

MORPHOLOGICAL CHANGES IN THE GASTRIC MUCOSA UNDER THE INFLUENCE OF ANTI-INFLAMMATORY DRUGS (A STUDY IN MALE RATS)

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Abstract: This study investigates the morphological changes in the gastric mucosa under the influence of anti-inflammatory drugs using male rats as an experimental model. Anti-inflammatory medications, particularly non-steroidal anti-inflammatory drugs (NSAIDs), are widely used in clinical practice but are known to cause adverse effects on the gastrointestinal tract.

The aim of this research is to evaluate structural alterations in the gastric mucosa following exposure to these drugs. Adult male rats were administered anti-inflammatory agents over a specified period, after which gastric tissue samples were collected for histological examination.

The results revealed significant morphological changes, including epithelial damage, mucosal erosion, inflammatory cell infiltration, and disruption of normal glandular architecture. These findings suggest that prolonged use of anti-inflammatory drugs can negatively impact the integrity of the gastric mucosa.

In conclusion, this study highlights the importance of careful use of anti-inflammatory medications and supports the need for protective strategies to minimize gastrointestinal complications.

Keywords: morphology, stomach, drugs, polypharmacy, mucous membrane, morphometry.

1. Introduction

Anti-inflammatory drugs, especially non-steroidal anti-inflammatory drugs (NSAIDs), are among the most commonly prescribed medications worldwide due to their analgesic, antipyretic, and anti-inflammatory properties. Despite their therapeutic benefits, these drugs are frequently associated with adverse effects on the gastrointestinal tract, particularly the gastric mucosa.

The gastric mucosa plays a crucial role in protecting the stomach lining from aggressive factors such as gastric acid, pepsin, and external chemical agents.

However, the use of anti-inflammatory drugs can disrupt this protective barrier by inhibiting prostaglandin synthesis, reducing mucus and bicarbonate secretion, and impairing mucosal blood flow. As a result, structural and functional damage to the gastric mucosa may occur.

Experimental animal models, including male rats, are widely used to study drug-induced gastric injury due to their physiological similarities to humans and the ability to control experimental conditions. Investigating morphological changes in the gastric mucosa provides valuable insights into the mechanisms of drug-induced damage and helps in developing preventive and therapeutic strategies.

Therefore, this study aims to assess the morphological alterations in the gastric mucosa of male rats following exposure to anti-inflammatory drugs.

Histological and morphometric analyses also reveal **adaptive and inflammatory responses** in the gastric mucosa. Repeated drug exposure can induce partial adaptation, slightly reducing the severity of deeper lesions, though epithelial disruption and inflammatory infiltration often persist. These experimental findings in rats closely reflect the **pathophysiological mechanisms of NSAID-induced gastritis in humans**, including prostaglandin suppression, microvascular disturbances, and increased susceptibility to acid-mediated injury (Wallace, 2008).

Materials and methods of research

The experiment was carried out in a vivarium on 180 five-month-old white male rats. Rats weigh 200-220 g. organized. At the beginning of the experiment, all mature rats were quarantined for 7 days; after eliminating somatic or infectious diseases, they were transferred to the usual vivarium regime with 2 meals a day. To study the effects of polypharmacy in experimental groups of animals, the following anti-inflammatory drugs were used: aspirin (a group of non-steroidal anti-inflammatory drugs - salicylic acid derivatives); paracetamol (a group of non-steroidal anti-inflammatory drugs - anilide derivatives); ibuprofen (a group of non-steroidal anti-inflammatory drugs - propionic acid derivatives); dexamethasone (synthetic glucocorticosteroid); plaquanyl sulfate (anti-inflammatory, antimalarial). White rats were divided into 5 groups (n=220): group I - control (n=40); Group II - rats treated with 2 types of anti-inflammatory drugs: paracetamol 15 mg/kg, aspirin 5 mg/kg (n

= 50); III - group - white rats treated with 3 types of anti-inflammatory drugs: paracetamol 15 mg/kg, aspirin 5 mg/kg, ibuprofen 6 mg/kg (n = 50); Group IV - white rats treated with 4 types of anti-inflammatory drugs: paracetamol 15 mg/kg, aspirin 5 mg/kg, ibuprofen 6 mg/kg, dexamethasone 0.1 mg/kg. (n = 30); Group V - white rats treated with 5 types of anti-inflammatory drugs: paracetamol 15 mg/kg, aspirin 5 mg/kg, ibuprofen 6 mg/kg, dexamethasone 0.1 mg/kg, hydroxychloroquine sulfate 6.5 mg/kg (n = 50).

Doses of this drug were calculated empirically and administered intragastrically daily as a solution for 10 days using a metal tube. From days 141 to 150 (5 months), rats were intragastrically administered 0.5 ml of distilled water (control group) and various combinations of anti-inflammatory drugs (experimental groups) for 10 days.

Results of our own research. In experimental animals, changes in the histomorphometric parameters of the main parts of the gastric mucosa were observed.

