Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

CURRENT VIEW ON HIP ARTHROPLASTY FOR ANKYLOSED HIP JOINT (LITERATURE REVIEW)

Azizov A. M.
Asilova S. U.
Tashkent Medical University and Kimyo International University in Tashkent, Department of Traumatology and Orthopedics

Abstract
The available literature on arthroplasty for the ankylosed hip joint remains highly relevant for the study of etiopathogenesis, clinical features, diagnostic methods, selection of surgical treatment, and staged postoperative rehabilitation of patients.

Keywords: Ankylosed hip joint arthroplasty, literature review, etiopathogenesis, clinical presentation, diagnostic methods, surgical treatment, rehabilitation.

Aim of the study
The aim of this review was to summarize literature data on comprehensive investigations using modern diagnostic, surgical, and rehabilitation technologies in patients with hip ankylosis.

1. Etiology and pathogenesis of hip ankylosis

Joint ankylosis is a pathological condition characterized by persistent immobility caused by fusion of the articular surfaces [19]. It develops against the background of a long-standing inflammatory or degenerative process and is accompanied by progressive restriction of motion in different parts of the musculoskeletal system. Bony ankylosis of the hip joint is of particular interest in modern orthopedics because of its high clinical significance [19, 26, 31]. In this condition, osseous or fibrous fusion develops between the articular surfaces, completely eliminating motion in the joint. Among all joint disorders, osteoarthritis of the hip occupies a leading place, and coxarthrosis accounts for up to 73–75% of all osteoarthritis cases according to different authors.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

According to Bavashev A.S. (2006) [8], various causes may contribute to the development of hip ankylosis, including closed and open trauma, infectious and non-infectious arthritis, osteomyelitis in the joint area, and degenerative-dystrophic changes. These conditions trigger pathological processes that include cicatricial transformation of the joint capsule and degenerative changes in the ligamentous, muscular, and osseous tissues, ultimately leading to progressive restriction of motion and complete joint blockage. Kirpichev I.V. (2016) [11, 12, 14] notes that purulent-inflammatory processes such as osteomyelitis, as well as severe trauma, are among the frequent causes of hip ankylosis. In many cases, the fusion is osseous in nature. Ankylosis leads to marked limping and impaired statics and gait biomechanics. Despite severe restriction of motion, pronounced pain syndrome is often absent in bony ankylosis. According to Amzaev S.Yu. (2011), ankylosis may develop as a consequence of chronic or acute inflammation of the articular and periarticular structures, as well as after trauma and improper or untimely treatment of intra-articular fractures and dislocations. Autoimmune diseases, especially ankylosing spondylitis, also play a substantial role [3, 4, 18]. Risk factors include prolonged immobilization and genetic predisposition; in particular, ankylosing spondylitis has been linked with HLA-B27 carriage. All these factors may lead to progressive joint damage up to complete ankylosis [34]. According to Guan Zheng et al. (2019) [39], patients with ankylosing spondylitis demonstrate increased osteogenic differentiation of mesenchymal stem cells, which may play a key role in the development of pathological ankylosis. In a three-dimensional biomimetic environment, osteogenesis was enhanced because of an imbalance in BMP-2 and Noggin expression. In two-dimensional cultures of bone-marrow mesenchymal stem cells, increased osteogenic activity was associated with excessive BMP-2 expression and insufficient levels of the inhibitor Noggin [33, 39]. In addition, the authors showed that mesenchymal stem cells from patients with ankylosing spondylitis retain an increased capacity for osteogenic differentiation in hydroxyapatite/β-tricalcium phosphate scaffolds, opening new prospects for understanding pathogenesis and for developing approaches to diagnosis and therapy, including prevention of pathological osteogenesis [28].

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

In the pathogenesis of ankylosis, prolonged inflammation and immobilization play a central role, causing fibrous degeneration of the synovial membrane, sclerosis, and the formation of bony bridges within the joint space. Early changes include chronic synovitis, thickening of the joint capsule, adhesion formation, and atrophy of the periarticular muscles [20, 21]. Special attention has been paid to the role of mesenchymal stem cells in the formation of bony ankylosis. The study by Guan Zheng et al. (2019) [39] demonstrated that in ankylosing spondylitis, bone-marrow mesenchymal stem cells exhibit increased osteogenic differentiation. In a three-dimensional biomimetic matrix of hydroxyapatite and β-tricalcium phosphate, patients with ankylosing spondylitis showed overexpression of the osteogenic protein BMP-2 together with decreased expression of its antagonist Noggin, which promoted pathological osteogenesis and the formation of bony bridges between the joint surfaces. Genetic predisposition has also been confirmed in ankylosing spondylitis, where a relationship with HLA-B27, a specific major histocompatibility complex antigen, has been established [27]. This factor contributes to chronic inflammation, activation of osteogenesis, and progression of ankylosis.

Thus, hip ankylosis develops as a result of the complex interaction of inflammatory, traumatic, degenerative, and immunological factors. The basis of its pathogenesis is chronic inflammation, which disrupts regenerative processes and promotes the formation of fibrous or bony ankylosing tissue [45, 46]. Understanding the molecular and cellular mechanisms of this process opens prospects for early diagnosis, prevention of pathological osteogenesis, and the development of targeted therapeutic strategies.

