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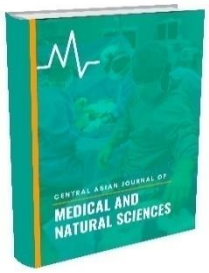

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Possibilities and Prospects of Ultrasound Diagnostics in Rheumatology

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Abstract: Currently, ultrasound (ultrasound) is one of the most informative imaging examination methods. Due to portability, accessibility, speed of implementation, relatively low cost and almost complete absence of contraindications, ultrasound is an effective method not only for diagnosis, but also to assess the quality of treatment. This method is highly informative for visualizing the tendino-ligamentous apparatus, hyaline cartilage, cortical bone, and paraarticular soft tissue, which greatly expands a rheumatologist's diagnostic and treatment options and allows for monitoring of efficacy of the treatment. This review article discusses the possibilities of using ultrasound in the diagnosis of a number of rheumatological diseases, such as: B. rheumatoid arthritis, osteoarthritis, spondyloarthritis, gout, tendon damage in hypercholesterolemia. The possibilities of using sonoelastography (a method for determining the elasticity of soft tissue structures) in the diagnosis of rheumatic diseases are also considered. According to the authors, sonoelastography could soon enter clinical practice as a first-line diagnostic method to detect biomechanical changes in tendons, muscles and ligaments and to assess treatment efficacy. Performing an ultrasound of the musculoskeletal system significantly expands the diagnostic and therapeutic options of the doctor.

Key words: rheumatic diseases, ultrasound examination of the musculoskeletal system, osteoarthritis, spondyloarthritis, rheumatoid arthritis, gout, sonoelastography.

Introduction

The issue of joint diseases remains complex and requires an integrated approach to diagnosis and treatment involving specialists from different fields: radiodiagnostics, orthopedic traumatologists, rheumatologists, rehabilitation specialists, physiotherapists, etc.

The decline of almost all age groups of the population, the tendency to become chronic and the steady progression of rheumatic diseases determine the importance of early detection. Detecting the disease at an early stage can prevent permanent disability, a severe reduction in quality of life and a significant increase in treatment costs.

Modern ultrasound (ultrasound) of the musculoskeletal system significantly expands the diagnostic and therapeutic options of the doctor. The interest in expanding the scope of ultrasound in the diagnosis of diseases of the musculoskeletal system is confirmed by the steady increase in publications on this topic.

Due to its portability, availability, speed of execution, relatively low cost and almost complete absence of contraindications, ultrasound is an effective method not only for diagnosis, but also for evaluating the quality of treatment.

Currently, in world practice, ultrasound is one of the most informative methods of visualizing the examination of the joints due to its high resolution in the visualization of the tendon-ligament apparatus, blood vessels, cartilage hyaline and cortical bone layer.

In addition, ultrasound is a direct contact between the researcher and the patient, which makes it possible to focus directly on the troublesome area during the examination. During ultrasound examination of the joint, the compression by the sensor serves as a guide when looking for a pathological site. Such an examination does not require special training, bulky equipment and is carried out in a short time.

Ultrasound data is currently included in the classification criteria for a number of diseases. Therefore, the presence of subdeltoid bursitis, biceps tenosynovitis, or shoulder synovitis is included in the European League Against Rheumatism (EULAR) classification criteria for polymyalgia rheumatica.

Each joint is made up of articular surfaces of bone covered with cartilage; Joint cavity and joint capsule, which surround the joint and are reinforced by ligaments. Additional elements of the joint include structures such as menisci, intra-articular ligaments, and sesamoid bones. The bones that form the joint fully reflect ultrasound, so their volumetric visualization is impossible. They are found as echogenic linear formations, leaving a wide acoustic shadow. Hyaline cartilage usually appears as a narrow hypoechoic or hypoechoic band whose structure and thickness can be assessed by ultrasound. The capsule is found only in large joints. The cross-sectional menisci are visualized as homogeneous triangular echogenic areas. Ultrasound makes it possible to assess their structure and integrity, as well as to detect prolapse in the joint cavity.

The ligaments of the joint are visualized as intertwining, weakly echogenic lines. Modern high-resolution sensors make it possible to assess their structure quite well. The joint cavity is visualized as a narrow anechoic zone. Paraarticular soft tissues, whose alterations are associated with joint diseases or may be the expression of an independent pathology (tendinitis, myositis, fasciitis), are also easily accessible for ultrasound imaging.

The list of indications for ultrasound of the joints is quite long. It should be noted that any changes in the joints (trauma, pain, limitation of movement, increase in volume, swelling, presence of a palpable formation) require ultrasound for the purpose of primary diagnosis and dynamic monitoring during treatment .

The examination of the joints is carried out in different sections: longitudinal, transverse and oblique. In addition, in order to obtain more complete information, the examination of the joint is carried out in the positions of flexion, extension and rotation.

Ultrasound examination of the joint examines two symmetrical joints, which can be particularly important in the differential diagnosis of traumatic joint damage and exacerbation of rheumatic disease caused by a minor traumatic factor.

The shoulder, elbow, knee and ankle joints are the most accessible for ultrasound. The diagnostic significance of ultrasound of a joint such as the hip is highly dependent on the patient's physique and is significantly reduced in people with increased body weight. At the same time, ultrasound of the hip joints in newborns and children of the first year of life is a very informative method for detecting congenital joint dysplasia. Ultrasound of small wrists is equally important, especially in the diagnosis of rheumatoid arthritis.