In the control group, the average number of intraepithelial lymphocytes per 100 villous epithelial cells in the cardiac section of the stomach was 10.5 ± 0.5 , in the middle section 13.9 ± 0.2 and in the distal section

15.1±0.3. In the dynamics of the second and third groups, a clear increase in the number of intraepithelial lymphocytes was not detected, but in groups 4 and 5, intraepithelial lymphocytes increased by 20% and 32%, to a greater extent in the pyloric region of the stomach. This indicates the migration of lymphocytes to the gastric mucosa, infiltration of the mucous membrane

in the control group was 11±0.3, and in the 5th experimental group, after using 5 types of anti-inflammatory drugs, the number of glandular tissues decreased to 8.7±0.14. on average, which is comparable to the first group, 20% less. In group 4, the number of individual gland tissues decreased by 17% and amounted to 9.1±0.21. In the 3rd group, the gland tissue decreased by 13.6%, and in the 2nd group by 11.8%, respectively.

The average number of individual glandular tissues in the corporal part of the stomach of rats is 14±0.32. In the studied groups, the amount of tissue of individual glands in the body of the stomach decreased by 12.8% in 5 groups, by 7.8% in 4 groups, by 6.8% in 3 groups and by 5% in 2 groups, depending on the number of drugs used .

In the studied groups, the amount of glandular tissue in the pyloric part of the stomach also decreased by 15% in 5 groups, by 11% in 4 groups, by 9.7% in 3 groups and by 1.9% in 2 groups (Fig. 1).

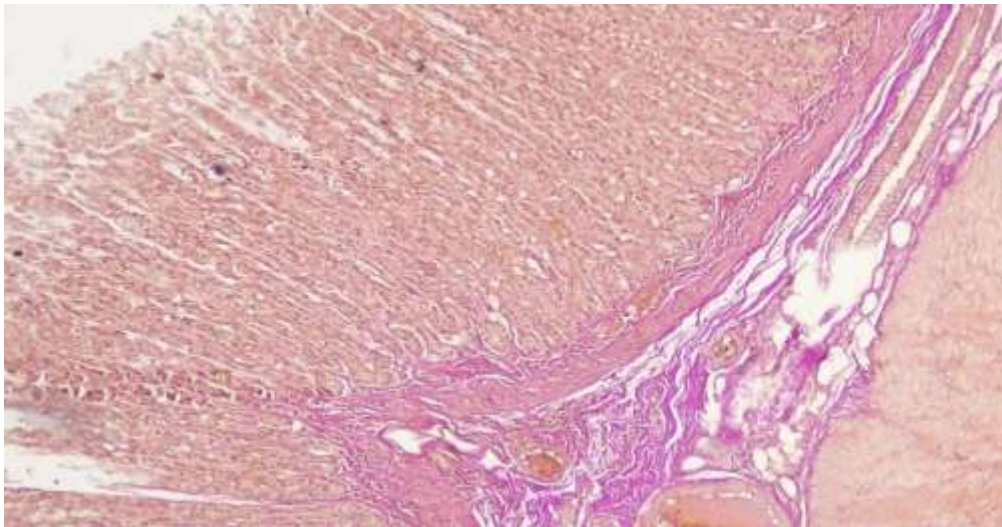


Figure 1. Average amount of glandular tissue in the control and experimental groups depending on the stomach, cm²

The experiment revealed changes in the size of glandular tissues and the distance between them during a macroscopic examination of gastric preparations in white rats. In dynamics, the distance between glandular tissues in the proximal stomach increased by 3.3% in groups 5 and 4, and in groups 3 and 2, the distance between glandular tissues did not significantly decrease.

When examining the tissues of the gastric glands, it was found that there were no significant changes in the number of tissues of the gastric glands as a result of the action of anti-inflammatory drugs, that is, in the first group they amounted to 18.7 ± 0.33 pieces, in the second group 18.9 ± 0.4 pieces ., in the third group 17.3±0.34 pieces, in the fourth group 17.9±0.22 pieces, in the fifth group 18.1±0.24 pieces.

Based on the results of the study, a decrease in the size of the gland tissue was determined. In the control group, the average size of glandular tissue in the proximal stomach was 2.8x3.21 mm, in group 2 -

2.4x3.16 mm, in group 3 - 2.2x3.0 mm, in group 4 it was 2.3x2.9mm and in group 5 1.6x2.0 mm in group equally. The size of the glandular tissue in the bodily part is larger than the glandular tissue in its proximal part; in the experimental groups, the size of the glandular tissue in the bodily part of the stomach decreased as follows, that is, the average size of the glandular tissue in the first group was

3.36x4.25 mm, in the 2nd group 3.14x4.04 mm, 3rd group 3.0x4.0 mm, 4th group 3.1x4.0 mm and 5th group 3.0x3.9 mm organized.

According to the results of the examination, an increase in the distance between the glandular tissues was detected. The distance between the glandular tissue of the gastric cardia increased by 17.2% in group 2, 21.4% in group 3, 27.3% in group 4 and 37.7% in group 5 compared with the control group. The distance between the glandular tissue in the body of the stomach increased by 2.1% in the second group, by 5% in the third, by 8.8% in the fourth and by 25.2% in the fifth group, respectively.

