Alcohol and injuries: causes and consequences

KA Shapovalov1*, LA Shapovalova2

Abstract
Introduction
The consumption of alcohol can cause serious injuries that often lead to disability and death of the population. The systematic effects of alcohol on muscle and bone tissue are major. Marked clinical aspects of treatment of injuries sustained the influence of alcohol. Modern scientific research in the field of injury prevention related to alcohol intoxication, are directed from one side to the study of pathological mechanisms occurring at the ultrastructural cellular level in muscle and bone tissue. Their clinical interpretation is developing towards clarifying diagnosis of major group injuries received in alcohol intoxication: multiple injuries of the musculoskeletal system, traumatic brain injury, frostbite and burns. On the other hand, the social and medical research aimed at identifying the high risk of injury in alcoholic intoxication, the development of effective measures to combat domestic, street, transport and road trauma.

Conclusion
Modern scientific research in the field of injury prevention related to alcohol intoxication is directed from one side to the study of pathological mechanisms occurring at the ultrastructural cellular level in muscle and bone tissue. Their clinical interpretation is developing towards clarifying diagnosis of major group injuries received in alcohol intoxication: multiple injuries of the musculoskeletal system, head injury, frostbite and burns. On the other hand, the social and medical research aimed at identifying the high risk of injury in alcoholic intoxication, the development of effective measures to combat domestic, street, transport and road trauma.

Introduction
One-time use of alcohol can cause serious injury. Systematic effect of ethanol on the human body manifests in pathological changes in muscle and bone tissues, which have a major impact on the synchronous operation of the musculoskeletal system. Production conditions in different industries also affect the increased consumption of alcoholic beverages in separate group’s contingent of industrial workers. Non-productive types of injuries are significantly heavier in concomitant alcohol. Diagnosis and treatment in persons, who received injuries in the state of alcohol intoxication, are complicated and require careful clinical examination of the patient1–3. This review discusses the causes and consequences of alcohol and injuries.

Discussion
The authors have referenced some of their own studies in this review. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

Effect of ethanol on muscle tissue
It shows specific signs of atrophy of muscle fibres. Alcohol induces the lesion myocytes, reduced glycogen content, and the appearance of fatty infiltration of the atomised, local vascular endothelial disorders and decreased enzyme activity of anaerobic glycolysis. The changes were more pronounced in the muscles of the lower extremities. Under the action of ethanol in skeletal muscle reduced the content of DNA and protein. As a protoplasmic poison, alcohol breaks all links in metabolism of muscle and bone tissue, and separates oxidative fosfolirirovanie in mitochondria. Simultaneously observed polymorphism of mitochondria is accompanied by the destruction of their cristae and outer membranes. Degenerative changes are also recorded in myofibrils, with marked inhibition of anaerobic processes. Degenerative changes in the muscle fibres pass to their destruction. The average diameter of muscle fibres under the influence of ethanol is 80.0% of their diameter in the control groups4,5. In patients with alcoholism, alcoholic myopathy may be accompanied by pain, myoglobinuria, muscle weakness and degeneration of muscle fibres and fibrosis. Chronic alcoholic myopathy is a sluggish syndrome with characteristic muscle weakness and atrophy. A major role in its development is ethanol, its metabolites, micronutrient deficiencies and other factors6.

*Corresponding author
Email: stampdu@rambler.ru

1 Department of Standardization and Quality Assessment of Medical Care of the State Budget Agency of Health of the Republic of Komi 'Republican Medical Information and Analytical Center', Syktyvkar, Komi Republic, Russia
2 State Autonomous Agency of Health of the Republic of Komi ‘Consultative Diagnostic Center of Republic of Komi’, Syktyvkar, Komi Republic, Russia

Bony skeleton
A newborn offspring of most experimental animals receiving ethanol during pregnancy did not have centres of ossification of the skull, sternum, spine and in the limbs—they have a much smaller size than foetuses of the control group. Alcohol triggers dysfunction with subsequent reduction in osteoblast activity, resulting in a very low rate of bone tumours. Direct toxic effect of ethanol on bone cells violates osteogenesis.