Rheumatoid arthritis. According to modern concepts, RA is an autoimmune rheumatic disease of unknown etiology characterized by chronic erosive arthritis (synovitis) and systemic damage to internal organs. Joint syndrome is the main manifestation of RA. The process primarily affects small joints and periarticular tissues. Early diagnosis of RA allows a quick start of treatment with modern basic anti-inflammatories and the use of genetically modified biological therapy (GEBT), which allows to achieve clinical and laboratory remission with a slowing of the phenomena inflammatory and destructive and, as a result, the prognosis of the disease improves significantly.

The pathogenesis of RA is based on the activation of a complex cascade of cytokines, leading to inflammatory proliferation of the synovial membrane, the development of pronounced exudative synovitis, the proliferation of specific pannus with the pathological formation of a vascular network in it, which subsequently leads to the destruction of articular cartilage and subchondral bone. Increased pannus vascularity and an enlarged synovial membrane may serve as indicators of RA activity, and conversely, pannus and synovial vascularity are significantly reduced during treatment of the disease. Ultrasound with color and power Doppler mapping has been shown to have high sensitivity in detecting synovitis in RA. Vascular structures are clearly visible at the sites of erosive changes in cartilage and bone.

The main criterion for evaluating the activity of the inflammatory process is the severity of synovial vascularization according to power Doppler mapping (EDC).

The early warning sign for RA is a destructive bone lesion with formation of cysts and erosions on the joint surfaces. Bony defects are not always visible on early RA radiographs.

Ultrasound of the hands shows early erosive changes in the joints much more frequently than X-rays. erosion is clearly visible, especially at the heads of the metacarpal bones.

Osteoarthritis. Ultrasound also plays an important role in the diagnosis of osteoarthritis - a heterogeneous group of diseases of various etiologies with similar biological, morphological and clinical manifestations and findings based on damage to all components of the joint, mainly cartilage, as well as subchondral bones, synovial membrane, ligaments, capsule, periarticular muscles.

On ultrasound, thinning of the articular cartilage, appearance of “debris” of destroyed cartilage and bone (“articular mice”) in the joint cavity, proliferative changes in the marginal bony articular surfaces (osteophytes), blurred and irregular contours of the articular surfaces, accumulation of fluid in the articular cavity, as well as damage to intra-articular structures and the para-articular apparatus can be made visible in the form of hypo- and dystrophic changes.

Early diagnosis of osteoarthritis is extremely important when rapid administration of chondroprotectors is effective in affecting articular cartilage which is still intact. Healthy cartilage is visible as a uniform, continuous, homogeneous anechoic streak of uniform thickness (Fig. 1). In osteoarthritis, the cartilage is unevenly thinned, with fuzzy contours and an inhomogeneous structure with possible inclusions (Fig. 2).

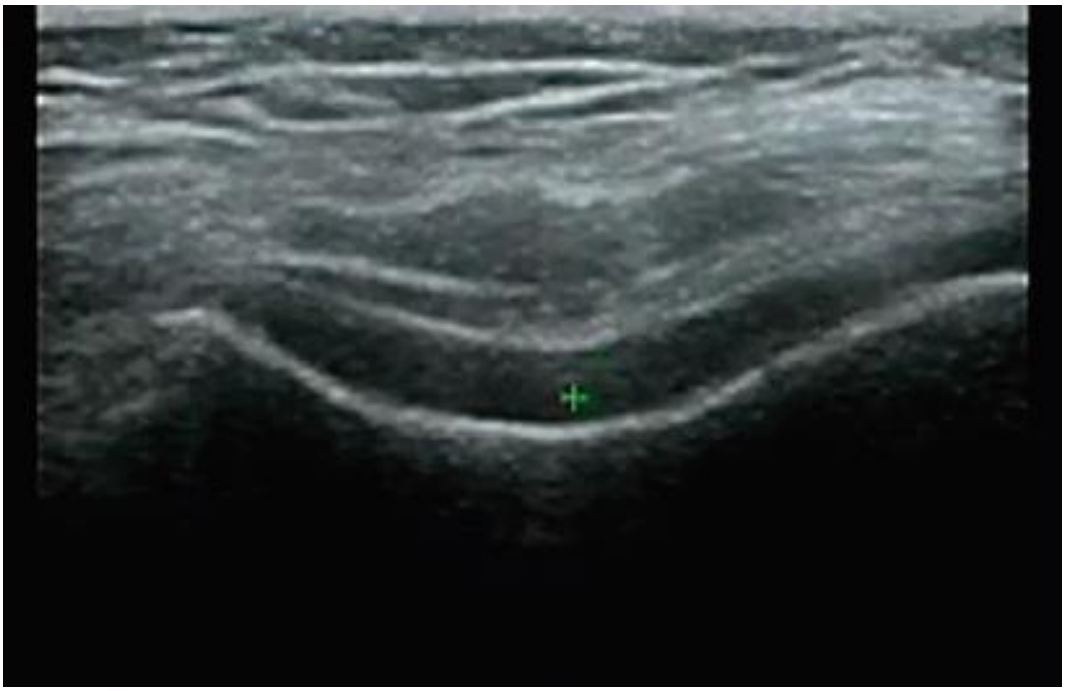

Fig.1. Hyaline cartilage is normal

Some researchers believe that when thinning hyaline cartilage, according to ultrasound, is less than 1.8 mm without fluid visualization, the appointment of chondroprotectors will be effective in influencing the still intact articular cartilage. It is also advisable in this case to consider the possibility of intra-articular injection of hyaluronic acid preparations. Thinning of hyaline cartilage less than 1.0 mm, changes in synovial bags and menisci, together with radiological data, is an indication for knee arthroplasty.

Fig.2. Hyaline cartilage in OA. Thickness reduction, contour irregularity, hyperechoic inclusions.