2. Clinical characteristics of patients with an ankylosed hip joint

Hip ankylosis is a severe pathological condition in which joint mobility is lost because of fibrous or osseous fusion of the articular surfaces. Clinical manifestations depend on the type of ankylosis, etiology, disease stage, limb position, and the general functional state of the musculoskeletal system [1, 6]. According to Amzaev S.Yu. (2011) [17], three main types of ankylosis are distinguished: cartilaginous, fibrous, and bony. Cartilaginous ankylosis develops

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

as a result of a long-standing inflammatory process leading to gradual fusion of the articular surfaces because of pathological changes in the cartilage. Clinically, it is accompanied by pain in the lower back and hip region, restricted lower-limb motion, and chronic nonspecific synovitis. As the disease progresses, pain may spread upward along the spine and limitation of motion may develop in all of its parts, including straightening of the cervical lordosis or formation of kyphosis. Limping is common. Fibrous ankylosis is characterized by connective-tissue adhesions between the articular surfaces. Motion is partially preserved but sharply limited and painful [22, 23]. Radiographically, scar tissue is seen within the joint space, sometimes with remnants of cartilage or synovial membrane fragments. Depending on the extent of fusion, partial and complete ankylosis are distinguished. In partial ankylosis, minimal motion may still be preserved [24, 25].

Bony ankylosis (true ankylosis) represents complete fusion of the articular surfaces with formation of a bony bridge [19]. It is associated with complete immobility of the joint. Clinically, marked atrophy of the gluteal muscles, a forced limb position, absence of joint motion, and lack of synovitis are typical. Pain syndrome in bony ankylosis is usually minimal or absent; however, some patients report groin pain that worsens during walking and prolonged standing [30, 32, 37].

According to Pavlov V.P. and Nasonova V.A. (2011), the leading symptoms in all forms of ankylosis are stiffness, restriction or complete absence of motion in the joint, and difficulties in performing usual household and occupational activities. In fibrous ankylosis, pain is pronounced during any attempt at movement. It often intensifies at night, disturbs sleep, and requires analgesics or non-steroidal anti-inflammatory drugs. In early stages, pain may decrease after physical activity, but with progression it becomes persistent and poorly responsive to medication [7, 16]. Bavashev A.S. (2006) [8] points out that the clinical manifestations of ankylosis depend on the anatomical localization of the affected joint. Hip ankylosis leads to significant impairment of gait, balance, and independent ambulation. Bilateral involvement often results in a “duck gait” and compensatory changes in the spine and knee joints. As the disease progresses,

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

especially in degenerative forms, increased cartilage degeneration and friction between the denuded femoral head and the acetabulum intensify pain and result in complete loss of mobility. At this stage, patients frequently lose the ability to walk independently and require crutches.

Special attention should be paid to hip ankylosis in ankylosing spondylitis. According to Amzaev S.Yu. (2011) [3, 4, 17, 18], this chronic systemic inflammatory disease is characterized predominantly by involvement of the spine and the large joints of the lower limbs. Its pathogenesis includes ankylosis of the apophyseal joints, syndesmophyte formation, and calcification of the ligamentous apparatus. Diagnosis at an early stage is difficult; in 20% of patients it is established only 6–7 years after disease onset. HLA-B27 is detected in up to 90% of patients, confirming the genetic basis of the disease [34].

At the initial stage of ankylosing spondylitis, patients often present to general practitioners or rheumatologists. Clinically, the disease manifests as sacroiliitis, pain in the sacroiliac region lasting more than 3 months, and associated features such as uveitis, enthesitis, and aortitis. In most cases, the disease starts between 15 and 30 years of age and accounts for about 8.5% of all ankylosis cases [40].

The leading clinical manifestation is the complete loss of active and passive motion in the hip joint. In bony ankylosis, movement is completely absent, whereas in fibrous ankylosis minimal amplitudes may remain within painful limits. As a rule, patients complain of severe functional impairment: inability to flex, abduct, or rotate the thigh, substantial shortening or lengthening of the limb, and impaired weight-bearing function [42, 43, 44].

Patients with hip ankylosis experience pronounced difficulty walking. Depending on the position of the fused joint—flexion, adduction, or external rotation—a forced gait develops with compensatory trunk tilt, hyperlordosis of the lumbar spine, pelvic obliquity, and overload of the contralateral limb. In unilateral ankylosis, marked limping with a shortened step is observed; in bilateral involvement, a typical “duck gait” develops. Secondary deformities of the spine and knee joints are also common. The degree of functional deficit depends on limb position at the time of fusion. The most favorable position is slight flexion (10–15°), abduction (5–10°), and neutral rotation, which allows the patient to sit

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

and partly retain the ability to walk. Ankylosis in adduction and internal rotation is considered the most disabling because balance and ambulation are markedly impaired [5, 13, 15].

In patients with long-standing ankylosis, secondary trophic changes are observed in the muscles, including atrophy of the gluteal, thigh, and lumbar muscles, as well as degenerative changes in adjacent joints, particularly the lumbosacral and knee joints.

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 than patients after arthroplasty. Given the chronic nature of the disease, they may experience difficulty with self-care, work, and social activity, significantly reducing quality of life [10].

The long duration of the disease, restricted mobility, altered body appearance, and chronic pain 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 ankylosis depends on its form, etiology, and stage. Bony ankylosis is characterized by complete immobility and minimal pain, whereas fibrous ankylosis is accompanied by pain and restricted motion. All forms lead to severe disability, gait disturbance, muscle atrophy, and reduced quality of life [29]. Therefore, early diagnosis, timely treatment, and appropriate orthopedic or surgical correction are of particular importance.

