

EXPERIENCE IN TREATMENT OF THE FEMORAL NECK FRACTURES

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ABSTRACT

We have performed a retrospective analysis of femoral neck fractures in 569 patients, who had undergone treatment at the Institute in 2009-2013. The proportion of patients was assessed by sex, age, circumstances of injury, date of admission, type of fractures, presence of comorbidity, methods of treatment, intra-operative blood loss and methods of its compensation, presence of lower extremities thrombosis and methods of its management, presence and type of complications, rehabilitation after operation. Also, we calculated the average pre-operative and total hospital stay and mortality, and made conclusions and recommendations for practice.

Keywords:

femoral neck fracture, hip arthroplasty, complications, prevention and treatment.

BACKGROUND

Femoral neck fractures are one of the most common injuries of the musculoskeletal system in elderly patients, and the number of these fractures is growing [1]. If the frequency of fractures of the femur will continue to grow in a sustained rate, the number of fractures in 2050 will increase compared to 1990 from 1.7 to 6.3 million. If we take into account the fact that the number of these fractures grows in the elderly every year by 1%, it will reach 8.2 million in 2050 [2]. Femoral neck fractures account for half of fractures of the proximal femur in elderly patients [3], at the same time, their frequency in patients younger than 50 years is only 2% [4]. The cause of injury is often a fall on the region of the greater trochanter [5].

Purpose of the study. To analyze archival material in order to identify ways to reduce the number of complications in patients with cervical hip fractures and reduce the time of treatment.

MATERIAL AND METHODS

We made a retrospective analysis of 569 medical records of patients with fractures of the femoral neck treated in the Emergency Department of Traumatology of Musculoskeletal System, N.V. Sklifosovsky Research Institute for Emergency Medicine in 2009-2013. We determined the proportion of patients by gender, age, circumstances of injury, date of admission, type of fracture, presence of concomitant diseases, methods of treatment, amount of intraoperative blood loss and its compensation methods, as well as availability and methods of treating thrombosis of the lower extremities, presence of other complications and its type and terms of mobilization of patients. We also calculated preoperative and total hospital stay and mortality rate.

RESULTS

There were 2.5 times more women than men (412 and 157, respectively). The prevalent age group were people over 60 (448 people, 78.4%). Fig. 1 shows the total number of patients in each age group. It is noteworthy that female patients prevailed in age groups elder than 61 years.

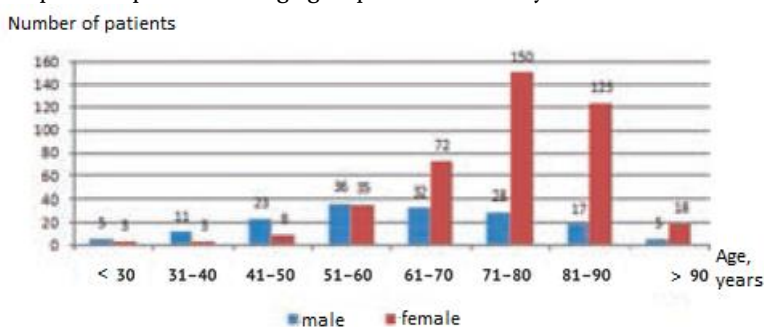


Fig. 1. Distribution of patients with femoral neck fractures, depending on the age and gender

In most cases, the cause of trauma in elderly patients was falling on the right or on the left side. In young patients, the main cause was high energy trauma such as a from height, traffic accident.

In most cases, the affected were admitted to hospital within the first 24 hours after trauma (Fig. 2).



Fig. 2. Distribution of patients depending on the time of admission

As a rule, patients with femoral neck fractures are elderly people who have a lot of concomitant diseases, which affect the timing and type of surgery and the possibility of surgical treatment. The diagram below (Fig. 3) shows that only 117 patients (21%) had no severe comorbidities. The vast majority of patients (393.69%) had from one to three concomitant diseases simultaneously, 59 patients (10%) had 4 or more comorbidities.