Damage to the paraarticular apparatus often occurs both against the background of arthrosis and arthritis of various etiologies, and independently of each other. One of the most obvious examples of

damage to the paraarticular apparatus is Baker's cyst - a synovial sac distended by fluid from the popliteal fossa, located in the medial section between the internal head of the gastrocnemius muscle and the tendon of the muscle semi-membranous. The causes of Baker's cysts can be osteoarthritis, rheumatoid arthritis, post-traumatic conditions of the knee joint. Baker's cyst presents as a rounded formation with sharp edges and anechoic contents, communicating with the joint cavity through the anastomosis. A characteristic of Baker's cyst is that when discovered, it is usually not the cyst itself that needs to be removed, but rather the cause that caused it.

If there are bursitis and Baker's cysts larger than 70.0 × 15 mm, it is recommended to perform punctures with ultrasound navigation. Ultrasound makes it possible to visualize the needle throughout its insertion, to avoid damage to blood vessels and nerve trunks, to evacuate the contents of the site of pathological changes and intra-articular injection of drugs (glucocorticoids, hyaluronates).

Spondyloarthritis. The role of ultrasound in the diagnosis of changes in the musculoskeletal system in patients with spondyloarthritis is also increasing. Spondyloarthritis is a group of chronic systemic inflammatory diseases of the spine, joints and entheses characterized by common clinical, radiological and genetic features. It is a heterogeneous group of diseases that includes ankylosing spondylitis (Bechterew's disease), reactive arthritis (ReA), psoriatic arthritis (PsA), spondyloarthritis associated with inflammatory bowel disease, juvenile spondyloarthritis and undifferentiated spondyloarthritis.

In patients with spondyloarthritis, ultrasound can visualize joint effusions even in the absence of clinical manifestations. In addition, an experienced sonographer will detect tendonitis, tenosynovitis, tendon ruptures, enthesitis, synovial hypertrophy and bone erosion.

Plantar fasciitis, the most common cause of foot pain in patients with spondyloarthritis, is characterized by thickening of the plantar fascia, decreased echogenicity and surrounding edema. All this concerns the main pathological ultrasound markers of spondyloarthritis.

The possibility of diagnosis and differential diagnosis of acute and chronic course of reactive arthritis using ultrasound is shown.

Enthesitis, as the most characteristic sign of all nosological forms of the group of spondyloarthritis, is available for visualization in power Doppler mode, which makes it possible to assess the degree of vascularization (neoangiogenesis) in the problem area. By modifying the severity of neoangiogenesis, the efficacy of local and systemic treatment can also be assessed.

Prospects for the use of ultrasound in the diagnosis of rheumatic diseases

Ultrasound diagnostic methods are constantly being improved. New methods are successfully tested and put into practice. Several studies have shown that when a contrast medium is used, an increase in signal from the hypervascularized synovium, an increase in color signal, synovitis, necrosis or fibrosis in the inflamed joints can be more clearly differentiated. Multimodal imaging technology "Fusion" ("Fusion") allows you to perform ultrasound with the simultaneous display of the corresponding slices of CT or MRI.

With the development of ultrasonic methods, it has become possible to assess the mechanical properties of soft tissues. Sonoelastography allows you to determine the elasticity of soft tissue structures. The method is based on determining the deformability of the fabric, which depends on its structure and composition. Elasticity is defined by the modulus of elasticity, which reflects the properties of a material to resist stretching or compression under elastic deformation. The techniques currently mainly used include compressive (quasi-static) elastography and shear wave (dynamic) elastography.

The principle of shear wave elastography is based on measuring the velocity distribution of elastic tissue strain waves obtained with an ultrasound pulse (Fig. 3). This technique allows not only a qualitative evaluation in the form of color elastograms, but also quantitative measurements in kilopascals or centimeters per second.

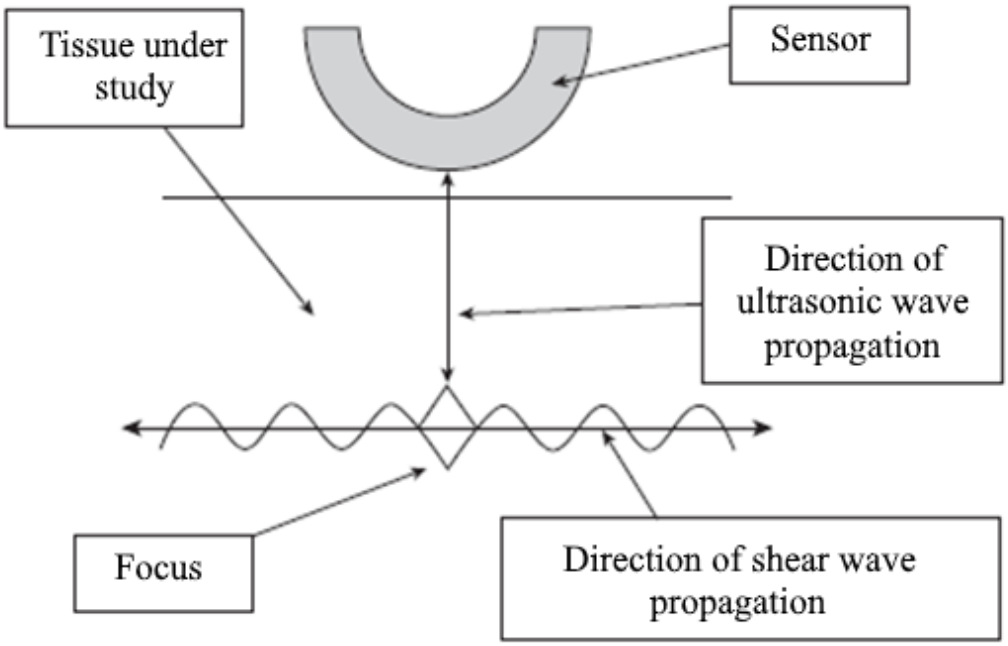

Fig.3. Physical basis of elastography

The elasticity of soft tissues such as subcutaneous fat, muscle, and connective tissue is known to be around 1 to 103 kPa. Malignant neoplasms have also been shown to have greater stiffness compared to normal tissue. This is the reason for the widespread use of elastography in the diagnosis of diseases of the liver, mammary gland, thyroid gland and prostate.

