

## General Adaptation Syndrome in Orthopedic Patients of Elderly and Senile Age

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### **Abstract:**

**Aims and Objectives:** The general adaptation syndrome is protective and adaptive and, as applied to orthopedic patients, it is primarily a switch from metabolism to catabolism of substrates in order to ensure optimal conditions for reparative regeneration in the fracture zone. Borrowing substrates such as proteins and minerals from other segments of the musculoskeletal system generally has minimal negative consequences for a young and compensated patient, while at the same time in elderly and decompensated patient metabolic stress is fraught with the development of complications described above.

**Goals** the study to analysis of metabolic and motor activity indicators in the postoperative period was performed in patients undergoing reconstruction of the proximal femur.

**Methodology:** A screening examination of 305 patients with injuries of the proximal femur metaepiphysis hospitalized in the clinic of traumatology and orthopedics of BSMU was performed.

**Results:** A screening study of metabolic parameters indicates that already at the time of hospitalization the vast majority of patients are in anemia and hypoproteinemia, which is associated with both premorbid background, various concomitant pathologies and an acute reaction of the body to trauma.

**Conclusion:** Both men and women showed a negative correlation of metabolic and motor activity indicators with the age.

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### **I. Relevance:**

Overall population aging confronts orthopedic practice with the need for surgical treatment of patients with many comorbidities of inflammatory, degenerative and neoplastic genesis, which leads to inefficiency of reactivity, adaptation and regeneration systems.

Bone tissue involution processes in target group patients cause marker fractures in thoracic spine, distal metaepiphysis of the radial bone and proximal metaepiphysis of the femur, with the latter having the bigger social significance due to their high lethality and prolonged maladaptation rate.

The keystone to successful osteosynthesis is optimal biomechanical and bone-implant ratio, which is very critical in conditions of poor bone tissue quality. Particularly in case of osseous osteosynthesis, DHS systems can be supplemented with a trochanteric pad and in case of intraosseous osteosynthesis there are versions with a long intramedullary component, which implies a large fixator – bone contact area. (Сепреев С.В., 2007, 2010, 2012; G. Taglang, 2009, Дубров В.Э, 2014).

The development of local and systemic complications in postoperative period may discredit the results of effective and high-technology surgical intervention, since in some cases the mechanical strength of synthesized segment does not provide painless support ability of the limb and an adequate level of rehabilitation.

The future development of medicine is outlined in the framework of nanotechnology, biotechnology, rational environmental management and investment in humanity.

Modern orthopedic practice is characterized by indispensable use of those diagnostic technologies that provide an assessment of body state at the systemic and population level. At the same time, the technology of total and all body examination becomes a routine.

It is known that the results of surgical treatment, using the technology of osteosynthesis or arthroplasty in patients of older age groups are significantly worse compared to population, especially in people under 50. This is due to the presence of background pathologies, which in turn cause unrelated infectious complications, hypercoagulation syndrome, joint defects and following fractures cascade.

The development of a wide complications range in orthopedic patients in the perioperative period, however, like the fracture itself, is only a consequence of systemic premorbid metabolic disorders.

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The universal concept of stress most clearly describes a condition that is increasingly used in clinical practice - metabolic stress (Г. Селье, 1949).

It is known that an acute reaction to trauma leads to increasing in energy requirements up to 20% compared with the basal metabolic rate due to the inevitable blood loss, local and systemic inflammatory reaction, hyperthermia and other factors. The combination of factors such as pain, immobilization, dyspeptic symptoms, the systemic effect of tissue breakdown products in the fracture region triggers the mechanisms of traumatic disease (Котельников Г.П., 2012).

The general adaptation syndrome is protective and adaptive and, as applied to orthopedic patients, it is primarily a switch from metabolism to catabolism of substrates in order to ensure optimal conditions for reparative regeneration in the fracture zone. Borrowing substrates such as proteins and minerals from other segments of the musculoskeletal system generally has minimal negative consequences for a young and compensated patient, while at the same time in elderly and decompensated patient metabolic stress is fraught with the development of complications described above.

