THE POSSIBILITY OF A FAVOURABLE OUTCOME AND REVERSIBILITY OF SEVERE ANKLE JOINT DAMAGE ON THE EXAMPLE OF A CLINICAL OBSERVATION

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ABSTRACT

The problem of aseptic talus necrosis consists of the following features: a) manifestation of the disease in the form of acute articular syndrome without typical symptoms; b) inevitable serious consequences in the form of disfiguring deforming arthrosis of the ankle joint, development of gross deformities of the rear foot, etc., resulting in disability. The lack of methods for monitoring the dynamics of the disease also plays an important role. This is particularly so with such an important issue as the substantiation of stopping immobilization and allowing the load on the foot in order to avoid collapsed talus and subsequent complications. It is believed that treatment started before radiographic changes helps to avoid severe complications, but for a number of reasons patients arrive already at the stage of late severe destructive changes. All of the above explains the high relevance of the problem of treatment of patients with aseptic talus necrosis. The importance of the presented clinical case and the value of this information can be considered several points: its example demonstrates the possibility of early diagnosis of severe talus damage cause by aseptic necrosis; based on objective data, a substantiation was made for allowing the load on the leg with body weight in the complex of rehabilitation measures; the possibility of regression of pathological changes associated with aseptic talus necrosis and the dynamics of the course of aseptic talus necrosis with a favorable outcome were demonstrated, which is confirmed by modern research methods. Thus, the need for magnetic resonance imaging has been confirmed for all referred patients with a clinical picture of local articular syndrome in the ankle joint, the possibility of complete regression of avascular necrosis symptoms in case of nonsurgical treatment at the early stages and the possibility of resolving the load on the leg in the complex of rehabilitation treatment have been demonstrated.

Key words: *clinical case, aseptic necrosis, talus, pre-radiological changes, regression of changes, MRI changes in the talus, MSCT changes in the ankle bone*

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ВОЗМОЖНОСТЬ ХОРОШЕГО ИСХОДА И ОБРАТИМОСТЬ ТЯЖЁЛОГО ПОРАЖЕНИЯ ГОЛЕНОСТОПНОГО СУСТАВА НА ПРИМЕРЕ КЛИНИЧЕСКОГО НАБЛЮДЕНИЯ

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РЕЗЮМЕ

Проблематика асептического некроза таранной кости складывается из следующих особенностей: а) манифестация заболевания в виде острого суставного синдрома без типичных симптомов; б) неизбежные тяжёлые последствия в виде обезображивающего деформирующего артроза голеностопного сустава, развития грубых деформаций заднего отдела стопы и т. д. с исходом в инвалидность. Важную роль играет отсутствие методики контроля за динамикой развития заболевания. Особенно это касается такого важного вопроса, как обоснование прекращения иммобилизации и разрешения нагрузки на стопу во избежание коллапса таранной кости и последующих осложнений. Считается, что лечение, начатое на стадии «дорентгеновских» изменений, позволяет избежать тяжёлых осложнений, но по ряду причин пациенты приходят уже на стадии поздних тяжёлых деструктивных изменений. Всё перечисленное объясняет высокую актуальность темы лечения пациентов с асептическим некрозом таранной кости. Важностью представленного клинического случая и ценностью информации о нём можно считать несколько положений, а именно: на его примере продемонстрирована возможность ранней диагностики тяжёлого поражения таранной кости асептическим некрозом; на основании объективных данных проведено обоснование разрешения возобновления нагрузки на ногу весом тела в комплексе реабилитационных мероприятий у пациента; продемонстрированы возможность регресса патологических изменений, связанных с асептическим некрозом таранной кости, и динамика течения асептического некроза таранной кости с благоприятным исходом, что подтверждено современными методами исследования. Таким образом, подтверждена необходимость проведения магнитно-резонансной томографии всем обратившимся пациентам с клиникой локального суставного синдрома в области голеностопного сустава, продемонстрирована возможность полного регресса симптоматики асептического некроза при консервативном лечении на ранних стадиях и показана возможность разрешения нагрузки на ногу в комплексе реабилитационного лечения.

