



The importance of the quality of power supply of treating fractures of the bones of the leg according to the ilizarov method

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The importance of the quality of power supply of treating fractures of the bones of the leg according to the ilizarov method

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Annotation

The aim of the work was to analyze the impact of the deterioration in the quality of nutrition of the population during the economic crisis that occurred after 1990 on the treatment of bone fractures.

The technique: In the period from 1970 to 2008, the impact of the deterioration in the nutrition quality of the population in particular of the Kurgan Region of Russia, expressed in preserving the caloric component due to an increase in the consumption of vegetables and bread and a decrease in the consumption of meat products by more than 35%, was analyzed. bone fragments in Ilizarov treatment in 1923 patients with closed diaphyseal fractures of the bones of the leg.

Results: The increase in the periods of fixation of bone fragments began in 1976 among a group of socially most vulnerable patients of retirement age, then among people over 50, among students, and after 1986 it became apparent in groups of patients of working age and reached by 2000 38% with helical and 111% ($p \leq 0,001$) for comminuted fractures.

Keywords: Fractures of shin bones, Ilizarov method, patient age, meat consumption

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To assess the effect of protein nutritional value as the most important factor influencing the reactivity of the human body, it is important to conduct research in the conditions of preservation of the caloric component of food consumed and the lack of long-term adaptation to a reduced level of protein intake. This situation has developed in the regions of Russia during the economic crisis of 1990-2000 [1]. The question of the effect of protein and caloric

nutritional deficiencies on the dynamics of fusion of damaged bone is not as simple as it might seem in the first approximation, since bone fractures grow together even in conditions of complete starvation [2]. Apparently, the organism in the course of previous life activity creates an emergency supply of necessary plastic materials, sufficient for fusion of an uncomplicated fracture. And only with chronic protein deficiency, bone fusion slows down [3,4]. In this case, the mechanical strength of the bone regenerate in experimental animals is



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insufficient. The protein deficiency of the organism can be judged on the basis of biochemical studies of the content of albumin and globulins in the blood plasma, as well as by the level of hemoglobin. It turned out that the hemoglobin content in the blood is interconnected with the results of treatment of trauma patients [5]. The lack of protein nutrition is unfavorable for bone consolidation [6], especially during long-term healing of bones in the hip joint [7].

With the elimination of the harmful effects of chronic protein deficiency, the consolidation of fractures of the long bones of the limbs is accelerated [8]. There is a large literature describing the importance of nutritional supplements and vitamin D3 for bone consolidation [9], especially in the elderly [10], in particular in lean elderly women with hip fractures [11]. Describes the reduction in the loss of bone substance in the proximal with fresh injuries [12]. The effectiveness of treatment depends on the quality and relevance of nutritional supplements to the needs of the body after a fracture [13]. Consequently, for reparative regeneration, the quality of life in the period of time (about 3 years) preceding the injury is of greater importance [2,3,6,8]. In practice, a traumatologist sometimes has to answer the question about the effect of alcohol consumption on fracture healing. In this matter, the opinion of researchers is controversial, since age groups with full and incomplete nutrition were not distinguished. Experimental conditions in rats have been proven, with chronic and excessive alcohol consumption, the reparative process is suppressed in the damaged bone [14,15]. The aim of the study was to identify the deterioration of the nutrition quality of the population of the Kurgan region of Russia for the duration of the fixation period of bone fragments in the standardized treatment of patients according to the Ilizarov method.

Material and Research Methods

The quality of nutrition was evaluated by the caloric component, which was close to the hygienic rate and the consumption of meat per capita per year [1]. This criterion included meat from cattle, pigs, poultry, and meat products. A selective test of the quality of patient nutrition at the clinic showed compliance with hygienic standards. Patients were treated in the Department of Traumatology No. 1 of the Laboratory of Acute Injury of the Russian Scientific Center Restorative Traumatology and Orthopedics named after Acad. G.A. Ilizarov using a spoke apparatus for external fixation of bone fragments. The archive material was analyzed - 512 case histories of patients with closed helical and comminuted fractures of the bones of the leg, who were treated at the clinic of the Scientific Center from 1970 to 2008. In addition, 641 patients were examined comprehensively who were treated at the RSC "VTO" for a closed diaphyseal fracture of the bones of the leg. All patients examined in history did not have concomitant chronic somatic diseases. As a control group, 208 healthy people were examined. The study of the condition of patients was carried out after a period of adaptation within 5-7 days after surgery with an interval of 14 days. The frequency of examinations averaged 3-4 during the period of treatment. Statistical processing of the results was carried out using methods of variation statistics with the definition of parametric t - Student's t-test, correlation and regression analyzes. Standard statistical programs used in the Microsoft Excel 2010 editor were used. The paper presents the arithmetic mean M, the error of the mean - m.

