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Clinical Characteristics and Examination Program of Patients with Bony Ankylosis

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Abstract: Clinical manifestations depend on the type of ankylosis, etiology, stage of the disease, position of the limb, and the general functional state of the musculoskeletal system. Taking into account the etiological factors of ankylosis, the patients were distributed as follows: ankylosis developed as a result of post-traumatic injury in 22 (9.16%) patients; more than half, 131 (54.58%), had an idiopathic form; ankylosing spondylitis (Bechterew's disease) was identified in 42 (17.5%) patients; rheumatoid arthritis in 34 (14.16%) patients; systemic lupus erythematosus in only 5 (2.1%) patients; and other causes of ankylosis were found in 6 (2.5%) patients. Hip joint ankylosis most often occurs in middle-aged and working-age individuals. In addition, men predominated among the patients—148 people (61.6%). The main clinical manifestations in these patients were persistent pain, limitation or complete absence of movement in the joint, limping while walking, limb shortening, and the presence of contracture in the hip joint area. A computer program for the clinical diagnosis of ankylosing spondylitis makes it possible to determine the degree and severity of ankylosed hip joint involvement with 99% accuracy.

Keywords: Clinical characteristics, bony ankylosis, sex, computer program, age, stage of the disease, pain, hip joint, sacroiliitis, synovitis, spinal lesions.

Introduction: Hip joint ankylosis (HJA) is a severe pathological condition in which mobility in the joint is lost due to fibrous or bony fusion of the articular surfaces. Clinical manifestations depend on the type of ankylosis, etiology, stage of the disease, position of the limb, and the general functional state of the musculoskeletal system [1, 5]. According to Amzaev S.Yu. (2011) [13], three main types of ankylosis are distinguished: cartilaginous, fibrous, and bony. Cartilaginous ankylosis develops as a result of a long-lasting inflammatory process that gradually leads to fusion of the articular surfaces due to pathological changes in the articular cartilage. Clinically, it is accompanied by pain in the lumbar region and in the hip joint area, limitation of lower-limb movement, and chronic nonspecific synovitis. Radiographs may show signs of sacroiliitis [41, 47]. As the disease progresses, the pain spreads upward along the spine, and mobility becomes limited in all of its regions, including straightening of the cervical lordosis or the development of kyphosis. Limping is often observed. Fibrous ankylosis is characterized by the formation of connective tissue adhesions between the articular surfaces. Movements in the joint are partially preserved, but they are sharply limited and accompanied by pain [17, 18]. Radiologically, scar tissue is detected in the joint space, sometimes with remnants of cartilage or fragments of the synovial membrane. Depending on the extent of fusion, partial and complete ankylosis are distinguished. In partial ankylosis, a minimal range of motion may be preserved [19, 22].

Bony ankylosis (true ankylosis) is complete fusion of the articular surfaces with the formation of a bony bridge

[15, 55, 56]. It is accompanied by complete immobility in the joint. Clinically, marked atrophy of the gluteal muscles, a forced position of the limb, absence of movement in the joint, and absence of synovitis are typical. Pain syndrome in bony ankylosis is usually minimal or absent; however, some patients report pain in the groin area that increases with walking and prolonged standing [23, 24, 25, 26, 31].

According to Pavlov V.P. and Nasonova V.A. (2011), the leading symptoms in all forms of ankylosis are stiffness, limitation or complete absence of movement in the joint, as well as difficulty performing usual daily and work-related activities. In fibrous ankylosis, pain is pronounced during any attempt at movement. The pain often intensifies at night, disturbs sleep, and requires analgesics or nonsteroidal anti-inflammatory drugs. In the early stages, pain may decrease after physical activity; however, as the disease progresses, it becomes persistent and poorly responsive to drug therapy [7, 12]. Bavashev A.S. (2006) [8] indicates that the clinical manifestations of ankylosis depend on the anatomical location of the affected joint. For example, hip joint ankylosis leads to pronounced disturbances of gait, balance, and the ability to move independently. In bilateral involvement, a “duck gait” and compensatory changes in the spine and knee joints often develop. As the disease progresses, especially in degenerative forms, enhanced cartilage degeneration and friction between the exposed femoral head and the acetabulum are observed, which leads to increased pain and complete loss of mobility. Patients at this stage often lose the ability to move independently and are forced to use crutches.