Ключевые слова: *клинический случай, асептический некроз, таранная кость, «дорентгеновские изменения», регресс изменений, МРТ-изменения таранной кости, МСКТ-изменения таранной кости*

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JUSTIFICATION FOR THE NEED TO DEMONSTRATE A CLINICAL CASE

Epidemiology

Aseptic necrosis of the ankle bone is known to be caused by fractures in 75 % of cases [1]. The object of study in this article is a patient with secondary ankle bone aseptic necrosis of non-traumatic genesis. No separate code for secondary ankle bone aseptic necrosis exists in the ICD-10 system; therefore, a number of generalized codes have been proposed for coding: M87.0, M87.1, M87.2, M87.3, M87.8, M87.9, M90.3, M90.4, M90.5. According to the international classification, osteonecrosis is included in the group of diseases of class XIII, subgroup M87. Bone osteonecrosis is a high incidence disease and registries are being kept in economically developed countries. Unfortunately, in Russia, aseptic necrosis has not been isolated in the structure of musculoskeletal morbidity in the adult population; accurate data on osteonecrosis of ankle bones are also not available. Meanwhile, there are many publications about the high incidence of the disease with a tendency to an increasing incidence [2, 3].

Diagnostics

The literature suggests that there are no pathognomonic clinical symptoms of ankle bone aseptic necrosis, but it is considered very likely that any patient who comes to the hospital with persistent localized inflammatory syndrome of the ankle joint without an apparent cause will probably have ankle bone aseptic necrosis [4]. X-rays, MSCT (multislice spiral CT scan) and magnetic resonance imaging (MRI) are the main diagnostic methods being used. These methods are used as complementary, allowing to establish a complete picture of the lesion [1]. Examination methods such as bone scintigraphy, densitometry, etc. are recommended for differential diagnosis. However, the aseptic necrosis diagnosis is currently usually late and occurs against the background of already developed complications [5].

Treatment

Treatment of patients with an ankle bone aseptic necrosis at ARCO (Association Research Circulation Osseous) stage 1 or less is offered both nonsurgically and surgically [6]. The basis of nonsurgical treatment is, first of all, unloading of the foot against the background of medication with various groups of drugs (non-steroidal anti-inflammatory drugs, anticoagulants, vasodilators, etc.). The time required for complete revascularisation of the ankle bone is up to 2 years, while the recommended time for unloading the lower extremity is up to 8 months; there is no justification for these terms in the literature, which is unacceptable nowadays, considering the high demands of patients to reduce treatment time, increase its comfort and reduce traumatism [5]. The results of surgical treatment according to ARCO stage 1 aseptic necrosis of the ankle bone by subchondral osteoplasty have been reported in the literature; however, this procedure has been shown to aggravate the course of osteonecrosis [6]. Other treatment methods (necrosis core decompression, corrective joint arthrodesis, mosaic osteochondroplasty, endoprosthetic joint replacement, etc.) are intended for use at later stages and in cases of complications [7–9].

Resume

In summary, the relevance of the presented issues is confirmed by the importance of early diagnosis of aseptic necrosis of the ankle bone, the lack of clear criteria of the disease course dynamics necessary for making tactical decisions, and the lack of treatment effect evidence.

In view of the above, there were a number of tasks to be accomplished at the beginning of the treatment of the patient in the submitted clinical case:

1. To confirm the severity of aseptic necrosis of the ankle bone and assess its stages.
2. As the treatment progresses, to reveal indications for authorising foot loading.
3. To undertake nonsurgical treatment, to evaluate its result, to confirm good clinical effect by the data of objective methods of study.

STUDY MATERIAL

The material for the study was the patient's outpatient card, which reflects his outpatient visits to physicians of different specialties, therapeutic manipulations performed, and the prescription of medicines. In addition, MSCT and MRI images were assessed in dynamics and during the treatment process until the patient recovered.

The study was approved by the local ethical committee of the Novosibirsk Research Institute of Traumatology and Orthopedics n. a. Ya.L. Tsivyan (extract No. 012/23 from the minutes of the meeting No. 005/23 dated May 26, 2023).