A correlation analysis of metabolic and motor activity indicators in the postoperative period was performed in patients undergoing reconstruction of the proximal femur.

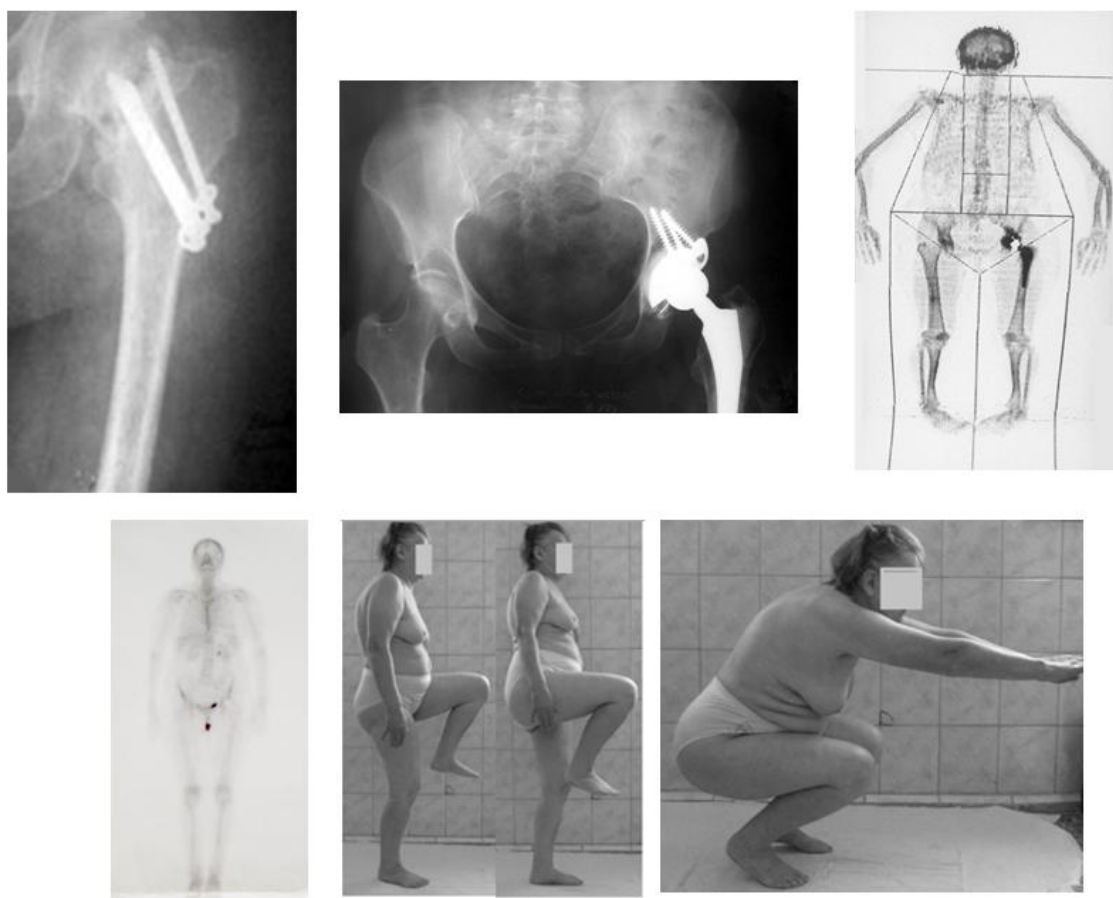
## **II. Materials And Methods**

A screening examination of 305 patients with injuries of the proximal femur metaepiphysis hospitalized in the clinic of traumatology and orthopedics of BSMU was performed. There were 121 men (39.76%) and 184 women (60.33%) in this sample, the average age was 63.41 years. (Fig. 2).

## **III. Results**

The vast majority of patients were in a state of hypoproteinemia of varying severity at the time of hospitalization. Both men and women showed a negative correlation of this parameter with the age. (Fig. 4,5).

Hypoalbuminemia was observed in more than half of patients over 60 years old and in 86.7% of the examined in the age group over 70 years (Fig. 3) Were detected a decrease in hemoglobin concentration was detected in 65% of patients over 60 years and a negative correlation with the age. (Fig. 6,7).