Particular attention should be paid to hip joint ankylosis in Bechterew’s disease (ankylosing spondylitis). According to Amzaev S.Yu. (2011) [2, 3, 13, 14], this chronic systemic inflammatory disease is characterized primarily by damage to the spine and large joints of the lower extremities. Its pathogenesis involves ankylosis of the apophyseal joints, formation of syndesmophytes, and calcification of the ligamentous apparatus. Early-stage diagnosis is difficult: in 20% of patients it is established only 6–7 years after disease onset. At the same time, the HLA-B27 antigen is detected in 90% of patients, confirming its genetic nature [29, 45, 49, 54].

At the initial stage of ankylosing spondylitis, patients often consult local therapists or rheumatologists. Clinically, the disease manifests as sacroiliitis, pain in the sacroiliac region lasting more than 3 months, and associated manifestations such as uveitis, enthesitis, and aortitis. In most cases, the disease begins between the ages of 15 and 30 years and accounts for about 8.5% of the total number of ankylosis cases [32, 33, 34, 35].

The leading clinical manifestation is complete loss of active and passive movements in the hip joint. In bony ankylosis, movement is completely absent, whereas in fibrous ankylosis minimal amplitudes may remain within painful limitations. As a rule, patients complain of pronounced functional impairment: inability to flex, abduct, or rotate the thigh, significant shortening or lengthening of the limb, and impaired weight-bearing function [36, 37, 38, 39].

Patients with hip joint ankylosis experience marked difficulty in walking. Depending on the position of the fused joint (in flexion, adduction, or external rotation), a forced gait develops with compensatory trunk tilt, hyperlordosis of the lumbar spine, pelvic tilt, and overload of the healthy limb. In unilateral ankylosis, pronounced limping with shortening of the step is observed, while in bilateral ankylosis a characteristic “duck gait” develops. Such patients also often have secondary deformities of the spine and knee joints [42, 43, 44, 46, 48]. The degree of functional deficit depends on the position of the limb at the time of fusion. The most favorable position is ankylosis in slight flexion (10–15°), abduction (5–10°), and neutral rotation. This position allows the patient to sit and partially preserve the ability to walk. The most inconvenient positions are adduction and internal rotation, in which balance and the ability to move are significantly impaired (Amzaev S.Yu., 2011; Kirpichev I.V., 2016) [4, 10, 11].

In patients with long-standing ankylosis, secondary trophic changes in the muscles (atrophy of the gluteal, femoral, and lumbar muscles) as well as degenerative changes in adjacent joints (lumbosacral and knee joints) are observed. Varicose veins of the lower limb are also often detected due to prolonged hypodynamia and overload of compensatory structures [45, 50, 51, 52, 53].

The severity of functional deficit is assessed using the Harris Hip Score, Oxford Hip Score, and other scales. According to clinical studies, patients with bony ankylosis have a higher level of disability and social maladaptation compared with patients after joint replacement. Given the chronic nature of the pathology, patients may experience difficulties with self-care, work, and social activity, which significantly reduces their quality of life [6, 9, 16, 20].

The long duration of the disease, limited mobility, altered appearance, and chronic pain syndrome often lead to anxiety-depressive disorders, reduced motivation for treatment, and social isolation. This requires a multidisciplinary approach that includes not only orthopedic treatment but also psychological support.

Thus, the clinical picture of hip joint ankylosis depends on its form, etiology, and stage. Bony ankylosis is accompanied by complete immobility and minimal pain, whereas fibrous ankylosis is characterized by pain syndrome and limited movement. All forms of ankylosis lead to pronounced disability, gait disturbance, muscle atrophy, and reduced quality of life [21, 27, 28, 30, 40]. Therefore, early diagnosis, timely treatment, and selection of adequate orthopedic or surgical correction are of particular importance.