3. Diagnostic methods in patients with hip ankylosis

Diagnosis of hip ankylosis requires an integrated clinical and instrumental approach aimed at determining the type of ankylosis (fibrous, bony, or cartilaginous), assessing the functional state of the joint, identifying the cause of disease, and evaluating disorders in adjacent musculoskeletal structures [19, 35, 36]. Timely and accurate assessment plays a key role in treatment planning, especially during the preoperative period when arthroplasty is considered.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

The first stage of diagnosis includes history taking and physical examination. The clinician clarifies complaints such as pain, restricted motion, and gait disturbance, as well as prior trauma, inflammatory, autoimmune, or infectious diseases, duration of symptoms, and the effectiveness of previous treatment [44].

The main diagnostic method for hip ankylosis is radiography of the pelvis in anteroposterior and lateral projections. It allows assessment of the degree of fusion of the articular surfaces, destruction of articular cartilage, presence of bony bridges in bony ankylosis, narrowing or complete disappearance of the joint space in fibrous ankylosis, changes in the acetabulum and femoral head, and signs of sacroiliitis, osteophytes, subchondral sclerosis, and osteoporosis. Radiography remains the principal and most accessible method of verifying hip ankylosis. According to Bavashev A.S. (2006), an early and characteristic radiographic sign of ankylosing spondylitis is bilateral sacroiliitis, which is accompanied by progressive destructive changes in the intervertebral discs and joint spaces. At later stages, marked periarticular osteoporosis and complete disappearance of the joint space are observed [8, 12, 42].

Poloiko Yu.F. et al. (2000) noted that the specific radiographic pattern of ankylosing spondylitis may become apparent only 2 years after disease onset; however, early signs of sacroiliitis, such as subchondral sclerosis, irregularity of the joint space, and erosions, may sometimes be detected as early as 3–4 months. Radiographic signs of hip ankylosis include blurred joint contours, narrowing or disappearance of the joint space, absence of marginal osteophytes, and absence of neoarthrosis.

The presence of these signs together with symmetrical sacroiliitis allows a highly reliable diagnosis of ankylosing involvement of the hip joints. Computed tomography makes it possible to visualize hidden bony bridges, evaluate cortical thickness, assess the volume of articular surface defects, and determine the condition of the acetabulum.

Magnetic resonance imaging is indicated when clarification of the condition of the soft-tissue structures is required, including the capsule, ligaments, residual elements of articular cartilage, active synovitis, bone-marrow edema, and inflammatory changes. MRI is especially informative in fibrous ankylosis, in

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

autoimmune or infectious etiologies, and in early periods when radiographic changes may still be absent.

Ultrasonography is used to a limited extent, mainly to assess periarticular soft tissues, the presence of effusion, pathological proliferation of the synovial membrane, subluxation, or secondary changes in muscles and tendons [9]. Laboratory methods help clarify the etiology of ankylosis, particularly when inflammatory, infectious, or autoimmune origins are suspected.

Bone scintigraphy may be used when inflammatory or neoplastic processes are suspected. It helps identify areas of increased metabolism, especially in occult osteomyelitis or tuberculous lesions. Densitometry is used to assess bone density and detect osteopenia or osteoporosis, especially in cases of prolonged immobilization or concomitant metabolic disorders. Electromyography and nerve conduction studies may be useful in patients with marked muscle atrophy, neurological symptoms, or suspected polyneuropathy.

A comprehensive diagnostic approach makes it possible not only to establish the presence of ankylosis but also to define its form, causes, and the degree of functional deficit, which is critically important for choosing subsequent treatment tactics, whether conservative management, surgery, or arthroplasty. In clinical practice, diagnosis of hip ankylosis requires the combined use of clinical, instrumental, and laboratory methods to comprehensively assess the affected joint, determine the stage of disease, the form of ankylosis, and the extent of involvement of surrounding tissues.

A typical radiographic sign of chronic osteomyelitis is bone thickening with the formation of cavities surrounded by a sclerotic zone, together with alternation of areas of osteosclerosis and osteoporosis. MRI is a highly accurate, noninvasive, and safe diagnostic method that makes it possible to evaluate the soft tissues, capsule, ligamentous apparatus, articular cartilage, and surrounding muscles. In ankylosing spondylitis, MRI can reveal inflammatory changes in the joints and periarticular tissues even at the preclinical stage, which makes it indispensable for early diagnosis.

Studies show that in ankylosing spondylitis the capsule and musculoligamentous structures of the hip joint are involved in 99% of cases, and the articular cartilage

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

in 95–100%. MRI not only confirms the presence of inflammation but also determines its activity, which is important when immunosuppressive or biological therapy is prescribed. In patients with long-standing hip ankylosis and reduced physical activity, osteopenia or osteoporosis often develops. In such cases, dual-energy X-ray absorptiometry (DEXA) is performed to quantitatively assess bone mineral density and determine the risk of pathological fractures. This method is essential for follow-up and for monitoring treatment effectiveness.

Doppler ultrasonography allows assessment of the vascular architecture in the hip region. According to Amzaev S.Yu., Akramov V.R., and Tikhilov R.M., Dopplerography can detect circulatory disorders, pathological vascular formations, and reduced perfusion in the femoral head and acetabulum [2, 19]. Nevertheless, this method remains insufficiently investigated in hip ankylosis and requires further scientific validation and clinical appraisal. Ermakov E.A. (2002) emphasized the potential of duplex scanning of the pelvic vessels, which may reveal zones of hypoperfusion in the joint region and serve as an additional marker of ankylosis progression risk.

