

## MULTISPIRAL COMPUTED TOMOGRAPHY AS AN INSTRUMENTAL METHOD FOR SUBSTANTIATING THE PLACEMENT OF THE ACETABULAR COMPONENT OF THE HIP JOINT ENDOPROSTHESIS IN DYSPLASTIC COXARTHROSIS

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**Key words:** dysplastic coxarthrosis, diagnosis, treatment, multispiral computed tomography.

**Objective:** to assess MSCT and clinical and radiological features of dysplastic coxarthrosis.

**Materials and methods of research:** the study is based on the data of examination of 32 patients with DC of III-IV stage who were undergoing examination and surgical treatment and the Republican Scientific and Practical Medical Center of Traumatology and Orthopedics of the Ministry of Health of the Republic of Uzbekistan from 2018 to 2019. The diagnosis was made on the basis of clinical and radiological criteria. The main features characterizing the dysplastic joint were: anteversion of the femoral neck; deviation of the acetabulum anteriorly from the sagittal plane; violation of the centering of the head in the horizontal plane; change in the cervico-diaphyseal angle and the angle of the vertical inclination of the depression (more than 60 °). At the same time, the acetabulum becomes shallow, and the immersion of the head into it is less than 1/3 (norm 1/2).

Among all surveyed, the majority were women - 90.6% (29 patients), while men - 9.4% (3 patients). The average age of the surveyed was  $45.8 \pm 2.3$  years.

**Results and research methods:** the research results showed that MSCT in patients with dysplastic coxarthrosis made it possible to obtain objective information on qualitative and quantitative changes

in the hip joint, to identify X-ray anatomical changes in the hip joint, which have a significant impact on the prognosis in the long-term period of treatment. We have developed a device for measuring the angle between planar anatomical structures.

This device is used as follows. The angle of the degree is preliminarily determined on MSCT to remind the true acetabulum (from 40 ° to 60 °). Set up the device to determine the point of remission of the true acetabulum. The protractor is not traumatic, convenient and easy to use, it allows you to determine the remission point for centralization of the acetabular component in patients with dysplastic coxarthrosis.

**Abstract:** In case of dysplastic coxarthrosis, MSCT diagnostics makes it possible to accurately determine the angle between planar formations and the center of rotation for the treatment of the acetabulum.

The developed device for measuring the angle between planar anatomical formations makes it possible to determine the angle between planar formations and the remission point in the true acetabulum for centralization of the acetabular component in patients with dysplastic coxarthrosis.

**Relevance.** Dysplastic coxarthrosis is a special type of degenerative-dystrophic lesion of the hip joint, manifested by deformation, disorganization and spatial inconsistency of all its components and structures. Despite the timely early detection of congenital underdevelopment of the elements of the hip joint, the problem of diagnosis and treatment of dysplastic coxarthrosis is still far from final resolution [4, 6, 9].

In recent years, there has been an increase in the incidence of the hip joint and the detection of the disease in earlier age groups, moreover in advanced forms, which in turn leads to persistent disability from 38% to 71% of cases [2, 3, 13]. Thus, timely diagnosis of coxarthrosis is necessary to solve not only medical, but also social problems. Radiation methods are of decisive importance in the diagnosis of coxarthrosis [5, 12].

The trigger mechanism for the development of coxarthrosis is changes in the parameters and morphology of the hyaline cartilage. As a result of numerous studies, it was found that cartilage degeneration increases with the progression of the disease stage, and the degeneration of the cavity cartilage contributes to the development of a similar process in the femoral head [6, 7, 8].

Hyaline cartilage is affected much more often in the acetabulum than in the head: 72.2% and 16.7%, respectively. Mainly the anteroposterior portion of the acetabulum suffers [9]

Among the factors in the onset of coxarthrosis, dysplasia of the hip joint ranges from 10 to 76%, while dysplastic coxarthrosis affects 86.3% of patients with hip pathology over 15 years old. [ten]

MSCT makes it possible to reliably visualize degenerative-deforming changes in the hip joints (coxarthrosis), to determine the correspondence of the severity of changes to radiological

classifications; identify subchondral cysts and accurately determine the severity of osteosclerosis of the articular surfaces; to clarify whether there are atypical areas in the structure of bone tissue caused, for example, by the presence of lytic or sclerotic metastases [1, 11].