The elasticity of soft tissue structures of the musculoskeletal system can also be changed under the influence of various pathological processes such as microdamage, inflammation, fibrosis and calcification.

The first publications on the use of elastography to assess the elasticity of skeletal muscles appeared in the mid-1990s. Since the end of the last decade, separate publications have appeared on the elastographic examination of tendons of various locations , mainly the Achilles tendon. A number of publications are devoted to the possibility of obtaining real-time information on the stiffness of the tendon, both with normal and degenerative changes, as well as to evaluate the mechanical properties of the tendon in dynamics in the context of ongoing therapy. In our opinion, the results showing multidirectional density changes in various ligaments and tendons in tendinopathies are interesting. Yes, B.K. Coombes et al., who assessed the density of the Achilles tendon and the intrinsic ligament of the patellar tendon by shear wave elastography, showed an increase in the intrinsic density of the patellar tendon and a decrease in the density of the Achilles tendon in patients with tendinopathy compared to healthy controls. However, some studies show that in Achilles tendonitis there is increased stiffness in the area of its attachment to the bone (enthesis), possibly due to the formation of enthesophytes and calcification of the tendon . It has also been shown that sonoelastography can detect degenerative changes in the tendons, calcifications in the thickness of the tendons, which are difficult to detect with other examination methods.

Recently, new reports have appeared on the diagnostic possibilities of the elastographic method in rheumatological diseases. E. Cindila et al. showed a significant difference in the elasticity of the major salivary glands in patients with Sjogren's syndrome. Q. Wang et al. report the use of shear wave elastography to determine stiffness indices of soft tissue structures in the region of the first metatarsophalangeal joint during the interictal period and during gout exacerbation. The possibility of using a tendon examination technique in scleroderma and ankylosing spondylitis is being actively studied. Our personal experience shows the possibility of determining the elasticity of the hyaline cartilage of the knee joint, which can be used for the dynamic evaluation of the effectiveness of chondroprotective therapy, but requires additional studies (Fig. 4, 5).

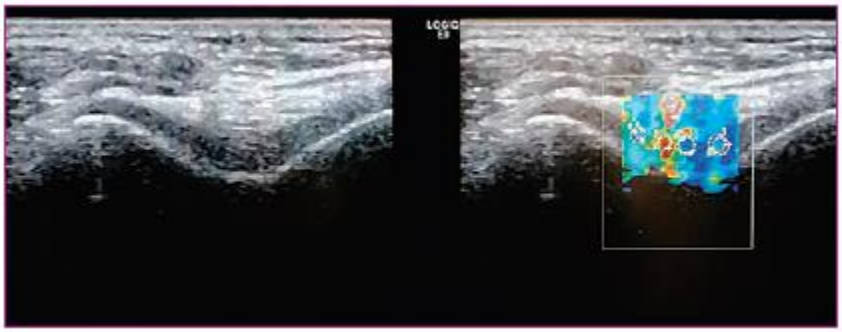

Fig.4. Hyaline cartilage of a healthy person

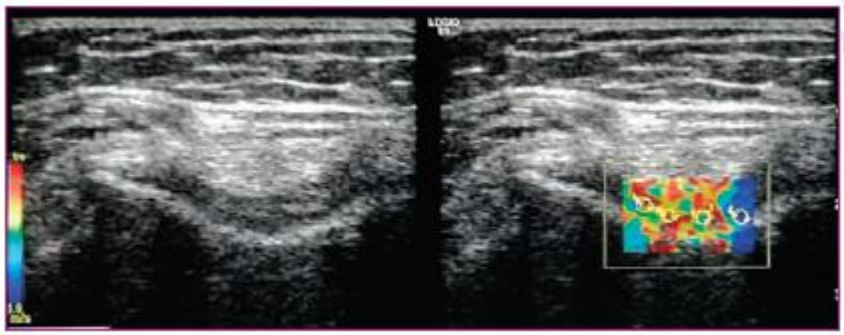

Fig.5. Hyaline cartilage of a patient with secondary osteoarthritis of the knee joint with RA. Hyperechoic inclusions in the cartilage structure are visualized in the B-mode and density increases during elastography.

Conclusion

Modern methods of ultrasound of the joints, due to the speed of execution, relatively low cost, the absence of contraindications and high resolution, significantly expand the diagnostic and treatment capabilities of a rheumatologist and allow you to control the effectiveness of therapy.

Currently, ultrasound for the diagnosis of joint diseases is still not widely used due to the small number of specialists who own this method, although in Europe and the USA, ultrasound is an integral part of the examination of the musculoskeletal system. Sonoelastography may soon be firmly established in clinical practice as a first-line diagnostic method for detecting biomechanical changes in tendons, muscles, ligaments, as well as assessing the effectiveness of the treatment.