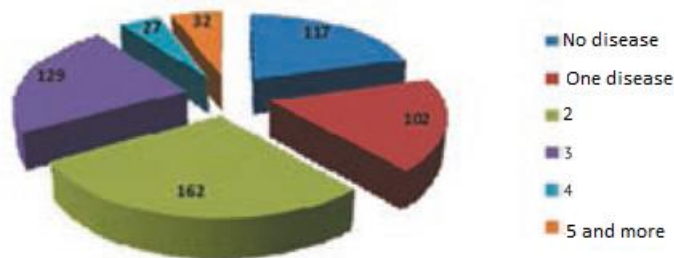


Fig. 3. Distribution of patients with fractures of the femoral neck depending on the number of related diseases (abs. values)

The most common comorbidities were hypertension (37.8%) and cardiosclerosis of varying etiology (24.2%), exertional angina — 14.9%, cardiac arrhythmias — 11.6% of patients. Diabetes type 2 was revealed in 8.8% of victims, often decompensated. In addition, 6.3% of patients had a history of acute ischemic stroke. Less commonly observed: chronic obstructive pulmonary disease, heart failure, chronic kidney disease, bronchial asthma, peptic ulcer disease and thyroid dysfunction. Fig. 4 shows the spectrum and incidence of co-morbidities.

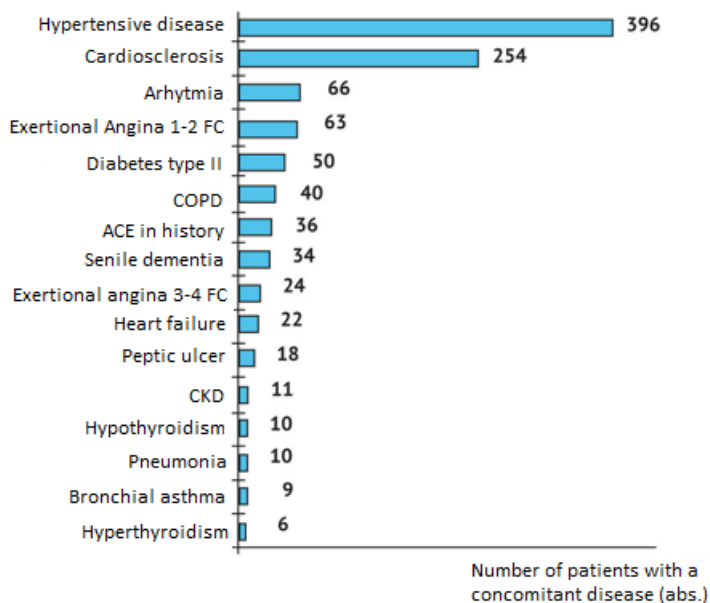


Fig. 4. Distribution of patients with fractures of the femoral neck depending on the type of concomitant diseases.

Notes: ACE — acute cerebrovascular event; COPD — chronic obstructive pulmonary disease; CKD — chronic kidney disease; FC — functional class

All patients with a suspected femoral fracture underwent X-ray upon admission, which in most cases is sufficient to establish the diagnosis and choice of tactics of treatment for a patient. CT scan of the hip was performed very rarely in cases where a damage was suspected, which may affect the treatment strategy (e.g., fracture of the femoral head at transtrochanteric fracture) or the presence of a fracture was a question. In terms of preoperative examination, we performed all laboratory tests (clinical, biochemical blood tests, coagulation, general urinalysis), ultrasound angiography of lower extremities, electrocardiography. All patients older than 60 years we examined by a physician, and if necessary, cardiologist, endocrinologist and psychiatrist. Also, we performed echocardiography and examined the function of the external breathing.

Among the treatment options were: conservative treatment, osteosynthesis of a fracture of the femoral neck with various fixators and femoral replacement. The following methods of femoral arthroplasty: total cementless, total cement and bipolar endoprosthesis. In 263 of 569 cases (46.2%), femoral replacement was performed, in 240 (42.2%) cases various options of osteosynthesis were performed and 66 patients (11.6%) were treated conservatively. The share impacted femoral neck fractures was 6.3% (36 patients), of whom 23 underwent conservative treatment, and 13 patients underwent osteosynthesis of the fracture. We observed a strong tendency to increase in number on the joint replacement operations and reducing the number of other treatments. So, in 2009, 57.2% of patients underwent fracture osteosynthesis, 22.6% – replacement, 20.2% – conservative treatment; at the same time in 2013, 70.2% patients underwent femoral replacement, 24.8% – osteosynthesis, and 5% – conservative treatment.

Fig. 5 presents data on patients undergoing different treatment options (in%).