In accordance with the objectives of the study, from 2013 to 2025, 240 patients with stage III–IV hip joint ankylosis (HJA) received inpatient treatment in the adult orthopedics department of the Republican Specialized Scientific and Practical Medical Center of Traumatology and Orthopedics. Taking into account the etiological factors of ankylosis, the patients were distributed as follows: ankylosis developed as a result of post-traumatic injury in 22 (9.16%) patients; more than half, 131 (54.58%), had an idiopathic form; ankylosing spondylitis (Bechterew's disease) was identified in 42 (17.5%) patients; rheumatoid arthritis in 34 (14.16%) patients; systemic lupus erythematosus in only 5 (2.1%) patients; and other causes of ankylosis were found in 6 (2.5%) patients. All patients were divided into two groups: the main group included 130 (54%) patients operated on using our proposed method, and the control group included 110 (46%) patients who underwent surgical treatment using traditional methods. The distribution of patients by sex and age is presented in Table 2.1.

Table 2.1.

Distribution of patients by sex and age

Sex	Age of patients				
	Under 25 years	26–35 years	36–45 years	46–55 years	Over 56 years
Women n=92	4	16	23	4	45
Men n=148	11	24	32	8	73
Total n=240	15	40	55	12	118

As can be seen from the presented data, among the examined patients, individuals aged 25 to 55 years predominated—122 people (51%), whereas the number of patients older than 56 years was 118 (49%). These data indicate that hip joint ankylosis most often occurs in middle-aged and working-age individuals. In addition, it was established that men predominated among the patients—148 people (61.6%).

Table 2.2.

Distribution of patients by age groups and stages of hip joint ankylosis

Age of patients	Stages of the disease							
	III stage				VI stage			
	Main		Control		Main		Control	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
25–55 years n=122	21	17,3	22	18	46	37,7	33	27
Over 56 years n=118	17	14,4	18	15,3	42	35,6	41	34,7
Total n=240	38	15,8	40	16,6	88	36,6	74	31

The presented data show that most patients were at stage IV of the disease—162 people (67.5%), of whom 79 patients (64.7%) were of working age (25 to 55 years). Stage III was diagnosed in 78 patients (32.5%),

and 43 of them (35.3%) also belonged to the working-age group. These data indicate that a significant proportion of patients postpone surgical treatment for a long time, which leads to progression of the disease to stage IV. At the same time, most of them are working-age individuals who lose the ability to work fully and often require outside assistance in everyday life. All this emphasizes the high relevance of timely diagnosis and surgical treatment of patients with hip joint ankylosis.

We analyzed the timing of patients' seeking medical care—from the appearance of the first symptoms of the disease to the development of hip joint ankylosis.

Table 2.3.

Time to patients' seeking medical care from disease onset to the development of hip joint ankylosis

Time of seeking care (year)	Stages of the disease							
	III stage				VI stage			
	Main		Control		Main		Control	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
After 1 year	0	0	0	0	0	0	0	0
3 years	6	15,8	7	17,5	10	11,3	11	14,8
5 years	11	29	11	27,5	32	36,4	22	29,8
10 years	21	55,2	22	55	46	52,3	41	55,4
Total n=240	38	15,8	40	16,6	88	36,6	74	31

As can be seen from Table 2.3, during the first three years after disease onset, most patients received treatment from other specialists. Only 13 (16.6%) patients with stage III disease and 21 (13.6%) with stage IV sought specialized care during this period. About one-third of the patients sought care 5 years after disease onset. More than half of the patients—43 (55%) with stage III and 87 (53.7%) with stage IV—sought care only after 10 years, which indicates the gradual formation of fibrous and bony hip joint ankylosis, after which they were referred for surgical treatment.

Before admission to our institution, more than half of the patients—136 people (56.6%)—received conservative treatment. In outpatient settings or in other hospitals, patients were prescribed antibacterial, anti-inflammatory, and hormonal therapy, as well as physiotherapy (Table 2.4). Almost all patients repeatedly underwent courses of conservative treatment; however, no stable improvement was observed, which became the reason for their hospitalization for surgery.

