Features of the Macroscopic Picture of the Femoral Head in Dysplastic Coxarthrosis

Akhmedov Shamshod Shavkatovich, Hamraev Behzod Uktamovich
Bukhara State Medical Institute

ABSTRACT

Dysplastic coxarthrosis is a degenerative-dystrophic disease due to congenital underdevelopment of the hip joint. The study of the etiopathogenesis of this disease made it possible to establish that the main factors contributing to its development are congenital progressive biomechanical imbalance. For a practicing orthopedic surgeon, determination of the X-ray anatomical features of a dysplastic hip joint and possible biomechanical disorders is necessary for choosing a tactic for surgical treatment of coxarthrosis, because the choice of the acetabular and femoral components of the endoprosthesis depends on the degree of dysplastic disorders.

KEYWORDS: *Dysplastic coxarthrosis, hyaline cartilage, femoral head morphology.*

Relevance of research: Dysplastic coxarthrosis is a degenerative-dystrophic disease due to congenital underdevelopment of the hip joint, in which deformation of the articular ends of the bones manifests itself in a change in the shape and depth of the acetabulum, changes in the cervico-diaphyseal angle and the proximal femur [1.3.5.7.9.11]. Residual defects in the development of the hip joint after conservative and surgical treatment are the main reason for the development of dysplastic coxarthrosis in 10-60% of cases. The study of the etiopathogenesis of this disease made it possible to establish that the main factors contributing to its development are congenital progressive biomechanical imbalance and local overloads of the chondral and subchondral structures of the joint. The higher the degree of mechanical overload associated with the underdevelopment of the mutually supporting zones of the femoral head and the roof of the acetabulum, the faster there is a breakdown of the resistant capabilities of the joint. M. Camosco (2005) considers dysplastic coxarthrosis as a response of tissue structures to an imbalance between load and resistance to it, first of the articular cartilage, and then of all joint structures as a result of anatomical and functional inconsistencies. Moreover, the severity of the degenerative-dystrophic process is due to the localization of areas of hypertension, a change in the size of the bearing surface of the joint, and the duration of chronic overload. The trigger mechanism for the development of any type of coxarthrosis, as well as dysplastic, are changes in the parameters and morphology of hyaline cartilage. Because of numerous studies, it was found that cartilage degeneration increases with the progression of the disease stage, and the degeneration of the cartilage of the cavity contributes to the development of a similar process in the femoral head [2.4.6.8.10.12.13.14]. In dysplastic coxarthrosis, pronounced deformation of the acetabulum and the proximal femur leads to discongruence and biomechanical inferiority of the joint [15.16.17.18]. It is the anatomical and biomechanical incompetence of the articular surfaces that leads to the development of secondary arthrosis mainly in persons over 30 years of age [19.20.21.22.23.24]. Crowe et al. proposed a classification (1979), which is based on an assessment of the level of cranial displacement of the femoral head and includes four types. The authors proceeded from the fact that on the radiograph of normal hip joints, the lower border of the tear figure and the place of transition of the femoral head into the neck are at the same level, and the head height is 20% of the pelvic height. With Crowe type I, the proximal head displacement is up to 50%