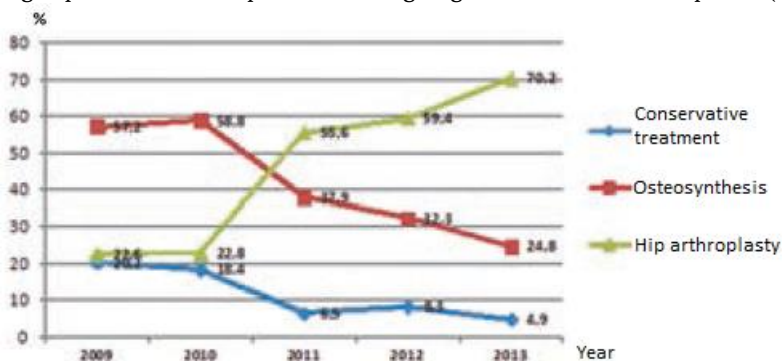


Fig. 5. Distribution of patients with fractures of the femoral neck, depending on the type of surgical treatment

Selection of replacement type depended on the age of patients and condition of the bone. Elderly or debilitated patients underwent a bipolar hip replacement arthroplasty. The total cement replacement was performed in patients with osteoporosis. In other cases, cementless total femoral replacement was performed. Of 263 patients undergoing femoral replacement, 30.4% of people had a bipolar prosthesis, 34.5% had a total prosthesis with cementless fixation and 35.1% had a total prosthesis with cement fixation.

In 15% of patients, thrombosis of the deep veins of the lower extremities was revealed in the preoperative period. Treatment of this complication resulted in a delay of surgery. If embologenic thrombosis (with a large floating fragment) was revealed, then a cava filter was installed prior to surgery. Ligation of the femoral vein or thrombectomy were performed more rarely as a first stage of surgical therapy. The average preoperative hospital stay was 10 days in 2009, in 2010 - 11, in 2011 - 12, 2012 - 10 and 2013 - 7. The dynamics of average preoperative bed days is shown in Fig. 6. The average preoperative hospital stay was slightly higher during hip joint replacement than during osteosynthesis (10.7 and 9.1, respectively), which is associated with more traumatic replacement, and prolonged preparation of the patient.

Average bed day

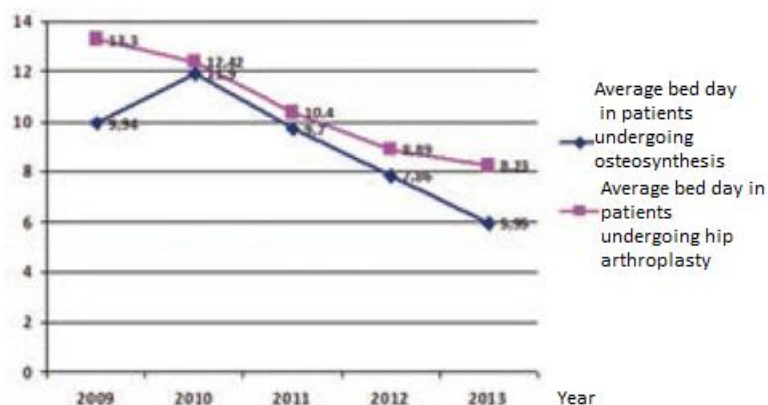


Fig. 6. Dynamics of average preoperative bed days in patients with femoral neck fractures, depending on the type of the upcoming surgery

Implementation of osteosynthesis of femoral neck with various fixators, usually is not accompanied by a large intraoperative blood loss, which can not be said about the hip joint replacement. Fig. 7 shows the amount of intraoperative blood loss during the hip joint replacement.

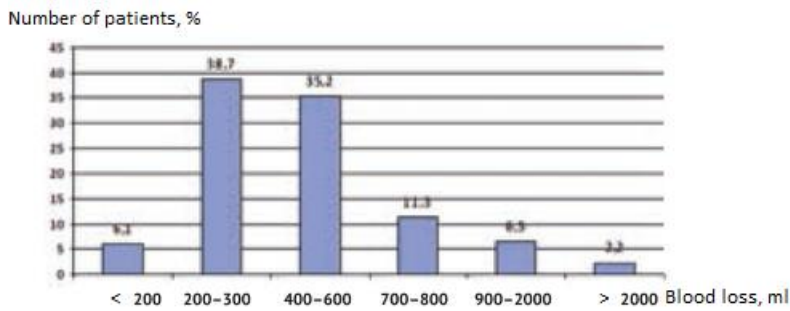


Fig. 7. Distribution of patients undergoing hip joint replacement depending on the volume of intraoperative blood loss (%)

Transfusion of blood components during the postoperative period was required in 13% of patients who had undergone hip joint replacement. Ways to replenish blood loss are shown in Fig. 8.