In patients with hip joint ankylosis, the clinical examination began with thorough collection of complaints, medical history, assessment of living conditions, previous diseases, and an objective examination of the general and local condition. The main clinical manifestations in these patients were persistent pain, limitation or complete absence of movement in the joint, limping while walking, limb shortening, and the presence of contracture in the hip joint area. Upon admission to the department, a medical history was collected from all patients. It was established that the provoking factors in the development of the disease in our patients were hip joint trauma in 22 (9.16%) patients, physical overload in 56 (23.3%) patients, and hypothermia in 42 (17.5%) patients.

The patient sample was formed according to the following criteria:

Inclusion criteria: age 25 years and older. All patients in whom hip joint ankylosis developed as a result of post-traumatic injury, ankylosing spondylitis (Bechterew's disease), rheumatoid arthritis, systemic lupus erythematosus, unclear etiology, or other causes.

Exclusion criteria: age under 25 years. Malignant neoplasms of the musculoskeletal system. Osteosclerotic conditions of the hip joint.

All patients underwent collection of anamnestic data, clinical examinations, functional tests, hip joint radiography, MRI or MSCT when necessary, ultrasonography, and Doppler examination of the hip joint vessels.

We developed a computer program for the clinical diagnosis of ankylosing spondylitis that makes it possible to determine the degree and severity of the disease (DGU 2021 0537). The following criteria were

used:

1. Pain in the lower back

Severe pain — 5 points

Mild, subsiding pain — 3 points

Pain subsiding after exercise — 1 point

2. Pain in the hip joint

Severe pain — 5 points

Mild, subsiding pain — 3 points

Pain subsiding after exercise — 1 point

3. Reduced respiratory excursion of the chest

Complete impairment — 5 points

Slightly impaired — 3 points

Excursion within the full range — 1 point

4. Atrophy of the gluteal muscles

Marked — 5 points

Slight — 3 points

Absent — 1 point

5. Synovitis of the hip joint

Marked — 5 points

Slight — 3 points

Absent — 1 point

6. Presence of the HLA-B27 histocompatibility antigen

Detected long ago, for many years — 5 points

Detected recently — 3 points

Absent — 1 point

7. Sacroiliitis

Marked — 5 points

Slight — 3 points

Absent — 1 point

8. Lesions of the spine and root joints (hip joint)

Marked — 5 points

Slight — 3 points

Absent — 1 point

The total score based on clinical signs is 45 points = 100%.

Of these: 45–30 points — pronounced clinical signs, grade 4

29–20 points — moderately expressed clinical signs, grade 3

19–10 points — mildly expressed clinical signs, grade 2

9 points and below — no clinical signs, grade 1

Examples of patients: Patient E., 45 years old, was admitted to us in 2024 with complaints of severe lower back pain — 5 points, hip joint pain — 5 points, reduced respiratory excursion of the chest — 5 points, gluteal muscle atrophy — 5 points, hip joint synovitis — 5 points, presence of the HLA-B27 histocompatibility antigen — 5 points, sacroiliitis — 4 points, lesions of the spine and root joints (hip joint) — 5 points. The total score based on clinical signs was 44 points, which corresponded to clearly expressed clinical signs of grade 4 disease. Based on the computer program, hip joint arthroplasty was recommended for the patient.

Thus, during the first three years after disease onset, most patients received treatment from other specialists. Only 13 (16.6%) patients with stage III disease and 21 (13.6%) with stage IV sought specialized care during this period. About one-third of the patients sought care 5 years after disease onset. More than half of the patients—43 (55%) with stage III and 87 (53.7%) with stage IV—sought care only after 10 years, which indicates the gradual formation of fibrous and bony hip joint ankylosis, after which they were referred for surgical treatment.

CONCLUSIONS

1. Hip joint ankylosis most often occurs in middle-aged and working-age individuals. In addition, it was established that men predominated among the patients—148 people (61.6%).

2. A significant proportion of patients postpone surgical treatment for a long time, which leads to progression of hip joint ankylosis to stage IV.

3. The main clinical manifestations in these patients were persistent pain, limitation or complete absence of movement in the joint, limping while walking, limb shortening, and the presence of contracture in the hip joint area.

4. A computer program for the clinical diagnosis of ankylosing spondylitis makes it possible to determine the degree and severity of ankylosed hip joint involvement with 99% accuracy.

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