of the head height or up to 10% of the pelvic height, with type II - 50–75% of the head height or 10–15% of the pelvic height, with type III - 75–100% or 15– 20% respectively. Crowe type IV is characterized by a proximal head displacement of more than 100% or more than 20% of the pelvic height. Due to the numerical parameters, Crowe's classification is clear and unambiguous; however, it does not fully take into account the changes in the acetabulum depending on the degree of dysplasia, which is important for planning the placement of the acetabular component of the prosthesis. An objective interpretation of the degree of dysplastic coxarthrosis is rather complicated and requires a good knowledge of possible dysplastic changes in the hip joint, which are caused by some pathogenetic features of the disease. The anatomical and radiological features of the hip joint in dysplastic coxarthrosis of varying severity are described. With dysplastic coxarthrosis of the I – II type, taking into account the Crowe classification, the following were noted: a decrease in the acetabulum index by 16% and the Viberg angle by 28%; narrowing of the cerebral cavity and a decrease in the length of the humerus of the femur by 6%; an increase in the Sharpe angle by 12% and the cervico-shaft angle by 6%. Dysplastic coxarthrosis is characterized by the progression of dysplastic manifestations; there is a defect in the roof of the acetabulum; the femoral head articulates with the true and false acetabulum. Type IV dysplastic coxarthrosis is characterized by maximum damage to the bone structures of the hip joint; the acetabulum is flattened; but the deficiency of the roof of the acetabulum is insignificant; formed neoarthrosis, isolated from the true depression [25.27.29.30.31.33.35.37.39.40.41]. Abnormal redistribution of stress forces in the hip joint in case of dysplasia leads to overload of the ilio-femoral ligament and excessive pressure in the cartilaginous lip ("acetabular stress"), which causes degenerative changes in the ligamentous apparatus, the appearance of foci of calcification under conditions of microtrauma. A long course of the process of dysplastic coxarthrosis can lead to dystrophic changes in the innervating nerve trunks and fibers. The abnormal structure of collagen in dysplastic coxarthrosis causes structural changes in the vascular bed in the hip joint: weakness, tortuosity and hyperextension of the walls of arteries and veins, a decrease in the number of anastomosing branches. All these structural changes lead to a decrease in the level of blood supply to the hip joint, to reversible capillary stasis at the level of the microvascular bed, and an increase in local tissue hypoxia [26.28.32.34.36.38.42.44.46]. With dysplastic coxarthrosis, all muscle groups of the hip joint are characterized by weakness, reduced ability to contract, degenerative changes in the fibers. In addition, the anatomical and biomechanical features of dysplastic coxarthrosis contribute to the convergence of the attachment points of muscle fibers in the abductor muscle group, which causes their positional weakness. In dysplastic coxarthrosis, the fundamental point is the violation of biomechanics in the joint and the redistribution of forces that ensure the centering of the head and stability in the hip joint. For an endoprosthetist, the determination of the X-ray anatomical features of a dysplastic hip joint and possible biomechanical disorders is necessary for the choice of tactics for surgical treatment of coxarthrosis, because the choice of the acetabular and femoral components of the endoprosthesis depends on the degree of dysplastic disorders, as well as carrying out total arthroplasty, which is the "gold standard" of treatment, in combination with the necessary additional techniques, such as plastic of the acetabular roof to compensate for its deficit, shortening osteotomy of the femur in order to minimize traction damage to the paraarticular tissues and restore the length of the limb [43.45.47.48.49.50.51.52].

Material and methods: The femoral heads were investigated after total hip arthroplasty from 42 patients diagnosed with dysplastic coxarthrosis. (women - 29, average age - 61.3 years; men - 123, average age - 52.4 years). In the process of cutting out material for histological examination, attention was paid to the macroscopic picture of the femoral head. The material was fixed in 10% formalin. After decalcification, paraffin sections were stained with hematoxylin and eosin, hematoxylin and picrofuchsin.