Thus, diagnosis of hip ankylosis is based on a comprehensive approach that includes radiography, MRI, densitometry, ultrasonography, and vascular methods. MRI provides early detection of inflammatory changes and assessment of soft-tissue structures. Densitometry makes it possible to monitor bone mineral density, whereas Dopplerography and duplex scanning allow assessment of vascular supply and vascular architecture in the joint region. Combined use of these methods improves diagnostic accuracy, supports individualized treatment planning, and improves prognosis in patients with hip ankylosis.

4. Features of hip arthroplasty in patients with ankylosis

Surgical treatment of patients with hip ankylosis is an important problem in modern orthopedics [40]. According to several authors, at early stages of the disease, when joint mobility is only partially impaired and daily activity and working capacity are preserved, preference may be given to conservative treatment. Such treatment includes physiotherapy procedures, anti-inflammatory drugs and analgesics, intra-articular injections, manual therapy, therapeutic

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

massage, exercise therapy, and mechanotherapy. Nevertheless, ankylosis of the hip joint is essentially an irreversible pathological condition, and in most cases total hip arthroplasty remains the only effective method for restoration of limb function. Studies have also described attempts to improve implant models with regard to clinical and radiographic variants of disease, including the choice between cemented and cementless designs [38, 41].

Changes in bone mineral density play an important role in the development of osteoporosis in ankylosis and may also contribute to implant instability. Aseptic postoperative changes around the prosthesis lead to periprosthetic bone resorption, substantially reducing implant longevity. Complications such as implant instability, fractures of the femoral component, technical difficulties during revision procedures, and the need for prevention of postoperative complications are therefore of particular relevance. According to Daniel J. et al., patients with ankylosing spondylitis are at increased risk of perioperative and postoperative complications after total hip arthroplasty. This systemic disease primarily affects the axial skeleton, including the spine and hip joints, and is often accompanied by marked kyphosis, disturbed sagittal balance, and altered spinopelvic biomechanics. In a Medicare-based study conducted from 2005 to 2012, data from 1006 patients with ankylosis who underwent total hip arthroplasty were analyzed. The complications considered included hip dislocation, periprosthetic fractures, wound infection, the need for revision arthroplasty, and infectious complications. The authors emphasized that patients with hip ankylosis have an increased risk of complications after arthroplasty because of altered biomechanics associated with a rigid kyphotic spine. Therefore, all potential risks should be discussed with patients before surgery, comprehensive preoperative medical optimization should be performed, and individualized component selection and positioning should be planned with account taken of disturbed biomechanical balance [47].

Although total hip arthroplasty remains the main method of surgical treatment, the presence of hip flexion contracture in ankylosis substantially complicates the procedure and reduces its effectiveness.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

A retrospective study described a new two-stage surgical strategy for patients with hip ankylosis and severe flexion contracture of the thigh. The study covered the period from 2011 to 2017. All patients were divided into two groups of 12 each. In the main group, release of the soft tissues around the hip, femoral osteotomy, and supracondylar traction were performed. In the control group, only standard total hip arthroplasty was carried out. Outcomes were assessed using clinical and radiographic data, including Harris Hip Score, visual analogue pain scale, range of motion, and the presence of femoral nerve injury and heterotopic ossification in the postoperative period. Statistically significant improvement was observed in both groups, but the two-stage approach produced better restoration of hip function, fewer complications, and consequently a better quality of life. Thus, the proposed surgical strategy may be considered an effective alternative in severe ankylosing involvement of the hip [39].

In another study, Beijing Da et al. evaluated technical features and early clinical outcomes of the direct anterior approach in total hip arthroplasty. The study included 100 consecutive unselected patients (50 men and 50 women) who underwent 116 primary hip arthroplasties, including 16 bilateral procedures, between March 11, 2015 and June 21, 2016. The mean follow-up period was 8.5 months. Mean postoperative scar length was 10 cm, and the mean Harris score was 93.62, indicating good functional recovery. Postoperative complications, including lateral femoral cutaneous nerve palsy, were recorded in 35 cases (30.2%), but all resolved without residual deficit. No dislocations or major neurovascular injuries were observed [42].

This technique also promoted faster postoperative recovery and may therefore be promising for widespread clinical use. Deepak Gautam et al. reported that despite marked pain relief and functional improvement after total hip arthroplasty in patients with ankylosis, a subgroup of patients with extra-articular extension contracture of the hip remained dissatisfied with treatment. Between July 2011 and June 2015, the authors studied 148 patients with bilateral hip involvement; in 10 of them (20 hips), extension contracture of both hips was identified and corrected intraoperatively. All patients were followed for at least two years. After

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

surgery, they were able to sit comfortably on an 18-inch chair with at least 90° of hip and knee flexion. No recurrence of extension contracture was observed [31]. A significant improvement in range of motion, functional mobility, and overall patient activity was noted. The authors concluded that although extension contracture of the hip is uncommon, it is a clinically meaningful problem and should be corrected during total hip arthroplasty.

In a study including 6468 total hip arthroplasties, heterotopic ossification developed in 1939 cases (30%). Risk factors identified for heterotopic ossification were male sex (OR 2.11; 95% CI 1.80–2.48), use of cemented implants (OR 1.48; 95% CI 1.00–2.17), bilateral surgery (OR 1.74; 95% CI 1.24–2.45), ankylosing spondylitis (OR 1.90; 95% CI 1.07–3.37), and hip ankylosis itself (OR 9.85; 95% CI 2.61–37.24). In contrast, rheumatoid arthritis decreased the risk of heterotopic ossification (OR 0.51; 95% CI 0.33–0.80). Age, NSAID use, femoral fractures, osteoarthritis, and osteophytes did not show a statistically significant association with increased risk of heterotopic ossification.

