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D.A. Nasirli
Azerbaijan Medical University, Baku, Azerbaijan

SMALL ACCESS SURGERY FOR TOTAL ENDOPROSTHETICS IN PATIENTS WITH DYSPLASTIC COXARTHROSIS

e-mail: medstatnauka@mail.ru

The most promising treatment of dysplastic coxarthrosis is total arthroplasty using mini- and non-invasive surgical access techniques. For a comparative assessment of the effectiveness of total hip arthroplasty using classical and modified surgical approaches, we analyzed the course of the disease in 55 patients with dysplastic coxarthrosis types 1 and 2 according to Hartofilakidis, divided into two groups: control – 25 patients and main – 30 patients. All patients underwent total hip arthroplasty. The results of the treatment were evaluated 6 months and 1 year after the intervention using clinical and radiological methods. Patients were evaluated for disease activity according to the DAS28 index and performed a complete blood count, study of the immune status by determining the serum concentration of C-reactive protein. A comparative analysis of the identified parameters shows that patients of the main group have a significantly more pronounced tendency to a decrease in the content of C-reactive protein at all stages of the postoperative period. When screening for chronic pain syndrome, there was a definite relationship between access technique and disease activity. The use of the proposed minimally invasive surgical approach for total hip arthroplasty in patients with dysplastic coxarthrosis is effective and can significantly reduce the intensity of pain and improve the results of arthroplasty in general.

Key words: dysplastic coxarthrosis, arthroplasty, surgical approach, protein, disease activity

Д.А. Насірлі

ХІРУРГІЧНІ МАЛІ ДОСТУПИ ПРИ ТОТАЛЬНОМУ ЕНДОПРОТЕЗУВАННІ ПАЦІЄНТІВ З ДИСПЛАСТИЧНИМ КОКСАРТРОЗОМ

Найбільш перспективним у лікуванні диспластичного коксартрозу є тотальне ендопротезування із застосуванням міні- та неінвазивних методик хірургічного доступу. Для порівняльної оцінки ефективності тотального ендопротезування тазостегнового суглоба із застосуванням класичних та модифікованих хірургічних доступів було проведено аналіз перебігу хвороби у 55 пацієнтів з диспластичним коксартрозом 1-го та 2-го типів за Hartofilakidis, розділених на дві групи: контрольна – 25 та основна – 30 хворих. Всім хворим виконувалося тотальне ендопротезування кульшового суглоба. Результати лікування були оцінені через 6 місяців та 1 рік після втручання за допомогою клінічного та рентгенологічного методів. У пацієнтів здійснювалася оцінка активності захворювання за індексом DAS28 та виконувався загальний аналіз крові, вивчення імунного статусу визначенням сироваткової концентрації рівня С-реактивного білка. Порівняльний аналіз виявлених параметрів показує, що пацієнти основної групи мали значно більш виражену тенденцію до зниження вмісту С-реактивного білка на всіх етапах післяопераційного періоду. При проведенні скринінгу хронічного больового синдрому був певний взаємозв'язок між методикою доступу та активністю хвороби. Застосування запропонованого мініінвазивного хірургічного доступу при тотальному ендопротезуванні кульшового суглоба у пацієнтів з диспластичним коксартрозом є ефективним і дозволяє суттєво знизити інтенсивність болю та покращити результати ендопротезування загалом.

Ключові слова: диспластичний коксартроз, ендопротезування, хірургічний доступ, білок, активність хвороби

Despite the increase in the number of hip replacement surgeries performed and the specialized centers that perform them, as well as the good functional results achieved at the same time, problems arise when comparing the results and effectiveness of various surgical approaches to the acetabulum, the use of different designs and methods of implantation of artificial joints, which is due to the lack of a single registry of total endoprosthetics and a clear systematization of the articular pathology itself [14]. Hip replacement

remains one of the urgent problems of modern orthopedics in patients with dysplastic coxarthrosis, which, being a degenerative-dystrophic disease, occupies an average of 20 to 80 % in the structure of similar pathological disorders in the joint area and manifests itself, against the background of deformation of the articular ends of the bones, in a change in the shape and depth of the acetabulum, a change in the proximal the department and the cervical-diaphyseal angle of the femur [12].

The frequency of occurrence of the studied disease among the able-bodied population in some countries may range from 5 to 25 % [7], accounting for about 17 % of the total pathology of the musculoskeletal system, while it is important to note that hip replacement operations are more often performed among young people and the epidemiological component is mainly represented by female patients [5, 14]. Dysplastic coxarthrosis leads to pathological changes in bone tissue and serious biomechanical changes around the joint itself, and the progressive nature of its destruction, along with some difficulties and possible complications arising during surgery, especially against the background of terminal arthritis, in more than half of cases leads to deterioration of almost all components of the quality of life of patients, including including a decrease in working capacity and frequent disability [13]. Severe dysplasia, which can be observed in dysplastic coxarthrosis, pronounced defects of the acetabulum edges can contribute to an increase in the number of postoperative complications and deterioration of the results of surgery [6, 8].

