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# Prophylaxis of complications of sugar diabetes in the distal sections of the lower limbs

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**ABSTRACT**: One of the most important problems is the prevention and treatment of late complications of diabetes syndrome. Among them, a diabetic foot syndrome occupies a special place in the forecast of survival and quality of life. The aim of the study is to assess adherence to the use of orthopedic footwear in patients with stop and small amputation ulcers, the reasons for abandoning orthopedic footwear, and the connection between the severity of deformities and the morphometric parameters of the feet in patients with orthopedic footwear.

**KEYWORDS**: High sugar level, top lining, leather lining, volume controllability, elongated backdrop, medical and technical requirement, orthopedic insole, rigid sole, toe cap

## I.INTRODUCTION

The diabetic foot syndrome is a complex of pathological changes in the footsteps of patients with diabetes mellitus, developing with specific lesions of the skin, peripheral nerves, vessels, osteoarticular apparatus and accompanied by an increased risk of purulent-necrotic complications. The urgency and social significance of this problem is connected, on the one hand, with a constant increase in the number of patients with diabetes mellitus, the frequent development of complications in them requiring surgical interventions, and, on the other hand, the high mortality of these patients.

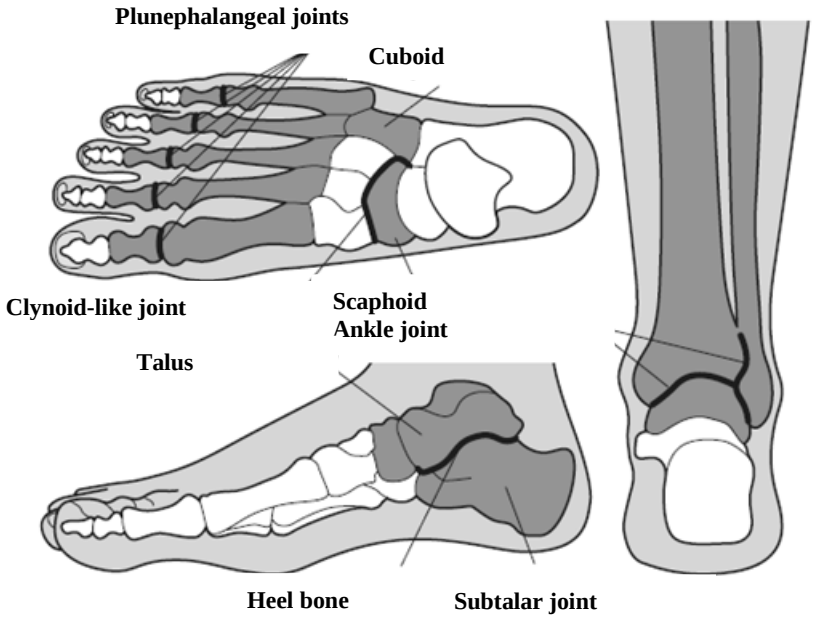


Fig.1. Human foot is the structure of the disease.

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To allow the problem of diabetic foot (Fig.1.) Is not possible without the presence of unloading medical shoes, which facilitates the rapid rehabilitation of patients and excludes recurrence of trauma to the feet.
The aim of the work is the biomedical justification and creation of medical footwear for patients with diabetes mellitus on the basis of the allocation of feet with characteristic forms of lesions and pathologies as a result of the disease; and the identification of the most sensitive reflex zones at the female feet.

Orthopedic shoes are shoes designed for people who have problems with the ligamentous apparatus of the foot or other diseases of the lower limbs. The use of properly selected orthopedic footwear helps to correct deformities at an early stage of development, and also prevents further progression of the disease. The correct selection of such shoes is carried out only by a specialist who directly deals with your disease or problems with your legs.

## II. SIGNIFICANCE OF THE SYSTEM

What is orthopedic footwear different from usual? It should be noted that such shoes have a special structure. It is through this that the medical effect is achieved. Orthopedic shoes are made of natural materials. No substitutes are acceptable here. It perfectly absorbs moisture and allows the foot to breathe. Diabetic foot arises, first of all, because of insufficient blood supply of the lower extremities (Fig. 2). A high level of sugar negatively affects the vessels, the tissues of the nerves, muscles and bones. The defeat of nerves with glucose toxins causes gipalgesia - a decrease in the perception of pain. The appearance of painful cracks, burning and itching in fungal infections, for a long time may be unnoticed by patients. And the damaged skin always becomes a source of infection. In addition, healing with diabetes is slow. Deformities of feet arise from obesity or poor vision - frequent concomitant diseases with diabetic foot syndrome. Shaving the overgrown fingernail on the leg, a person who can not bend over or see badly. As a result, the nail bed is damaged and a wound occurs. [1]