LITERATURE

1. Abdurakhmanovich , K. O., & Javlanovich , Y. D. (2022). Magnetic Resonance Tomography for Damage to the Ligamentous Structures of the Knee Joint. CENTRAL ASIAN JOURNAL OF

MEDICAL AND NATURAL SCIENCES, 3(2), 27-34. Retrieved from https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/617

2. Abdurakhmanovich , K. O., & Servetovna , A. A. (2022). Guidelines for Ultrasound Examination in Gynecological Diseases. CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES, 3(2), 22-26. Retrieved from https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/616
3. Abdurakhmanovich, K. O., & ugli, G. S. O. (2022). Ultrasonic Diagnosis Methods for Choledocholithiasis. *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES*, *3*(2), 43-47.
4. Abdurakhmanovich, K. O., & ugli, G. S. O. (2022). Ultrasound Diagnosis of the Norm and Diseases of the Cervix. *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES*, *3*(2), 58-63.
5. Abdurakhmanovich, Khamidov Obid, Akhmedov Yakub Amandullaevich, Ataeva Saodat Khurshedovna, Ametova Alie Servetovna, and Karshiev Behruz Orif ugli. 2021. "Role of Kidney Ultrasound in the Choice of Tactics for Treatment of Acute Renal Failure". *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES* 2 (4), 132-34. https://doi.org/10.47494/cajmns.v2i4.263.
6. Akhmedov Y.A., Rustamov U.Kh., Shodieva N.E., Alieva U.Z., Bobomurodov B.M. Modern Application of Computer Tomography in Urology. Central Asian journal of medical end natural sciences, volume 2 issue 4 Jul-Aug 2021 P.121-125
7. Amandullaevich AY, Danabaevich JK. Ultrasound Diagnosis of Hirschsprung's Disease in Children. CAJMNS [Internet]. 2022Mar.3 [cited 2022May24];3(2):64-1. Available from: https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/623
8. Amandullaevich AY, Zafarjonovich UZ. Possibilities of MRI Diagnostics of Focal Liver Defeats. CAJMNS [Internet]. 2022Mar.3 [cited 2022May24];3(2):35-2. Available from: https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/618
9. Amandullaevich, Akhmedov Yakub, Rustamov Umar Khaidarovich, Shodieva Nodira Egamberdievna, Alieva Umida Zairovna, and Bobomurodov Bektosh Mamadiyorovich. 2021. "Modern Application of Computer Tomography in Urology". *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES* 2 (4), 121-25. https://doi.org/10.47494/cajmns.v2i4.261.
10. Ametova Alie Servetovna, Saitkulova Shahribonu Rakhmatillevna, Khaidarova Aziza Anvarovna. Early Rheumatoid Arthritis: Possibilities Of Mri Diagnosis. TJMS [Internet]. 2022 Feb. 24 [cited 2022 May 24];5:260-6. Available from: https://zienjournals.com/index.php/tjm/article/view/879
11. Ataeva S.Kh., Ravshanov Z.Kh., Ametova A.S., Yakubov D.Zh. Radiation visualization of chronic joint diseases. Central Asian journal of medical end natural sciences, volume 2 issue 2 March-aprel 2021 P.12-17
12. Ataeva Saodat Khurshedovna, Ravshanov Zafar Khazratkulovich, Ametova Alie Servetovna, and Yakubov Doniyor Zhavlanvich. 2021. "Radiation Visualization of Chronic Joint Diseases". *CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES* 2 (2), 12-17. https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/107.
13. Backhaus M., Burmester G.R., Gerber T. et al. Guidelines for musculoskeletal ultrasound in rheumatology. Ann Rheum Dis. 200;60 (7):641–649.

14. Cooperberg P.L., Tsang I., Truelove L., Knickerbocker W.J. Gray scale ultrasound in the evaluation of rheumatoid arthritis of the knee. Radiology. 1978;126(3):759–763. DOI: 10.1148/126.3.759.

15. Doniyor Javlanovich Yakubov, Zafar Berdimuradovich Karimov , Sherzod Obid Ugli Gaybullaev , and Mehriddin Mashrab Ugli Mirzakulov. "Ultrasonic and radiological picture in the combination of chronic venous insufficiency and osteoarthritis of the knee joints" Academic research in educational sciences, vol. 3, no. 5, 2022, pp. 945-956.

16. Elnady B., El Shaarawy N.K., Dawoud N.M. et al. Subclinical synovitis and enthesitis in psoriasis patients and controls by ultrasonography in Saudi Arabia; incidence of psoriatic arthritis during two years. Clin Rheumatol. 2019;38(6):1627–1635. DOI: 10.1007/s10067-019-04445-0.

17. Genc H., Cakit B.D., Tuncbilek I., Erdem H.R. Ultrasonographic evaluation of tendons and enthesal sites in rheumatoid arthritis: comparison with ankylosing spondylitis and healthy subjects. Clinical rheumatology. 2005;24(3):272–277.

18. Is lower extremity vein pathology a risk factor for the development of osteoarthritis of the knee joint? / I. Yu. Khodzhanov, B. M. Mamasoliev, A. N. Tkachenko [et al.] // Ural medical journal. – 2022. – Vol. 21, № 2. – P. 19-25. http://doi.org/10.52420/2071-5943-2022-21-2-19-25.