The main method on the part of specialists in choosing the treatment of degenerative-dystrophic pathology of the hip joint is considered to be total endoprosthetics, which allows to reduce the severity of pain in patients and significantly improve their quality of life in a certain period of time [1].

The purpose of the study was to conduct a comparative analysis of the results of total hip replacement using classical and modified surgical approaches to the acetabulum in patients with dysplastic coxarthrosis of the hip joint.

Material and methods. To assess the effectiveness of total hip replacement with the use of various surgical approaches, a prospective analysis of the course of the disease was carried out in 55 patients with dysplastic coxarthrosis of types 1 and 2 according to Hartofilakidis, who were treated at the Therapeutic Surgical Clinic of the Azerbaijan Medical University. All the examined patients (100 %) were persons of working age. The average age of patients was 51.6 ± 0.55 and 50.3 ± 0.71 years, respectively, in the first and second groups (from 45 years to 56 years). The criteria for inclusion in the study were: 1) dysplastic coxarthrosis of types 1–2 according to the classification of Hartofilakidis and 3–4 stages of the pathology under study according to X-ray data; 2) clinical signs of severe pain syndrome; 3) movement restrictions in the diseased joint. Exclusion criteria were associated with the presence of severe somatic pathology: 1) osteoporosis and long-term use of glucocorticosteroids; 2) kidney stones; 3) diseases of the digestive system; 4) insulin-dependent type of diabetes mellitus; 5) viral diseases.

All patients underwent cementless total endoprosthetics of the affected joint. Operating technique No. 1 – control group (25 patients). Direct side access, proposed by R. Bauer and improved by K. Hardinge [3]. Surgical technique No. 2 was performed in the main group (30 patients). After collecting the anamnesis, in order to determine the activity of the inflammatory process, a general blood test was performed, which necessarily included the study of the immune status of patients to determine serum concentrations of the level of C-reactive protein (CRP) by the immunonephelometric method. Patients were assessed for disease activity according to the DAS28 index (Disease Activity Score) [4] (including an assessment of the number of swollen and painful joints, ESR and a general assessment of the state of health according to VAS): high activity – $DAS28 > 5.1$; moderate activity – $3.2 \leq DAS28 \leq 5.1$; low activity – $2.6 \leq DAS28 < 3.2$; remission – $DAS28 < 2.6$. It is worth noting that before and after the endoprosthetics, we conducted repeated clinical studies and biochemical analyses in order to assess the further dynamics of the patient's condition.

Statistical data processing was carried out using the Statistica 7.0 application software package and the Excell 2013 standard statistical analysis package. Statistical methods included the estimation of the arithmetic mean (M), the standard error of the mean ($\pm m$). The critical level of reliability of the null statistical hypothesis (about the absence of significant differences or factor influences) was assumed to be 0.05 ($p \leq 0.05$).

Results of the study and their discussion. The study included 55 patients with a reliable diagnosis of hip hyperplastic coxarthrosis of the I and II radiological stages, who gave written informed consent to participate in the studies. The first surgical technique involves performing a skin incision 12–16 cm long over the large trochanter, dissecting the wide fascia of the thigh throughout the wound, separating the muscle fibers of the middle gluteus muscle for 3 cm above the tip of the large trochanter, separating the middle gluteus muscle and the lateral portion of the quadriceps femoris subperiostally from the anterior surface of the large trochanter. Then dislocation of the femoral head is performed and further manipulations are performed.

To accommodate the patient in the main group, a set containing X-ray permeable holders was used in the following places: the pubic symphysis – two long holders and the sacral spine – two long holders. After that, the skin of the operated limb is treated three times with an antiseptic solution and covered with sterile linen, with the exception of the operating field, in compliance with all the rules of asepsis-antiseptics. Thromboembolic and compression stockings are put on the operated limb before the patient is moved to the operating room, and he is placed on the operating table on a healthy side. After spinal anesthesia, access was made along the outer-lateral surface of the hip joint and a skin incision 5–6 cm long along the trochanter line of the thigh, in the projection of a large trochanter with a layered dissection of subcutaneous tissue and a wide fascia of the thigh throughout the wound.

After careful hemostasis, the large gluteal muscle is separated at the place of its attachment and the hook is pulled upward and posteriorly. The posterior edge of the small gluteal muscle is gently pushed forward to demonstrate the underlying capsule. In order to avoid damage to soft tissues before the longitudinal dissection of the capsule, further manipulations are carried out through the gap between the middle gluteal and piriformis muscles, without damaging or crossing any muscles or tendons.

