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## WAYS TO SOLVE ORTHOPEDIC FOOT PROBLEMS ASSOCIATED WITH BIOMECHANICAL DISORDERS

**Purpose.** To analyze the most common consequences of traumatic foot injuries today in wounded lower limbs and to determine orthopedic shoes that will help restore motor activity and correct the biomechanics of the feet.

**Keywords:** orthopedic shoes, rehabilitation shoes, peroneal neuropathy, foot drop, orthopedic insoles.

**Introduction.** Today, a fairly large percentage of the population suffers from orthopedic foot problems of various origins. Previously, the vast majority of patients were elderly. However, since the beginning of the war in Ukraine, the number of people with gunshot wounds of various types has increased significantly. At the same time, according to statistical data, in 70% of cases, these are injuries to the limbs. Depending on the mechanism of gunshot wound formation (bullet, shrapnel, mine-explosive, etc.), such wounds can lead to bone fractures and significant soft tissue damage [1]. Untimely pre-medical and medical care, contamination and depth of the wound, long-term immobilization of the limb can lead to numerous injuries and even an amputation. Such conditions require long-term rehabilitation and further restoration of foot function with the help of correct orthopedic shoes. Therefore, research and improvement of orthopedic shoes are very relevant today.

**Methods of research.** 3D scanning, analysis of foot prints using polymer foam, automated 3d-design.

**Results.** Analyzing traumatic consequences of foot injuries, they can be conditionally divided into the following groups:

- deformities that can be solved with the help of properly selected comfortable shoes and special orthopedic insoles (slight shortening of the leg, flat feet, valgus or varus, minor plegia of small muscle groups);
- foot conditions that require an upgraded upper design on a standard or slightly customized shoe lasts (restricted ankle movement, etc.);

- orthopedic problems that require the individual manufacture of lasts, orthoses and a special design of the upper of footwear (plegia, drop foot, major deformation of the foot skeleton, major shortening of the lower limb, etc.);

- postoperative footwear, which have the construction of a convenient way of wearing shoes, the use of special materials with an antibacterial effect, and a special sole with unloading of the front part of the foot or heel.

In this work were implemented two different methods of solving orthopedic problems related to leg muscle plegia, which disrupt the biomechanics of the foot.

In the first case, the orthopedic problems were caused by a severe injury to both legs of a fighter, which he had a year ago and numerous surgical operations. As a result part of the leg muscles were damaged and did not fully recover. On both legs there were problems with the work of 2-3-4 fingers, which led to problems during a walk. The analysis of the footprint in the polymer foam showed the lowering of the heads of 2-3 metatarsal bones, which causes discomfort and even pain with significant loads.

Special orthopedic insoles which can be inserted into the boots were made for this patient. The shape of the insole, developed on the basis of a 3D copy of the foot print in polymer foam, provided support for the internal longitudinal arch, metatarsal roller and pronator in the area of 2-3-4 fingers (Fig. 1).



**Fig. 1. Study of feet and manufacture of individual orthotics for a fighter with wounds.**

One of the common consequences of injuries can be neuropathy - damage to nerves or neurons. Consequences of neuropathy can be loss of sensory function, limited joint mobility, hollow-claw foot, flexible or rigid flatfoot with hallux valgus, Charcot foot, partial foot amputations, ulceration. For such cases, such orthopedic elements of shoes as a special insert insole, increased height of the instep, increased toe spring of the last, elastic or rigid sole (depending on the deformation), shock-absorbing heel, and rigid tongues might be used [2].

A separate case of a patient with peroneal neuropathy (drop foot) was considered. As a result of the disease, the right foot lost the possibility of active flexion, which made it difficult to walk. Wearing a special orthosis was uncomfortable.

Therefore, moccasins with a rigid fixation of the toe part of the foot in a raised position were made. This made it possible to avoid the toe sticking to the floor while walking. A pair of moccasins with a high back counter for the heel fixation and a velcro fastener for better fixation of the foot was made (Fig. 1).

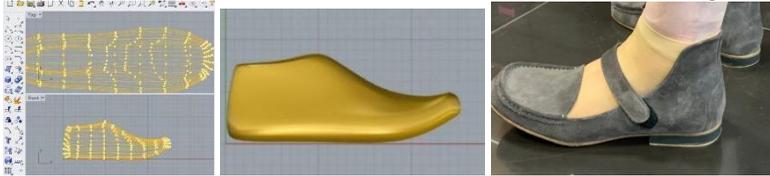


Fig. 2. Designing the shoe last and the orthopedic shoes for peroneal neuropathy and drop foot.

**Conclusions.** Orthopedic shoes today are an important element that can improve the quality of life of people with foot disorders. Already after 2 days of using tactical shoes with the special orthotics the soldier felt an improvement in the condition of his feet and ease of their work during motor activity. The orthopedic moccasins developed on the special shoe last allowed the patient not to use the orthosis while walking. 3D technologies (3D scanning, automated design, etc.) make it possible to ensure the exact correspondence of the shoe last and orthotic design to the needs of the patient and the structure of his feet which is really important.

### References

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