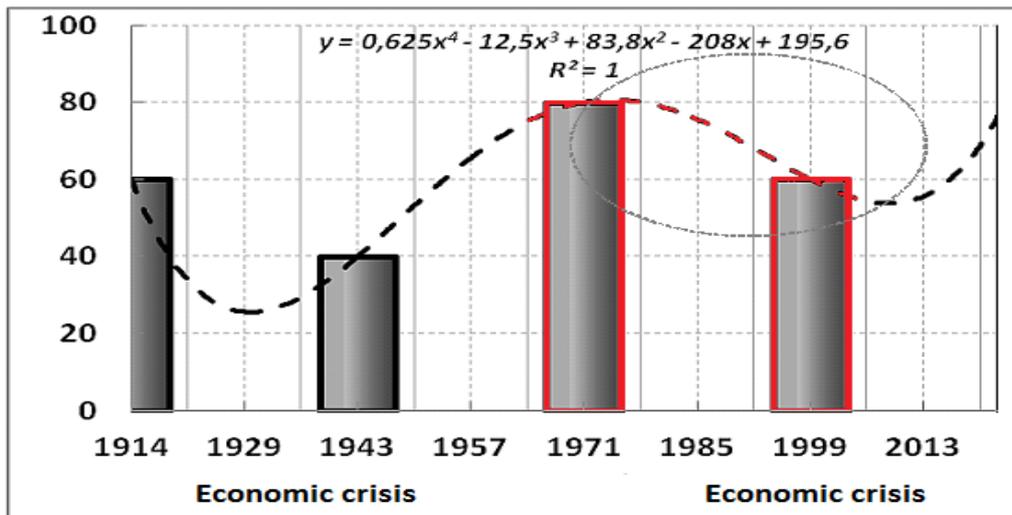
Results of Research

At the beginning of the last century, economist N. Kondratiev [17] discovered the cycles of development of the world economy repeated every 50 years. We are witnessing the finale of the 5th cycle (Figure 1). With the mathematical

approximation of the reference points of this cycle by a regression equation of level 4 in the analyzed period, a phase of reduction of

economic indicators of the Kurgan region is revealed.

Figure 1: Diagram of the dynamics of large cycles of the socio-economic situation.



More than 50 years ago, a new Ilizarov osteosynthesis technology was introduced into clinical practice, which made it possible to significantly reduce the time and improve patient outcomes. The Ilizarov method has gained wide international recognition. During the period of triumphal introduction of a new treatment method, clinical success largely allowed ignoring the role of socio-economic factors in determining the rates of reparative regeneration. Indeed, the relatively severe closed comminuted fractures grew together in a time comparable to the duration of treatment of patients with closed helical fractures. In terms of applying the Ilizarov treatment method, the age of patients also did not have a significant effect on the timing of the fracture of a broken bone, which allowed the method to be used in pediatric and geriatric practice [18]. However, already after 1985, a gradual increase in the duration of treatment of patients became apparent, and the more, the more severe the injury, the greater the displacement of bone fragments and the age of the patients (Figure 2). When all the conditions of the osteosynthesis

technology are fulfilled, such an increase in the duration of treatment required an explanation. The versions put forward about the overwhelming nature of the increase in the terms of treatment of patients in previous years did not confirm or could not have a decisive influence on the revealed tendency.

The increase in the terms of inpatient treatment of patients was contrary to the principles of insurance medicine, aimed at reducing costs in treating patients. In the last 10 years, the nutritional quality of patients gradually recovered, which made it possible to successfully treat patients with closed fractures of the leg bones in an outpatient setting, when the development of periosteal callus became an additional fixing point. The identification of facts of deterioration in the quality of life of the population of Russia, and especially of the Kurgan region, an increase in the morbidity and mortality of the population, a decrease in the birth rate, a slowdown in the growth and development of children was the reason for a more detailed assessment of the dynamics of treatment periods for patients with closed

fractures of the leg bones. If we analyze the dynamics of profit and loss of the population of the Kurgan region, reflecting the change in the socio-economic conditions of the population, as well as the dynamics of protein intake of animal origin, we observe a decrease in the corresponding graphs. Thus, the level of consumption of meat by the inhabitants of the

region decreased from an average of 69 to 45 kg per year per person (Figure 3). The average per capita cash income in the Kurgan Region was the lowest in the Urals Federal District, and the families' diet was mainly carbohydrate-containing foods: potatoes, bread products and confectionery [19].