Research results. The studied material made it possible to identify a number of morphological conditions in the main areas studied, namely: in the articular cartilage, subchondral bone, the marginal zone of the cartilaginous plate, the cortical plate of the neck, cancellous bone. In the articular cartilage, the morphology of tissues was determined, which we divided into three groups. Articular cartilage - characterized by uneven thickness in different departments, the absence of a cell-free zone. The stratification of chondrocyte groups, their orientation, multidirectionality, together with the fibrillar component - collagen fibers, is impaired, relative to the thickness and length of the cartilaginous plate. Fragmentation of cartilaginous tissue on the surface with the separation of tissue complexes in the form of gaps in the deep sections. Discomplexation of structural components in the thickness of the articular cartilage. The border line disappears. In the subchondral bone, it is necessary to isolate the zone of enchondral osteogenesis, since it largely determines the morphology of the progression of coxarthrosis. In this zone, areas of completed and incomplete ostegenesis are identified. Completed osteogenesis is determined by the presence of a plate of bone tissue that separates the cartilaginous tissue from the structures of the bone marrow with vessels, endostome. Osteogenesis incomplete is revealed in the form of two variants of structures: a - vascular penetration. from bone marrow to articular cartilage with areas of bone tissue desorption, altered cartilage tissue and areas of enchondral osteogenesis; b - preservation of cartilaginous tissue in the adjacent bone beams of the zone of enchondral osteogenesis, the presence of newly formed cartilaginous tissue in these areas. Osteoporosis is determined in the cancellous bone of the femoral head; fatty and hematopoietic bone marrow; newly formed connective tissue; chronic osteomyelitis; foci of necrosis, myxomatosis, pseudocysts. The revealed morphological changes in the complex of tissues during the formation of dysplastic coxarthrosis allow us to consider the morphogenesis of osteoarthritis as the interaction of cartilaginous, bone tissues, tissues of the marginal zone of the femoral head, bone marrow structures of the zone of enchondral ossification, vessels and connective tissue. The morphological basis of this interaction is determined by the essential role of vessels that perform not only trophic (service), but also morphogenetic functions. It is characterized by the germination of blood vessels, pericytes, and connective tissue cells from the bone marrow into the articular cartilage. This is accompanied by resorption of cartilage tissue, enchondral osteogenesis, or lack of osteogenesis; the tissue complex reaches the surface of the cartilaginous plate. Connective tissue with vessels - fibroblasts, collagen fibers on the surface of the cartilaginous plate, on the one hand, provide resorption of the cartilaginous tissue, and on the other hand, until a certain time, form the articular surface. The progression of incomplete osteogenesis - the growth of vessels and pericytes into the cartilaginous plate with resorption of cartilaginous tissue from the bone marrow and resorption of cartilaginous tissue from the side of the panus - leads to the division of the articular cartilage into separate fragments, the replacement of hyaline cartilage with connective tissue. In the marginal zone of the articular surface of the femoral head, restructuring of the tissue complex leads to the proliferation of connective tissue, displacement of the synovial lining and obliteration of the joint cavity. In the zone of interaction of the hyaline cartilage of the joint with the subchondral bone, fractures are detected. This leads to a displacement of tissues relative to their original positions. Subsequently, during the healing process - the fusion of morphogenetically closely related tissues - a kind of histotectonics and anatomical deformation of the femoral head are carried out. Obliteration of the joint cavity leads to the formation of contractures, restructuring of tissues in the hip joint.

Conclusion: The foregoing makes it possible to assess morphological changes in the femoral head in dysplastic coxarthrosis based on the understanding that this complex of tissues that carry a supporting function is associated with gravity. As a result, in the morphogenesis of dysplastic coxarthrosis, along with vessels, an important place belongs to mechanomorphosis, which determines the behavior of tissues. Based on this, it is possible to choose the optimal method of endoprosthetics for dysplastic coxarthrosis.

Reference:

1. Plushev, A.L. Dysplastic coxarthrosis. Theory and practice / A.L. Plushev. - M.: Leto-print, 2007.
2. Antti Eskelinen. Total hip arthroplasty in young patients - with special references to patients under 55 years of age and to patients with developmental dysplasia of the hip / Antti Eskelinen: academic dissertation. - Helsinki, 2006.-128 p.
3. Loskutov A.E., Tooth T.A., Loskutov O.A. On the classification of dysplastic coxarthrosis in adults. Orthopedics, traumatology and prosthetics: scientific and practical journal 2010; 2: 83–87.
4. Nishii, T. Disorders of acetabular labrum and articular cartilage in hip dysplasia: evaluation using isotropic high-resolutional CT arthrography with sequential radial reformation / Nishii T. [et al.] // Osteoarthritis Cartilage. - 2007. - Vol.15, N 3. - P. 251–257. 2014; 10 (1): 32-38.
5. Eskelinen A. Total hip arthroplasty in young patients with special references to patients under 55 years of age and to patients with developmental dysplasia of the hip: PhD diss. Helsinki, 2006; 128 p.
6. Lesnyak OM Clinical practice guidelines: Osteoarthritis. Diagnostics and management of patients with osteoarthritis of the knee and hip joints. M.: Geotar-Media, 2006; 176 s.
7. Yang S, Cui Q. Total hip arthroplasty in developmental dysplasia of the hip: a review of anatomy, techniques and outcomes. World Journal of orthopedics 2012; 18 (5): 42–48.
8. Yusupov K.S., Norkin I.A., Anisimova E.A. et al. Total hip arthroplasty in combination with double V-shaped shortening subtrochanteric osteotomy of the hip in patients with Crowe IV type dysplastic coxarthrosis. Saratov Journal of Medical Scientific Research, 2014. 10 (1): 114-119.
9. Anisimova E.A., Yusupov K.S., Anisimov D.I., Bondareva E.V. Morphology of the bone structures of the acetabulum and the femoral component of the hip joint // Saratov Journal of Medical Scientific Research 2014; 10 (1): 32-38.).
10. Tsaregorodtsev A.G. Vascular pathology in connective tissue dysplasia in thanatogenesis with sudden death of young people. Siberian Medical Journal 2008; 23 (1): 55-59.
11. В.Р. Акрамов, Ш.Ш. Ахмедов, Б.У. Хамраев, А.А. Тешаев Э.М. Хаятов, У.У. Раджабов., Эндопротезирование тазобедренного сустава при переломах шейки бедренной кости //. Проблемы биологии и медицины.- Самарканд №3 (96) 2017. стр- 23-26.
12. Акрамов В.Р. Особенности эндопротезирования тазобедренного сустава при анатомических нарушениях вертлужной впадины. “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан г.Ташкент № 3 – 2011 , Стр.94-97
13. Акрамов В.Р. Некоторые проблемы эндопротезирования ранее оперированного тазобедренного сустава. “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан Ташкент № 2 – 2011 , Стр.110-113.
14. Акрамов В.Р.,Ахмедов Ш.Ш., Хамраев Б.У- (Эндопротезирование тазобедренного сустава при переломах шейки бедренной кости) “ПРОБЛЕМЫ БИОЛОГИИ И МЕДИЦИНЫ ” Узбекистан г. Самарканд № 3 – 2017 (96), Стр.23-26
15. Акрамов В.Р.,Ш.Ш.,Хамраев А.Ш,Хамраев Б.У – (Тотальное эндопротезирование тазобедренного сустава и профилактика возможных осложнений) “НОВЫЙ ДЕНЬ В МЕДИЦИНЕ” Узбекистан. г. Ташкент, №4 (20) 2017, Стр.56-58