Administration of ethanol during the critical development of the neural tube to form the foetus in mice found that 30.0% of live embryos revealed exencephaly, microcephaly, mandibular and maxillar hypoplasia, and finger abnormalities of the limbs. Violation of morfogenez of skull accompanied by agenesis and fusion of vertebral bodies and arches, scoliosis, the appearance of additional edges of splitting or merging. Skeletal dysplasia is described in patients with signs of foetal alcohol syndrome. In ethanol-treated animals compared with controls was less than the length of the tibia (5.1%), reduced the average rate of endostnoy (4.3 times) and periostnoy (7.7%) bone. There is a decrease in the average mineralisation rate (27.0%) and a significant increase in the periostium of medium thickness of periost (by 49.0%). It was found dependence of the intensity of skeletal ossification in foetal development of tolerance to ethanol in rats. Morphological study of biopsies in people who long to drink alcohol show; the number of osteoid tissue was significantly higher than the norm, especially in alcoholic women. The circulating concentrations of alcohol do not have adverse effects on the liver and testes have a direct toxic effect on bone growth. Disruption of homeostasis of bone tissue in chronic alcoholism is the cause of it injuries, leading to spontaneous fractures, due to the development of osteomalacia and osteoporosis. Osteomalacia usually develops due to abnormal metabolism of vitamin D, as well as, possibly due to disruption of production of enzymes, which leads to a secondary parathyroid hyperfunction. Risk factor for osteoporosis is the combined use of alcohol with smoking, resulting in a decrease in trabecular bone volume, trabecular thickness average and the average thickness of the bone wall. Women who smoke heavily, especially over 60 years old and suffer from alcoholism, often have deformation of the vertebrae and symptoms of osteoporosis.

Long-term use of alcohol leads to a proportional reduction in vertebral cancellous bone, which is one of the main causes in this cohort of patients with compression fractures. Bone changes in alcoholic patients are explained by two mechanisms: the loss of the structural integrity of bone and impaired lipid metabolism. Bone disorders manifest osteoporosis, aseptic necrosis of the bone and fat embolism. Minor injuries are fractures of the hip, wrist and spine. X-rays of bones in chronic alcoholics reveals pockets of avascular necrosis, dissecting degenerative disc disease, osteoarthritis and periostitis. This often affects the hip and shoulder joints. Changes in the lower extremities are both upper and sided. In the hip occurs acetabular protrusion, in the shoulder bones—osteoporosis spots and primary bone infarction, and localised myositis ossificans. Restructuring the bones of the cranial vault covers all sectors, but mainly the internal plate, that showed a profound shift in the direction of reducing the volume of the brain, venous stasis and premature formation of sclerotic processes.

Rib fractures in patients with alcoholism occur 15–16 times more frequently than patients who do not consume alcohol. Profound changes in bone and muscle tissue is the result due to the action of chronic alcohol intoxication which causes degeneration of tissues. For the injured, intoxicated characteristics change in water and electrolyte balance, blood counts and normal insulin response to a traumatic hyperglycaemia, hypothermic state, and are more acute during the delirium and reduced reactivity to infection. Saving the values of weight has a positive effect on loss of bone mass and reduces the risk of fractures even with alcoholism. Changes in the musculoskeletal system in people who use alcohol, enhances the injury and leads to more serious damage.
malignant disease, the combination of it with severe mental disorders. The diagnosis of alcoholism in a floating structure is established as 16.0% higher than men of the territorial population. Alcohol most often leads to hospitalisation in surgical departments. Mortality among sailors due to alcohol abuse is 5 times greater than in the territorial population. The entry of people in a particular group quickly equals the amount of alcohol consumed within the majority of workers. The most common cause of alcohol consumption in the workplace is the desire to maintain friendly relations with colleagues (75.7%). Other motives are also the desire to relieve stress and improve performance. Industrial consumption of alcohol affects educational qualifications and skills of workers and employees. Among the workers, the number of people binge drinking reaches 50.0%.