Figure 2: Dynamics of the duration of the fixation period in the treatment of patients with comminuted and helical fractures of the bones of the leg.

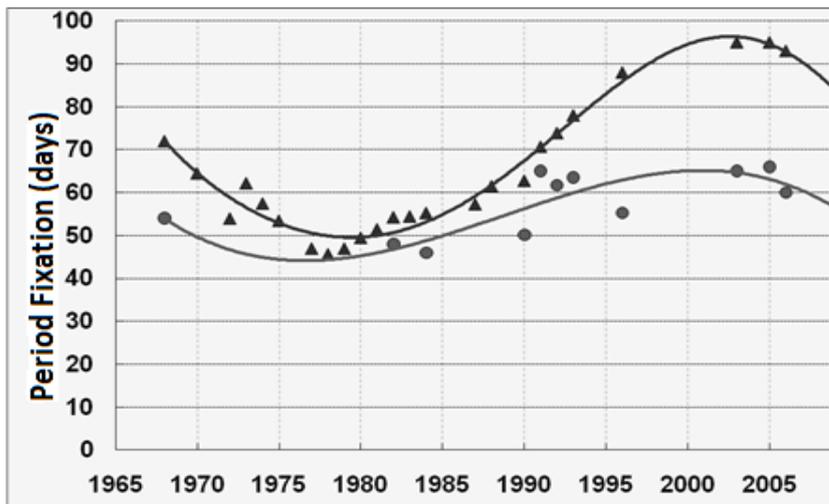
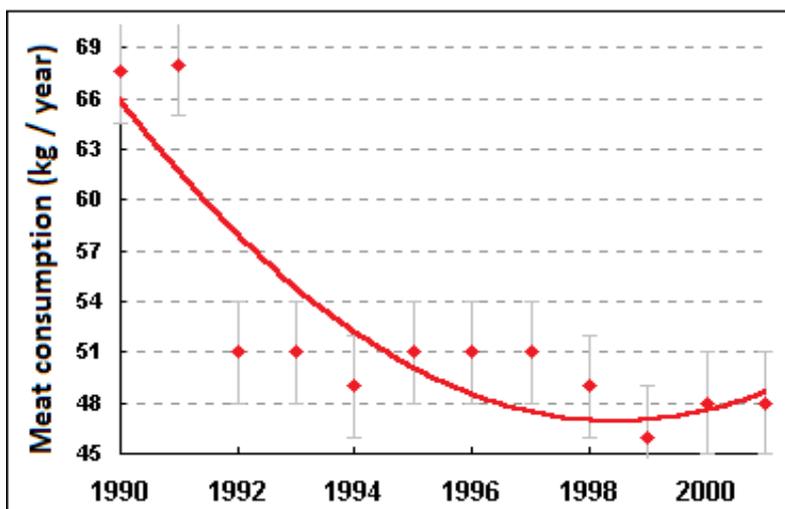


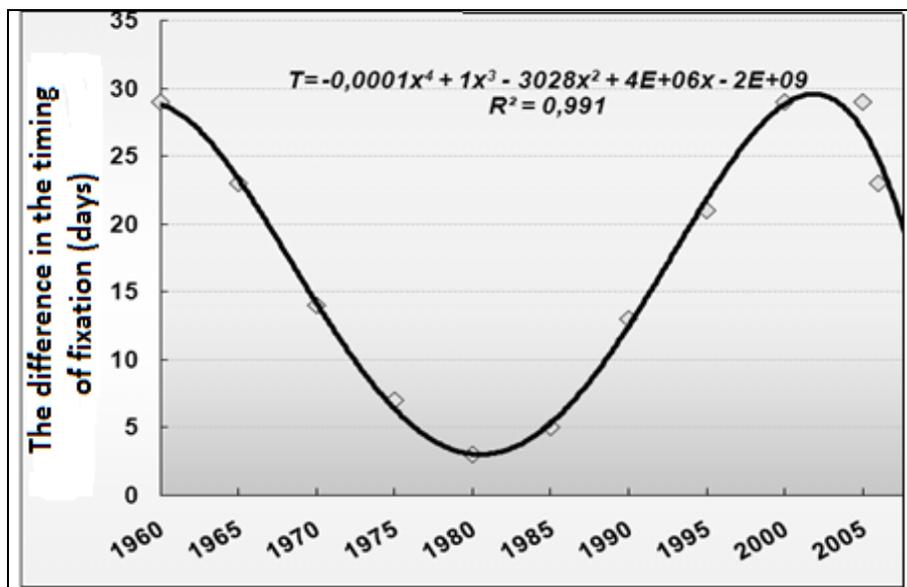
Figure 3: Dynamics of per capita meat consumption by the population of the Kurgan region.