In the pyloric region, the distance between glandular tissues in the control group averaged 25.46 ± 0.59 mm, in the second group the distance between glandular tissues increased to 28.6 ± 0.65 , in the third group 30.3 ± 0.59 , in the fourth group 33.1 ± 0.57 and increased to 41.6 ± 0.93 mm in the fifth and last group (Fig. 2).

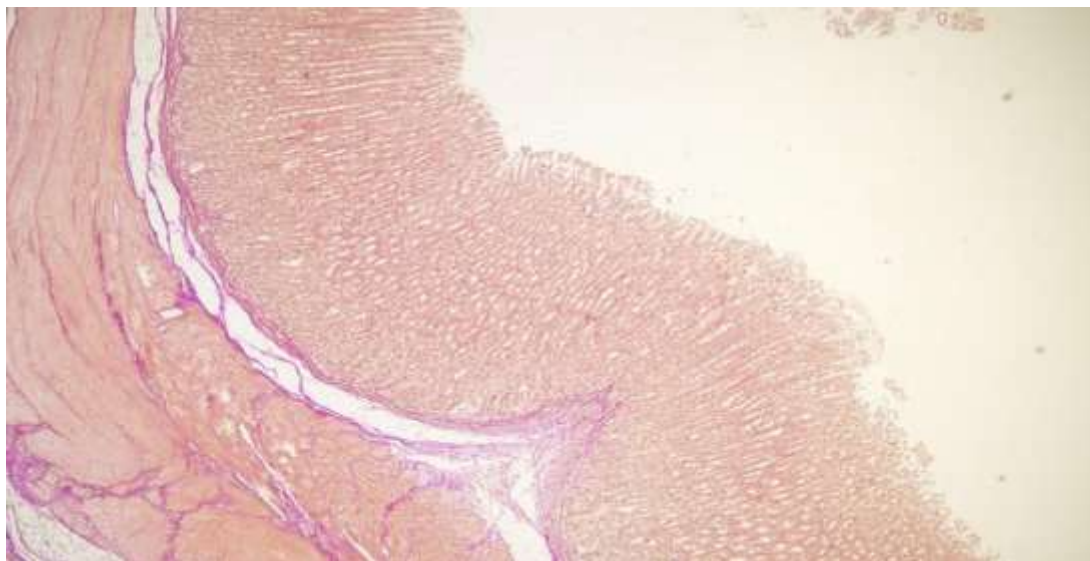


Figure 2. Change in the dynamics of the distance between the tissues of the gastric gland in the control and experimental groups, mm.

According to the identified data, significant changes in the nodes in the glandular tissue of the stomach walls were also revealed. Compared to the number of nodes in the control group, it was found that the number of glandular tissue decreased in number and size. And the distance between the fields is much greater, which was clearly manifested in the glandular tissue of the pyloric section of the stomach. (Fig. 5).

Dimensions of glandular tissue in the body of the stomach: 0.76x0.86 mm in the first group, 0.72x0.83 mm in the second group, 0.62x0.74 mm in the third group, 0.6x0.7 mm in the fourth group, and in the fifth group 0.54x0.68 mm.

The results of the study showed that the gastric gland tissue in the first control group had an oval (61.2%), round (32.9%) and irregular (5.9%) shape. The total area of accumulation of glandular tissue was 5.06% of the total area of the stomach. The accumulation of glandular tissue of the stomach in the second group was oval (59.3%) and round (34.6%), less often rectangular and irregular in shape (6.1%), the total area of the collected lymphoid nodes was 4.03% of the total area stomach. In the third group, the collected lymphoid nodes were oval (50.5%) and round (36.0%), rectangular and irregular (13.5%), the total area of the collected lymphoid nodes was 3.69% of the total area of the stomach. In the fourth group, the collected lymphoid nodes were oval (45.2%) and round (37.5%), rectangular and irregular (17.3%), the total area of the collected lymphoid nodes was 3.28% of the total area of the stomach.

Clusters of gastric lymph nodes in the fifth group had an oval (40.3%), round (40.1%), rectangular and irregular shape (19.6%), the total area of the cluster of lymphoid nodes was 2.85% of the total area of the stomach.

Conclusion

The effect of polypharmacy of anti-inflammatory drugs in the experimental group of rats on the mucous membrane of the stomach wall, submucosa and glandular tissue was corrected in group 5 compared to control group 1. At the same time, in the cardiac section of the wall of the organ of group 5, the height of the mucous layer of the stomach wall is 8.4%, the mucous base - 10.5%, the gland tissue - 37.0%, the mucous layer - 7.60. % at the bottom of the stomach and 17.8% falls on the mucous membrane, and in the gland tissue by 29.7%, the height of the mucous membrane in the body of the organ by 6.52%, the base of the mucous membrane by 16.7% and in the gland tissue by 34.4%, the height of the mucous membrane in the pyloric part of the stomach by 6.2%, in the mucous membrane it was found that the base decreased by 15.9% and in the gland tissue by 32.2%.

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