## III. LITERATURE SURVEY

People with diabetes should pay special attention to their feet and feet (Fig. 3). To protect against injuries with reduced sensitivity, prevention of orthopedic ulcers, it is advised to wear diabetic footwear. People suffering from diabetes mellitus are affected by blood vessels and nerves. As a result, the sensitivity of the legs decreases the risk of injury to the feet increases, the development of ulcerative foot defects.
Diabetic footwear is one of the preventive measures aimed at preventing the development of foot lesions.
Diabetes mellitus itself affects the vessels and, in turn, worsens the course of the atherosclerotic process. From the point of view of orthopedics, prevention is divided into primary and secondary. Primary prevention is aimed at preventing damage to the skin of the feet, in particular, ulceration, and secondary - is designed to consolidate the success of conservative or surgical treatment.
If the patient has foot deformities not associated with diabetes mellitus, and in the absence of manifestations of diabetic angiopathy and neuropathy, orthopedic insoles and prepared orthopedic shoes are prescribed, into which the master can make corrections if necessary. For patients with signs of angiopathy or neuropathy, individual diabetic insoles are manufactured for the footprint taken from the foot and orthopedic shoes. Patients with healed ulcers on the feet, with inactivity of the pathological process, special orthopedic footwear is manufactured on the individual shoe. To obtain negative use of sparing, atraumatic techniques. With pronounced neurotrophic and purulent-necrotic manifestations of diabetes mellitus on the patient's foot, they are supplied with individual orthopedic footwear or an injection shoe. Patients with amputation defects in feet are prescribed special corrective devices, individual orthopedic shoes, prosthetic fingers or anterior foot. For the early mobilization of patients with open ulcerative foot defects, individual special orthopedic shoes are used. [2]
The invention relates to the shoe industry, namely, to orthopedic footwear for patients with diabetes mellitus. The invention relates to the field of medicine, namely, to medical orthopedic footwear intended for patients with diabetes mellitus.
Recommended orthopedic footwear consists of interconnected lining and top, insole and soles, fasteners and tongue. In the shoes introduced a set of additional insoles, the substrate, the layers of which are not fastened together. The work piece of the top and the leather lining (pads) are made of one-piece and one-sided ones. The insole is made of multi-layer with the possibility of excluding pressure on the joints of the foot in a standing position. A set of insole substrates is made with the possibility of removing them from the shoe, providing an additional volume for a comfortable

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positioning of the foot, taking into account changes in its volumetric parameters during the day. The tongue is attached to the outer surface of the top of the shoe, with the lining (leather lining) of the shoe and the layer of the insole in contact with the foot, made of plastesote. The method of manufacturing orthopedic footwear includes, in addition to other operations, modeling, tightening the shoe with a multi-layered insoles and a polyester insoles insole. Then tighten the leather lining (lining) on the shoe with the insole, grind the lining work piece along the long edge with the main soft insole and cut the excess. Model shoes, applying lines of the upper edge and the front line of bers on the lining, lay the braid and glue the back to the lining. The finished semi finished product is tightened with a one-piece top billet, the shoe reliefs are lined with decorative and strengthening cords, the track is stretched, the sole is opened after the gluing of the sole, the shoes are removed from the front berms, the shoes are removed from the shoe, then the soft collar is tied over the upper edge, shoes to the union and birches through the lining and the top of the shoe. The technical result of the invention is to improve the performance properties of shoes. All diabetic footwear is designed to improve foot functions and improve the comfort of movement for people suffering from diabetes. Some shoes, developed by orthopedists, have an additional space for the foot, necessary to feel as comfortable as possible.


Fig.2. Vascular injury

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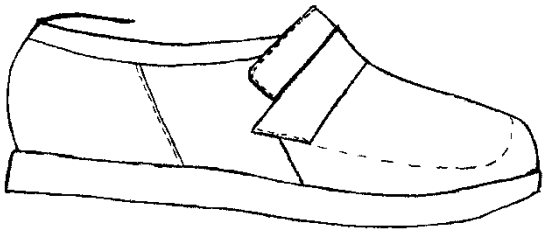
## IV. METHODOLOGY

Proper foot care is an important part of the treatment, because leg problems are the most common complication in diabetes that can lead to hospitalization. It is proved that quality orthopedic footwear significantly (by 2-3 times) reduces the risk of diabetic foot syndrome - it provides a more effective preventive effect than most drugs prescribed for this purpose (Fig. 4).