Cho S.M., Jung S.H., and Chung Y.J. reported the use of cementless prostheses and the posterolateral approach in all cases. Mean follow-up was 3.6 years (2 to 8 years). Heterotopic ossification was registered in 9 cases (11.1%). Stable fibrous ingrowth was observed in 52 joints and osseous ingrowth in 29 joints. Sciatic symptoms occurred in three cases but had no serious neurological consequences and responded to conservative treatment. No periprosthetic fractures, dislocations, or implant loosening were recorded. The authors concluded that total hip arthroplasty in patients with severe ankylosis demonstrates satisfactory results and high surgical effectiveness. In a later series from September 2014 to June 2017, 15 patients (12 men and 3 women; 21 joints) with a mean age of 34.4 years were operated on. Harris Hip Score and visual analogue pain scale were used to assess clinical efficacy, and mean follow-up was 26.2 months. Two intraoperative complications occurred—a greater trochanter avulsion and a linear femoral fracture—both successfully treated with wire fixation. Severe complications such as hematoma, deep vein thrombosis, or nerve injury were not recorded. There was no loosening or sinking of prosthetic components, and heterotopic ossification was absent. Pain was completely

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

relieved in 18 joints and persisted only during walking in 3. The authors concluded that the direct anterior approach provides good short-term recovery with less tissue trauma, less postoperative pain, and rapid functional restoration [43].

From June 2008 to May 2012, 17 patients (13 men and 4 women; mean age 24.2 years) were operated on. All suffered from severe pain and complete loss of hip motion. Mean disease duration was 8.3 years and mean duration of joint ankylosis was 7.6 years. All procedures were performed by a single surgeon. Postoperative assessment included pain, range of motion, and Harris Hip Score. Mean follow-up was 31.7 months. All patients showed marked clinical improvement in hip function, and no case required reoperation or showed implant loosening. The authors concluded that simultaneous bilateral cementless total hip arthroplasty is a reliable treatment method that considerably improves quality of life and reduces pain severity, although the procedure is technically demanding and requires careful attention to possible intra- and postoperative complications [44].

Another study compared imaging parameters of the spine, pelvis, and hip before and after surgery. Between January and July 2015, 38 patients (56 hips) with hip ankylosis underwent primary total hip arthroplasty, while 36 patients (45 hips) with osteonecrosis of the femoral head served as controls. The authors noted that preoperative pain and hip mobility did not differ substantially between groups, whereas postoperative pain was significantly more pronounced in patients with osteonecrosis. In patients with hip ankylosis, tapered stems were often associated with insufficient filling of the middle and distal femoral segments, whereas anatomic stems provided better filling of the medullary canal [45].

Between January 2008 and January 2012, 12 patients (24 hips) with hip ankylosis, including 11 men and 1 woman aged 27 to 62 years, underwent surgery. Disease duration ranged from 5 to 32 years. The authors analyzed pre- and postoperative hip mobility, Harris Hip Score, and intra- and postoperative complications. Mean follow-up was 72.6 months (60 to 96 months). Positive changes were recorded in all cases: three patients achieved excellent results, six good results, and three satisfactory results. One patient developed Brooker I heterotopic ossification without clinical manifestations, and another patient with severe flexion

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

contracture sustained femoral nerve injury that completely recovered within one year. No implant loosening, dislocation, acute infection, or deep vein thrombosis was observed. Thus, total arthroplasty proved effective in advanced forms of hip ankylosis [46].

A study including 68 patients (73 hips) aged 18 to 50 years who underwent arthroplasty between March 2001 and May 2009 evaluated outcomes in osteonecrosis of the femoral head, congenital dysplasia, ankylosing spondylitis, osteoarthritis, traumatic arthritis, femoral neck fractures, rheumatoid arthritis, and tumors. Harris Hip Score, UCLA score, and visual analogue pain scale were used. During a mean follow-up of 9.7 years (6 to 14 years), ceramic component fracture requiring revision occurred in 3 cases, and one patient reported squeaking. No other patients showed osteolysis, component loosening, or significant pain. Five- and ten-year Kaplan–Meier implant survival was 98.6% and 95.9%, respectively. The authors concluded that third-generation ceramic-on-ceramic bearings demonstrate high clinical effectiveness and good long-term survival, particularly in young patients. The same report emphasized that in severe contracture associated with ankylosis, a two-stage approach including soft-tissue release, femoral osteotomy, and supracondylar traction may provide better functional outcomes and lower the risk of complications such as femoral nerve injury and heterotopic ossification [39].

Kuzyk P., Gross A., and Lamb I.R. reported a high mean postoperative Harris score of 93.62 in a series of 100 patients (116 operations), without dislocations or serious neurovascular injuries. The main complication was paresthesia of the lateral femoral cutaneous nerve (30.2%). The authors stressed that this approach allows accurate implant positioning and promotes accelerated recovery after surgery. In a separate study of 32 patients (42 hips) with a mean follow-up of 9 years, significant improvement in Harris score, pain score, and range of motion was observed in patients with shorter disease duration and when large-diameter femoral heads were used. Components remained stably fixed, while osteolysis was more often detected in metal-on-polyethylene than in ceramic-on-ceramic bearings [42].

