American Journal of Medicine and Medical Sciences 2024, 14(2): 477-480
DOI: 10.5923/j.ajmms.20241402.64

Disturbances of Morphofunctional Parameters of the Kidney When Exposed to Alcohol

Khamroev I. S., Khamdamov I. B.

Bukhara State Medical Institute named after Abu Ali ibn Sina, Bukhara, Uzbekistan

Abstract Ethanol intoxication leads to a noticeable reactive increase in the morphometric parameters of the capsule, layers and parts of the kidney. The greatest increase is observed at 3 months of age, and the smallest at 12 months of age. The use of polaren syrup as a correction has a positive effect on the morphometric parameters of the kidney, where the indicators are close to the control group.

Keywords Alcohol, Kidneys, Polaren, Kidney parenchyma, Capsule thickness, Cortical substance, Brain matter

1. Introduction

At the present stage, studying the mechanisms of the influence of alcohol on the human body, as well as the likelihood of irreversible changes in the functioning of the human body with regular consumption of large doses of alcoholic beverages is a popular topic of scientific research. In this regard, studying the problem of the influence of alcohol on the human body is very important today. The progress of civilization must be associated with the spiritual self-improvement of people, with the rejection of the absolutization of material values and the revival of harmony between man and nature in the spirit of the best achievements of the people. An imbalance in man's relationship with nature is the root cause of all the diseases of civilization. Modern civilization is characterized by a significant increase in the number of diseases based on the perverted inclinations of the individual. These include tobacco smoking, alcoholism, drug addiction, substance abuse, AIDS, hepatitis and others [1,2]. Recently, according to the opinions of Bobrova N., (2019), Parna K. et al (2018), Razvodovsky Y (2015), the consumption of surrogate drinks has significantly increased, which reduces the quality and life expectancy of users, which subsequently leads to disability and premature death. Around the world, every year, according to the World Health Organization (WHO), about 2.5 million people die due to the consumption of surrogate drinks [1,2]. Research by I.V. Beinikova (2016) found that when poisoned by alcohol surrogates, a significant synchronous change occurs in the blood plasma and erythrocytes of patients and a disruption of one of the links in the pathogenesis of severe tissue and organ disorders occurs, which should be taken into account when developing approaches to the correction of metabolic disorders [1]. In case of sudden death from alcoholic cardiomyopathy, morphological changes in the kidneys are observed, manifested in the form of dystrophy of the tubular epithelium. As a result of damage to the histohematic barrier of the capillaries of the kidneys, discirculatory damage occurs, which aggravates the violation of vascular permeability of the vascular wall [3].

It is worth noting that one of the important problems from a medical and social point of view is alcoholism. The consumption of alcoholic beverages has an unfavorable, negative impact on the health of the population and great material and economic damage. As a result of a high level of alcoholism, there is an increase in the number of patients and the frequency of deaths in people of working age [2].

The results of epidemiological and experimental studies have shown that excessive consumption of ethanol causes more than 60 types of diseases and, depending on the dose, is a factor contributing to the development of a large number of other diseases [1,20]. Patients with poisoning with ethyl alcohol products occupy first place in the structure of acute exogenous poisonings. Ethanol is a universal destroyer that has a detrimental effect on all human organs and systems. Alcoholism affects all systems of the body and, based on this, it can be attributed equally to mental and somatic diseases [1].

According to literature sources, in some cases, in persons who consume alcoholic beverages in moderate quantities, signs of alcoholic damage to internal organs may be detected [2].

The condition of CAI occurs when alcohol is consumed in quantities exceeding the individual capabilities of the body, as well as the dehydrogenase systems of the consumer to oxidize the incoming latter and its metabolites, resulting in the development of alcoholic illness, which can acquire mental or somatic pathology with predominant damage to "target organs" [1,20].

Received: Feb. 2, 2024; Accepted: Feb. 19, 2024; Published: Feb. 22, 2024
Published online at http://journal.sapub.org/ajmms

According to the results of a study by Paukova V.S. and Erokhin Yu.A., (2014), in patients with alcoholic cirrhosis, the development of hepatorenal syndrome is noted, and degeneration of the tubular epithelium occurs in the renal structures [2,16,17,18,19]. Alcoholic nephropathy is caused by the toxic effects of ethanol associated with alcoholic excess, which is combined with acute alcoholic hepatitis. In this case, we can talk about alcoholic glomerulonephritis, which marks a decrease in the area of the glomeruli by 3 times compared to the norm [3,9,10,11,12,13,14,15].