In the structure of non-industrial injury, proportion of damage associated with alcohol intoxication reaches 32.0%. Their account is complicated due to the fact that more than 20.0% of victims to seek treatment in the second and even the third day after injury, resulting in lengthening the period of treatment, and to establish the fact of intoxication is extremely difficult. Workers in agriculture alcohol intoxication was the cause of street injury in 15.1% of patients; home—17.6% and transport—21.3%. On materials in the emergency station, the most common cause of injury is the referral trauma inflicted by other persons in a fight, as a result of domestic incidents, and other anti-social activities (42.0%), a fall causing injury in 34.8% of patients, unknown causes (complete loss of memory or deep drunkenness)—7.7%, strike from a hard object—1.8%; animal bites (all provoked)—1.8% other causes—1.8%. Treatment of patients with injuries of alcohol most often occurs between 14.30 and 8.00, a third of patients are admitted to hospital after more than 9 h after the accident. In the analysis of fatal home injuries PS marine and fishing fleets found that 94.0% of victims were men and 6.0% were women, mostly aged between 25 and 35 years. The most common reason for the occurrence of these injuries was bullying and fighting, preceded by drinking and quarrels. In 70.0% of cases and 82.0% of the victims, the attackers at the time of damage were due to the influence of alcohol.

High frequency of alcohol was found in victims of road traffic accidents: 29.5–48.7% of their blood measured ethanol. It is set in 21.0–77.0% of road fatalities exceeding the controls by 3–10 times. According to the forensic medical examination of those killed in car accidents by the influence of alcohol was 44.4%, as a result of railway injuries—60.4%, motor traumas—58.8% and of tractor—78.9%. Risk factor for falling in a road accident is the early start of alcohol consumption combined with aggressiveness. For this reason, men in rural areas dying from injuries is significantly more likely (1.6 times) than in women, and in the cities of this difference is even higher (2.1 times). If we take the fatal accident rate in alcoholic intoxication on transport for 100, then the construction workers it is 62, in agriculture - 56, in the industry - 53, with employees - 19 students - 4. In this case, 77.3% are workers of different sectors of the economy, and 14.2% pensioners. The concentration of ethanol in the blood is 2.5–3.5% and mortality rate is 18.8%, more common in complicated fractures, lacerations, and fractures of the skull base. Often traumatised state complicates delirium tremens.

Alcohol intoxication of drivers caught in a road traffic accident occurs in 5.9–38.2% and pedestrians, 10.2–33.0%. Alcohol, even in small quantities, has adverse effects, breaking skills required for safe driving. In a state of intoxication at the time of road traffic injuries was 38.7% of total deaths and 6.6% for the number recovered.

Among the residents of the regional centre of industrial alcohol intoxication was observed in 19.3% of the injured (including 24.7% men; 8.8% women). The structure of the patients was 74.0% of workers and 11.2% employees. The two new isolated social groups are small in number, but with a high percentage of alcohol in trauma: (1) not working women of working age, defined themselves as housewives (14.9% alcohol) and (2) individuals with uncertain social status, temporary unemployed (29.0%).

Injuries resulting from acts of hooliganism are heavier than the average household and street damage: hospitalisation was required in 47.6% of cases and in 0.8% death was in place. The number and duration of hospitalisation is related to the frequency of accidents. Patients with chronic alcoholism, drug treatment consists on the account, marked by repeated injury. Among them, patients with one injury were 54.9%, two—21.4% and 14.2% for three or four 4.2%, five—1.7%, seven—1.5%, eight—0.2%, nine—0.4%. Patients who drink alcohol heavily and risk death from an accident are 2.8–8 times higher than that of the non-drinking population, including a fall in 16 times, 10 times in burns or fire, 2–3 times in work-related injuries. According to world statistics, more than 25.0% of deaths are due to drowning associated with alcohol.

Clinical aspects of injuries in alcohol intoxication

The difficulties in diagnosing the dominant focus and choice of treatment of fractures of the musculoskeletal system in people with damage to the influence of alcohol is (1) glossing clinical manifestations of ‘acute
abdomen,’ (2) evacuation of the hospital in a state of shock, not diagnosed, and (3) ‘pseudo peritoneal’ syndrome caused extensive bruising arising fractures of the lumbosacral spine and pelvis that simulate damage to the abdominal cavity.