Patient information

Patient V., a 51-year-old man, clerical worker, a resident of a million-strong city, visited the clinic of Novosibirsk Research Institute of Traumatology and Orthopedics n. a. Ya.L. Tsivyan for an outpatient appointment. The patient signed consent to participate in the study, according to the World Medical Association Declaration of Helsinki, and to publish the results of the study without identification. The medical history revealed that 4 weeks before the patient encounter, following a COVID-19 infection (and hormone therapy) severe pain and swelling in the ankle area on the left side, and claudication were observed. The patient was visually inspected and examined.

The following methods were used to diagnose and treat the patient.

Clinical method

The presence of pain according to the visual analogue scale (VAS), ankle swelling (with ligature at the level of ankle poles), hyperaemia (visually), temperature difference (with infrared laser thermometer), range of active and passive motions in the ankle joint (with an angle meter) were assessed. The above measurements were performed at the examination day, 1, 2, 3, 4, 6 and 9 months from the onset of the disease.

Radiological method

The patient underwent X-ray of the ankle joint in the straight and lateral projections in the standing position at the time of patient encounter, 6 months after patient encounter, and at the end of treatment.

Tomographic method

The patient underwent MSCT and MRI at the time of patient encounter, as well as 1, 2, 3, 4, 6, 9, 12 months after patient encounter.

Functional method

The result was assessed according to AOFAS (American Orthopaedic Foot & Ankle Society) at the end of treatment, after 12 months.

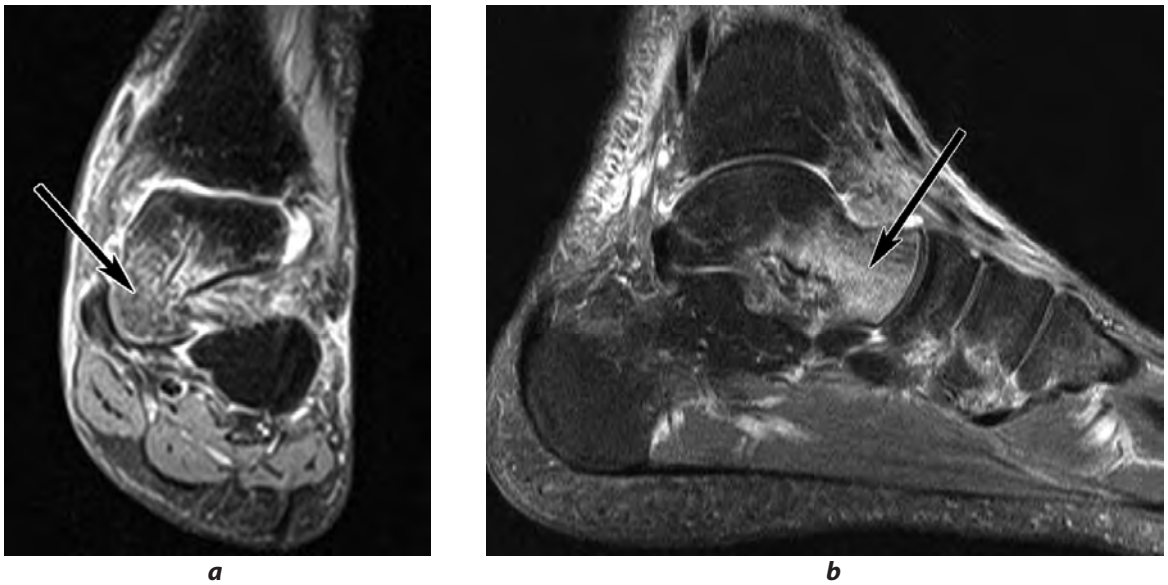
CASE HISTORY

The disease onset was swelling, redness, fever and sharp pain of the left ankle joint area 4 weeks after COVID-19 infection and massive hormone therapy. Approximately one week after the onset of the disease, the patient encountered to the clinic of foot and ankle surgery of Novosibirsk Research Institute of Traumatology and Orthopedics n. a. Ya.L. Tsivyan. Physical examination revealed a provisional diagnosis of secondary aseptic necrosis of the ankle bone. The diagnosis was confirmed with X-ray, MSCT and MRI studies of the ankle bone being performed (Fig. 1–3).

a ***b***

FIG. 1.