The consequences of acute and chronic alcohol intoxication on parenchymal organs are described in detail in scientific literature. The pathogenetic mechanisms of kidney damage in AAI and CAI have not yet been fully studied, and the current points of view are quite controversial. It should be noted that there are few scientific studies on the toxic effects of alcoholic beverages on the structure of the kidneys, and the conclusions presented in them are contradictory [1,2,3,4,5,6,7,8].

Changes in internal organs observed during alcohol intoxication are practically irreversible, since disruption of the body's compensatory capabilities is almost inevitable, as a result of the constant intake of alcohol at a relatively low capacity of deeply and irreversibly affected internal organs.

Currently, many authors are considering the issues of morphogenetic changes in internal organs during alcoholic injuries. In addition, etiological and pathogenetic mechanisms, as well as morphological features of alcoholic hepatopathy and alcoholic nephropathy, were formulated. The details of the morphogenesis of alcoholic damage to internal organs are widely discussed in the scientific literature. At the same time, the microanatomical and immunohistochemical cellular structures of the kidneys when exposed to ethanol in the experiment remain insufficiently studied.

Thus, our analysis of data from domestic and foreign literature shows that there are no studies on the complex morphofunctional state of the kidneys during alcohol intoxication. This determines the need for further research, for which it is advisable to use a combination of pathomorphological, morphometric and histochemical research methods.

2. Purpose of the Study

To study the effect of ethyl alcohol on the morphometric parameters of the kidneys of rats and to substantiate the possibility of the protective effect of polaren.

3. Materials and Methods

The experiment was carried out in the autumn-winter period of 2022-2023. at the Department of Anatomy, Clinical Anatomy (OHTA) BukhMI on outbred white rats. These laboratory animals were subjected to a mandatory veterinary examination to identify existing diseases, assess their condition and age.

In the experimental study, 128 white laboratory rats (females, males) were used at newborn, 3, 6 and 12 months of age based on the division of age periods to identify the dynamics of changes in the morphometric parameters of the structural elements of the rat kidney in postnatal development (Geliashvili O. A., 2018, Zapadnyuk I.P., 2021).

1 month sexually mature infantile, the period when the appearance of secondary sexual characteristics is observed. 3 months sexually mature juvenile, have the ability to reproduce. 6 month reproductive young animal, period of active reproduction. 12 months reproductive maturity, considered a period of decline.

4. Results and Discussions

The kidneys of rats are covered with a dense connective tissue capsule, consisting of bundles of collagen fibers, elastic and reticular fibers, which form the outer and inner layers.

It has been studied that the thickness of the capsule is not the same throughout the entire organ. In newborn rat pups, the thickness of the kidney capsule in the upper pole is on average 5.7±0.54 µm, at the renal hilum - 8.8±0.68 µm, and in the lower pole - 6.0±0.55 µm. In 1 month old rats, the thickness of the kidney capsule in the upper pole is on average 6.8±0.52 µm, at the renal hilum - 9.3±0.74 µm, and in the lower pole - 6.6±0.54 µm.

The parenchyma of the rat kidney in the frontal section is represented by the superficially located renal cortex and the medulla lying next to it. In newborn rat pups, the thickness of the cortical layer at the levels of the upper pole of the kidneys averages 242.1 ± 10.8 µm, at the hilum - 247.0 ± 11.4 µm, and in the lower pole - 150.8 ± 3.82 µm.

At 3 months of age in rats, the cortical layer in the upper pole of the kidneys has an average thickness of 263.5 ± 11.6 µm, at the renal hilum - 312.0 ± 9.21 µm, in the lower pole - 183.1 ± 3.97 µm. In 6-month old rats, the cortical layer in the upper pole of the kidneys has an average thickness of 280.4±10.9 µm, at the renal hilum - 331.8±5.93 µm, in the lower pole - 213.2±4, 08 microns. By the age of 12 months in rats, the thickness of the cortical layer is not the same throughout the kidneys, in the upper pole on average - 316.0 ± 11.8 µm, near the renal hilum - 406.8 ± 9.45 µm, and in the lower pole - 277, 5±5.32 µm.

