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MODERN SURGICAL TECHNIQUES FOR FRACTURES OF THE PROXIMAL FEMUR

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ABSTRACT

This article focuses on modern minimally invasive surgical treatment of proximal femur fractures. A brief history of surgical treatment of such fractures is presented. Modern minimally invasive methods of surgical treatment of fractures of the proximal femur are described.

Introduction. Injury is a complex biosocial phenomenon, a consequence of extreme exposure of the organism to external factors of different nature in various circumstances of human work and life. Causes of musculoskeletal system injuries rank 3rd after acute respiratory infections and musculoskeletal system diseases (11,2%), and 2nd by days of disability (15,8%). According to A.V. Kaplan [15,16], mortality in fractures of the proximal end of the femur in the elderly ranges from 6 to 45%. However, the number of complications during conservative treatment of this pathology reaches 40-90% [7,8]. Fractures of the proximal femur lead to immobility in the injured. By the time of injury, the elderly already have various comorbidities, which together cause a collapsing "decompensation syndrome" of systems and organs, resulting in a high mortality rate. The main comorbidities in the elderly are atherosclerosis (46%), diseases of the cardiovascular system (37%), gastrointestinal tract (24%), respiratory (19%) and genitourinary system (12%) Although fractures of the proximal femur are one of the most common injuries in the elderly and the elderly the results of surgical treatment of femoral neck fractures are still unsatisfactory. The main causes of unsatisfactory treatment outcomes are aseptic necrosis of the femoral head (6.1-73.1%), nonunion (11.1-58.1%), deforming arthrosis (4.8-60.4%). The wide variability in the data, according to researchers can partly be explained by the different types of fractures and the features of the methods

used to fix them. The main factors influencing the development of adverse outcomes are: a) inability to create stable osteosynthesis against the background of osteoporosis and in types II and III of fractures according to Powel's classification; b) development of avascular disorders in the head in types III and IV fractures according to Garden. Currently, many elderly patients with fractures of the proximal femur in trauma hospitals in our country are refused surgical treatment because of their general condition and disease complex. With conservative treatment, more than 50% of patients die within six months of injury from hypostatic complications. The main cause of death is pulmonary artery thrombosis and thromboembolism (TELA), congestive pneumonia and bedsores. Conservative treatment methods do not provide the necessary conditions for the consolidation of bone fragments, healing occurs only in 10-12% of victims, and due to long-term orthopaedic treatment, the mortality rate reaches 21.2% . Fractures of the proximal femur are among the most frequent and complex skeletal fractures in the elderly, leading to mortality and disability. The most urgent problem is the rapid relief of pain syndrome and restoration of patients' motor activity - the main way to prevent hypostatic complications, and practically to save patients' lives. In our opinion, such an opportunity is provided by performing emergency surgical interventions in all patients regardless of age and the presence of concomitant diseases.

The treatment of proximal femur injuries is one of the pressing problems of modern traumatology. The main tasks of orthopedists-traumatologists are the choice of treatment tactics and the development of modern minimally invasive methods of surgical treatment for fractures of this localization, especially in elderly and old people.

It is well known that the effectiveness of treatment depends primarily on the timely admission of the patient to the clinic. Thus, in the first three days after the fracture osteosynthesis can be performed; in later periods hip arthroplasty is more effective. In the case of osteosynthesis, the prospect of a good result is inversely proportional to

In the case of osteosynthesis, the prospect of a good outcome is inversely related to the time since the injury: the earlier the operation, the better the chances of a good outcome. However, even with late admission or delayed surgery, when intensive preoperative correction of comorbidities or basic function abnormalities is required, a favourable outcome may be achieved, but with the use of an endoprosthesis. In men between 60 and 80 years of age, the ratio of neck fractures to vertebral fractures is known to be approximately the same. In contrast, femoral neck fractures predominate in all age groups except the elderly, doubling every 5-6 years [5,14,15,36,39], indicating an important role for systemic osteoporosis in the genesis of femoral neck fractures. It is predicted that 11.6% of women aged 50 years will be hospitalised with fractures of this location in later life. Obviously, the main contingent consists of patients with a high prevalence of chronic somatic pathology: 70-92% of patients, in addition to the fracture, have concomitant diseases of the cardiovascular, respiratory, urinary and digestive systems. It is also known that due to anatomical and biomechanical factors, femoral neck fractures with displaced

fragments cannot be repaired without surgical intervention. The treatment of proximal femur fractures remains a complex problem. The choice of treatment depends on the patient's age, physical activity prior to injury, comorbid somatic pathology, osteoporosis, urgency of surgical intervention, appropriateness of treatment, atraumaticity, and comprehensive rehabilitation treatment in the postoperative period [7]. The main method of treatment for femoral neck fractures remains operative. When performing organ-preserving osteosynthesis type operations, great attention is paid to the time factor: the operation must be performed as early as possible from the time of injury. The success of the operation depends on accurate repositioning and compression of the bone fragments, correct insertion of fixators, and comprehensive rehabilitation . Successes in the treatment of this pathology over several decades have been mainly due to improvements in the technical means of providing surgical intervention to increase the stability of the bone fragments. More modest advances have been made in the prevention and treatment of trophic disorders in the injured joint. Preoperative examination of patients with femoral neck fractures is limited to bilateral radiographs and only occasionally to computed tomography (CT). However, to optimise the preoperative examination, the choice of surgical technique and its effectiveness, it makes sense to use other informative diagnostic techniques: magnetic resonance imaging, ultrasound, contrast-enhanced angiography, ultrasound Doppler sonography (USD) of vessels, radiometry, radiography, scintigraphy, etc.