*Patient V. Left ankle joint X-ray in straight (**a**) and lateral (**b**) projections: no pathological changes in the ankle bone were revealed*



a ***b***

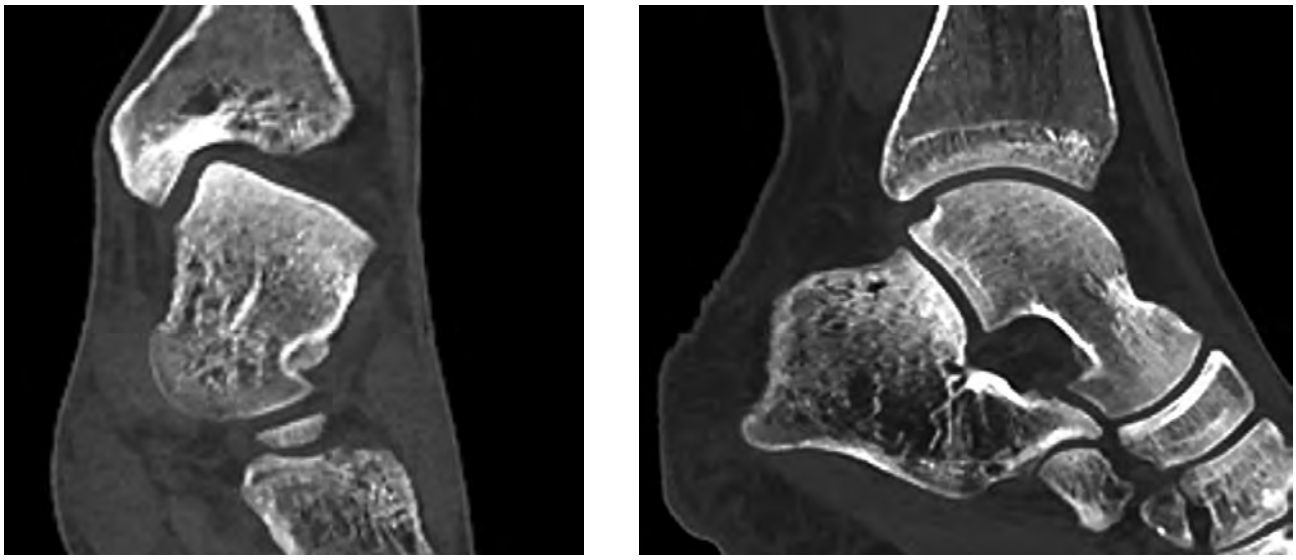
FIG. 2.

*Patient V. MRI of the patient's ankle joint, coronal (**a**) and sagittal (**b**) scans: severe bone marrow swelling with epicentre in the area of the head of the ankle bone, spreading to the block of the ankle bone (indicated by the white arrow); ankle joint synovitis. Aseptic talus necrosis, the stage of edema*

Examined jointly by a rheumatologist and endocrinologist, diagnosed as secondary aseptic osteonecrosis of the ankle bone at the stage of oedema. After the diagnosis was confirmed, treatment was carried out, which began with puncture of the ankle joint (seeding of synovial fluid – sterile). Complete unloading of the leg with orthosis immobilization. Drug therapy was initiated, including selective cyclooxygenase inhibitors, calcium metabolism regulators, bone resorption inhibitors, and cartilage metabolism regulators. The patient underwent a course of physical therapy, therapeutic exercises under the supervision of a physiotherapist.

In 4 weeks, there was a decrease in pain syndrome by 6 (60 %) VAS points, swelling subsided and the thickness of the tibia in the supra-ankle area decreased from 32 to 28 cm (by 25 %). Control MRI and MSCT examinations of the ankle bone were performed. Despite the clear positive clinical dynamics of the disease, however, the stage studies rather indicated the opposite. Preservation of signal brightness was observed on control MRI (Fig. 4).