16. Акрамов В.Р., Ахмедов Ш.Ш., Хамраев А.Ш., Хамраев Б.У- (Эндопротезирование тазобедренного сустава при дегенеративно-дистрофических заболеваниях у взрослых) “БЮЛЛЕТЕНЬ АССОЦИАЦИИ ВРАЧЕЙ УЗБЕКИСТАНА” Узбекистан г.Ташкент № 2 – 2018, Стр.42-44.
17. V.R.Akramov,B. A.SH.Khamraev, SH.SH.Akhmedov, B.U.Khamraev,(The Arthroplasty Of The Hip At Fracture Of A Neck Of A Femur) European Journal of Business & Social Sciences., ISSN: 2235-767X.,Volume 07 Issue 05.,May 2019.
18. V.R.Akramov,B. A.SH.Khamraev, SH.SH.Akhmedov, B.U.Khamraev,(Prevention Of Possible Complications Before And After Total Endoprotesization Of The Combin) European Journal of Business & Social Sciences., ISSN: 2235-767X.,Volume 07 Issue 05.,May 2019.
19. Асилова Саодат Убайевна., Акрамов Вохид Рустамович., Ахмедов Шамшод Шавкатович., Мирзамуродов Хабибжон Халимович (Ташкент, Узбекистан).//ОЦЕНКА РЕЗУЛЬТАТОВ ЛЕЧЕНИЯ ПРИМЕНЕНИЯ ОБОГАЩЕННОЙ ТРОМБОЦИТАМИ ПЛАЗМЫ ПРИ АСЕПТИЧЕСКОМ НЕКРОЗЕ ГОЛОВКИ БЕДРЕННОЙ КОСТИ. POLISH SCIENCE JOURNALЮ., ISSUE 12(33) Part 2. WARSAW, POLAND Wydawnictwo Naukowe "iScience" 2020.
20. НА Корж, ВА Филиппенко, ВА Танькут, ВР Акрамов, АВ Танькут. ПЕРВИЧНОЕ ЭНДОПРОТЕЗИРОВАНИЕ НА РАНЕЕ ОПЕРИРОВАННОМ ТАЗОБЕДРЕННОМ СУСТАВЕ.// Вісник морської медицини. Украина. № 2 2011,Стр.196-197.
21. Асилова Саодат, Акрамов Вохид, Назаров Равшан, Ахмедов Шамшод. МРТ-исследование у пациентов с идиопатическим кокаартрозом тазобедренного сустава.// Международный журнал психосоциальной реабилитации. № 2 Том 24 2020, Стр.410-415.
22. Ахмедов Ш. Ш. и др. ЭНДОПРОТЕЗИРОВАНИЕ ТАЗОБЕДРЕННОГО СУСТАВА ПРИ ДЕГЕНЕРАТИВНО-ДИСТРОФИЧЕСКИХ ЗАБОЛЕВАНИЯХ У ВЗРОСЛЫХ //КОЛОНКА РЕДАКТОРА. – 2008.
23. Ахмедов Ш. Ш. и др. The peculiarities of prophylaxis of pulmonary thromboembolism after total hip endoprosthesis in dysplastic coxarthrosis //Новый день в медицине. – 2020. – №. 2. – С. 53-55.
24. Akhmedov S. The arthroplasty of the hip at fracture of a neck of a femur //European Journal of Business and Social Sciences. – 2019. – Т. 7. – №. 5. – С. 1423-1428.
25. Тешаев А., Асилова С., Ахмед С. Аппаратно-хирургическое лечение переломов дистального конца костей предплечья // Европейский журнал молекулярной и клинической медицины. - 2020. - Т. 7. - №. 3. - С. 3906-3919.
26. Ахмедов Ш. Ш. и др. Особенности профилактики ТЭЛА после тотального эндопротезирования при диспластических коксартрозах. – 2020.
27. Shavkatovich A. S., Shahobovich K. A., Esonboevich T. B. METOD FOR OPTIMIZATION OF PIPE JOINT ENDOPROSHETICS IN DYSPLASTIC COXAARTHROSIS //Euro-Asia Conferences. – 2021. – Т. 3. – №. 1. – С. 204-205.
28. Shavkatovich A. S., Shahobovich K. A., Esonboevich T. B. METHOD OF EARLY REHABILITATION AFTER TOTAL HIP ENDOPROSHETICS IN DYSPLASTIC COXARTHROSIS //E-Conference Globe. – 2021. – С. 184-185.