19. Khamidov O. A., Khodzhanov I. Yu., Mamasoliev B.M., Mansurov D.Sh., Davronov A.A., Rakhimov A.M. The Role of Vascular Pathology in the Development and Progression of Deforming Osteoarthritis of the Joints of the Lower Extremities (Literature Review). Annals of the Romanian Society for Cell Biology, Romania,Vol. 25, Issue 1, 2021, Pages. 214 – 225

20. Khamidov O.A., Akhmedov Y.A., Ataeva S.Kh., Ametova A.S., Karshiev B.O. Role of Kidney Ultrasound in the Choice of Tactics for Treatment of Acute Renal Failure. Central Asian journal of medical end natural sciences, volume 2 issue 4 Jul-Aug 2021 P.132-134

21. Khamidov O.A., Akhmedov Y.A., Yakubov D.Zh., Shodieva N.E., Tukhtaev T.I. Diagnostic possibilities of uses in polykystosis of kidneys. Web of scientist: International scientific research journal, volume 2 issue 8 August 2021 P.27-33

22. Khamidov O.A., Ataeva S.Kh., Ametova A.S., Yakubov D.Zh., Khaydarov S.S. A Case of Ultrasound Diagnosis of Necrotizing Papillitis. Central Asian journal of medical end natural sciences, volume 2 issue 4 Jul-Aug 2021 P.103-107

23. Khamidov O.A., Ataeva S.Kh., Yakubov D.Zh., Ametova A.S., Saytkulova Sh.R. Ultrasound examination in the diagnosis of fetal macrosomia. Web of scientist: International scientific research journal, volume 2 issue 8 August 2021 P.49-54

24. Khamidov O.A., Mirzakulov M.M., Ametova A.S., Alieva U.Z. Multispiral computed tomography for prostate diseases. Central Asian journal of medical end natural sciences, volume 2 issue 2 March-aprel 2021 P.9-11

25. Khamidov O.A., Normamatov A.F., Yakubov D.Zh., Bazarova S.A. Respiratory computed tomography. Central Asian journal of medical end natural sciences, volume 2 issue 2 March-aprel 2021 P.1-8

26. Khamidov O.A., Urozov U.B., Shodieva N.E., Akhmedov Y.A. Ultrasound diagnosis of urolithiasis. Central Asian journal of medical end natural sciences, volume 2 issue 2 March-aprel 2021 P.18-24

27. Khamidov O.A., Yakubov D.Zh., Alieva U.Z., Bazarova S.A., Mamaruziev Sh.R. Possibilities of Sonography in Differential Diagnostics of Hematuria. Central Asian journal of medical end natural sciences, volume 2 issue 4 Jul-Aug 2021 P.126-131

28. Khamidov O.A., Yakubov D.Zh., Ametova A.S., Bazarova S.A., Mamatova Sh.T. Application of the Ultrasound Research Method in Otorhinolaryngology and Diseases of the Head and Neck Organs. International Journal of Development and Public Policy, volume 1 issue 3 August 2021 P.33-37

29. Khamidov O.A., Yakubov D.Zh., Ametova A.S., Turdumatov Zh.A., Mamatov R.M. Magnetic Resonance Tomography in Diagnostics and Differential Diagnostics of Focal Liver Lesions. Central Asian journal of medical end natural sciences, volume 2 issue 4 Jul-Aug 2021 P.115-120

30. Khamidov Obid Abdurakhmonovich, Zhuraev Kamoliddin Danabayevich, Khamrokulov Munis Mukhsinovich, Azimova Kamola Alisherovna, and Sayfiev Davron Dilshod Ugli. "The role of computed tomography in the diagnosis of choble (literature review)". The American Journal of Medical Sciences and Pharmaceutical Research, vol. 4, no. 04, Apr. 2022, pp. 1-7, doi:10.37547/TAJMSPR/Volume04Issue04-01.

31. Khamidov Obid, Ametova Alie, and Ravshanov Zafar. "Ultrasonography of synovial cysts and wrist joint". Involta Scientific Journal, vol. 1, no. 6, May 2022, pp. 480-9, https://involta.uz/index.php/iv/article/view/221.

32. Khodzhibekov M.X., Khamidov O.A., Mardieva G.M. Verification of radiation methods in diagnostics of injuries of the knee joint intra-articular structures. International Journal of Pharmaceutical Research. 2020:13(1), p. 302-308.

33. Khurshedovna AS, Danabaevich JK. Ultrasound Diagnosis of Fetoplacental Insufficiency. CAJMNS [Internet]. 2022Mar.3 [cited 2022May24];3(2):53-7. Available from: https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/621

34. Khurshedovna AS, Zafarjonovich UZ. Ultrasound Examination for the Diagnosis of Acute Appendicitis. CAJMNS [Internet]. 2022Mar.3 [cited 2022May24];3(2):72-7. Available from: https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/624

35. McAuliffe S., McCreesh K., Culloty F. et al. Can ultrasound imaging predict the development of Achilles and patellar tendinopathy? A systematic review and meta-analysis. Br J Sports Med. Br J Sports Med. 2016;50(24):1516–1523. DOI: 10.1136/bjsports-2016-096288.

36. McDonald D.G., Leopold G.R. Ultrasound B-scanning in the differentiation of Baker's cyst and thrombophlebitis. Br J Radiol. 1972;45(538):729–732. DOI: 10.1259/0007-1285-45-538-729.

37. McNally E. Practical Musculoskeletal Ultrasound E-Book. Elsevier Health Sciences; 2014.

38. Obid Abdurakhmanovich Khamidov, Saodat Khurshedovna Ataeva, Zafar Narbay Ugli Nurmurzaev Pathology of lower extremity veins in osteoarthritis of knee joints // Academic research in educational sciences. 2022. №5. URL: https://cyberleninka.ru/article/n/pathology-of-lower-extremity-veins-in-osteoarthritis-of-knee-joints (дата обращения: 29.08.2022).