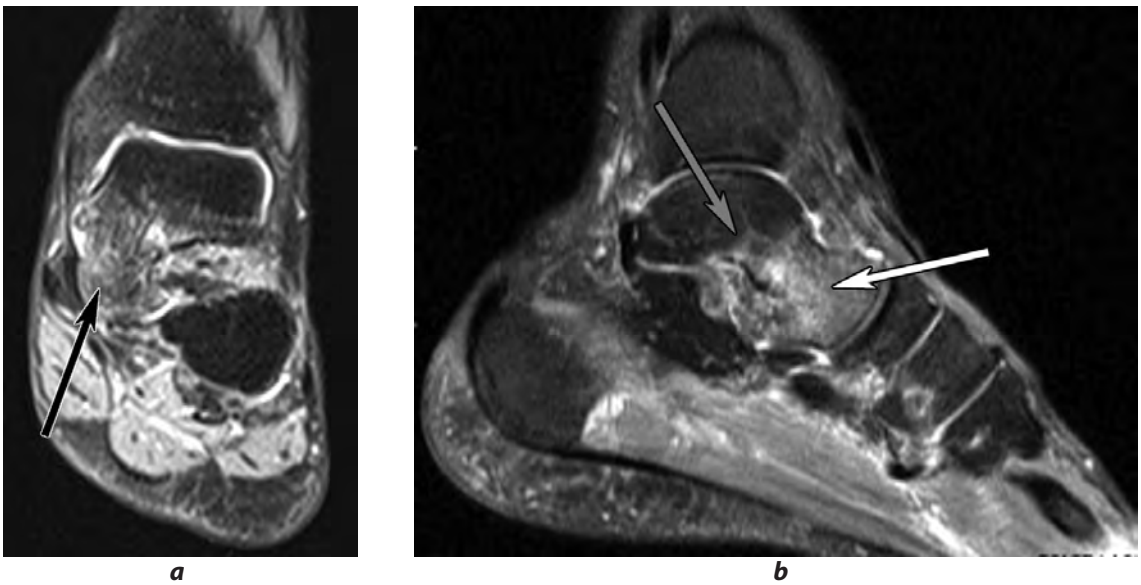
Signs of bone resorption appeared on the control MSCT (Fig. 5). The prescribed treatment was continued with special emphasis on foot unloading.



a ***b***

FIG. 3.

*Patient V. MSCT of the ankle joint, coronal (**a**) and sagittal (**b**) scans: no signs of destruction of the ankle bone are observed*



a ***b***

FIG. 4.

*Patient V. MRI of the ankle joint, coronal (**a**) and sagittal (**b**) scans. Bone marrow oedema (black arrow) persists. A cyst formation in the area of the head of the ankle bone is observed. Bone marrow swelling persists in the area of the head of the ankle bone (white arrow) with spreading to the trochlea of talus; small cysts (grey arrow). Ankle joint synovitis*

The next follow-up examination was performed 4 weeks later. The clinical picture demonstrated complete relief of pain syndrome in the ankle joint. Positive dynamics was observed on control MSCT and MRI. There was a decrease in the brightness of the signal from the bone marrow of the ankle bone, the appearance of a "spotty structure" of the bone substance, which was explained by "focal" suppression of the inflammatory process (Fig. 6).

