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# Current State of the Problem of Diagnosis and Treatment of Patients with Acetabular Fractures

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**Abstract** Fractures of the acetabulum are one of the most severe injuries of the musculoskeletal system, differ in complexity and variety and represent intra-articular injuries of the hip joint. Despite significant advances in hip surgery over the past decades, the treatment of patients with acetabular fractures remains an urgent problem of modern traumatology and orthopedics. The indicators of the frequency of this type of injury are small (0.05% - 0.32%), however, the combined nature, the significant severity of the injury is the cause of high mortality among victims in the acute and early stages of traumatic illness. Most of the survivors become disabled for a long period of time, and sometimes for the whole life.

**Keywords** Acetabulum, Physiological, Osteosynthesis, Minimally invasive osteosynthesis, Primary total hip arthroplasty, Surgical treatment, Acetabular fracture

## 1. Introduction

Injury to the acetabulum is one of the most difficult types of injuries to the pelvic bones, which occur in 7-22% of cases [5]. The frequency of this type of injury is low (0.05 - 0.32%), however, the combined nature, the significant severity of the injury causes high mortality. Most of the survivors become disabled for a long period, and sometimes for the whole life. Victims with injuries of the acetabulum are often people of working age - under 50, which determines the socio-economic significance of this problem. [13]

A steady increase in the number of victims of this category has been noted since the middle of the 20th century and is due to the development of technological production, the emergence of high-speed transport, as well as other high-energy traumatic factors. According to a number of authors, acetabular fractures most often occur as a result of road accidents - about 89% of victims, as well as falls from a height - in almost 12% [9].

Numerous studies have shown that the proportion of fractures of the pelvic bones is 1.7-10% among all fractures [3] and increases to 18.6% in polytrauma. According to a number of authors, acetabular fractures account for 5.9 to 20% of all pelvic fractures [1,8], of which 42-71% of injuries occur as a result of road traffic accidents [6]. The second most frequent source of injuries leading to such injuries is occupational injury 11–25% [4], while other causes are identified in 4% of cases.

In recent decades, there has been an increase in the absolute and relative number of pelvic and acetabular fractures in the structure of injuries, that is, both the total number of fractures (relative number) and the proportion of acetabular fractures (absolute number) are increasing [4]. Men who are of working age (up to 73%) prevail among the victims. [2,7].

According to O.Sh. Buachidze (2003), diagnostic errors occur in 12.6% of patients and most often in patients with multiple injuries.

Comparing the statistical data of various literary sources, it can be stated that isolated IV fractures were found in 28-35% of cases. In most of the victims, IV injuries were a component of concomitant injuries (76-89%), and in 22-30% of the victims, head injuries dominated in the clinical picture, in 8-14% - chest injuries, in 2-7.9% - abdominal injuries ... Quite often, injuries to the extremities (38-43%), peripheral nerves (in most cases of the sciatic nerve - 14-20%), the organs of the genitourinary system (14-17%), the spine (2-3%) were observed in patients with IV fractures. violation of the integrity of the pelvic ring (6.2%) [5]. In the long term after an IV injury in most of the victims, many researchers have revealed a significant dysfunction of the lower limb, which was the cause of persistent disability in 30–67.7% of patients [6,13,16].

Analysis of diagnostic errors made it possible to establish that they occurred in 12.6% of IV fractures [6].

Acute massive blood loss, as a rule, is not characteristic of

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IV fractures, but it can occur with displaced fractures in combination with a violation of the pelvic ring [13].

Analysis of data from foreign literature shows that in the industrially developed countries of Western Europe and America, surgical methods of treatment are preferred in patients with explosive injuries [13]. In the absence of contraindications on the part of internal organs and systems, open reduction and internal fixation were performed within 3-10 days after injury (on average after 8.9 ± 2.9 days) [11]. After removing the victims from shock and stabilizing the functions of the vital systems of the body, patients with IV injuries underwent open reduction and internal fixation of the IV in a planned manner for up to 120 days or more [10]. These progressive trends in our country have developed only in single large medical institutions and research centers [6,9,14,16].

Analysis of publications shows that the indications for surgical treatment are type B and C pelvic fractures [9]. In this case, as a rule, immediate fixation of pelvic fractures is required as an urgent primary surgical procedure aimed at stopping bleeding and combating shock [8,12]. The timing of surgical interventions on the pelvic ring and IV, according to recent publications, is primarily due to the patient's condition, the severity of anatomical and functional injuries, the duration of the resuscitation period and varies from 1-3 to 34 days [4]. It should be noted that in almost all publications the authors write about the need for surgical treatment of patients in this group [5] at an earlier date (6-10 days).

However, despite the huge number of scientific papers devoted to the use of CT, there are no clear indications and timing of this study.

In addition to radiography and computed tomography, which are standard diagnostic methods for such injuries, in some cases, it is advisable to use magnetic resonance imaging (MRI).

According to the studies of a number of domestic and foreign authors, the main causes of explosive damage were road accidents and falls from a height [4,8].

