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TWO-STAGE REVISION HIP REPLACEMENT PATIENS WITH SEVERE ACETABULUM DEFECT (CASE REPORT)

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ABSTRACT. Favorable short-term results of arthroplasty are observed in 80–90% of cases, however, over the longer follow up period the percentage of positive outcomes is gradually reduced. Need for revision of the prosthesis or it's components increases in proportion to time elapsed from the surgery. In addition, such revision is accompanied with a need to substitute the bone defect of the acetabulum. As a solution the authors propose to replace pelvic defects in two stages. During the first stage the defect was filled with bone allograft with platelet-rich fibrin (allografting with the use of PRF technology). After the allograft remodeling during the second stage the revision surgery is performed by implanting standard prostheses. The authors present a clinical case of a female patient with aseptic loosening of acetabular component of prosthesis in the right hip joint, with failed hip function of stage 2, right limb shortening of 2 cm. Treatment results confirm the efficiency and rationality of the proposed bone grafting option. The authors conclude bone allograft in combination with the PRF technology proves to be an alternative to the implantation of massive metal implants in the acetabulum while it reduces the risk of implant-associated infection, of metallosis in surrounding tissues and expands further revision options.

Keywords: hip revision arthroplasty, bone defect, bone grafting, augment, PRF technology.

INTRODUCTION. A positive result of hip re-endoprosthetics (HJ) largely depends on the correct solution of a number of preliminary tasks. One of the most serious problems in hip arthroplasty is bone tissue deficiency, in the overwhelming majority of cases, acetabular bone tissue deficiency. The choice of surgical treatment tactics is greatly facilitated if the size of the acetabular defect and its localization are known [1].

To determine these parameters W.G. Paprosky et al. Proposed an easy-to-reproduce and practical classification [2]. One of the most severe is a massive acetabular defect with complete loss of support for all its structures - type 3B according to W.G. Paprosky. That is, the destruction of the supra-acetabular array occurs, and the implant is displaced more than 3 cm above the upper edge of the obturator hole. In addition, there is a medial displacement of the acetabular component into the pelvic cavity with its overlap behind the Koehler line, up to the sacroiliac joint. The back column also shows signs of damage and loses its support. Radiographically, this is manifested by the spread of the osteolysis zone below 15 mm from the upper edge of the obturator opening. Thus, with this type of defect, the roof of the acetabulum, both columns and the bottom are affected. Less than 40% of the bone tissue retains its ability to fix the porous-coated acetabular component [3].

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At the initial stages of revision arthroplasty, the placement of cemented acetabular components with the use of a large amount of bone cement is traditionally used, but this often leads to the development of early cup instability and the progress of bone tissue deficiency. According to the observations of N.S. Amstutz et al, instability of the acetabular component appears in 9.1% of patients within 2 years after surgery [4]. To compensate for bone deficiency, J. Meehan et al. Suggest using massive allografts and acetabular components of cementless fixation. However, their use increases the risk of early and late complications, including infectious [5]. The incidence of unsatisfactory results with this technique ranges from 17 to 60% 2-14 years after surgery [6]. Therefore, for reconstruction with large defects of the acetabulum, many surgeons recommend using either the transplantation of the entire acetabulum and the installation of a cement-fixation cup (mainly in young people), or an anti-protrusive support ring (APC) and a cement-fixation cup (in older patients) [4 , 5]. In all proposed methods, defect replacement and implantation of the acetabular component are performed simultaneously. The calculation is made on the support of bone grafting and primary press-fit fixation of the acetabular component, as well as on the fact that the subsequent restructuring of the bone plastic material will make it possible to achieve the secondary fixation of the component [6].

We propose a technique for two-stage re-endoprosthetics of the hip joint in the presence of an extensive bone defect with a high risk of SSI, which has arisen after previous re-endoprosthetics with replacement of the defect with a large amount of bone cement.

We used PRF-technology - a method of obtaining platelets with a high content of fibrin [7]; deproteinized bone allografts in the form of longitudinal cuts made from intravital resected femoral heads. Allografts were prepared according to the author's method. An important property of this material is the preservation of the required level of physical and mechanical characteristics, morphological features and elemental composition of allogeneic bone [8, 9].

We present a clinical case as an example. In working with the patient, the ethical principles prescribed by the World Medical Association Declaration of Helsinki, revised in 2013 and the "Rules of Clinical Practice in the Russian Federation" approved by the Order of the Ministry of Health of the Russian Federation No. 266 of June 19, 2003, were observed. Patient gave his voluntary written consent to the publication of this clinical observation.