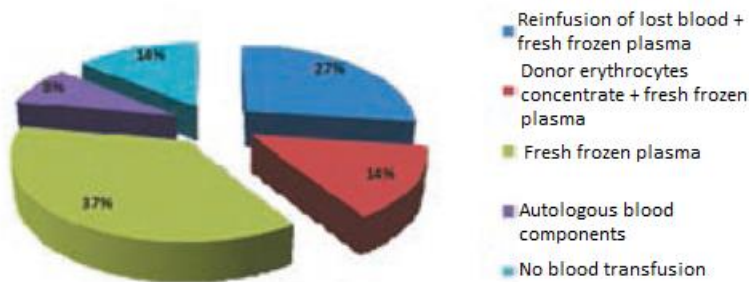


Fig. 8. Distribution of patients with femoral neck fractures who underwent hip joint replacement, depending on the type of compensation of intraoperative blood loss

In patients with femoral neck fractures thromboembolic complications often develop. In order to prevent pulmonary embolism (PE), ultrasound angiography of lower extremities is performed prior to surgery and activation of a patient. In 2009, 74% of patients were examined, in 2010 – 77%, in 2011 – 84%, in 2012 – 97% and in 2013 – 96%. In 153 patients (27%), thrombosis of the deep veins of the lower extremities was revealed. Mural thrombosis (49% of cases) prevailed, occlusive thrombosis was observed in 20% of cases and floating thrombosis was revealed in 31% of cases. However, these figures vary for different types of surgery. We found that in patients who had undergone hip joint replacement, the incidence of thrombosis of deep veins was higher (37.4% of cases), while in patients who had undergone osteosynthesis of femur, thrombosis occurred less often – in 23.7% cases (Fig. 9).

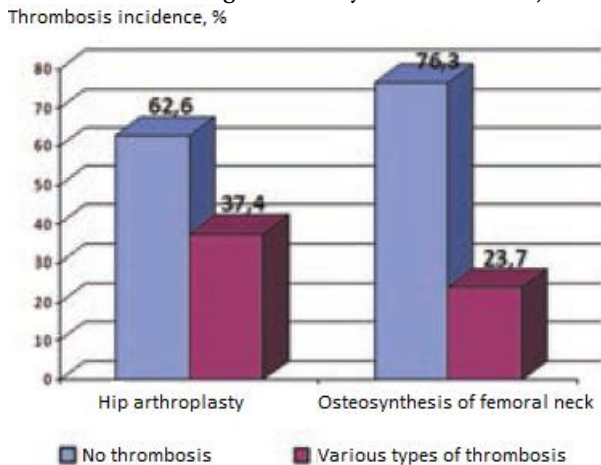


Fig. 9. The incidence of thrombosis of deep veins of the lower extremities in patients with femoral neck fractures, depending on the type of surgery

The structure of revealed thrombosis depending on the type of surgery is shown in Fig. 10.

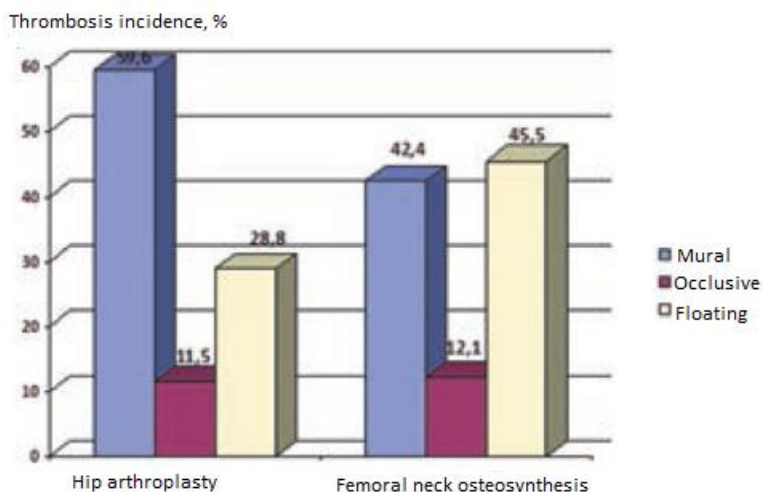


Fig. 10. The incidence of various types of thrombosis in patients with fractures of the femoral neck, depending on the type of surgery