29. Хамраев А. Ш., Тугузов Б. Э., Ахмедов Ш. Ш. Оптимизация тотального эндопротезирования тазобедренного сустава при диспластическом коксартрозе //Врач скорой помощи. – 2020. – №. 8. – С. 60-71.
30. Shavkatovich A. S. Prevention of possible complications before and after total end protestation of the combine //European Journal of Business and Social Sciences. – 2019. – Т. 7. – №. 5. – С. 1413-1422.
31. Mirzamurodov Habibjon Halimovich, Nurulloev Sukhrob Ozodovich. IMPROVEMENT OF SURGICAL TREATMENT OF PATIENTS WITH COMBINED DEGENERATIVE-DYSTROPHIC PATHOLOGY OF THE HIP JOINT AND SPINE WITH PREVALENCE OF MANIFESTATIONS OF COXARTHROSIS// British Medical JournalVolume-1, No 2., 2021. P.180-187.
32. Mirzamurodov, Habibjon H. (2021) "FEATURES OF SURGICAL TACTICS OF TREATMENT OF PATIENTS WITH COXOVERTEBRAL SYNDROME," Central Asian Journal of Medicine: Vol. 2021 : Iss. 2 , Article 7.
33. Mirzamurodov H. H. New approaches to treatment of patients with coxovertebral syndrome //Asian journal of Pharmaceutical and biological research. – 2021. – Т. 10. – №. 2. – С. 9-19.
34. Ходжанов И.Ю., Мирзамуродов Х.Х. «Тазово-вертебральный синдром, диагностика и лечение». *научно-практический журнал «Травматология, ортопедия и реабилитация»* 1 (2021): 70-76.
35. Kh, Mirzamurodov H., I. Yu Khodzhanov, and S. O. Nurulloev. "Complex conservative therapy for hip-spine syndrome." *International Scientific and Educational electronic journal" Education and science in the xxi century* (2021): 1438-1439.
36. Kh, Mirzamurodov Kh, et al. "Optimization of total hip arthroplasty in dysplastic coxarthrosis." *New day in medicine* 4 (2020): 32.
37. Nurulloyev S. O., Mirzamuradov H. H. Morphological Changes In Bone Tissue In Chronic Osteomyelitis On The Background Of Application Of Plate Concentrate //The American Journal of Medical Sciences and Pharmaceutical Research. – 2021. – Т. 3. – №. 04. – С. 160-164.
38. Nurullaev S. O. et al. Our experience in the treatment of grade I-II gonarthroa with hyaluronic acid preparations //ACADEMICIA: AN INTERNATIONAL MULTIDISCIPLINARY RESEARCH JOURNAL. – 2020. – Т. 10. – №. 12. – С. 1767-1771.
39. Nurulloev S. O., Kh M. K. Our experience in the treatment of degree i-ii gonarthrosis with drugs hyalouranic acid //Innovation in the modern education system. – 2021. – №. 1 Part 5. – С. 546-548.
40. НуруллоевС., & Бахранов, Б. (2021). Анализ Частоты Встречаемости Ацептического Некроза Головки Бедренной Кости После Covid-19. *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES*, 284-287.
41. Nurulloev, Sukhrob O. (2021) "FEATURES OF MORPHOLOGICAL CHANGES IN THE BONES AND SURROUNDING TISSUES IN CHRONIC OSTEOMYELITIS AND TREATMENT WITH LASER OSTEOPERFORATION," *Central Asian Journal of Medicine*: Vol. 2021 : Iss. 2 , Article 8.
42. Nurulloyev Sukhrob Ozodovich. Analysis of morphological changes in the bones after osteomyelitis and features of treatment methods // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021