In the treatment of combined injuries from the influence of alcohol, 30.0% of patients experienced complications, delirium tremens, and acute liver and renal failure, and the development of heart failure in the background of alcoholic myocardiodystrophy. In the case of delirium tremens in the duration of hospital treatment increased by an average of 12 days, and complications were observed in 49.0% of patients.

Drunkenness is set in every third patient, who was in hospital for the various injuries of the musculoskeletal system. Wounds, bruises, abrasions, bruising of soft tissues are installed in 54.9% of patients, of whom 7.0% had multiple bruises and wounds, and wounds with injuries of large vessels and tendons. Surgical treatment reaches 80.0% of all trauma care in a specialised department to provide trauma care for victims of alcohol.

The average duration of hospitalisation of patients with injuries sustained in the influence of alcohol is 19.0 ± 0.2 days, the duration of treatment for fractures of the lower extremities 33.6 ± 0.7; burns, 29.2 ± 2.2; intracranial injuries, 14.8 ± 0.3. Duration of temporary disability to the effects of trauma in chronic alcoholics is 3.2 times higher than that of the control group, and with occupational injuries is 4.1 times. The frequency of hospital admissions of alcohol in men and women are strongly affected by alcoholic traditions in territorial population.

With the combination of brain damage from being drunk, it becomes more difficult for diagnosis of neurological manifestations, traumatic disease is more severe and is characterised by severe cerebral disorders that often develop psychosomatic complications in the post-traumatic period. Duration of impaired consciousness in mild traumatic brain injury in alcoholic intoxication varies from a few minutes to 6 h, and its severity from mild to stupor.

In patients with trauma of the spine and spinal cord injury in alcohol intoxication, the degree of trauma is expressed to a greater degree, and neurological and functional outcomes are worse than sober patients. With the high level of alcohol consumption (207 ml per week) for men and women increases the risk of hip fracture (relative risk is 1.3 and 1.5), which was significantly increased to moderate (59–177 ml.) and strong (more than 207 ml per week.) drinkers aged less than 65 years.

In patients with brush cut wounds with damage to tendons and nerves, dislocations and fracture-dislocations that are delivered to the hospital in an intoxicated state, after treatment are associated with a large number of strains and finger contractions, 16.0% of patients had to have repeated surgeries to restore hand function.

Cold injury in 90.0% of patients with frostbite occurred in alcohol intoxication. Treatment of frostbite is a serious obstacle in the form of persistent venous disorders occurring in super cooled limbs in the late period. There is a marked positive effect of ethanol after intravenous administration in experimental burns associated with its vasodilating action. However, in patients with moderate burns and deep thermal damage area of 20.0% of the body surface and the index of the severity of 31–60% in alcohol exacerbates the acute period of burn disease. When comparing patients with haematological parameters, injuries sustained in alcoholic intoxication revealed a high difference in terms of prothrombin time and haematocrit.

The effectiveness of government injunctions against alcoholism and drunkenness is not effective enough. In the first year of the ‘anti-alcohol campaign in 1985’ in the Soviet Union in June–October 1985, compared with 1984, the percentage of ‘alcohol trauma’ among men decreased by 43.6%, and 21.3% among women, including 56.0% of students, 52.2% workers, 17.9% employees and 9.0% unemployed. This is primarily due to the mechanism of the impact of socio-medical activities, namely the introduction of strict discipline, a medical examination of workers before going to work. The number of hospitalised victims of alcohol intoxication decreased by 43.0%, and 60.0% in deaths. However, retrospective analysis showed that short-term reduction in the number of injuries sustained in a drunken state, gave way to significant growth, use of surrogate alcohol fluids.

**Conclusion**

Modern scientific research in the field of injury prevention related to alcohol intoxication, are directed from one side to the study of pathological mechanisms occurring at the ultrastructural cellular level in muscle and bone tissue. Their clinical interpretation is developing towards clarifying diagnosis of major group injuries received in alcohol intoxication: multiple injuries of the musculoskeletal system, head injury, frostbite and burns. On the other hand, the social and medical research aimed at identifying the high risk of injury in alcoholic intoxication, the development of effective measures to combat domestic, street, transport and road trauma, which can significantly reduce or even eliminate accidents with the influence of alcohol, to reduce all types of non-production of alcoholic injury of different groups.
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Review


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