It has been established that the time limits for fixation have increased especially sharply among the socially unprotected segments of the population (disabled people, pensioners, students). When the mathematical analysis of the curves of fixation of fractures in different years, it is possible to reveal their wave-like character with a period of about 50 years. Such a coincidence with the duration of the large Kondratieff cycles of the economic development of the country leaves no doubt that the basis of the studied periodic changes is the trend for the entire population as a whole. It is also important to note that the increase in terms of fixation in patients of different ages did not begin at the same time, but depended on the accumulated structural reserves of adaptation of

the organism, which turned out to be the lowest among people of retirement age, then in patients over 40 and young people. This unequal dependence of the body's resistance of patients of different ages to the deterioration of living conditions confirms the role of food quality and adaptation reserves in changing the duration of the fixation period. It was found that already after 1979 and over the next 25 years, the periods of fixation of the bones of the tibia in patients with comminuted fractures increased by 111% ($p \leq 0.001$). At the same time, the difference in terms of fixation of comminuted and helical fractures of the bones of the tibia increased (Figure 4).

Figure 4: The difference in the timing of fixation of bone fragments in patients with closed comminuted and helical fractures of the bones of the leg.



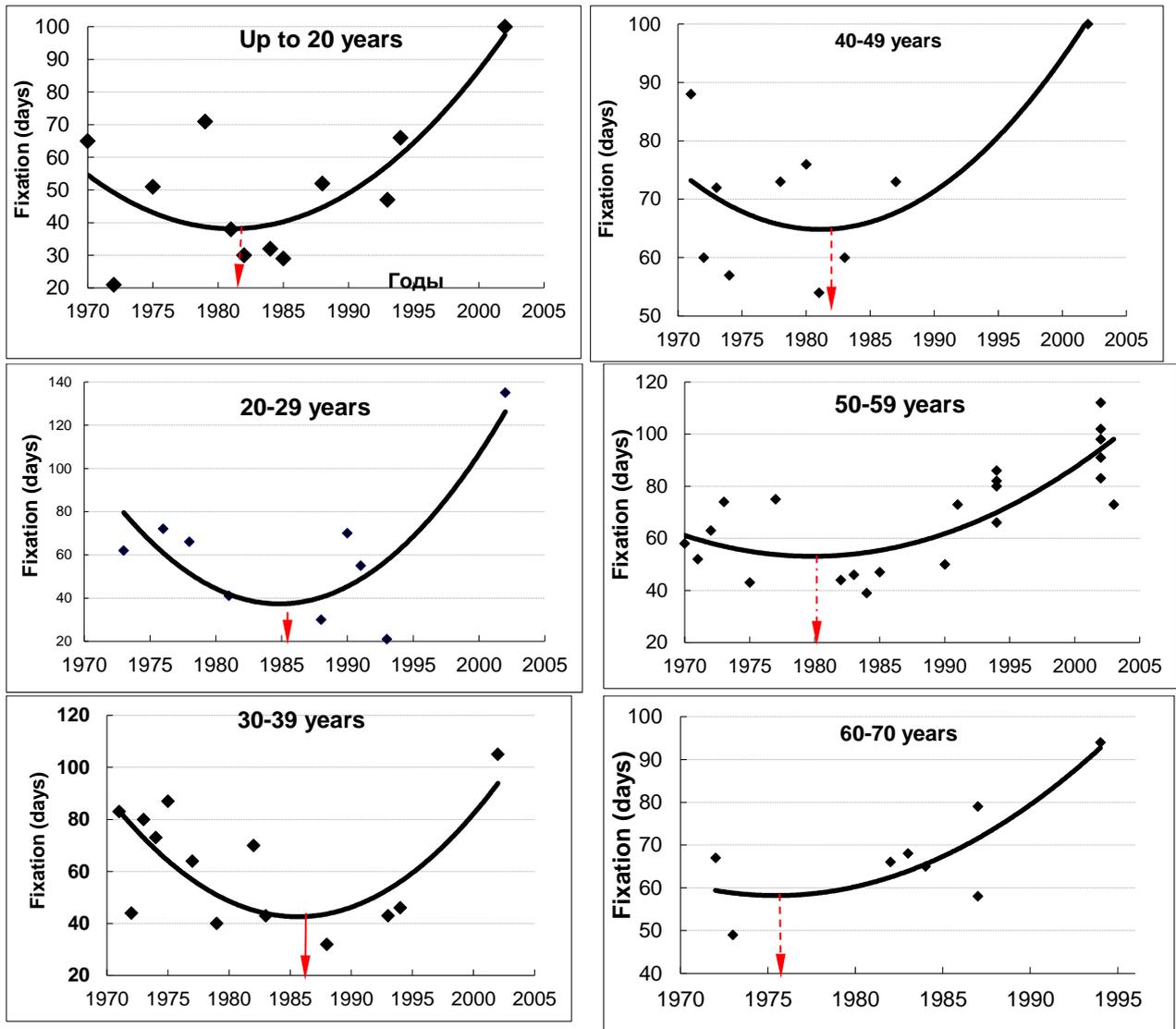
The period of the minimum periods of treatment in patients with comminuted fractures of the bones of the lower leg of different ages did not end at the same time and depended on the structural reserves of adaptation. The increase in terms of fixation in patients older than 60 years began in 1973, in patients 40-59 years old - in 1980, in children and adolescents