39. Reuss-Borst M.A., Pape C.A., Tausche A.K. Hidden gout-Ultrasound findings in patients with musculo-skeletal problems and hyperuricemia. Springerplus. 2014;3:592. DOI: 10.1186/2193-1801-3-592.

40. Rudikoff J.C., Lynch J.J., Phillips E., Clapp P.R. Ultrasound diagnosis of Baker cyst. JAMA. 1976;235(10):1054–1055.

41. Rustamov U.Kh., Shodieva N.E., Ametova A.S., Alieva U.Z., Rabbimova M.U. US-diagnostics for infertility. Web of scientist: International scientific research journal, volume 2 issue 8 August 2021 P.55-61

42. Rustamov U.Kh., Urinboev Sh.B., Ametova A.S. Ultrasound diagnostics of ectopic pregnancy. Central Asian journal of medical end natural sciences, volume 2 issue 2 March-aprel 2021 P.25-28

43. Yakubov Doniyor Javlanovich, Juraev Kamoliddin Danabaevich, Gaybullaev Sherzod Obid ugli, and Samiev Azamat Ulmas ugli. "Influence of gonarthrosis on the course and effectiveness of treatment of varicose veins". *Yosh Tadqiqotchi Jurnali*, vol. 1, no. 4, May 2022, pp. 347-5, http://2ndsun.uz/index.php/yt/article/view/287.

44. Yakubov DZh, Gaybullaev ShO. The diagnostic importance of radiation diagnostic methods in determining the degree of expression of gonarthrosis. Uzbek journal of case reports. 2022;2(1):36-40. https://doi.org/10.55620/ujcr.2.1.2022.7

45. Yang J., Zhang H., Zhou B. et al. The distinctive characteristics of ultrasonic imaging of enthesitis in spondyloarthritis patients. Zhonghua nei ke za zhi. Zhonghua Nei Ke Za Zhi. 2015;54(7):628–632.

46. Zhavlanovich YD, Servetovna AA. Ultrasonography and its Role in Clinical Diagnosis. CAJMNS [Internet]. 2022Mar.3 [cited 2022May24];3(2):48-2. Available from: https://cajmns.centralasianstudies.org/index.php/CAJMNS/article/view/620

47. Атаева С.Х., Ахмедов Я.А. УЗИ высокого разрешения для детской патологии мошонки. Uzbek journal of case reports. 2022;2(1)

48. Балабанова Р.М., Эрдес Ш.Ф. Распространенность ревматических заболеваний в России в 2012–2013 гг. Научно-практическая ревматология. 2015;53(2):120–124. [Balabanova R.M., Erdes Sh.F. The incidence and prevalence of rheumatic diseases in Russia in 2012–2013. Rheumatology Science and Practice. 2015;53(2):120–124 (in Russ.)]. DOI: 10.14412/1995-4484-2015-120-124.

49. Балглей А.Г., Ткаченко А.Н., Хайдаров В.М., Мансуров Д.Ш., Уразовская И.Л. Частота и структура осложнений при артроскопическом лечении остеоартрита коленного сустава // Вестник Северо-Западного государственного медицинского университета им. И.И. Мечникова. - 2022. - Т. 14. - №2. - С. 35-47. doi: 10.17816/mechnikov108370

50. Галушко Е.А., Насонов Е.Л. Распространенность ревматических заболеваний в России. Альманах клинической медицины. 2018;46(1):32–39. [Galushko E.A., Nasonov E.L. The prevalence of rheumatic diseases in Russia. Almanac of clinical medicine. 2018;46(1):32–39 (in Russ.)]. DOI: 10.18786/2072-0505-2018-46-1-32-39.

51. З.З. Умаркулов, Б.М. Мамасолиев. Влияние посттравматической хондропатии на функциональное состояние коленных суставов у спортсменов. Uzbek journal of case reports. 2022;2(1):31-35. https://doi.org/10.55620/ujcr.2.1.2022.6

52. Зубарев А.В. Диагностический ультразвук. Костно-мышечная система. М.: Стром; 2002. [Zubarev A.V. Diagnostic ultrasound. Musculoskeletal system. M.: Strom; 2002 (in Russ.)].

53. Камолиддин Данабаевич Жураев, Обид Абдурахмонович Хамидов, Дониёр Жавлонович Якубов, Сардор Икром Угли Акбаров Ульразвуковое исследование щитовидной железы // Scientific progress. 2022. №3. URL: https://cyberleninka.ru/article/n/ulrazvukovoe-issledovanie-schitovidnoy-zhelezy (дата обращения: 29.08.2022).

54. Hamidov Obid Abdurahmanovich. "Diagnostics of injuries of the soft tissue structures of the knee joint and their complications" European research, no. 1 (37), 2020, pp. 33-35.

55. Обид Абдурахманович Хамидов, Саодат Хуршедовна Атаева, Зафар Нарбай Угли Нурмурзаев Патология вен нижних конечностей при остеоартрите коленных суставов // Академические исследования в области педагогических наук. 2022. №5. URL: https://cyberleninka.ru/article/n/pathology-of-lower-extremity-veins-in-osteoarthritis-of-knee-joints.

56. Пересада А.С., Борисов А.В., Степуро Л.И. и др. Особенности инструментальной диагностики периартикулярной патологии области плечевого сустава. Медицинские новости. 2013;12(231):82–85. [Peresada A.S., Borisov A.V., Stepuro L.I. and others. Features of instrumental diagnosis of periarticular pathology of the shoulder joint. Medical news. 2013;12(231):82–85 (in Russ.)].