In newborn rat pups, the thickness of the medulla in the upper pole of the kidneys averages 257.5±9.7 µm, at the hilum levels - 296.8±7.34 µm, and in the lower pole - 168.4±3.7 µm.

By 1 month of age in rats, the thickness of the medulla in the upper pole of the kidneys averages 278.3±10.9 µm, at the hilum levels - 311.6±9.5 µm, and in the lower pole - 199.5±4.26 µm.

At 3 months of age, the thickness of the medulla is on average 295.7±13.1 µm, at the renal hilum - 352.1±8.3 µm, and in the lower pole - 219.8±5.07 µm. By 6 months of age, in the upper pole of the kidneys the thickness of the medulla averages -307.2±10.5 µm, at the levels of the renal hilum - 356.4±11.9 µm, and in the lower pole -231.2±3.9 microns. In 12-month-old rats, the thickness of the medulla at the levels of the upper pole of the kidneys reaches an average of 319.8 ± 15.8 µm, at the hilum of the kidneys - 368.4 ± 15.2 µm, at the levels of the lower pole the thickness reaches an average of 244.1±3.61 µm.

Thus, from the neonatal period to 12 months of age, the growth rate of the thickness of the capsule in the upper pole is 1.6, at the gate 1.3, in the lower pole 1.4 times. The thickness of the cortex in the upper pole of the kidneys is 1.3 times, at the hilum 1.6 times, and in the lower pole 1.8 times. The growth rate of the medulla in the upper pole and the renal hilum is 1.2 times, in the lower pole 1.4 times.

As a result, the highest rate of increase in the thickness of the renal capsule in the upper pole was observed at 3 months of age (13.8%), at the renal hilum (14.2%) and in the lower pole (8.3%) at 1 month of age. The rate of increase in the thickness of the renal cortex in the upper pole of the kidneys is (2.3%) at the renal hilum (11.1%) in the lower pole (12.5%). In the renal medulla, the highest growth rate was observed at the renal hilum (11.5%) in the upper (5.9%) and lower pole (9.2%) at 3 months of age.

The renal corpuscles consist of a vascular glomerulus, enclosed between the afferent and efferent arterioles, and its capsule. In newborn rats at the levels of the apical part of the nephron, the size of the renal corpuscle is on average - 26.0 ± 0.63 µm, the thickness of the Shumlyansky-Bowman capsule averaged -7.1 ± 0.32 µm, in 1-month-old rats the diameter of the glomerulus is 33.0 ±0.95 µm, the thickness of the glomerular capsule reaches an average of 9.0±0.32 µm. At 3 months of life in rats at the levels of the apical part of the nephron, the size of the renal corpuscle was on average 41.3±0.71 µm, the thickness of the Shumlyansky-Bowman capsule was on average -11.0±0.71 µm. In 6-month-old rats, the size of the renal corpuscle at the levels of the apical part of the nephron is on average 43.9±1.0 µm, the thickness of the Shumlyansky-Bowman capsule was -14.6±0.67 µm. At 12 months of age in rats at the levels of the apical part of the nephron, the size of the renal corpuscle reaches an average of 47.0 ± 0.36 µm, the thickness of the Shumlyansky-Bowman capsule averaged 16.1 ± 0.71 µm.

The highest rate of increase in the diameter of the glomerulus by 3 months of age is 21.3% and the thickness of the Shumlyansky-Bowman capsule by 6 months of age by 24.6%.

The growth rate of the diameter of the glomerulus and Shumlyansky-Bowman capsule was revealed in late postnatal ontogenesis. In our opinion, the greatest increase in the Shumlyansky-Bowman capsule and the lumen of the primary and secondary convoluted tubules is associated with the transition of rats to sexual maturity.

5. Conclusions

Ethanol intoxication leads to a noticeable reactive increase in the morphometric parameters of the capsule, layers and parts of the kidney. The greatest increase is observed at 3 months of age, and the smallest at 12 months of age. The use of polaren syrup as a correction has a positive effect on the morphometric parameters of the kidney, where the indicators are close to the control group.

REFERENCES

[1] Antonova V. M. et al. Morphofunctional state of the kidneys at the stage of structural disorders of light desynchronosis in an experiment // Modern problems of science and education. – 2017. – No. 1. P.62.

[2] Kurzin L. M. et al. Morphological assessment of structural changes in human kidneys in the age aspect // Modern problems of science and education. – 2012. – No. 2. – P. 95.