A 71-year-old female patient was admitted for treatment on 04/21/2016 with a diagnosis of aseptic acetabular instability of the endoprosthesis of the ES and the right hip joint, grade 2 joint failure (IFC), shortening of the right lower limb by 2 cm.Right coxalgia syndrome. On admission she complained of pain in the groin area on the right, in the right gluteal region and in the lower back, shortening of the right lower limb. No signs of systemic inflammation were found in paraclinical analyzes.

In 1992, the patient received a closed fracture of the acetabulum on the right as a result of a traffic accident, for which a hip replacement was performed. In 2000,

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aseptic instability of the endoprosthesis was revealed, as a result of which a re-endoprosthetics of the right hip joint was performed. In 2005, for total aseptic instability, a second hip replacement was performed on the right. From the moment of re-endoprosthetics, the patient was worried about pain in the right hip joint, aggravated by walking. Since September 2015, the pains were constant. The patient was admitted to our clinic for re-endoprosthetics of the right hip joint.

According to the results of additional studies, signs of systemic inflammation were not revealed. According to the data of X-ray examination methods (X-ray of the pelvis in frontal projection, X-ray of the right hip joint in two projections, MSC T followed by 3D reconstruction), the patient had a type 3 B acetabular defect according to W.G. Paprosky. An increase in the size of the acetabulum up to 70 × 47 mm was noted. The bottom of the acetabulum is thinned, with the presence of defects and fragmentation of bone tissue, prolapse into the pelvic cavity by 25 mm and up to the sacroiliac joint.

Taking into account the multiple (1992, 2000, 2005) of surgical treatment, puncture of the prosthesis area was performed to exclude periprosthetic infection. The bacteriological test result is negative. When analyzed according to the ASA (American Society of Anestesiologists) scale, the somatic status and operational risks were defined as III (1 point), the predicted volume of surgery and time exceeded the value of 75 percentiles (1 point), and the wound class corresponded to a conditionally clean wound (taking into account the multiple previously performed operations) [11]. Thus, the risk of developing an infection according to the NNIS (National Nosocomial Infections Surveillance) scale, according to the CDC (Centers for Disease and Prevention) recommendations, was estimated at 3 points [12]. This corresponded to the likelihood of developing a surgical site infection (SSI) in 15–18% of cases [13, 14].

This circumstance prompted the decision to carry out a two-stage arthroplasty. The first stage was the removal of the endoprosthesis and bone alloplasty of the defect using PRF technology. To prevent displacement of the allograft, it was planned to install a Flexible Wire Mesh (X-change Revision Surgical Protocol Stryker Exeter), fixed with 6 Stryker screws screwed along the perimeter of the defect. At the same time, during the operation, it was planned to take biopsies (at least 6 to remove the issue of latent paraprosthetic infection). Later, in the absence of SSI in the postoperative period and with formed bone regeneration, it was planned to carry out the second stage of treatment with the implantation of revision acetabular structures.

On April 27, 2016, a surgical intervention was performed: removal of the ES I endoprosthesis with bone grafting of the defect. We performed an arcuate approach along the outer surface of the proximal third of the femur along the old postoperative scar. Then the proximal femur was mobilized. As a result of scar excision, altered acetabular walls with bone cement were identified. The head of the endoprosthesis was brought into the wound and removed. The femoral component of the

endoprosthesis was stable, the proximal part of the femur showed signs of bone lysis: the greater trochanter was absent, in the region of the lesser trochanter there were bone defects filled with white detritus. The femoral stem component ES I with 11/13 taper was removed by traction with little force. In the area of previously installed cerclages, a linear fracture of the femur occurred, which required its fixation with a rope.

Cement acetabular cavity ES I turned out to be unstable and mobile. It was not possible to remove it as a conglomerate with the cement mantle, without damaging the bone structures formed around it. Therefore, the acetabular cavity was first sequentially drilled with milling cutters, and then the cement mantle was fragmented with osteotomes and removed.

The acetabular defect has been identified as type 3B by W.G. Paprosky. The anterior column was absent; instead, there was a swollen, altered bone tissue - a thickened arch-like bone plate. The bottom of the cavity looked like a thin inwardly curved bone plate that extended upward and medially, up to the sacroiliac joint. The supra-acetabular array was absent, the back column was changed, but preserved. The posterior edge of the acetabulum was absent. The ischium was filled with white detritus for 15 mm. The contour of the bone is preserved in the form of thin plates along the periphery. The visible pubic bone was intact and was bleeding. On the inner surface of the bone defect, a large number of cyanotic granulations were noted, which were taken for bacteriological examination.