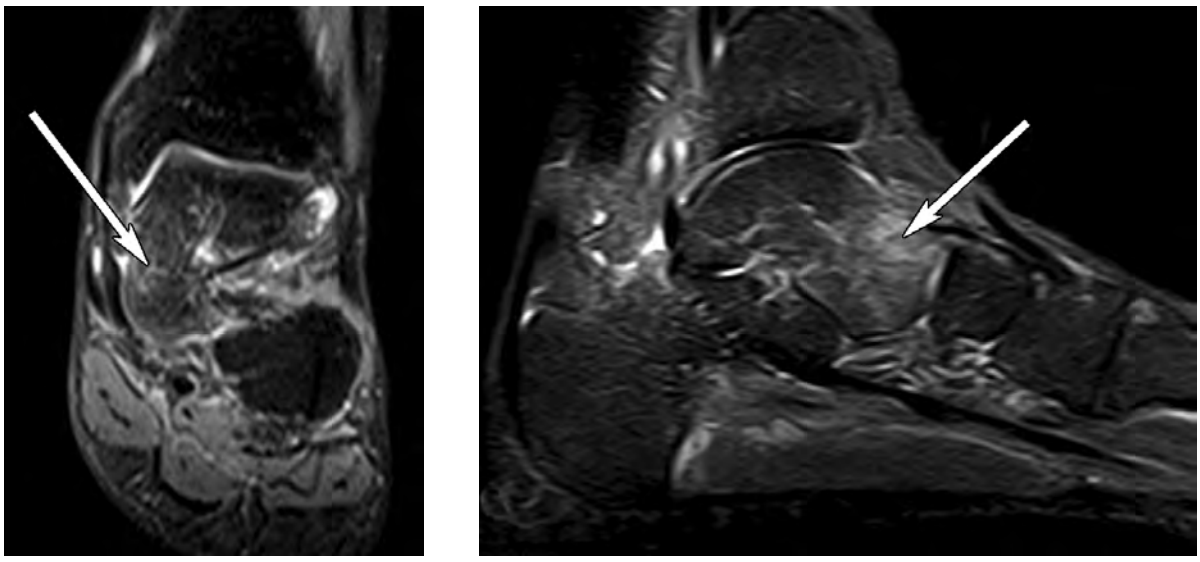
The patient underwent control MSCT, which revealed signs of not only cyst formation cessation, but also restoration of the ankle bone trabecular structure (Fig. 7). The patient's favourable combination of clinical and imaging findings justified the patient to allow a dosed load on the lower limb with gradual weaning off the means of additional support over a period of 2–3 weeks.

Treatment was extended and was accompanied by positive dynamics of the course of the disease; the patient regained full support of the lower extremity 2.5 months after the treatment onset. Control examinations were continued once a month: positive dynamics was observed in the form of clinical improvement and gradual reduction of MR signal brightness with complete clinical recovery to the degree of asymptomlessness and to the restoration of normal MR signal from the bone substance of the head

a ***b***

FIG. 5.

*Patient V. MSCT of the ankle joint, coronal (**a**) and sagittal (**6**) scans. The bony structure of the head and neck of the ankle bone is observed to be disturbed (white arrow). Evidence of small cysts in the head and neck of the ankle bone*



a ***b***

FIG. 6.

*Patient V. MRI of the ankle joint, coronal (**a**) and sagittal (**b**) scans. A decrease in signal intensity is observed; mosaicism of the image of the head of the ankle bone appears (white arrow). Decreased brightness of the MRI signal in the area of the ankle bone head, appearance of "mosaicism" of the ankle bone head area. A cyst formation in the area of the head of the ankle bone is observed*

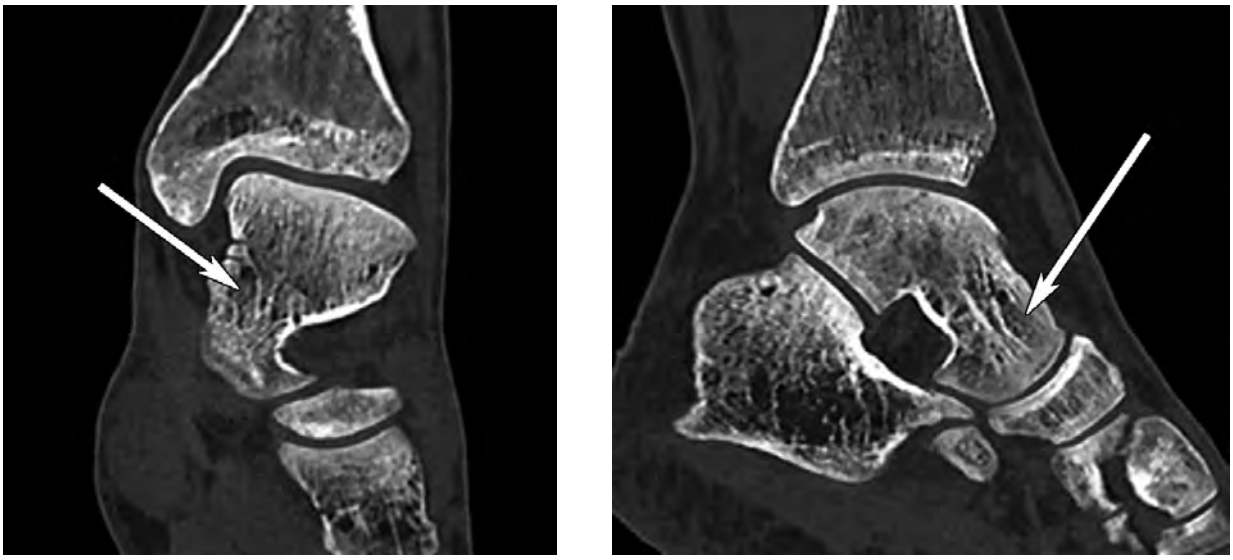
of the ankle bone by September 2022, i. e. by the 8th month from the treatment onset (Fig. 8).

