, macrophages (derived from monocytes) are cells involved in phagocytosis, that is, "splenocytes" are increased. In 9-month-old white rats, a mature spleen tissue is developed during this period.

The weight of 9-month-old white rats increased by 1.16 times, and the absolute weight of the organ increased by 1.06 times compared with 6-month-old white rats. The diameter of the LT and KM decreased by 1.47% and 5.85%, respectively, compared with 6-month-old white rats. LTs have a round, oval and oblong shape. The relative area of the white pulp decreased by 2.0%, the total number of lymphocytes in the LT decreased by 9.6%, and the total number of lymphocytes in the PALM increased by 3.2%.

## 4. Conclusions

When comparing the body weight of 3-6-9-month-old white rats: the body weight of 6-month-old white rats increased by 1.93 times compared to 3-month-old white rats, and the body weight of 9-month-old white rats increased by 1.16 times compared to 6-month-old white rats. In chronic renal failure, the spleen of 9-month-old white rats increased by 1.16 times compared to 6-month-old experimental animals.

The absolute organ weight of 3-month-old white rats increased by 1.52 times, and the absolute organ weight of 9-month-old white rats increased by 1.06 times compared to 6-month-old white rats. In chronic renal failure, the spleen of 9-month-old white rats was larger than that of 6-month-old experimental animals, and the absolute weight of the organ increased by 1.1 times.

The relative area of the white pulp of 3-month-old white rats was reduced by 8.1% compared to 6-month-old white rats.

The diameter of the LTs and KM of 6-month-old white rats was reduced by 10.7% and 9.42%, respectively, compared to 3-month-old white rats. The diameter of the LTs and KM of 9-month-old white rats was reduced by 1.47% and 5.85%, respectively, compared to 6-month-old white rats. In chronic renal failure, the spleen of 9-month-old white rats was increased by 13.64% compared to 6-month-old experimental animals.

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