



Radiation visualization of chronic joint diseases

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ABSTRACT: Chronic diseases are the most frequent representatives in the general structure of joint diseases. The aim of the work was to determine the staging of joint lesions in dynamics, the specificity of X-ray and ultrasound research methods in the recognition of early and late manifestations of post-traumatic conditions, degenerative-dystrophic lesions and rheumatoid arthritis. Diagnostic and prognostic criteria of joint damage in the considered group of diseases were identified, the informativeness and diagnostic value of X-ray and ultrasound diagnostics at the early and later stages of the development of the pathological process were determined.

Key words: diseases, joint, X-ray, ultrasound diagnostics.

Introduction

The analysis of our many years of consulting and diagnostic work has shown that the early manifestations of degenerative-dystrophic, inflammatory diseases and the consequences of the postponed trauma of the articular apparatus have recently been increasingly found in adolescence and adulthood. At the same time, pronounced manifestations are observed during the period of the most active labor activity: from 18 to 55 years old and represent one of the most frequent causes of temporary or long-term disability, and in some cases, disability of patients. Timely diagnosis of these diseases at the early stages of the development of the pathological process is important for solving this medical and social problem.

The etiological factors leading to the development of a wide range of joint lesions are diverse. These include: chronic and acute overload, injuries and their consequences, some

infectious processes that can lead to the development of the disease at a fairly early age. It is at this stage of the development of the pathological process that an active multifaceted correction is already needed, which allows to suspend the development, or to postpone extremely negative clinical manifestations of the disease for a long period of time.

The aim of the study is to determine the diagnostic capabilities in the recognition of early and late manifestations of post-traumatic conditions, degenerative-dystrophic lesions of the knee joint, rheumatoid arthritis of large and small joints according to X-ray and ultrasound diagnostics.

Since 2000, 928 patients with the considered diseases of the knee joint have been examined. The first group consisted of 486 patients with different periods after suffering a knee joint injury - from 2 days to 4 years, aged 14 to 70 years, of which 292 men (60.1%), 194 women (39.9%).

As a methodological support, we used standard plain radiography and ultrasound diagnostics, which were performed according to the standard technique with linear transducers 7.5-10 MHz. At the same time, the complex assessed the state of the joint space, integumentary cartilage, subchondral plate, ligamentous apparatus, bursae, menisci, volvulus, synovial membrane and popliteal fossa. The condition of the cruciate ligaments was assessed if necessary.

An analysis of the results of X-ray studies showed the absence of a violation of the integrity of the bones involved in the formation of the knee joint, as well as the presence of age-related features of a degenerative-dystrophic nature. However, in no case were manifestations reflecting traumatic changes in the elements of the knee joint found.

Ultrasound examination assessed the condition of the ligamentous apparatus, synovium and intra-articular structures, including the menisci. If necessary, a dynamic test was performed with an adequate volume and direction of movement of the knee joint.

With Doppler sonography, there was no blood flow in the intact menisci; with fresh ruptures, the density the edges of the rupture coincided with the general echogenicity of the damaged meniscus. In the period up to three weeks after injury, blood flow in the injured meniscus was also absent. Up to two months and later after the injury, the edges of the meniscus became smoother and were characterized by increased echogenicity [1]. In this time interval after the trauma in this group of patients, in 69% of the ruptures were combined with the identification of a newly formed vessel in the meniscus with the presence of atypical blood flow (V_{max} - 25-35 cm / sec).

In terms of one year or more after the injury, a newly formed vessel was also detected in the meniscus, the maximum blood flow velocity in which reached 28 to 62 cm / sec.

As a result of the study, it was found that in the early stages after the injury, the intact meniscus does not contain blood vessels; in the case of an old meniscus rupture, a newly formed vessel was revealed in the rupture projection with atypical blood flow and high

maximum velocity. This symptom manifested itself in most of the examined patients. A direct correlation was found between the duration of the meniscus rupture and the blood flow velocity in the pathological vessel.

In the second group examined 386 patients with various stages of development of deforming osteoarthritis (DOA) of the knee joint at the age from 18 to 78 years, of which women - 222, men - 164. The existing involutive changes in the knee joint, as a rule, were combined with overweight patients and significant physical exertion. From the anamnesis, 146 patients had trauma. The examination took into account the data of X-ray and ultrasound research methods.

According to the survey radiography, first of all, the corresponding criteria for the staging of degenerative-dystrophic lesions, the severity of subchondral osteosclerosis and compensatory restructuring of the bone structure within the end sections of the bones involved in the formation of the knee joint were determined. Manifestations and direction of lower leg subluxation were also found.

During ultrasound examination in mostly young patients with a history of knee trauma, degenerative-dystrophic changes were less pronounced and manifested in the form of consequences of damage to the ligamentous apparatus, more often lateral ligaments. In this case, the internal lateral ligament (ICL) was most often injured and complete or incomplete meniscus ruptures were detected. The presence of degenerative changes in the menisci was manifested by the compaction of the edges of the rupture with an increase in echogenicity, which indicated that the damage was significant. Damage to the anterior horn of the internal meniscus with damage to the internal compartment of the joint in the form of an uneven thickening of the articular bag, a decrease in its trabecular echostructure with the presence of fluid and dense echostructures in the subcapsular space (subcapsular synovitis) was more often noted. Such changes were accompanied by bursitis and synovitis, depending on the severity of the existing reactive inflammatory process. In 76% of cases, damage to the anterior horn of the internal meniscus was found in combination with damage to the posterior horn of the external meniscus.