From the patient's peripheral vein, 42 ml of blood (with the addition of Z-Activator) was taken into 6 tubes, 7 ml each, and 1 ml of 10% calcium chloride solution. The tubes were centrifuged at 4G acceleration for 10 min. The resulting fibrin clots were placed in the bone defect of the cavity alternately with deproteinized bone allografts in the form of plates up to 3–5 mm thick, made from the heads of the femoral bones.

Laying was carried out with impaction. After complete filling of the defect, to prevent displacement of the allograft during verticalization of the patient, fixation was performed with a perforated flexible wire mesh plate (X-change Revision Surgical Protocol Stryker Exeter), fixed with 6 screws (Stryker).

Drainage was not installed due to the need to form a hematoma for the graft to be impregnated with platelets. In conclusion, layer-by-layer sutures were applied to the wound with vicryl, intradermal sutures, and an aseptic dressing.

The postoperative period was uneventful, antibacterial therapy with Cefazolin 2 g 3 times a day was carried out until the results of bacteriological studies were obtained. Negative results were obtained on the 5th day, after which antibiotics were canceled. The patient was trained to walk with crutches and was discharged home on the 14th day after surgery.

Considering the systemic osteopenia revealed in the patient with t-criterion = -1.5; secondary widespread osteoporosis of the right lower limb; pronounced regional osteoporosis in the area of the right hip joint against the background of gross sclerotic

changes in the adjacent sections of the articulating bones; the waiting period for the second stage was reduced to 4 months. The absence of SSI signs during this period confirmed the aseptic nature of instability, which, in turn, increased the likelihood of maintaining the support ability of the bone-plastic material in the defect. There was also a likelihood of maintaining acceptable bone quality in the right femur.

The patient was admitted to the second stage of treatment 09.09.2016. Upon admission, the diagnosis was made: defect of the right hip joint after removal of the ESI endoprosthesis; condition after bone grafting of an extensive defect in the right acetabulum 3 B; unsupported right lower limb. In the KLA, there was leukocytosis with degenerative right shift, thrombocytosis, ESR 66 mm / h, CRP - 8.97 mg / l.

The absence of systemic inflammation made it possible to perform staged surgical treatment. On the 17th week. after removal of the prosthesis and bone alloplasty, the right hip joint was replaced with a Zimmer Wagner 225 / Continuum endoprosthesis with an augment installation.

The skin, subcutaneous tissue, fascia were dissected through the access to the previous operative scar in the proximal third of the right thigh, and the scars were mobilized. The area of the acetabulum is sharply mobilized. Metal mesh and screws visualized.

The structures were removed without technical difficulty. Under the mesh, an array of bone allograft with a flat surface, tightly welded to the bone bed, was determined. Fragments from this area were taken with nippers for histological examination. The ischium is then visualized as the lowest pivot point. The upper point of support was verified in the iliac wing region at a distance of 76–78 mm from the ischium. The acetabulum was machined sequentially from 54 mm, focusing on the true center of rotation, with periodic activation of the reverse mode, up to 62 mm. At the same time, medialization was avoided, while preserving bone grafting as much as possible.

The Continuum 62 acetabular cavity with 62/20 augment was tested, with a half-length augment implanted in the upper sphere of the bone-impacted defect. The wedging between the pivot points is considered sufficient. The augment was sequentially fixed with three screws: the diameter of the first screw was 50 mm, the other two were 60 mm, after which a 62 mm Zimmer Continuum acetabular component was implanted between the ischium and the augment with fixation to the augment with cement and additional fixation with one 50 mm screw. The depth of the depression is sufficient. The fixation is satisfactory. A 36 mm polyethylene insert is installed under the femoral head.

Further, the proximal end of the femur was brought out into the wound. The femoral canal was visualized, the scars were excised. Bone tissue in the upper third was assessed as sufficiently dense and was bleeding. The femoral canal was enlarged with drills and a 14/225 femoral stem was implanted. The head of the endoprosthesis -3.5 / 36 is fixed on the femoral component. The endoprosthesis was assembled in the wound; the range of motion was checked. The range of motion was found to be

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sufficient. A PVC drainage tube was brought to the endoprosthesis bed through the counter-opening. Were imposed layer-by-layer sutures on the wound with vicryl, intradermal sutures, and aseptic dressing. Postoperative control radiographs were taken.

Long-term results were assessed after 10 months. at a correspondence consultation by phone. The patient refused to undergo a full-time examination, citing the absence of pain. The patient reported that she walks with a crutch with full load on the right lower limb, using a 2 cm-high limb length compensator. When walking, pain in the area of the right hip joint was assessed by the patient according to the VAS of 3 points. In filling out the Harrison questionnaire, the doctor orthopedic traumatologist at the place of residence helped: the result was assessed as satisfactory (78 points).

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