After the incision of the subcutaneous tissue, the widest fascia of the thigh is cleared of it and a Z-shaped dissection is made in it with a length of 3–4 cm, after which the joint capsule is dissected and due to flexion, reduction and external rotation of the thigh, the femoral head is dislocated. We outline the saw line and produce the sawdust of the femoral neck according to preoperative planning. Further, during bending, reduction and external rotation, the head is dislocated and the standard stages of total endoprosthetics are carried out. There is no need to separate the rectus femoris muscle from the joint capsule, it is enough to withdraw it with a retractor together with the anterior muscle capsule flap anteriorly. Then the Homan-type retractors are installed on the front and rear surfaces of the cavity, thereby ensuring the visibility of the acetabulum and its processing. Along the course of scars and remnants of the joint capsule, they move to the upper edge of the acetabulum to excise the remnants of the capsule and scar tissue before entering and exiting the acetabulum, until the “exposure” of the subchondral bone tissue, that is, trying not to damage the cartilage cover, since the preservation of the subchondral layer of the acetabulum provides the most favorable conditions for endoprosthetics. The technique of the protrusion socket is performed – medialization of the acetabulum. When using a cementless type of fixation and installation of the acetabulum, the size of the injected acetabular component of the endoprosthesis was 1–2 mm larger than the acetabulum itself.

When checking, the fixation of the acetabular component in the acetabulum was reliable. After that, the joint is brought into the position of external rotation when the hip joint is bent by more than 90 degrees. With a special lift brought under the large spit, the proximal femur is removed into the wound. Then the operated hip is rotated outward, and brought in such a way that the level of the neck sawdust protrudes into the wound, and it was convenient to process it. Having opened the bone marrow canal of the femur, its sequential expansion is carried out and, it is cleaned of the remains of the bone marrow with a chisel and developed with rasps to the required size, after which the same size prosthesis, or rather its body, is placed in the femoral canal, the head of the required size is selected and the femoral component is set into the acetabulum. The joint is checked for hip stability and volume and amplitude of movements. In the structure of patients of the two groups, the largest number was occupied by women (Table 1). The average age of patients was 51.6 ± 0.55 and 50.3 ± 0.71 years, in the first and second groups, respectively ($p > 0.05$).

Table 1

Clinical characteristics of the examined patients with hypoplastic coxarthrosis of the hip joint

Index	Patients groups	
	Control group (n=25)	Main group (n=30)
Gender, n (%)		
– Male	9 (36 %)	14 (46.7 %)
– Female	16 (64 %)	16 (53.3 %)
Age, years	51.6 ± 0.55 (45–56)	50.3 ± 0.71 (43–56)
BMI, kg/m ²	26.2 ± 0.19 (25–28)	26.1 ± 0.19 (22–28)
Kellgren radiological stage, n (%):		
I	17 (68 %)	21 (70 %)
II	8 (32 %)	9 (30 %)
VAS pain, mm	27.5 ± 0.34 (25–32)	26.8 ± 0.37 (23–32)
WOMAC index, mm	543.9 ± 2.30 (524–563)	541.4 ± 1.66 (523–557)

The indicators in the groups do not differ, $p > 0.05$

In the main group of patients (n=30), in which we preferred the surgical technique we proposed, the minimum and maximum protein levels recorded in the blood samples of patients before endoprosthesis were 6.6 mg/l and 10.7 mg/l, respectively, and the average during this period of the study in patients was determined to be 8.4 ± 0.26 mg/l, and in the blood samples of the same patients after 12 months was 5.4 ± 0.11 mg/l ($p < 0.001$). During this period of the study, the differences between the average values of one of the main markers of the acute phase of inflammation, that is, C-reactive protein (CRP), and the corresponding indicators before endoprosthesis identified in the above group turned out to be statistically unreliable ($p > 0.05$) (Table 2).

Table 2

Indices of C-reactive protein in groups of patients with hip hypoplastic coxarthrosis before and after endoprosthetics

Patient groups	C-reactive protein, mg/l		P
	Before endoprosthetics	12 months after	
Control group (n=25)	7.9 ± 0.23 (5.8–10.7)	5.6 ± 0.12 (5.0–7.5)	<0.001
Main group (n=30)	8.4 ± 0.26 (6.6–10.7)	5.4 ± 0.11 (4.6–6.5)	<0.001
P ₁	>0.05	>0.05	

Note: p is the statistical reliability of the difference in indicators (t is the Student's criterion)