Treatment result

The swelling, pain and hyperaemia in the ankle joint had completely resolved by the time the lower extremity was loaded. The range of motion in the ankle joint, reduced by 25 % compared to the healthy one, was fully restored after 12 months (35°/0°/23°). Foot support was restored, the positive dynamics as measured by VAS was 6 points, AOFAS score was 38 points. A good treatment result was obtained. It should be mentioned that the patient was examined 1 year after the treatment: the achieved result was preserved in the form of practically asymptomatic clinical picture, which was confirmed on control MRI and MSCT. The tomographic picture was favourable, had no dynamics compared to controls after 6 months and is therefore not being reported.

DISCUSSION

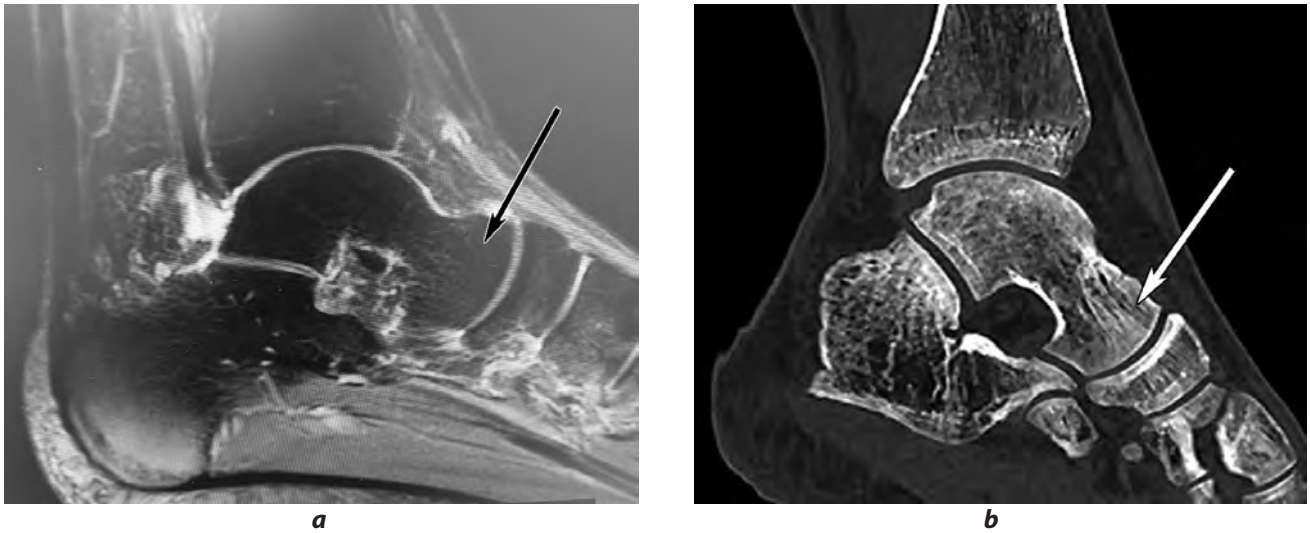
Numerous studies directly or indirectly suggest that changes in aseptic necrosis of the ankle bone are fatal [8, 9]. It is considered that nonsurgical treatment is indicat-



a ***b***

FIG. 7.