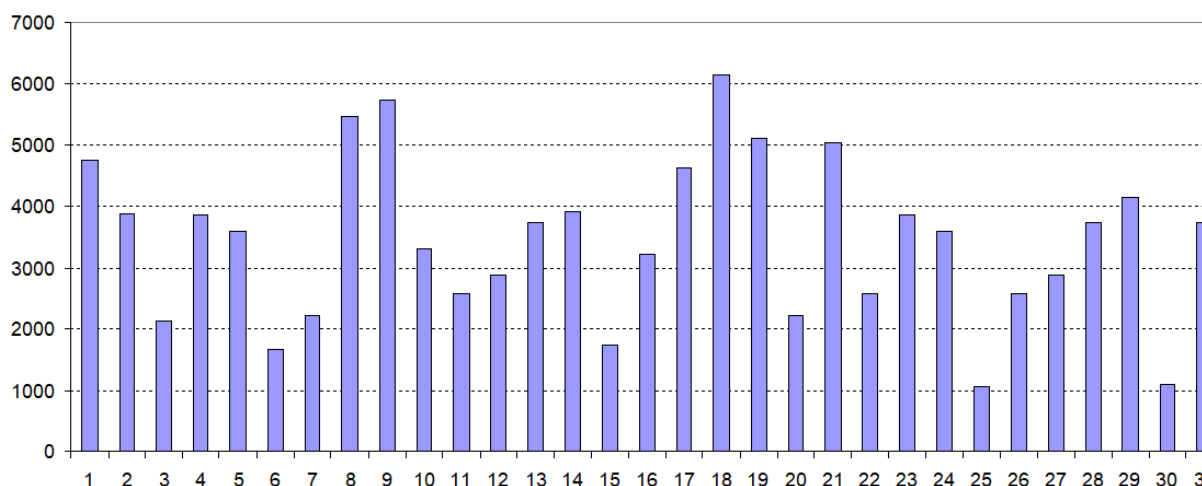


Fig 1. Patient K., 72 y.o., 18 years after hip arthroplasty. 82 on the HHS scale.

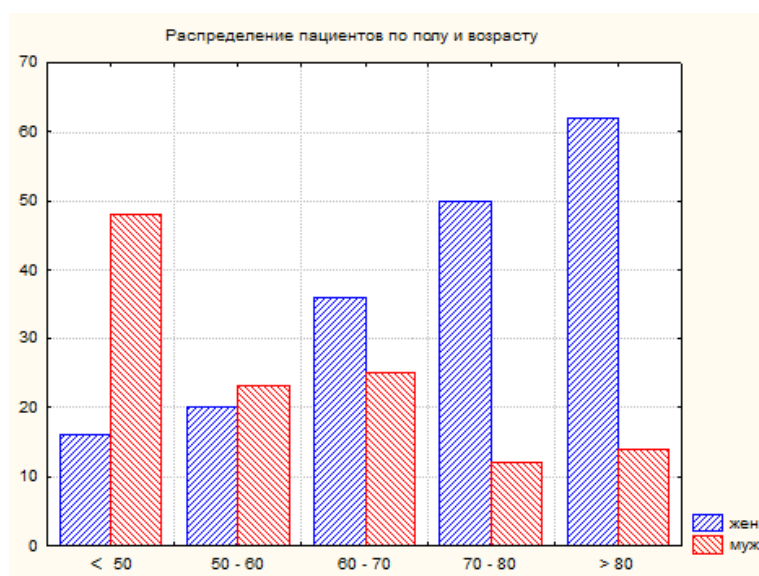


Fig. 2. Examined patients distribution by age.