From the point of view of the biomechanics of IV injuries, most specialists identify three fundamental, but, in fact, interrelated approaches to the characteristics of trauma: the degree and nature of congruence disorder! articular surfaces, stability of the hip joint (HJ) and the variant of mechanogenesis (mechanism) of damage.

Analysis of the fracture mechanism showed that the nature of the acetabular damage is largely determined by the relationship in the joint at the time of injury, i.e. the degree of flexion, abduction, adduction, or rotation. Flexion and adduction of the hip leads to dislocation, with flexion and mid-rotation position, a fracture of the upper-posterior edge occurs, with 90° flexion - a fracture of the posterior edge, with 115° flexion - a fracture of the postero-lower edge of the acetabulum. [10]. Under the action of force from the femoral neck and median rotation, a transverse fracture of the acetabulum occurs. With internal rotation of 25-50°, transverse fractures in combination with a fracture of the ilio-ischial support, the latter often breaks when abducted towards the thigh by 10-15°. For a fracture of the ilio-pubic support to occur, external rotation of at least 30° and abduction of the thigh are necessary, and the impact force must act on the greater trochanter. [9].

Fractures of the edge of the acetabulum, as a rule, are accompanied by iliac dislocation of the hip, a common complication of such fractures is damage to the sciatic nerve - 2-4% [6]. Fracture of the bottom of the acetabulum in 30% of cases is accompanied by a central dislocation of the hip [14]. In this case, the impact force acts along the femoral neck, the proximal part of the thigh is in the position of 10-20° of internal rotation, and the main impact force is shifted to the central part of the depression. With this type of fracture, complications are possible in the form of damage to the pelvic organs, massive internal bleeding into the retroperitoneal space, and the development of shock, which naturally causes difficulties in the timely diagnosis of acetabular fractures [3,6]. Although, according to O.Sh. (2002), only in 11% of cases, acetabular fracture is a damage that determines the severity of the patient's condition. O.Sh. Buachidze (2002), writes that diagnostic errors occur in 12.6% of patients and most often in patients with multiple injuries.

Currently, various authors use the term "vault of the acetabulum", understanding by it the part of the acetabulum located above the notch in the direction of the action of the total vector of forces applied to the acetabulum. On computed tomograms, the arch is presented in the form of a hemisphere, the border of which is located 10 mm below the apex of the acetabulum [13].

To ensure the normal function of the hip joint, to distribute the load on the entire accessible articular surface, to reduce the load on the articular cartilage, the size of the fornix of the acetabulum should be sufficiently long, since the direction of the forces acting on the acetabulum changes depending on the type of daily human activity [16]. Matta J.M. et al. consider that the dimensions of the arch should exceed the limits of the area of action of the naphtha [12].

In order to test the hypothesis about the leading role of the acetabulum in determining the outcome of treatment, Matta J. et al. [13] proposed a way to quantify its damage. It was found that the unrepaired displacement of the acetabulum fragments of more than 3 mm with the range of the posterior and middle arches of the VV fornix up to 30°, the anterior arch up to 20°, in all observations lead to unsatisfactory results. Since it was not possible to achieve satisfactory reduction of fractures of this type by conservative methods, the authors conclude that the range of the acetabulum vault less than 45° in each of the three dimensions is an indication for surgical treatment [15].

E.Yu. Valiev, A. Tilyakov studied the process of treating patients in scientific research. The results of treatment of patients with acetabular injuries from 6 months to 1 year were studied. Evaluation of the results of treatment of patients was carried out in two directions: anatomical and functional. The anatomical result was assessed on the basis of control radiographs and computed tomograms. Long-term

functional results were assessed on the basis of complaints, clinical data, range of motion in a healthy and damaged joint. Complete elimination of displacements of bone fragments of the acetabulum with restoration of congruence of articular surfaces was considered good anatomical results. Full restoration of the functionality of the pelvic ring and hip joints was considered good functional results. Incomplete elimination of displacements with good adaptation of bone fragments was considered satisfactory anatomical results. Satisfactory functional results were considered for pain arising from prolonged physical exertion, limitation of extreme movements in the hip joint, presence of pelvic deformity that did not significantly affect the support function, with limitation of movements in the joint to 25-30% with a slight defect in gait. Unsatisfactory results were assessed in the presence of severe pain syndrome, including at rest, with restriction of movements in the hip joint for more than 30%, impaired support function and the occurrence of secondary degenerative-dystrophic diseases - coxarthrosis, aseptic necrosis of the femoral head, etc. [17]

## 2. Conclusions

Thus, acetabular fractures occupy an important place in the structure of injuries. In addition, in recent years, there has been an increase in car injuries and the proportion of acetabular fractures continues to increase steadily. Moreover, this type of injury is characterized by high mortality and disability. The problem of diagnosis and treatment of acetabular fractures has been the subject of many works, at the same time, the current methods of conservative treatment are insufficiently effective and have many disadvantages. There are also deficiencies in the diagnosis of acetabular fractures and there are no clear indications for the use of modern diagnostic methods.

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