[3] Mikhalchuk E.Ch., Matsyuk Y.R. Structural and cytochemical features of developing kidneys of rat pups under antenatal exposure to incorporated radionuclides. VSMU Bulletin. - 2005 - Volume 4. No. 1, p. 14-19.

[4] Khamdamov I.B. Morphofunctional features of the abdominal press in women of reproductive age // New day in medicine. Bukhara, 2022. -№3(41) - P. 223-227.

[5] Khamdamova M.T. Ultrasound features of three-dimensional echography in assessing the condition of the endometrium and uterine cavity in women of the first period of middle age using intrauterine contraceptives // Biology va tibbyot muammolari. - Samarkand, 2020. - No. 2 (118). - P. 127-131.

[6] Khamdamova M. T. Ultrasound assessment of changes in the endometrium of the uterus in women of the first and second period of middle age when using intrauterine and oral contraceptives // Biomedicine va amaliyot journals. – Tashkent, 2020. - No. 2. - Part 8. - P.79-85.

[7] Khamdamova M. T. Anthropometric characteristics of the physical status of women in the first and second period of middle age // A new day in medicine. Tashkent, 2020. - № 1 (29). - P.98-100.

[8] Khamdamova M.T. Age-related and individual variability of the shape and size of the uterus according to morphological and ultrasound studies // News of dermatovenereology and reproductive health. - Tashkent, 2020. - No. 1-2 (88-80). - P.49-52.

[9] Khamdamova M. T. Anthropometric characteristics of the physical status of women in the first and second period of middle age // A new day in medicine. Bukhara, 2020. - № 1 (29). - C. 98-100.

[10] Khamdamova M.T. Age-related and individual variability of the shape and size of the uterus according to morphological and ultrasound studies // News of dermatovenereology and reproductive health. - Tashkent, 2020. - No. 1-2 (88-80). - P. 49-52.

[11] Khamdamova M.T. Ultrasound features of three-dimensional echography in assessing the condition of the endometrium and uterine cavity in women of the first period of middle age using intrauterine contraceptives // Biology va tibbyot muammolari. - Samarkand, 2020. - No. 2 (118). - P. 127-131.

[12] .Khamdamova M. T. Ultrasound assessment of changes in the endometrium of the uterus in women of the first and second period of middle age when using intrauterine and oral contraceptives // Biomedicine va amaliyot journals. – Tashkent, 2020. - No. 2. - Part 8. - P.79-85.

[13] Khamdamova M.T. Features of ultrasound parameters of the uterus in women of the first and second period of middle age using injection contraceptives // New day in medicine. Bukhara, 2020. - No. 2/1 (29/1). - P. 154-156.

[14] Khamdamova M.T. Features of ultrasound images of the uterus and ovaries in women of the second period of middle age using combined oral contraceptives // New day in medicine. Bukhara, 2020. - No. 2 (30). - P. 258-261.

[15] Khamdamova M.T. Individual variability of the uterus and ovaries in women who use and do not use various types of contraceptives // New day in medicine. Bukhara, 2020. - No. 3 (31). - pp. 519-526.

[16] Khamdamova M. T. Echographic features variability in the size and shape of the uterus and ovaries in women of the second period of adulthood using various contraceptives // Asian Journal of Multidimensional Research - 2020. – N9 (5). - P. 259-263.

[17] Khamdamova M. T. Somatometric characteristics of women of the first and second period of adulthood using different contraceptives with different body types // The american journal of medical sciences and pharmaceutical research - 2020. – N8 (2). - P.69-76.

[18] Khamdamova M.T., Zhaloldinova M.M., Khamdamov I.B. The state of nitric oxide in blood serum in patients with cutaneous leishmaniasis // New day in medicine. Bukhara, 2023. - No. 5 (55). - P. 638-643.

[19] Khamdamova M.T., Zhaloldinova M.M., Khamdamov I.B. The value of ceruloplasmin and copper in blood serum in women wearing copper-containing intrauterine device // New day in medicine. Bukhara, 2023. - No. 6 (56). - pp. 2-7.

[20] Khamdamova M. T. Bleeding when wearing intrauterine contraceptives and their relationship with the nitric oxide system // American journal of pediatric medicine and health sciences Volume 01, Issue 07, 2023 ISSN (E): 2993-2149. P. 58-62.