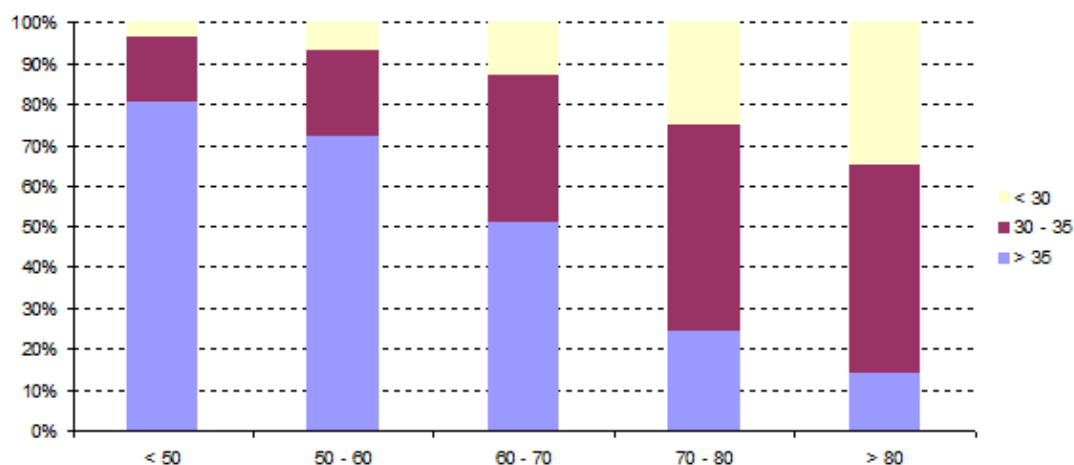


Fig. 3. Serum albumin in patients from different age groups

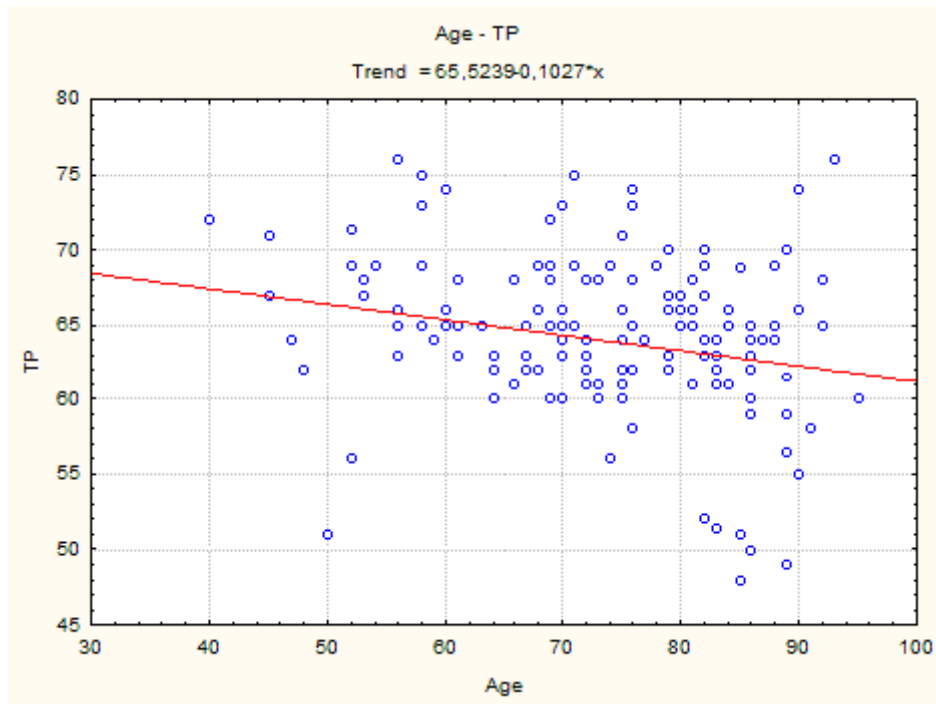


Fig. 4. Crude protein rate in women (N - 184)