The main goal of orthopedic footwear is to protect the foot from the formation of diabetic ulcers. Thanks to its structure, such shoes allow:

- reduce pressure on overloaded areas of the plantar surface,
- prevent horizontal friction, i.e. do not rub the foot skin,
- Do not squeeze the foot even with deformations (protruding bones),
- protect the foot from front and other shocks,
- ensure sufficient air ventilation, comfort and convenience when putting on and removing, the possibility of volume adjustment during the day.



a) Sole of standard serial footwear

b) Sole of orthopedic footwear for diabetics
Fig.4. Soles of shoes

For these tasks in the design of shoes there are special elements and it is manufactured with certain requirements:

- rigid (unbending) outsole with a ridge protruding in front,
- pillow and roller on the sole surface of the insole (if necessary),
- an insole that repeats the shape of the foot and is made of cushioning materials,
- the minimum number of seams,
- The width of the shoe is not less than the width of the foot (especially in the area of connecting the toes with the foot),
- additional volume in the shoes for the insole,
- lack of a toe (insertion in the bow of the shoe) and elastic (extensible material) of the top and sub-tie,
- elongated back,
- volume control (in case of foot swelling),
- heel with chamfered front edge. [3]

The folding insole is made of three-layered and includes an elastic-elastic base, a soft damping middle layer and an atraumatic overcoat.

The article may comprise an additional insole, which is removable from the shoe, providing an additional volume for a comfortable location when the volumetric parameters of the foot change during the day. The shoe lining is made of textile material.

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In Fig. 5. The form of the claimed footwear is shown on the side. Position A is the side profile of the overflow of the toe part of the sole in the form of a broken line (rockersole), B is the side profile.
It should be noted that ensuring the uniformity of load distribution on the foot, allowing maximum reduction in foot damage.
The task in hand is solved by improving the design of the insole to ensure the uniformity of the load on the entire part of the foot of the contiguous load on the entire part of the foot in contact with the insole.
The essence of the invention lies in the fact that orthopedic footwear for patients with diabetes mellitus consists of a sole bound with a sole and interconnected whole-topped and lined with a tongue, a multilayered embedded volume insole made with the possibility of removing it from shoes, fastening elements, This insole is made by a three-layer insole of the lower and upper elastic-elastic coatings, the method by which it is sealed with a certain pressure, yn Hugo-elastic material having a hole with nipelnym device for changing the pressure in the sealed zone of the main insole component. The proposed design of orthopedic footwear for patients with diabetes mellitus allows to relieve pressure on individual parts of the foot, while ensuring a uniform distribution of the load on the entire surface of the foot. At the same time, it is possible to achieve maximum unloading of the foot due to a combination of materials of a three-dimensional insole.

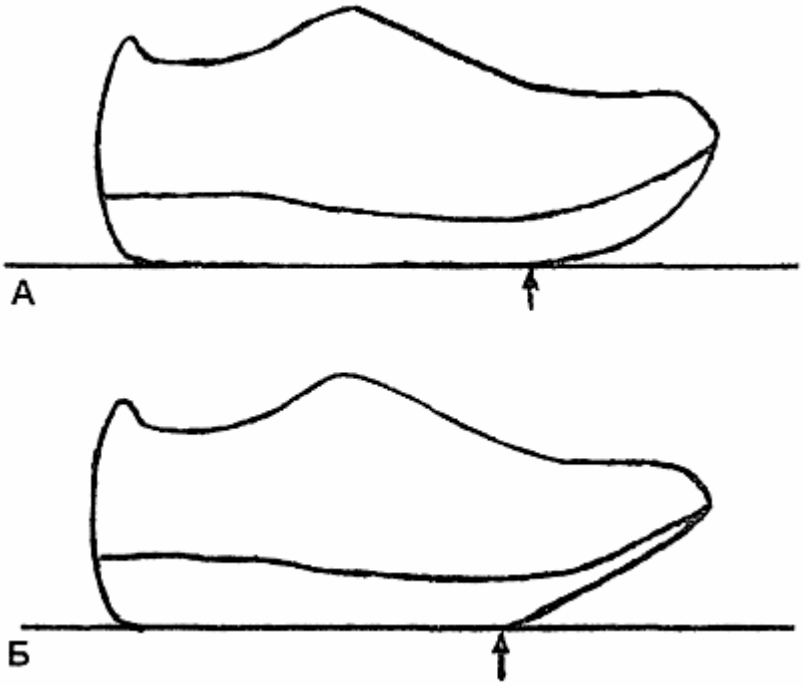


Fig.5. View from the side of the rocker sole.

