# X-ray diagnostics and endoprosthesis replacement of knee joints with a condition of hemophilic arthropathy amongs population of Kazakhstan

**Zh.S. Abdrakhmanova , R.I. Rakhimzhanova , D.O. Zhekeyeva**

*JSC " Astana Medical University "*

*Astana, Kazakhstan*

One of main symptoms of hemophilia are bleeding in large joints, according to statistics they account for about 60-70% [1]. They frequently occur after injury, with transition chronic phase, followed by progression of arthropathy, result of which - rough deforming changes and early disability among patients with hemophilia [2].

Timely diagnosis and treatment of changes in joints in early stages of their formation can significantly affect prognosis of disease [3, 4]. Due to development of new technologies, we have new opportunities to detect changes in osteoarticular system and soft tissues of patients with hemophilia with using x-ray, computed tomography, magnetic resonance imaging, ultrasound, scintigraphy [5, 6]. Magnetic resonance imaging allows us to identify early changes in joints and periarticular tissues of hemophilic arthropathy [6, 7]. In recent years computed tomography (CT) widely used for detecting even small changes of bone structure with hemorrhages into joints however we don't have information about using CT for verifying stage of progression of hemarthrosis, no clear description of computer tomograms at various stages of hemophilic arthritis [6, 8].

According to our colleagues [4, 9] and our opinion, complexity of " endoprosthesis replacement" of large joints in such patients can be regarded as at 1/10 "total hip arthroplasty" and 1/20 at "knee replacement". If there is one operation conducted for patients with hemophilia, its complexity is equivalent to 10 or 20 operations of routine patients.

Implementation of health densitometric devices in practice allows you to control BMD level of periprosthetic region and to prevent instability of implant and improve knee replacement surgery in postoperative period [9, 10, 11].

**Objective**: To estimate complex diagnostics and providing tertiary care in the form of endoprosthesis replacement in patients with hemophilic arthropathy amongst population of the Republic of Kazakhstan .

**Materials and methods**: The work is based on an analysis of results of examination and treatment of 65 patients with hemophilic arthropathy of large joints. They treated in specialized department of replacement orthosurgery and polytrauma JSC "National Scientific Center of emergency medical care", Astana. To determine the volume of orthopedic care at admission and after surgery, all patients with hemophilia A, besides hematological laboratory work also used the following methods: X-ray, CT and MRI, rentgendensitometry and ultrasound osteometry.

**Results:** The clinicoradiological classification E.Z. Novikova (1967) was used when using standard X-ray to assess severity of joint destruction in patients with hemophilia. According to X-ray findings: in 26% of cases revealed no pathology (although the patients complained of pain in the joints), I stage is set in 5,8% of patients, II stage - in 6,7%, 37.5% , IV stage in 24,4% , during the examination of the hip joints - III-IV stage

Lately, X-ray computed tomography widely used for pathology of joints. We evaluated progression of hemophilic osteoarthritis with using standard radiography and computed tomography in order to accurately determine bone changes at different stages of osteoarthritis.

Stage 1: the x-ray: height of joint space is not reduced or decline slightly (to 10%), marginal osteophytes and subchondral cysts are absent (Fig. 1a); on computer tomograms: subchondral cysts with sporadic sclerotic rim, minor subhodndral sclerosis, thickening of joint capsule, glomerular bone structure in edge of articular ends as a sign of osteoporosis unexpressed (Fig. 1b).

Stage 2: the x-ray: small (from 10 to 25-50%) reduction height of joint space, isolated small osteophytes (Fig. 2a); on computer tomograms: 2-3 small subchondral cysts with sclerotic rim, sometimes with breaking line, local subhodndral sclerosis in tibiofemoral area or patella-femoral joint region, regional erosion in subchondral epiphysis, joint contours rough, intercondylar eminence is edgy with small defects on lateral surfaces of articular ends , bone structure is glomerulal, cellular (Fig. 2b).

Stage 3: the x-ray and computer tomograms deformation of articular ends, reducing height of joint space of more than 50%, subchondral layer is destroyed due to single large or 3 small marginal osteophytes or more, 2-3 large or 3-5small subchondral cysts and more; on computer tomograms as in aseptic necrosis - signs of depressed fracture (Fig. 3), moderate subchondral sclerosis, intercondylar eminence smoothed and destroyed, bone structure of metaphysis glomerular.

Stage 4: the x-ray and computer tomograms articular surface is deformed, flattened, joint space narrowed or complete obliteration of the interosseous space, with fibrous and most bony ankylosis, large marginal osteophytes, 4-5 large subchondral cysts in subchondral layer, significantly pronounced common subchondral osteosclerosis (fig. 4a, b); on computer tomograms increase CT density areas of depressed fracture, displacement of patella and its various deformation, osteoporosis as a major cellular structure. It marked erosion or bone defects, from compression of chronic hematomas, areas osteosclerosis on radiogramms and increase density in CT densitometry surrounding soft tissues due to calcified hematoma (fig. 5a, b, c).

CT, unlike X-rays, has high sensitivity characteristics in diagnosis of hemophilic arthropathy (91.8% and 72.7%, respectively), whereas specificity of radiography superior CT specificity (86.4% and 71.3%). The combination of X-rays + CT increases sensitivity to 96.7%, at the same time ratio of TM and DS is optimal (3: 2).

Osteopenia and osteoporosis were revealed in all patients with hemophilia using ultrasound osteometry and X-ray denstitometrii. It was a reason for prescribing calcium early in postoperative period to prevent instability of implant components. On basis of diagnosis and to determine degree of joints dysfunction we have developed algorithm of complex treatment of patients with hemophilic arthropathy, which included knee replacement.

Evaluation of bone mineral density was performed at 3, 6 and 12 months after hip replacement and compared with baseline during treatment of osteoporosis. For comparison, we take a group of operated patients who were not taking calcium supplements.

The influence of anti-osteoporetic drugs was revealed to prevent bone loss in areas of implant. In group of patients without treatment it showed progressive decrease BMD after 6 months almost 2 times. By the end of the year people taking drug are marked signs of recovery BMD ($p \leq 0.05$), and patients without treatment of osteoporosis are showed - slowing down recovery process, which increased risk of instability of knee joint prosthesis.

*Keywords: hemophilia, hemophilic arthropathy, X-ray diagnostics, prosthetics, osteoporosis, densitometry*

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