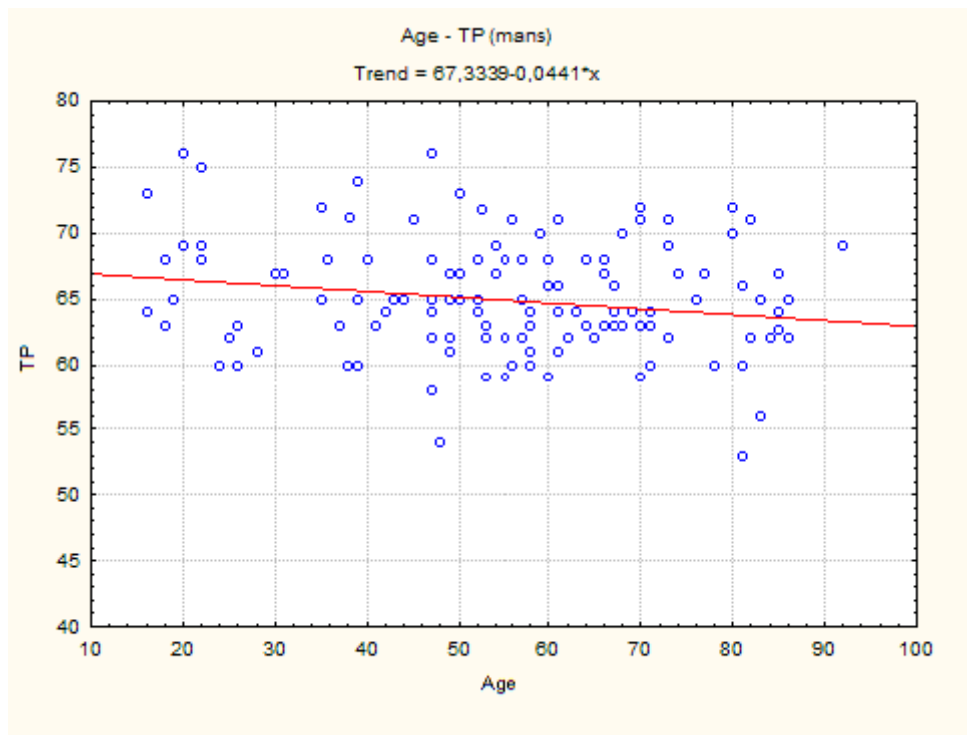


Fig. 5. Crude protein rate in men (N = 121)