Also, MSCT of the hip joints is used for intra-articular fractures of the hip and pelvic bone (femoral neck, femoral head, acetabulum) in order to visualize the displacement of fragments, as well as to plan surgical treatment [2]. MSCT allows performing three-dimensional reconstructions, thanks to which the traumatologist can understand exactly where and how the fragment has moved, and take measures to fix it, and restore the anatomical shape of the bone [3, 4].

**Purpose of the study:** assessment of MSCT and clinical and radiological features of dysplastic coxarthrosis (DC).

**Materials and methods of research:** the study is based on the data of examination of 32 patients with stage III-IV DC who were undergoing examination and surgical treatment and the Republican Scientific and Practical Medical Center of Traumatology and Orthopedics of the Ministry of Health of the Republic of Uzbekistan from 2018 to 2019.

The diagnosis was made on the basis of clinical and radiological criteria. The main features characterizing the dysplastic joint were: anteversion of the femoral neck; deviation of the acetabulum anteriorly from the sagittal plane; violation of the centering of the head in the horizontal plane; change in the cervico-diaphyseal angle and the angle of the vertical inclination of the depression (more than 60 °). At the same time, the acetabulum becomes shallow, and the immersion of the head into it is less than 1/3 (norm 1/2).

Among all surveyed, the majority were women - 90.6% (29 patients), while men - 9.4% (3 patients). The average age of the surveyed was  $45.8 \pm 2.3$  years.

All patients underwent MSCT examination, which was performed on a double-slice spiral computed tomograph according to standard protocols. The angular and linear parameters of the acetabulum and femoral head were determined.

In the statistical analysis, parametric and nonparametric tests were used in the Statistica for Windows V 7.0 program using the Student's t-test for mean values. Group differences were considered statistically significant at  $p < 0.05$ .

**Results of the study:** In all examined patients, the main clinical manifestations were flexion-adductor and rotational contractures of the hip joints, shortening of the limbs interested in the pathological process, persistent pain syndrome, severe lameness with impaired support function of the limb and the locomotor act of walking.

15 patients (53.1%) had unilateral joint damage, in 17 patients (46.9%) the process extended to both joints.

When analyzing MSCT images, a narrowing of the joint space was evident, uneven. Multiple osteophytes of significant size are visualized; pronounced subchondral sclerosis; multiple (up to ten) subchondral cysts are determined (Fig. 1).

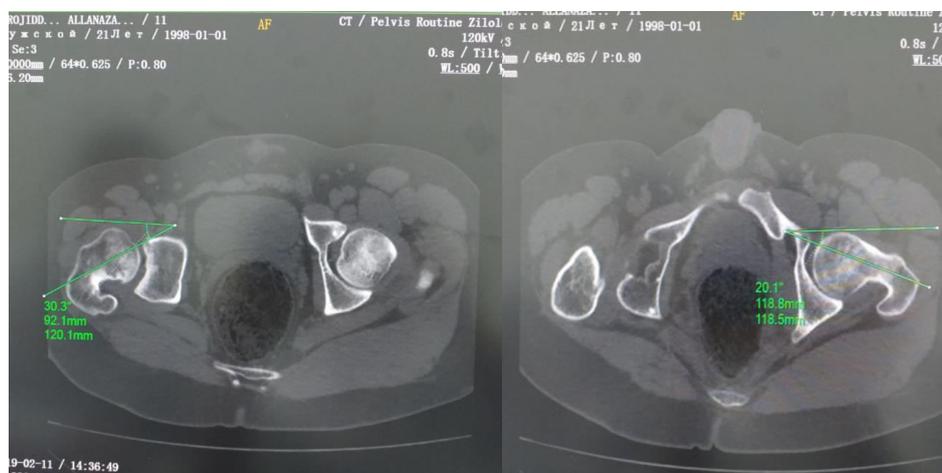
**Figure: 1. MSCT cystic formation in the acetabulum and femoral head.**



The dimensions of the cystic areas in the femoral head, as well as in the pelvic bone, were 4-11 mm in diameter and were surrounded by an osteosclerosis zone.