## V. EXPERIMENTAL RESULTS

The upper covering of the insole is made of ortholux material with perforation. The material contributes to the creation of an optimal microclimate in shoes, has elastic-elastic properties, reduces the "shearing force" and friction during walking and running. The intermediate layer, which is placed under the top coating due to hermetic, elastic-elastic properties and air under pressure, reduces the typical loads from the zones of increased pressure, takes the form of a foot during the wear and the load will be uniform throughout the foot. The lower padding of the embedded volume insole also allows the unloading of the foot due to the high cushioning function.
Orthopedic shoes for diabetics consist of sole 1, attached with a sole of the top and a lining (in the figure on the image), are made whole-cut with a soft tongue of shoes. Inside the shoe is a padded insole 3 consisting of the upper 4, and the lower 5, coatings made of elastically elastic materials, and between them is installed an intermediate hermetically

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sealed and partially filled air 7 with a certain pressure gasket 6 of an elastically elastic material. The gasket 7 has an opening with a drip device 9 for changing the air pressure in the sealed area of the gasket (Fig. 6).
The design works as follows, when moving and walking a patient with diabetes mellitus, concentrated load insole 3 is affected by concentrated loads in various parts of the foot surface (depending on the shape of the foot for the disease). The corresponding parts of the upper gasket 4 are deformed and then the load falls on the intermediate gasket 6. Due to the air 7 being pressurized in the sealed area of the gasket 6, the instantaneous load is redistributed and the upper part of the gasket 6 presses the shape of the foot and the pressure over its entire surface distributed evenly. In this case, the lower gasket 5 also performs a uniform distribution of the load over the entire surface of the stack. If necessary, through the nipple device 9, air pressure can be regulated in the 7-sealed zone of the gasket. 6. A survey of patients who were provided with orthopedic footwear is presented, the results are shown in Table 1. The analysis of the use of orthopedic footwear is shown at below recommended.