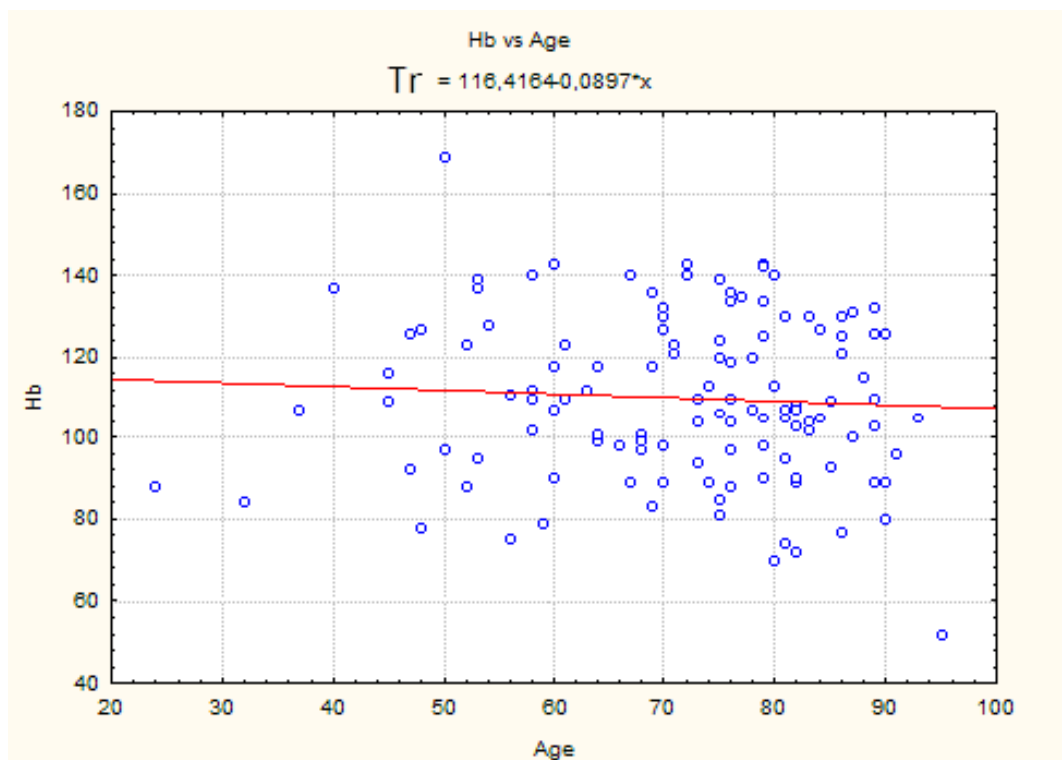


Fig. 6. Hemoglobin concentration in women

Fig. 1. presents a clinical example of a 72 years old patient, a long-term (18 years) result of hip joint arthroplasty. A history of the left femur collum fracture, osteosynthesis with cannulated screws - formation of a pseudoarthrosis, which is why a removal of fixatives and arthroplasty were performed. In the postoperative period was performed a course of motor rehabilitation, antiresorptive therapy using 3 infusions of 5 mg of zoledronic acid, followed by combined calcium preparations (up to 1000 mg / day) and 800 IU of vit D for 10 years. An analysis of functional activity 18 years after arthroplasty revealed the completion of 3453.51 steps per day, which corresponds to the age norm. The maximum number is 6147, the minimum is 1049 steps per day. The analysis of functional activity reflects physiological circadian rhythms and social adaptation.

#### IV. Discussion

Protein - energy metabolic disorders and hypoxia of mixed genesis are the basis of infectious complications from the postoperative wound, bronchopulmonary or urinary system.

Protein deficiency causes inadequate muscle tone, ataxia and low motor activity, which also discredits the usefulness of surgical intervention. Currently, however, specialists do not have criteria for the early detection of such violations, which complicates the timely use of pathogenetic correction. (Котельников Г. П., Труханова И.Г., 2006; Spahn D.R. Coats T. J., 2007).

Deep vein thrombosis of the lower extremities is the cause of fatal complications, which for the most part forms lethality statistics in early postoperative period. The use of anticoagulants is currently in protocol, while in the literature there is still not enough information about the effectiveness of preventive therapy in conditions of metabolic stress, which makes it difficult to choose various schemes and the duration of thromboprophylaxis. (Загородний Н.В., 2009; Nieto J.A., Espada N.G., 2012).

Alongside with improving the injuries surgical treatment technologies is the problem of preventing complications after surgical reconstruction in terms of restoring the functional activity. It is known that such patients are at risk for various metabolic and energy disorders, hemostasis system, tissue and hemic hypoxia, which undoubtedly affects the outcome of surgical treatment.

The data of high lethality and functional status in the postoperative period prompt an increasing number of specialists to look for the causes of metabolic disorders at the preoperative stage.

Even successful reconstruction of the damaged segment does not guarantee an adequate restoration of the initial level of motor activity and the functioning of various body systems.

A wide range of surgical treatment complications can be determined by various metabolic disorders such as: metabolic stress, disturbances of phosphorus - calcium homeostasis, systemic hypercoagulation syndrome (Fig. 8).

## V. Conclusions

A screening study of metabolic parameters indicates that already at the time of hospitalization the vast majority of patients are in anemia and hypoproteinemia, which is associated with both premorbid background, various concomitant pathologies and an acute reaction of the body to trauma. Traumatic disease develops in connection with blood loss, pain, iatrogenic immobilization and psychoemotional disorders.

Such changes in the body lead inevitably to an increase in the need for plastic substrates such as proteins, fats, carbohydrates, vitamins and minerals and of course energy, but dyspepsia due to pain, disturbances in the digestive system and physical inactivity, cannot provide as adequate entry of substrates into the bloodstream, as well as the specific dynamic action of food, which is why the vicious cycle of metabolic stress closes. Moreover, the combination of surgical and rehabilitation component under the condition of individual pathogenetic correction of metabolic disorders allows the restoration of functional activity in accordance with the age range.

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