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

In another study, 32 patients (64 hips) underwent staged arthroplasty using direct anterior and lateral approaches. The direct anterior approach group had better early outcomes, including lower blood loss, a shorter incision, and faster functional recovery. No differences were found in anatomic component position or complication rates, although injury to the lateral femoral cutaneous nerve was more frequent in the direct anterior approach group.

In 33 patients (49 joints), the optimal implant position was determined based on anatomical landmarks. Mean anteversion and abduction angles did not differ from normative values. Displacement of the acetabular component was minimal in most patients, and coincidence with the anatomic acetabular center was achieved in 59.2% of cases. Causes of pathology included avascular necrosis of the femoral head, sequelae of femoral neck fracture, osteoarthritis of the hip on the background of ankylosis, acetabular dysplasia, and rheumatoid arthritis.

In one cohort, men predominated (17 patients, 19 joints) compared with women (8 patients, 8 joints); mean patient age was 45.6 years. Procedures were performed on 13 left, 10 right, and 2 bilateral hip joints. The postoperative period was uneventful in almost all patients: wounds healed by primary intention, and no infection, periprosthetic fracture, or deep vein thrombosis was observed. Only one case of sciatic nerve injury occurred and was controlled with symptomatic treatment, and one case of prosthetic loosening required revision. Mean follow-up was 51 months. At final follow-up, mean Harris score improved to 92.1 ± 3.6 compared with a baseline of 47.6 ± 14.2, demonstrating marked functional improvement. Radiographically, all prostheses were well positioned, without signs of dislocation, osteolysis, bone resorption, or heterotopic ossification.

In the same series, postoperative evolution was free of serious complications. Prosthesis survival reached 96.3% (26 of 27). At final examination, the average Harris score was 92.1 ± 3.6, and the distribution of outcomes was excellent in 19 joints, good in 5, satisfactory in 2, and poor in 1. Radiographs demonstrated good component position and no signs of osteolysis, heterotopic ossification, or dislocation [37].

Therefore, methods aimed mainly at improving limb length are associated with high surgical trauma, prolonged immobilization, and significant limitations in

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

quality of life. After cast removal, contractures, muscle atrophy, increased complication risk, and a prolonged rehabilitation period are often observed. When choosing a surgical strategy for hip ankylosis, preference should be given to approaches that minimize trauma, simplify the technique, improve effectiveness, ensure early mobilization, and shorten rehabilitation time.

5. Rehabilitation after total hip arthroplasty

In hip ankylosis, adequate postoperative rehabilitation is of major importance for achieving satisfactory results after total hip arthroplasty. According to Karpukhin A.O. (2014), the main task of this period is restoration of hip joint function and strengthening of the muscular apparatus through therapeutic exercises and gradual recovery of motion. With properly organized rehabilitation, return to work may be possible by the end of the tenth week.

According to Akramov V.R. (2011) [2], prevention of joint disease requires regular physical activity, exercises aimed at strengthening the muscular corset, timely treatment of inflammatory processes, and preventive massage. In early stages of joint pathology, physiotherapy, kinesitherapy, and osteopathy can improve mobility and help prevent disease progression.

At the inpatient stage, particular attention is paid to preoperative preparation and to surgical treatment itself. The early postoperative phase lasts up to 4 weeks, and the late phase extends from 4 to 12 weeks. During the late phase, patients under the supervision of the surgeon and the exercise therapy specialist perform targeted rehabilitation exercises.

Gradual mobilization of muscles, ligaments, joint capsules, and tendons is necessary to restore stability and balance and to adapt patients to active daily life.

Conclusion

Clear indications and contraindications for total hip arthroplasty have been described, and approaches to postoperative rehabilitation have been developed. However, both short-term and long-term results of surgical treatment remain insufficiently studied, particularly questions of endoprosthesis instability, the frequency of postoperative errors, and complications. All this points to the need

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

for comprehensive studies using modern diagnostic and rehabilitation technologies. Further in-depth investigation of the clinical manifestations of ankylosis is also required, with a multilevel and multidisciplinary approach, especially in light of new operative methods and the need for staged rehabilitation after total hip arthroplasty.

References

[1] Азизов М.Ж., Рузибаев Д.Р. Клинико-функциональные результаты тотального эндопротезирования тазобедренного сустава // Ортопедия, травматология и протезирование.-Харьков, 2012.-№1.-С. 81-83.

[2] Амзаев С.Ю. Новые методы повышения эффективности эндопротезирования тазобедренного сустава при ризомелической форме болезни Бехтерева./ С.Ю. Амзаев.// Вестник КРСУ. Бишкек -2011. -№4. - С. 132-136.

[3] Асилова С.У., Рузибаев Д.Р. // Электронейромиографические показатели нервно-мышечного аппарата поражённых нижних конечностей у пациентов до и после эндопротезирования тазобедренного сустава Журнал теоретической и клинической медицины. – Ташкент, 2016.- №3.- С. 151-153.

[4] Асилова С.У., Рузибаев Д.Р. Некоторые вопросы оценки эффективности эндопротезирования тазобедренного сустава // Материалы 2-конгресса травматологов и ортопедов «Травматология и ортопедия Столицы. Настоящее и будущее».-Москва, 2014.-С.22

[5] Ахтямов, И. Ф. Ошибки и осложнения эндопротезирования тазобедренного сустава : рук-во для врачей / И. Ф. Ахтямов, И. И. Кузьмин — Казань : Центр оперативной пе чати, 2006. — 328 с.