In the control group of patients (n=25), where the Harding technique was used, the average blood level of the studied protein detected before endoprosthesis was 7.9 ± 0.23 mg/l. At this time, the maximum indicator for the level of CRP in biological materials taken from patients of the same group was 10.7 mg/l, and the minimum was 5.8 mg/l. In the course of further studies, it was found that the average protein level in the blood samples we received from patients 1 year after the end of the endoprosthesis operation significantly decreased to 5.6 ± 0.12 mg/l ($p < 0.001$). During the entire rehabilitation process there was a decrease in the activity of the disease compared to the initial data and by the sixth month after DAS28 endoprosthesis significantly ($p < 0.001$) decreased in all groups. The index indicators presented in the table correspond to the frequency of detection of patients of all three groups with a high degree of coxarthrosis. At the time of surgery, in $26.9 \pm 0.37\%$ and $27.5 \pm 0.36\%$ of patients, respectively, in the first and second groups, the activity of the disease was high (Fig.1).

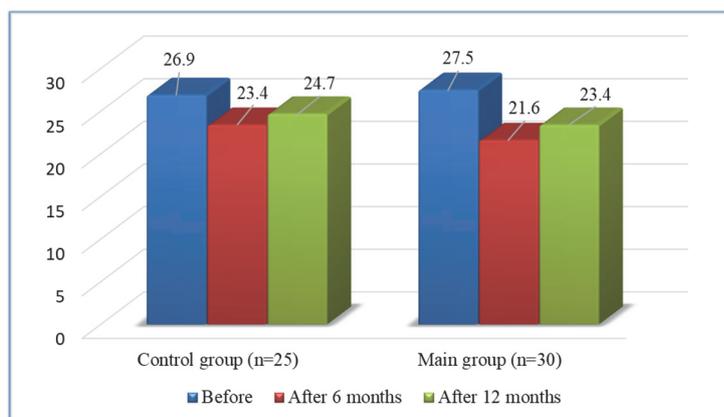


Fig. 1. Disease activity according to the DAS28 index in patients with coxarthrosis before and after endoprosthetics

However, the distribution of the examined patients by stages of disease activity found that at the final stage of observations, most of the patients in the control group were still in the stage of high disease activity ($24.7 \pm 0.51\%$), while in the main group the number of such patients averaged $23.4 \pm 0.37\%$, the differences between these groups were statistically significant ($p < 0.05$).

Thus, at the 6th and 12th month of the study, the differences between the average indicators for the studied index obtained after and the indicators recorded in the period before endopro-

stheses were determined as statistically significant in all observation groups. In a relatively larger number of patients of the main group who participated in the study, it was possible to achieve a more pronounced decrease in the degree of disease activity only by the 6th month of follow-up as evidenced by the data obtained by the DAS index, which allows us to talk about effective treatment of the pathology under study.

During the International Symposium (Musculoskeletal Infection Society – MSIS.2011) and the Second International Consensus Meeting on Musculoskeletal Infection (Second International Consensus Meeting on Musculoskeletal Infection.2018), based on several studies reflecting certain specificity and sensitivity of such indicators of serum inflammation as ESR and C-reactive protein levels, there were some recommendations on the criteria for the diagnosis of periprosthetic infection are given and their relevance is confirmed [11]. The level of one of the indicators of inflammation, that is C-reactive protein, was increased in the patients included in the study, which is consistent with the results of observations by some foreign authors, according to which in patients with aseptic etiology of pain, the level of C-reactive protein

was slightly increased and was in the range of 6–10 mg/l (in our case indicators up to surgical intervention and total hip replacement varied in the range of 5.8–11.3 mg/l) [9].

At the same time, it is important to note the fact that some literature data indicate that a change in the level of the studied serum markers of inflammation, with limited specificity and sensitivity, may be associated with the presence of concomitant disease and with excessive traumatization of bone and surrounding soft tissues [1]. Thus, traditional surgical access is more traumatic due to damage to more muscles during surgery, which slows down the process of restoring the function of the operated limb and can cause the development of infectious complications. The large length of access during surgery with Harding's access negatively affects the restoration of the function of the operated hip joint. The proposed method of hip replacement in dysplastic coxarthrosis in the main group of patients can be considered quite reasonable and effective due to the relatively earlier improvement of functional ability and relief of pain syndrome. Against the background of greater invasion with surgical access, postoperative complications in soft tissues are likely, which is confirmed by the results of studies by foreign authors and which determines the need to reduce to a minimum or exclude, if possible, additional traumatic factors during surgical treatment [10].

Conclusion

A comparative analysis of the revealed parameters shows that the patients of the main group have a significantly more pronounced tendency to decrease the content of C-reactive protein.

The following advantages of the proposed surgical access should be noted: minimally invasive, low risk of infection, low injury rate, rapid restoration of mobility in the joint according to the indicators of the activity index of the pathology under study (DAS28); reduction of the rehabilitation period.

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