57. Ризаев Ж.А., Хамидов О.А., Рустамова Д.А., Кушаков Б.Ж. Сравнительный анализ лучевых методов исследования при коронавирусной инфекции SARS-COV-2 (2019-NCOV)// Проблемы биологии и медицины. - 2022. №2. Том. 135. - С. 96-104. DOI: http://doi.org/

58. Российские клинические рекомендации. Ревматология. Под ред. Е.Л. Насонова. М.: ГЭОТАР-Медиа; 2017. [Russian clinical recommendations. Rheumatology. Ed. E.L. Nasonova. M.: GEOTAR-Media; 2017 (in Russ.)].

59. Рузикулов О.Ш., Жураев И.Г., Хамидов О.А., Келдияров А.Х., Мансуров Дж.Ш., Садуллаев О.А. Насколько необходима оптимизация ведения больных с переломом шейки бедренной кости?// Проблемы биологии и медицины. - 2022. №2. Том. 135. - С. 214-223. DOI: http://doi.org/

60. Саматов Ж.Ж., Жураев И.Г., Хамидов О.А., Давлетов Б.И., Мансуров Дж.Ш., Темуров А.А. Частичные разрывы передней крестообразной связки: обзор анатомии, диагностики и лечения// Проблемы биологии и медицины. - 2022. №3. Том. 136. - С. 269-274. DOI: http://doi.org/

61. Сигал З.М., Сурнина О.В. Ультразвуковая патотопография коленного сустава. Медицинский вестник Башкортостана. 2017;4(70):43–48 [Segal Z.M., Surnina O.V. Ultrasound pathotography of the knee joint. Medical Bulletin of Bashkortostan. 2017;4(70):43–48 (in Russ.)].

62. Xamidov Obid Abduraxmanovich, Optimization of Radiological Diagnostics of Injuries of the Soft Tissue Structures of the Knee Joint and Their Complications, American Journal of Medicine and Medical Sciences, Vol. 10 No. 11, 2020, pp. 881-884. doi: 10.5923/j.ajmms.20201011.10.

63. Хабарина Н.В., Есин Е.В. Ультразвуковая диагностика суставного синдрома в ревматологической практике: этапы становления. КМКВ. 2016;2:40–49 [Khabarina N.V., Esin E.V. Ultrasound diagnosis of articular syndrome in rheumatological practice: stages of formation. KMKV. 2016;2:40–49 (in Russ.)].

64. Хамидов О.А., Аметова А.С. Инородные тела подвздошной кишки – редкий случай из практики (клиническое наблюдение). Uzbek journal of case reports. 2022;2(1):27-30. https://doi.org/10.55620/ujcr.2.1.2022.5

65. Хамидов О.А., Атаева С.Х. Аудит ультразвукова исследования для диагностики острого аппендицита (ретроспективное исследование). Uzbek journal of case reports.2022;2(1):41-45. https://doi.org/10.55620/ujcr.2.1.2022.8

66. Хамидов О.А., Нурмурзаев З.Н. Ультразвуковая диагностика дефектов межжелудочковой перегородки на ранних сроках беременности// Проблемы биологии и медицины. - 2022. №3. Том. 136. - С. 124-127. DOI: http://doi.org/

67. Хамидов О.А., Равшанов З.Х. Остеонекроз головки бедренной кости после COVID-19: серия случаев. Uzbek journal of case reports. 2022;2(1):

68. Хамидов Обид, Мамасолиев Баходир, and Аметова Алие. “Сравнительный анализ клинических и визуальных характеристик остеомаляции и спондилоартрита”. Involta Scientific Journal, vol. 1, no. 6, May 2022, pp. 461-79, https://involta.uz/index.php/iv/article/view/220.

69. Хамидов Обид, Мансуров Джалолиддин, and Зарпуллаев Джавохир. “Меры точности магнитно-резонансной томографии 1,5 т для диагностики повреждения передней крестообразной связки, мениска и суставного хряща коленного сустава и характеристики поражений: прогностическое исследование”. Involta Scientific Journal, vol. 1, no. 6, May 2022, pp. 490-11, https://involta.uz/index.php/iv/article/view/222.

70. Хинцман Й., Купац П. УЗИ опорно-двигательного аппарата. Стандартные плоскости сканирования. М.: МЕДпресс-информ; 2013. [Khintsman J., Kupats P. Ultrasound of the musculoskeletal system. Standard scan planes. M.: MEDpress-inform; 2013 (in Russ.)].

71. Хитров Н.А. Ультразвуковое исследование суставов. Современная ревматология. 2008;2(4):42–45. [Khitrov N.A. Ultrasound examination of joints. Modern rheumatology. 2008;2(4):42–45 (in Russ.)]. DOI: 10.14412/1996-7012-2008-506.

72. Ходжибеков М.Х., Хамидов О.А. Обоснование ультразвуковой диагностики повреждений внутрисуставных структур коленного сустава и их осложнений. №3 (31), 2020. С.526-529.

73. Швед Н.И., Михайлив Л.М., Мартынюк Л.П. Роль ультразвукового исследования в диагностике и мониторинге эффективности лечения подагрического артрита. Боль. Суставы. Позвоночник. 2015;4(20):34–38. [Shved N.I., Mikhayliv L.M., Martynyuk L.P. The role of ultrasound in the diagnosis and monitoring of the treatment of gouty arthritis. Pain. Joints. Spine. 2015;4(20):34–38 (in Russ.)].

74. Якубов Д.Ж., Гайбуллаев Ш.О. Влияние посттравматической хондропатии на функциональное состояние коленных суставов у спортсменов. Uzbek journal of case reports. 2022;2(1):36-40. https://doi.org/10.55620/ujcr.2.1.2022.7