- in 1981, in patients 20-29 years old - in 1985, and in patients 30-39 years old 1986 (Figure 5). It should be noted that in human ancestors with bipedism, injury with fracture of limb bones led to a loss of ability to independently obtain food, and the fusion could be carried out solely by mobilizing structural reserves of adaptation, which are reduced in the elderly and are

insufficient in a growing organism. By the way, in the conditions of economic stratification of the society, the most vulnerable people with a

reduced level of mineral density of the skeleton bones are the most vulnerable with injuries.

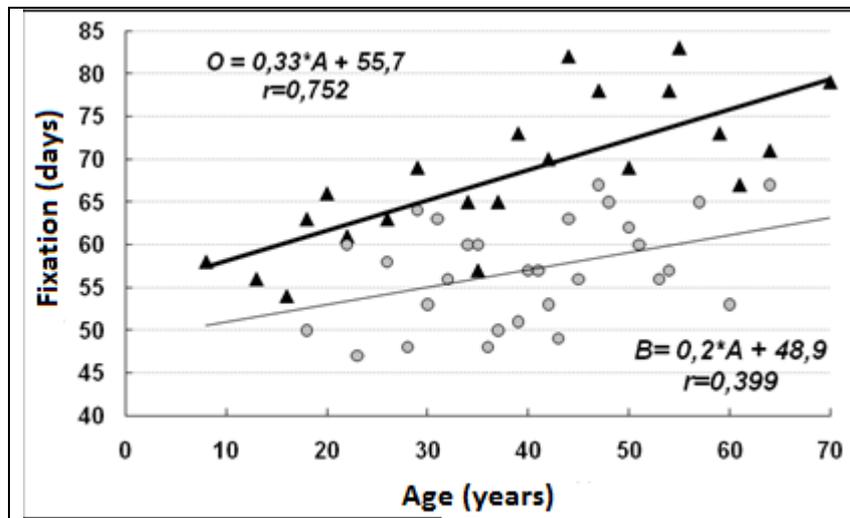
Figure 5: Dynamics of the duration of fixation in the treatment of patients with closed comminuted fractures of leg bones of different ages.



With closed spiral fractures of the bones of the lower leg, the fixation dates for the last 15 years increased by 32% (from 50 ± 5 to 66 ± 3 days). In 1990-1998, the duration of treatment of patients

was in direct proportion to their age, and for every 10 years of life, the fixation period increased with helical fractures for 2 days, and for comminuted fractures for 3.3 days (Figure 6),

Figure 6: Age dynamics of the duration of the fixation period in helical (B) and comminuted (O) fractures of the shin bones.



Thus, deterioration in the quality of nutrition of the population, in particular, a decrease below the minimum level of the norm of essential proteins of animal origin leads to an increase in the duration of treatment of patients, especially with severe, comminuted fractures of the bones of the leg, and the more, the smaller the structural reserves of adaptation of the organism in people, in particular in patients of retirement age.

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