The dimensions of the length of the femoral neck on the affected side are on average  $1.7 \pm 0.09$  cm, while on the healthy side it is  $2.2 \pm 0.1$  cm. The cervical-diaphyseal angle on the affected side was slightly increased and averaged  $141, 3 \pm 1.20$ , while on the unaffected side  $129.4 \pm 0.80$ .

Ante and retroversion of the acetabulum averaged  $19.0 \pm 0.70$  on the affected side and  $16.7 \pm 0.60$  on the unaffected side. The anterior entry angle of the acetabulum was  $66.9 \pm 0.80$  on the affected side and  $73.1 \pm 2.90$  on the unaffected side (Fig. 2).



**Figure: 2. MSCT: Determination of the ante angle and retroversion**

Slight shortening (up to 2 cm) - in 8 patients (25.0%), moderate (up to 5 cm) - in 1 patient (3.1%), in other cases no shortening was observed.

The center of rotation for the treatment of the acetabulum averaged  $45.8 \pm 0.12$  degrees (Fig. 3).

**Figure: 3. MSCT: Determination of the center of rotation for the treatment of the acetabulum (before the operational planning).**

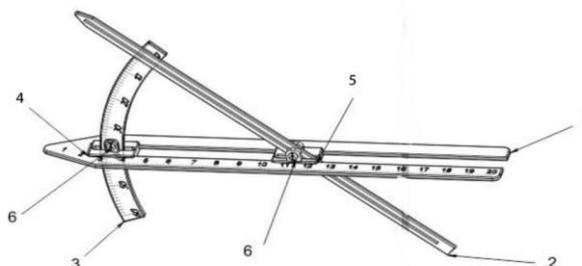


As a result of preoperative planning, the remission point ranged from 44 to 48 degrees.

The results of the work showed that the use of MSCT in patients with dysplastic coxarthrosis made it possible to obtain objective information about the qualitative and quantitative changes in the hip joint, to identify X-ray anatomical changes in the hip joint, which have a significant effect on the prognosis in the long-term period of treatment.

In the RSSPMCT Traumatology and Orthopedics, a device was developed and implemented to measure the angle between planar anatomical formations. A device for measuring the angle between planar anatomical structures is used as follows.

The angle of the degree is preliminarily determined on MSCT to remind the true acetabulum (from  $40^\circ$  to  $60^\circ$ ). The device is adjusted to measure the angle between the planar anatomical formations and to determine the point of remission of the true acetabulum. (fig. 4).



**Figure: 4. A device for measuring the angle between planar anatomical structures**

The required angle is displayed on the protractor with an axial measuring scale, it is fastened using a movable protractor coupling with a screw and a screwdriver; and sterilized.

The immediate results of treatment up to 6 months after the operation were studied in 22 patients. At the same time, the patients led an active lifestyle, moved without additional support, there was no pain syndrome, but minor anatomical abnormalities were allowed that did not significantly affect the function of the limb in the form of shortening of the limb within 1-1.5 cm, limitation of movements in the hip joints within no more than 10 degrees.

Long-term results in the period from 1 to 2 years after the operation were studied in all patients. When studying, the main attention was paid to everyday and industrial activity and the support function of the limb. A good result was noted in 95.5% of cases, while a satisfactory result was noted in 4.5%. Thus, the device for measuring the angle between planar anatomical structures is not traumatic, convenient and easy to use.

### **Conclusions:**

1. MSCT in patients with dysplastic coxarthrosis made it possible to obtain objective information about the qualitative and quantitative changes in the hip joint, to identify X-ray anatomical changes in the hip joint, which have a significant effect on the prognosis in the long-term period of treatment.
2. Conducting MSCT in patients with dysplastic coxarthrosis allows you to accurately determine the angle between planar formations and the center of rotation for processing the acetabulum.
3. The developed device for measuring the angle between planar anatomical formations is not traumatic, convenient and easy to use, it helps to determine the angle between planar formations and the point of remission in the true acetabulum for centralization of the acetabular component in patients with dysplastic coxarthrosis.

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