*Patient V. MSCT of the ankle joint, coronal (**a**) and sagittal (**b**) scans. Restoration of the "bar" (beamed) structure of the head and neck of the ankle bone is observed (white arrow). Confirmation of bone structure restoration of the ankle bone head and neck (white arrow) and regression of small cyst formation in the ankle bone head and neck*



a ***b***

FIG. 8.

*Patient V. **a** – MRI of the ankle joint, sagittal scan: uniformity of the MRI signal from the ankle bone in the area of the former lesion (black arrow). **b** – MSCT of the ankle joint, sagittal scan: confirmation of the restoration of the bone structure of the head and neck of the ankle bone (white arrow) and regression of the formation of small cysts in the head and neck of the ankle bone, areas of osteosclerosis. Good treatment resultss*

ed in a number of cases, but it is impossible to preserve the anatomy of the ankle bone, and its collapse with severe outcome is inevitable [2, 3]. Presumably this can be considered to be true in some cases, but this example rather supports the idea that early pathogenetic treatment can preserve the anatomical shape of the ankle bone. Early diagnosis and treatment is the key to success, which is important for primary care physicians to be aware of. Considering that aseptic necrosis has no specific clinical picture in the early stages, the classic diagnostic technique of X-ray is not successful for diagnosis; however, X-ray in pain of unclear origin is indicated to exclude findings such as platypodia, mass lesions, ligamentous injuries, cysts, fatigue fractures [4]. A debate comparing multislice computed tomography and magnetic resonance imaging is a controversy in the pages of the printed media. The answer is unequivocal: both examinations are indicated. The closer to the time of disease onset, the more valuable MRI data are the further away – the more valuable MSCT data are due to their purpose [1]. The question of surgical tactics in the early period of osteonecrosis of the ankle bone has not been definitively resolved. From one side, there are many reports about the advantage of the nonsurgical method [1, 4]. No guidance is however provided as to which indicators should be used to decide whether to allow loading of the foot, whether to reduce the process, and so on. [5]. The proposed "subchondral osteoplasty" surgery, developed for the treatment of early-stage osteonecrosis, has not lived up to expectations: there are reports that its use aggravates the course of aseptic necrosis [9]. The described clinical case in our study demonstrates the possibility of early nonsurgical treatment of the patient.

CONCLUSIONS

In summary, the described clinical case provides evidence of the possibility for complete regression of clinical and imaging symptoms; the importance of early diagnosis of aseptic necrosis of the ankle bone is evident. The key success factor in this case was the alertness of the traumatologist, outpatient rheumatologist in terms of early detection of aseptic necrosis. The X-ray method familiar to traumatology and orthopaedics does not demonstrate its positive properties for the diagnosis of aseptic necrosis in the early stages. A team approach involving a rheumatologist, endocrinologist, led by an orthopaedic trauma surgeon was the basis of success in treating the patient. Interruption of acute inflammation in the bone marrow of the ankle bone by complete unloading, immobilization of the affected extremity, prescription of nonsteroidal anti-inflammatory drugs, physiotherapy, metabolic therapy, paraarticular blockades with glucocorticosteroids served as the basic principle of treatment. The clinical case is of particular value in assessing the dynamics of the course of the disease using objective methods and forming actions against this basis. For instance, the beginning of clear reduction of MR-signal intensity on T2 weighted images (T2-VI) and restoration of bone substance in the necrosis zone, confirmed by MSCT and MRI examinations, allowed to start foot loading, and complete restoration of MR-signal on T2-VI as well as restoration of the bone structure of the ankle bone in combination with the clinical picture of no symptoms allowed to consider the patient as recovered.

The following conclusions can therefore be stated:

1. If a patient encounters with unexplained localized joint syndrome of the ankle joint, aseptic necrosis of the ankle bone should be considered and examined, including MRI if there are no changes observed with conventional X-rays.

2. The basis of nonsurgical treatment of a patient with an aseptic necrosis of the ankle bone is immobilisation and unloading of the leg in the conditions of "multidisciplinary approach", dynamic MRI and MSCT control when making a decision about the change of therapeutic methods.

3. If the basic principles outlined in the article are followed, changes in the ankle bone are reversible until complete clinical recovery and radiological symptoms.

Conflict of interest

The authors of this article declare no conflicts of interest.

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