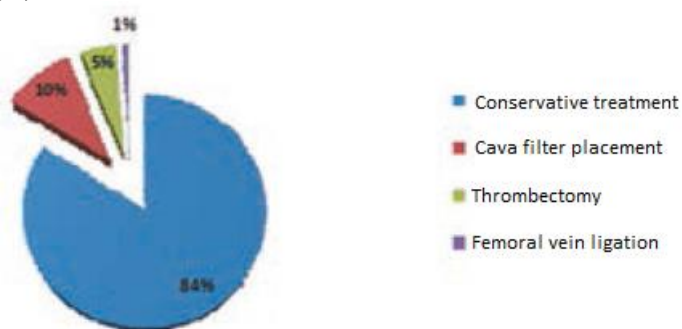


Fig. 11. Distribution of patients with thrombosis of the lower limbs, depending on the method of treatment of thrombosis

All patients with fractures of the femoral neck underwent thrombosis prophylaxis by means of infusion therapy, the use of various antiplatelet agents and anticoagulants, elastic bandaging of the lower limbs and the complex of therapeutic exercises. If thrombosis of deep veins was revealed, then therapeutic doses of direct and indirect anticoagulants (conservative treatment) were administered, surgical methods of treatment were performed more rarely (ligation of the femoral vein, thrombectomy, installation of a cava filter).

Primary healing of postoperative wounds occurred in most cases (96.5% of all surgical interventions). Complications of treatment: superficial suppuration of postoperative wound – 0.8% (4 case after arthroplasty), bedsores – 1.7%, pneumonia – 0.5%, endoprosthesis dislocation – 0.5%. The lethal rate was 3.3% (19 patients, 4 of them died on the operating table, 6 – in the postoperative period and 9 – during the conservative treatment). In most cases, the cause of death was pulmonary embolism and rare causes were acute cardiovascular and multiple organ failure.

Terms of activation of patients in the postoperative period depended on pain, presence of thrombosis of the lower extremities and timing of ultrasonic diagnosis. Under activation we mean training patients to sit up in bed, with legs dangling, get out of bed and walk around with an additional support on the "walkers." Fig. 12 presents estimated terms of activation of patients with fractures of the femoral neck and changes in these indicators.

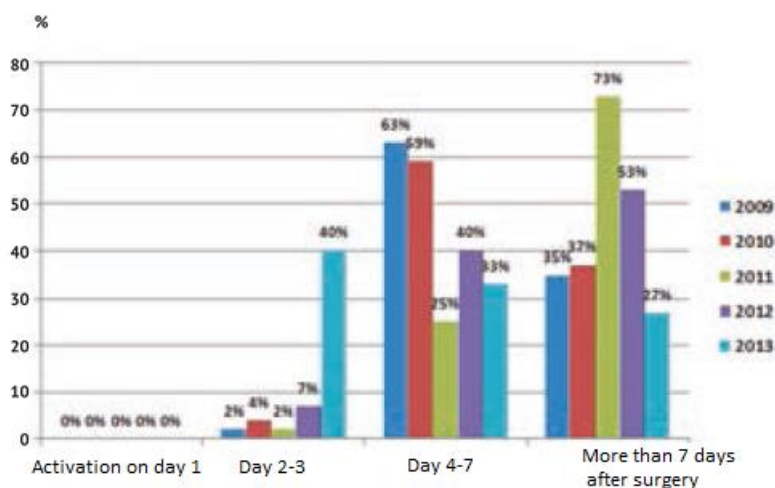


Fig. 12. The distribution of patients depending on the timing of activation postoperatively

The average term of activation of patients was 8 days in 2009, 10 days in 2010, 12 days in 2011, 9 days in 2012, and 6 days in 2013.

The average hospital stay was 28 days in 2009, 26 days in 2010, 28 days in 2011, 24 days in 2012 and 21 days in 2013.