43. Хамраев Б. У., Акрамов В. Р. Программа для выражения способа лечения методом блокирующего интрамедуллярного остеосинтеза при переломе бедренной кости //Свидетельство об официальной регистрации программы для ЭВМ. Агентство по интеллектуальной собственности Республики Узбекистан. – 2019.
44. Khamraev B.U., Akhmedov Sh.Sh. TWO-STAGE REVISION HIP REPLACEMENT PATIENS WITH SEVERE ACETABULUM DEFECT (CASE REPORT) // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021.
45. Khamraev B.U., Akhmedov Sh.Sh. OUR EXPERIENCE OF TREATMENT OF FEMOR FRACTURES BY THE METHOD OF INTRAMEDULAR LOCKING OSTEOSYNTHESIS. // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021.
46. Uktamovich H. B., Shavkatovich A. S. OPTIMIZATION OF BLOCKING INTRAMEDULLARY OSTEOSYNTHESIS METHODS FOR FEMORAL FRACTURES //Asian journal of pharmaceutical and biological research. – 2021. – Т. 10. – №. 3.
47. Uktamovich H. B., Shavkatovich A. S. BLOCKING INTRAMEDULLARY OSTEOSYNTHESIS-AS EFFECTIVE METHOD FOR FEMORAL FRACTURES //Asian journal of pharmaceutical and biological research. – 2021. – Т. 10. – №. 3.
48. Khamraev B. U., Akramov B. P. Program for expressing the method of treatment by the method of blocking intramedullary osteosynthesis for a fracture of the femur //Certificate of official registration of a computer program. Agency for Intellectual Property of the Republic of Uzbekistan. – 2019.
49. Amrilloevich N. D. Features of the application of external osteosynthesis in gonarthrosis //Asian journal of Pharmaceutical and biological research. – 2021. – Т. 10. – №. 2.
50. Uli Z. A. K., Amrilloevich N. D. MORPHOLOGICAL CHANGES IN THE HYALINE CARTILAGE OF THE KNEE JOINT AGAINST THE BACKGROUND OF INTRA-ARTICULAR ADMINISTRATION OF THE PREPARATION OF HYALURONIC ACID IN RATS WITH EXPERIMENTAL OSTEOARTHRITIS //Asian journal of pharmaceutical and biological research. – 2021. – Т. 10. – №. 3.
51. Uli Z. A. K., Amrilloevich N. D. MORPHOGENESIS OF HYALINE CARTILAGE OF THE KNEE JOINT AGAINST THE BACKGROUND OF INTRA-ARTICULAR INJECTION OF PLATELET-RICH AUTOLOGOUS PLASMA //Asian journal of pharmaceutical and biological research. – 2021. – Т. 10. – №. 3.
52. Ziyadullaev Abdusalom Khabibulla oglu. EVALUATION OF THE FUTURE RESULTS OF APPLICATION OF ARTHRO-MEDULLARY BYPASSING IN GONARTHROSIS. // Asian journal of Pharmaceutical and biological research. Volume 10 Issue 2 MAY-AUG 2021