In femoral neck fractures, especially subcapital and transcervical fractures, the blood supply to the femoral head is severely compromised, which impairs the consolidation capacity of the fracture. Reparative capacity in the fracture zone directly depends on the time elapsed since the injury. According to foreign authors, femoral neck fractures should be treated surgically as soon as possible, up to 48 h [3,7]. In many foreign clinics, these operations are considered urgent. In domestic traumatology, the minimum time for osteosynthesis of fractures of this localisation is 3 to 5 days. However, surgical treatment after a longer period of time increases the percentage of nonunions and avascular necrosis [2,3]. The first closed femoral neck osteosynthesis with steel spokes was performed by Langenbeck in 1850. The operation was repeated by Konig in 1875 and Nikolaysen in 1897 using a similar fixator. However, the poor fixation properties of the fixator and its material, and the lack of sufficient aseptic and antiseptic treatment prevented the method from being widely used. In 1904, Whitman reported on the successful treatment of a femoral neck fracture after closed X-ray controlled repositioning and immobilisation with a coxite plaster cast. This was the beginning of the widespread use of conservative treatment of fractures of this localization. However, clinical experience with this method indicates its unreliability due to secondary displacements, healings, and contractures. The number of unsatisfactory results ranges from 78% to 82%.

This led to the development of new techniques for the surgical treatment of femoral neck fractures. The three-blade nail osteosynthesis method proposed by Smith-

Petersen in 1927 and modified by Johansen in 1934 seemed to solve the problem. However, despite the widespread introduction of such fixators into clinical practice, unsatisfactory outcomes were observed in 29-64% of patients. The use of more biomechanically reliable structures such as the Seppo fixator, AO compression screws, and Hansson nails did not result in a significant reduction in complications in the immediate and long-term postoperative periods. Although the use and acceptance of the 3-blade nailing method for fixation of femoral neck fractures is universal, many authors note its disadvantages [7].

These disadvantages include the frequent migration of the nail, mobility between the fractures, and the development of diastasis between them, which subsequently causes a false joint. A frequent complication is aseptic necrosis of the femoral head, occurring in 20-30% of cases even when the fragments are well adapted (18). In recent years, various compression fixators have become widespread. They bring the bone fragments into close contact with each other, ensuring immobility of the bone fragments, which is the most important condition for successful fracture healing . Methods for the surgical treatment of proximal femur fractures. There are different techniques for closed percutaneous osteosynthesis of the proximal femur:

- Percutaneous osteosynthesis fixators developed at CITO. The fixator is a cylindrical rod with multistepped threads in the area of the femoral head and the area of the greater trochanter. In the distal part of the fixator the thread is placed in a cone, which provides compression of the fracture as the fixator is inserted into the femoral head;
- Noll breaking nails by introducing three nails in parallel (or at a slight angle to each other) in a transcervical direction achieve a fairly stable fixation of the proximal femoral bone fractures. However, these nails do not provide the necessary compression (especially in thin bone structures) because they are cortically threaded;
- using femoral cannulated screws. As with the Noll nailing, a stable fixation of the femoral head is achieved and the necessary compression between the bone fragments is achieved thanks to the spongy thread of the screws. This method gives good results, but it is technically more complicated and requires more time than Noll's osteosynthesis (because the screws are screwed in manually with a wrench) as well as auxiliary tools (guide wire, wrench, guide) .

The two main methods of surgical treatment of femoral neck fractures, osteosynthesis and endoprosthesis, do not satisfy surgeons because of the high number of complications. The treatment of proximal femur fractures should be aimed at preventing these fractures by increasing the load-bearing reliability of this naturally created bone structure by all possible means, as well as by creating new biocomposites based on bone apatite, possibly in osteosynthesis with autografts and improving their surgical treatment technique. For the treatment of vertebral fractures, L-shaped plates with different angular orientation and dimensions of the diaphyseal lining are used. However, although they provide rigid fixation and have considerable functionality, these fixators are not always used for complex proximal femoral osteochondral fractures. The development of theoretical and practical aspects of osteosynthesis with

external fixation devices on the basis of rods and spokes for treatment of intra- and periarticular fractures of the proximal femur is a promising direction in modern traumatology.

Conclusion. Thus, the operative method is the main method for treating fractures of the proximal femur, which allows performing repositioning, stable fixation of bone fragments with interfracture compression, and early activation of patients (especially in elderly and old age). With surgical fixation, the consolidation of fractures reaches 80% and the rehabilitation period is shortened. Nevertheless, improving the treatment of proximal femur fractures in order to reduce the incidence of fracture incoordination and to develop targeted and effective means to influence bone tissue regeneration and prevent postoperative complications remains an urgent task

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