In patients with involutive DOA who had a history of trauma, ultrasound semiotics manifested itself mainly in uneven narrowing of the joint space, sharp deformity and compaction of the subchondral plate [2,3]. At the same time, the menisci were sharply deformed, unevenly compacted, and this mainly concerned the anterior horns, reactive bursitis and synovitis were detected in 86% of cases. In both groups of patients - with post-traumatic and involutive DOA - in 42% of cases, Baker's cysts localized in the inner part of the popliteal fossa were detected, which indicated an increase in intra-articular pressure.

From a fairly representative list of joint diseases, it is difficult to find analogs for rheumatoid arthritis (RA), which stands out unfavorably, first of all, by the lack of knowledge regarding its etiological factor, fuzzy contours of clinical manifestations and results of

laboratory diagnostics, as well as a wide range of all kinds of trigger mechanisms that ensure its development.

In connection with the above, as well as other well-known reasons, the problem of timely and reliable recognition of RA has recently acquired particular relevance due to an increase in the frequency of lesions and the involvement of young patients in the register of sick patients. In addition, the medical and social significance of the consequences of the pathology under consideration is determined by the rather early onset disability, which reaches 70%, and mortality from infectious complications and renal failure. For many years, the X-ray method retained the leading role in the diagnosis of RA. However, its capabilities do not provide diagnostic information regarding the early stages of the development of the process. In this context, the importance of identifying the initial stages of RA manifestation in resonance mode with the morphological debut of the disease - exudative synovitis, should be emphasized.

Of the radiation methods for diagnosing RA, ultrasound (ultrasound) and magnetic resonance imaging (MRI) are increasingly used. There is no doubt that MRI is the leading method for the accurate diagnosis of early stages of RA. However, this method cannot be widely used as a screening method due to its high cost. Due to its resolution and informational content, ultrasound can be used for the initial examination of patients, as well as for dynamic observation during treatment, thereby eliminating the need for traditional radiography. However, despite the obvious advantages of this method, ultrasound semiotics has not been sufficiently developed in the aspect of interpretation and comparison of the obtained data with the pathological and anatomical substrate of early stages of RA joint damage.

We examined 56 patients, which constituted the third group, aged 18 to 46 years with a reliable diagnosis of RA according to the criteria of the American Rheumatological Association. Of these, 8 are men (14.3%) and 48 are women (85.7%). with different periods of limitation of the disease from 4 months to 12 years. Were examined n phalangeal (32), proximal interphalangeal (44), knee (27), ankle joints (30) and hip joints (18).

All patients underwent an ultrasound scan with linear transducers 7.510 MHz using the standard technique. At the same time, the complex assessed the state of the joint space, integumentary cartilage, subchondral plate, joint capsule, synovial membrane, paraarticular tendons, and the presence of contents in the joint capsules.

The initial manifestations of RA in the first stage were detected in the form of hyperemia, edema of paraosseous soft tissues (in the acute period), and small pathological vessels were traced with color Doppler mapping (CDC). Tendinitis and tenosynovitis of limited extent were visualized in the adjacent regions [4]. Less often, the unevenness of the subchondral plate and a slight unevenness of the contours of the integumentary cartilage were detected.

In the second stage of RA, various degrees of unevenness and discontinuity of the subchondral plate appeared in the form of "steps", moderate thinning of the integumentary cartilage, uneven narrowing of the joint space, the appearance of a hypoechoic paraarticular shadow with the presence of small vessels in it. As a rule, tenosynovitis of the tendons persisted. In large joints, bursitis of varying severity appeared, the synovial membrane thickened and a pathological vascular network was traced in it in the CDC. The degree of activity of the process manifested itself in the severity of the listed symptoms.

The third stage was characterized not only by a pronounced unevenness of the subchondral plate, but also by the appearance of fragmentation of the compact layer in the epimetaphysal zones [5]. In the same sections, a hypo-echogenic area of an almost homogeneous structure with uneven contours (pannus) was revealed. The articular cartilage was sharply thinned. In the interphalangeal joints, there was a sharp narrowing and deformation of the joint spaces in combination with hypotrophy of the interosseous muscles.

At the fourth stage, visualization of the joints was severely difficult. In the paraarticular tissues, the shadows of the pannuses were traced. In some areas, the articular cartilage was absent. There was a pronounced deformation of the articular surfaces, atrophy of muscles and tendons, and in some cases ankylosis of the wrist and ankle joints.

Conclusion

Affordable non-invasive ultrasound examination of the knee joint with Doppler ultrasonography in patients who have undergone trauma provides a quick and objective analysis of the state of the meniscus tissue, reliably indicates the presence or absence of damage, its duration, the severity of existing degenerative changes, which determines the choice of tactics for adequate treatment and rehabilitation of this groups of trauma patients.

The foregoing makes it possible to recommend a highly informative ultrasound examination with Doppler ultrasound without fail to all patients with knee injury of various ages, along with the performance of traditional X-ray examination.

The method of ultrasound examination for DOA of knee joints of various origins allows you to quickly and reliably determine not only the early signs of the existing deforming osteoarthritis, but also significantly expands the diagnostic capabilities for changes in the soft tissue elements of the joint, which, of course, is inaccessible to the method of traditional radiography. The results obtained ensure the recognition of degenerative lesions of the knee joint at the initial stages of the development of the pathological process. This ultimately makes the treatment timely and effective, as well as expands the search and use of adequate conservative treatment methods.

Ultrasound examination in RA makes it possible to quickly and reliably determine not only the early signs of a particular stage in the course of the pathological process, but also significantly expands the objectification of diagnosis of a fairly wide range of changes in the

soft tissue elements of the joint. This, in turn, ensures the recognition of RA at the initial stages of development, and also allows one to assess the dynamics, the degree of activity of the inflammatory process and monitor the effectiveness of the treatment.

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