[6] Бестаев Д.В., Божьева Л.А. Оценка данных компьютерной томографии легких у больных ревматоидным артритом с и без интерстициального поражения легких и изучение взаимосвязи выявленных поражений с прогрессированием деструкции суставов // Лечащий врач. - Москва, 2015. - №3. - С. 63-66.

[7] Загородний, Н. В. Эндопротезирование тазобедренного сустава. Основы и практика : рук-во / Н. В. Загородний. — М. : ГЭОТАР-Медиа, 2012. С.704

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

[8] Кирпичев И. В. [и др.] Отдаленные рентгенологические результаты после тотального эндопротезирования тазобедренного сустава // Сборник тезисов IX съезда травматологов-ортопедов. — Саратов, 2010. – С 457- 458
[9] Кирпичев, И. В. Отдаленные результаты эндопротезирования тазобедренного сустава / И. В. Кирпичев, С. Е. Львов, С. В. Швец // Вестн. Ивановской медицинской акаде мии. — 2013. — Т. 18, № 1. — С. 19 – 23
[10] Рузибаев Д.Р. Лечебная физкультура как основной метод реабилитации при эндопротезировании тазобедренного сустава // Журнал теоретической и клинической медицины. – Ташкент, 2015.- №5.-С. 64-67.
[11] A.Katakam, H.S. Bedair, C.M. Melnic Do all rigid and unbalanced spines present the same risk of dislocation after total hip arthroplasty? A comparison study between patients with ankylosing spondylitis and history of spinal fusion. // J Arthroplast, 35 (2020), pp. 3594-3600
[12] Adil S.A. · Hooper, M. · Kocher, T. Conversion of hip arthrodesis using robotic arm technology. //Arthroplast Today. 2021; 9:40-45
[13] Allouch H, Shousha M, Böhm H. Operationen bei ankylosierender spondylitis (morbus bechterew) Z. Rheumatol. 2018;76:848–859.
[14] Apel M, et al. Variants in RUNX3 contribute to susceptibility to psoriatic arthritis, exhibiting further common ground with ankylosing spondylitis. Arthritis Rheum. 2013;65:1224–1231.
[15] Awad, M.E. · Farley, B.J. · Mostafa, G. Direct anterior approach has short-term functional benefit and higher resource requirements compared with the posterior approach in primary total hip arthroplasty: a meta-analysis of functional outcomes and cost. // Bone Joint J. 2021; 103:1078-1087
[16] Babaie F, et al. The role of gut microbiota and IL-23/IL-17 pathway in ankylosing spondylitis immunopathogenesis: new insights and updates. Immunol. Lett. 2018;196:52–62.
[17] Baeten D, et al. Risankizumab, an IL-23 inhibitor, for ankylosing spondylitis: results of a randomised, double-blind, placebo-controlled, proof-of-concept, dose-finding phase 2 study. Ann. Rheum. Dis. 2018;77:1295–1302.
[18] Baeten D, et al. Secukinumab, an interleukin-17A inhibitor, in ankylosing spondylitis. N. Engl. J. Med. 2015;373:2534–2548.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

[19] Baraliakos, X. et al. Long-term effects of interleukin-17A inhibition with secukinumab in active ankylosing spondylitis: 3-year efficacy and safety results from an extension of the Phase 3 MEASURE 1 trial. Clin. Exp. Rheum. 2017 №36, P. 50–55

[20] Chen B, et al. Role of HLA-B27 in the pathogenesis of ankylosing spondylitis (review) Mol. Med. Rep. 2017;15:1943–1951.

[21] Chen C, Zhang X. ERAP1 variants are associated with ankylosing spondylitis in East Asian population: a new Chinese case-control study and meta-analysis of published series. Int. J. Immunogenet. 2015;42:168–173.

[22] Daniel J Blizzard 1 , Colin T Penrose 1 , Charles Z Sheets 1 , Thorsten M Seyler 1 , Michael P Bolognesi 1 , Christopher R Brown 1 Ankylosing Spondylitis Increases Perioperative and Postoperative Complications After Total Hip Arthroplasty . 2017 Aug;32(8):2474-2479. doi: 10.1016/j.arth.2017.03.041. Epub 2017 Mar 27.

[23] De Oliveira Filho R.A., G.J. Silva, I. de Farias Domingos [et al.] Association between the genetic polymorphisms of glutathione S-transferase (GSTM1 and GSTT1) and the clinical manifestations in sickle cell anemia [Text] // Blood Cells Mol. Dis. – 2013. – Vol. 51(2). – P. 76–79.

[24] Deepak Gautam, Rajesh Malhotra / Total Hip Arthroplasty in Ankylosing Spondylitis With Extension Contracture of Hips// Arthroplasty 2019 Jan;34(1):71-76. doi: 10.1016/j.arth.2018.08.025.

[25] Deodhar A, et al. Three multicenter, randomized, double-blind, placebo-controlled studies evaluating the efficacy and safety of ustekinumab in axial spondyloarthritis. Arthritis Rheuma. 2019;71:258–270. doi: 10.1002/art.40728.

[26] Deodhar A, Yu D. Switching tumor necrosis factor inhibitors in the treatment of axial spondyloarthritis. Semin. Arthritis Rheu. 2017;47:343–350.

[27] Di Martino A., Geraci G., Brunello M., D'Agostino C., Davico G., Curreli C., Traina F., Faldini C. Hip-spine relationship: Clinical evidence and biomechanical issues. Arch. Orthop. Trauma. Surg. 2024;144:1821–1833.