DISCUSSION

In recent years, approaches to treatment of femoral neck fractures have not changed. According to the literature, conservative treatment may be selected for impacted fractures without displacement, but due to the high risk of secondary displacement osteosynthesis is recommended even for these fractures. Osteosynthesis with cannulated screws is usually performed for fractures without displacement and fractures in young patients. After the surgery, the graduated weight of operated limb is recommended for a period of 8-12 weeks. However, many elderly patients are not able to carry out these recommendations. [6] Also, elderly patients require more early activation after surgery and that is why hip joint replacement is a method of choice for them [7-9]. Our method of treating patients with fractures of the femoral neck was dependent on the severity of concomitant diseases, degree of decompensation and thus anesthetic risk. Conservative treatment was carried out at impacted fractures of the femoral neck, the presence of severe comorbidity and denial of patients or their relatives to undergo the surgery. In 2009-2013, there was a stable trend of growing number of hip joint replacements compared to other treatments. In 2013, hip joint replacement was performed in 70.2% of patients. Delays in the surgical treatment of patients with fractures of the femoral neck, according to the literature, lead to an increase in the incidence of postoperative complications, length of hospital stay and mortality [10, 11]. Early surgical treatment of patients with fractures of the femur reduces the risk of deep venous thrombosis and pulmonary embolism [12, 13]. In our practice, we tried to operate these patients as soon as possible for the purpose of early activation and prevent hypostatic complications such as pressure sores, pneumonia and deep vein thrombosis. However, the timing of surgery also depended on the severity of comorbidity, the need for all tests in the medical history, provided by orders, the availability of formal records of specialists for each type of comorbidity and the presence and severity of thrombosis of the lower extremities. Measures for glucose management in decompensation of diabetes, heart rhythm disorders and other related diseases also resulted in a delayed surgical treatment, increasing the preoperative hospital stay. However, we managed to reduce the preoperative hospital stay by 40% with the help of osteosynthesis and by 38% performing the hip joint replacement. The preoperative hospital stay reduced due systematization and improvement of methods to prepare elderly patients for surgery, quickened preoperative examination of patients, and improved anesthesiologic assistance. However, relatively long preoperative hospital stay forced us to continue improvement of examination techniques for elderly patients with femoral neck fractures. According to literature, femoral fractures occur most often in patients with concomitant cardiac disease, chronic kidney disease, diabetes, stroke, tumor and COPD. In 70% of cases, patients with diabetes had diabetes type 2, which is often decompensated after surgery [14, 15]. Comorbidity plays a significant role in the postoperative recovery of patients [16]. According to literature, in 35-42% of patients with fractures of the femur, there is a decreased blood supply to the myocardium [17]. Our findings correlate with the literature: 79% of incoming patients had comorbidities of various types. Mental disorders occur approximately in 10% of patients (mostly over 65 years old) with femoral fractures. The pathophysiological origin of cognitive disorders is not fully understood [18-20]. Postoperative delirium occurs in 13.5-33% of patients with femoral fractures. It can manifest as hyper- and hypoactivity or alternation [21]. Regional anesthesia reduces the incidence of delirium in the early postoperative period [22]. Thrombosis of deep veins of lower limbs is also a frequent complication of femoral neck fractures. PE with revealed deep vein thrombosis or without it is the cause of

10% of deaths in the hospital [23]. At the same time, in patients operated on for a fracture of the femur, the incidence of pulmonary embolism within the next 3 months after surgery ranges from 1.4 to 7.5%, which underlines the need for anticoagulants [24, 25]. According to our data, 27% of patients had thrombosis of lower extremities. One of the factors increasing the preoperative hospital stay and delayed activation of patients was difficulty in performing ultrasound angiography of lower limbs in order to prevent pulmonary embolism. Today, the Department has its own specialist, and this reduced the wait for the procedure. Mortality during the first year after injury in elderly patients with femoral fractures reaches 18-33%, and the average hospital mortality rate is 2.7% [26]. The mortality rate in our group of patients was 3.3%, which correlates with the literature data.

CONCLUSION

From the analysis of archival material, it follows that the main causes of death in patients with femoral neck fractures are still complications associated with physical inactivity, such as pulmonary embolism. Consequently, for most early activation of patients they have to be operated on as soon as possible and set on their feet after surgery. The surgical treatment is the only way to save the patient from pain, which do not allow to take care of him/her. We believe that only a very high degree of operational risk may be a contraindication for surgery. The surgery should be performed eliminating examinations and consultations, which may tighten the preoperative preparation. We need to improve perioperative analgesia protocol that will activate a patient as soon as possible after surgery. It is also necessary to develop a protocol of joint action with the vascular surgeon in the diagnosis of thromboembolic complications in patients with femoral fractures.

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