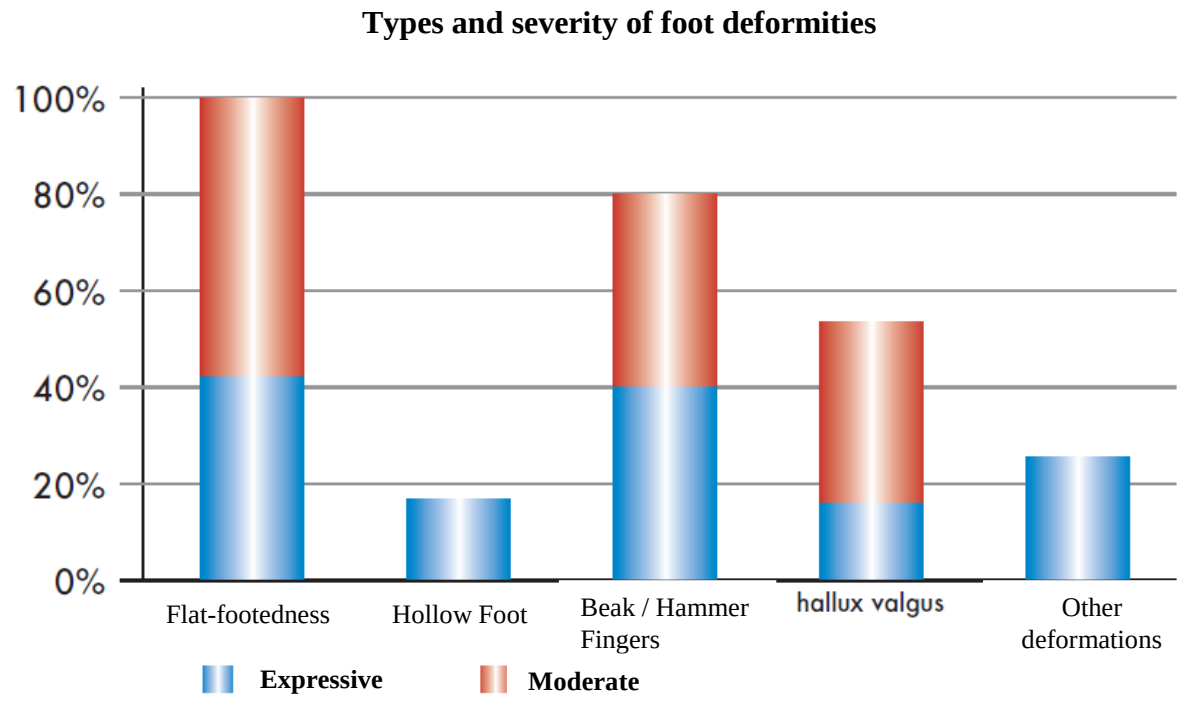


Figure 3. The prevalence of various types of deformities of the feet in the study group.

## VI. CONCLUSION AND FUTURE WORK

Table 1.
**Indices of use of orthopedic footwear**

| | Number of complaints on everyday and pain shoe brushes | |
|---|---|---|
| | Within a week | Within a month |
| Footwear | 12 | 37 |
| Recommended shoes | - | 2 |

Shoes in fact patients did not complain of injuries and pains in their feet. The design allows uniformity of load across the entire surface of the foot. The design can be used for all kinds of shoes.
Orthopedic shoes for the sick with diabetes mellitus

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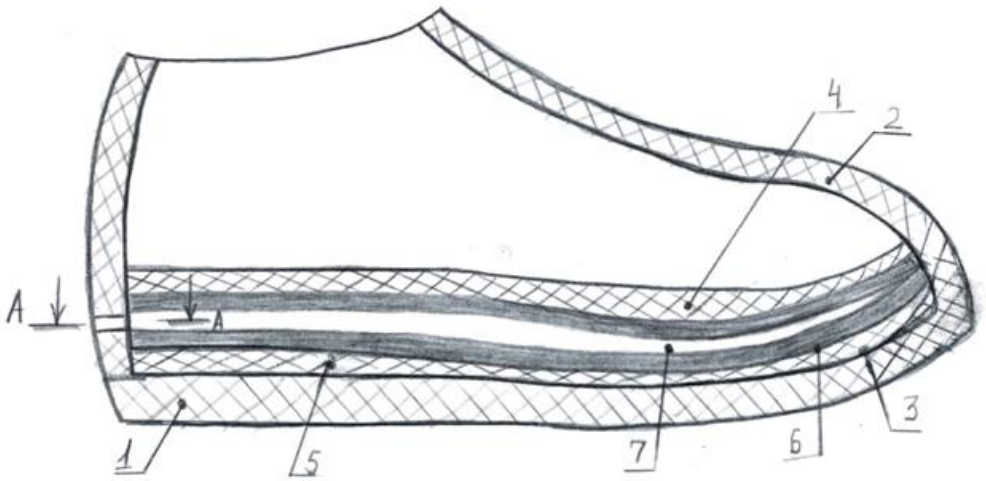


Fig. 1

A-A
Increased

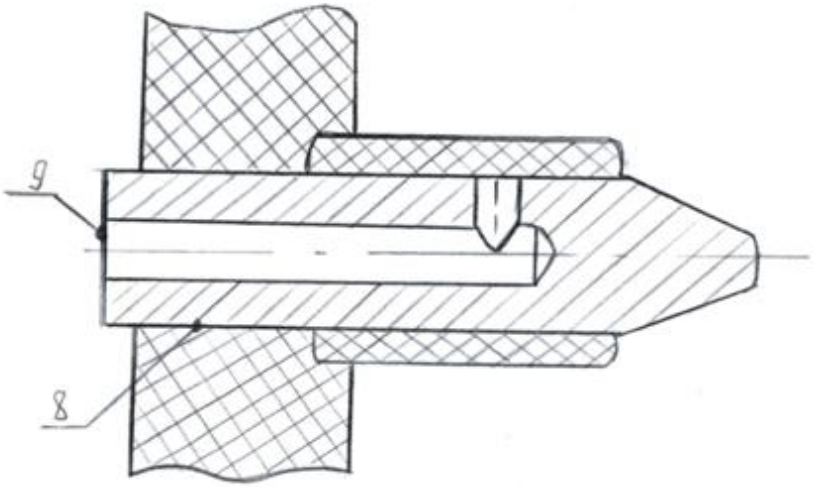


Fig. 2

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