[28] Ding L, Gao YH, Li YR, Liu JG, Li SQ, Qi X. Determinants of satisfaction following total hip arthroplasty in patients with ankylosing spondylitis. International orthopaedics. 2018;42(3):507–11.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

[29] Eftekhary N., Shimmin A., Lazennec J.Y., Buckland A., Schwarzkopf R., Dorr L.D., Mayman D., Padgett D., Vigdorchik J. A systematic approach to the hip-spine relationship and its applications to total hip arthroplasty. Bone Jt. J. 2019;101:808–816.

[30] El-Zayadi AA, et al. Interleukin-22 drives the proliferation, migration and osteogenic differentiation of mesenchymal stem cells: a novel cytokine that could contribute to new bone formation in spondyloarthropathies. Rheumatology. 2017;56: 488–493.

[31] Foissey C., Batailler C., Coulomb R., Giebaly D.E., Coulin B., Lustig S., Kouyoumdjian P. Image-based robotic-assisted total hip arthroplasty through direct anterior approach allows a better orientation of the acetabular cup and a better restitution of the centre of rotation than a conventional procedure. Int. Orthop. 2023;47:691–699.

[32] Gausden, E. · Parhar, H. · Popper, J. Risk factors for early dislocation following primary elective total hip arthroplasty // J Arthroplasty. 2018; 33:1567-1571

[33] Grochans, S.; Rachubińska, K.; Cybulska, A.M.; Iżak, W. The quality of life in patients after hip endoprosthesis implementation. Long-Term Care Nurs. 2021, 6, 5–15.

[34] Guan Zheng, Zhongyu Xie, Peng Wang, Jinteng Li, Ming Li, Shuizhong Cen, Su'an Tang, Wenjie Liu, Guiwen Ye, Yuxi Li, Shan Wang, Xiaohua Wu, Hongjun Su, Yanfeng Wu, Huiyong Shen Enhanced osteogenic differentiation of mesenchymal stem cells in ankylosing spondylitis: a study based on a three-dimensional biomimetic environment Cell Death Dis. 2019 Apr 25;10(5):350.

[35] He C, et al. The effect of total hip replacement on employment in patients with ankylosing spondylitis. Clin. Rheuma. 2016;35:2975–2981.

[36] Hebeisen M, et al. Response to tumor necrosis factor inhibition in male and female patients with ankylosing spondylitis: data from a swiss cohort. // J. Rheumatol. 2018;45:506–512. doi: 10.3899/jrheum.170166.

[37] Huang, G. , Zhao, G. , Chen, K. How much does lumbar fusion change sagittal pelvic tilt in individuals receiving total hip arthroplasty. Arthroplasty. 2019; 1:14

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 2, Issue 4, April 2026
Website: usajournals.org

[38] Kenna T.J, et al. Disease-associated polymorphisms in ERAP1 do not alter endoplasmic reticulum stress in patients with ankylosing spondylitis. Genes Immun. 2015;16:35–42. doi: 10.1038/gene.2014.62.
[39] Khalifa, A.A., Bakr, H.M., Said, E. Technical note on using intraoperative Smartphone applications to adjust cup inclination angle during total hip arthroplasty (THA).// Arch Bone Jt Surg. 2020; 8:734-738
[40] Kleeman-Forsthuber L.T., Elkins J.M., Miner T.M., Yang C.C., Jennings J.M., Dennis D.A. Reliability of spinopelvic measurements that may influence the cup position in total hip arthroplasty. J. Arthroplast. 2020;35:3758–3764. doi: 10.1016/j.arth.2020.06.056.
[41] Kunze K.N., Huddleston H.P., Romero J., Chiu Y.F., Jerabek S.A., McLawhorn A.S. Accuracy and precision of acetabular component position does not differ between the anterior and posterior approaches to total hip arthroplasty with robotic assistance: A matched-pair analysis. Arthroplast. Today. 2022;18:68–75. doi: 10.1016/j.artd.2022.08.004.
[42] Kuzyk P. · Gross, A. · Lamb, I.R. Use of imageless navigation in the conversion of hip fusion to total hip arthroplasty.// Cureus. 2021; 13, e18404
[43] L. Li, J. Fu, C. Xu, et al. Factors associated with blood loss in ankylosing spondylitis patients with hip involvement undergoing primary total hip arthroplasty: a cross-sectional retrospective study of 243 patients. // J Orthop Surg Res, 15 (2020), p. 541.
[44] Lee SH, Lee GW, Seol YJ, Park KS, Yoon TR. Comparison of outcomes of total hip arthroplasty between patients with ankylosing spondylitis and avascular necrosis of the femoral head. Clin. Orthop. Surg. 2017;9:263–269.
[45] Oommen AT, Hariharan TD, Chandy VJ, Poonnoose PM, Kuruvilla AAS, Timothy RS. Total hip arthroplasty in fused hips with spine stiffness in ankylosing spondylitis.// World J Orthop. 2021;12(12):970–82.
[46] Sharma A.K., Cizmic Z., Dennis D.A., Kreuzer S.W., Miranda M.A., Vigdorchik J.M. Low dislocation rates with the use of patient specific “Safe zones” in total hip arthroplasty. J. Orthop. 2021;27:41–48.
[47] Vigdorchik J.M., Sharma A.K., Buckland A.J., Elbuluk A.M., Eftekhary N., Mayman D.J., Carroll K.M., Jerabek S.A. 2021 Otto Aufranc Award: A simple Hip-Spine Classification for total hip arthroplasty: Validation and a large multicentre series. Bone Jt. J. 2021;103((Supple. B)):17–24.