ORTHOPEDIC SOLE INCLUDING CORRECTIVE MEANS FOR TREATING METATARSALGIA AND PLANTAR SKIN DISORDERS

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ABSTRACT

An orthopedic insole capable of being inserted into a shoe or the like for relieving and/or treating skin disorders and/or calluses and/or metatarsal pain comprises at least one semi-rigid corrective element capable of producing an inner metatarsal support, over the rear portion of the head of the first metatarsal, and/or a median metatarsal support, over the rear portion of the second and/or third and/or fourth metatarsal head, and/or an external metatarsal support, over the rear portion of the fifth metatarsal head.
ORTHOPEDIC SOLE INCLUDING CORRECTIVE MEANS FOR TREATING METATARSALGIA AND PLANTAR SKIN DISORDERS

SCOPE OF THE INVENTION

[0001] The present invention relates to an orthopedic insole capable of being inserted into a shoe or the like for relieving and/or treating skin disorders and/or calluses and/or metatarsal pain, designed for any person having a skin disorder and more particularly for diabetics in order to prevent the development of ulceration.

BACKGROUND OF THE INVENTION

[0002] In the field of podology, it is well known that plantar calluses or skin disorders can cause difficulties in walking and can develop into ulceration in the case of deficiency in tissue nutrition, as occurs with patients suffering from so-called type 1 or particularly type 2 diabetes mellitus, or with the elderly having circulatory problems.

[0003] A callus is conventionally an excessive formation of normal keratin on the affected site of the body. Its origin can be linked either to disorders such as psoriasis, mycosis or eczema for example, or be purely mechanical. The formation of calluses is said to be a normal process enabling the foot to be protected from traumas. Plantar calluses spread over the metatarsal heads and more generally over the second metatarsal head.

[0004] The formation of calluses of mechanical origin basically appears to be due to excessive pressure that is too great and over too long a period during walking. In fact, the increase in pressure stimulates the release of cytokines and epidermal growth factors in the epidermis, leading to the increased production of cells and finally to the appearance of calluses. This excessive pressure can be due to anatomical anomalies that can cause a modification in gait and dysfunction in the mechanics of the foot, such as anomalies of the rearfoot and forefoot, digital deformations or bony excrescences for example, and/or extrinsic factors such as shoes that are ill-fitting, worn for too long, unsuitable, etc., or sporadic or intensive motor activities that can cause an excessive load on certain parts of the body for example.

[0005] The treatment of calluses basically consists in the application of acetylsalicylic acid (aspirin)-, lactic acid- and urea-based cream onto the callus. Sometimes alpha-hydroxyl acid (obtained from sugar cane) is also recommended. Furthermore, calluses can be treated by pumice stone, which must first be moistened, or by any other abrasive device.


[0007] Nevertheless, all these treatments and all these soles do not correct the cause of the appearance of calluses so as to prevent them from regularly reappearing. Moreover, despite the treatments, it is sometimes possible to see suppuration occur, linked to an infection of the serous bursa located beneath the callus that can lead to ulceration, particularly among diabetics.

[0008] French Patent Application FR 2 869 507 is also known, which describes a raised relief plantar orthosis allegedly enabling the treatment of the vast majority of individual cases. The said plantar orthosis comprises, from the front to the back, over a substantially flat area, so-called subcapital areas, namely one area for the first metatarsal head and one area for the fourth and fifth metatarsal heads and, behind these areas, separated from each other, one retrocapital bar area or retrocapital support and having a relief whose thickness varies. The retrocapital bar is an element located just behind the metatarsal heads, which constitute as a whole the metatarsal palate.

[0009] This type of sole, apart from the fact that the thickness of between 1 and 10 mm of the raised elements is too great causing too much discomfort for patients making this type of sole totally unusable, does not allow the cause of the appearance of calluses to be rectified because the retrocapital bar is located behind the metatarsal heads.

BRIEF DESCRIPTION OF THE INVENTION

[0010] One of the aims of this invention is therefore to remedy these drawbacks by proposing an orthopedic insole of simple design and low cost, adapted to the morphology of the foot of each patient and enabling excess pressure to be eliminated in order to eliminate calluses and relieve patient’s pain.

[0011] To this effect and according to the invention, an orthopedic insole is proposed capable of being inserted into a shoe or the like for relieving and/or treating calluses and/or metatarsal pain; said sole is remarkable in that it comprises at least one semi-rigid corrective element capable of producing a so-called inner retrocapital support on the rear portion of the head of the first metatarsal, and/or a so-called median retrocapital support, on the rear portion of the second and/or third and/or fourth metatarsal head, and/or a so-called outer retrocapital support, on the rear portion of the fifth metatarsal head.

[0012] Said corrective element is preferably positioned on the lower face of said sole.

[0013] Moreover, said corrective element is advantageously connected to the sole in a removable manner.

[0014] According to a variation of the sole, said corrective element has fixing means capable of cooperating with matching fixing means connected to the lower face of the sole.

[0015] On its lower face, the sole comprises at least one recess extending from the inner edge to the outer edge of the sole, opposite the metatarsal heads, and in which the corrective element is capable of being positioned.

[0016] According to another variation, on one of its faces the said corrective element has loops and/or hooks capable of cooperating with hooks and/or loops.

[0017] Advantageously, on its lower face the sole has a recess located in front of the metatarsal heads, at the plantar pad, said recess extending from the inner edge to the outer edge of the sole, and capable of receiving a so-called lower anterocapital element having pre-cut lines in order to enable the creation of at least one hollow under the callus or calluses and/or skin disorders. This enhances the cushioning located in front of the metatarsal heads and, in association with an optional flexible plantar pad, beneath the metatarsal heads on the upper face of the sole. The said lower anterocapital element is pre-cut into five areas so as to create in certain cases a hollow at one or more metatarsal heads in order to reduce the pressure on said head or heads.
Incidentally, the sole comprises on the one hand an anti-valgus or anti-pronation corrective element capable of being inserted in a so-called anti-valgus recess made on the lower face of the sole, along its inner edge, under the plantar vault, and on the other hand an anti-varus or anti-supination corrective element capable of being inserted in a so-called anti-varus recess made on the lower face of the sole, along its outer edge, at the plantar vault.

Advantageously, its upper face the sole has means guiding the progression of the foot along the physiological axis of the gait.

These means consist in a sub-scaphoidian profiled element, on the upper face of the sole, which substantially has the shape of a hemi-dome and/or in a sub-cuboidian element located, on the upper face of the sole, on the outer side of the sub-scaphoidian element and having the shape of a bean, with its convexity facing backwards from the median longitudinal axis of the sole and/or in a medio-tarsian axial means, on the upper face of the sole, oval in shape and widening towards the front to terminate just before the metatarsal heads in order to distribute the support beneath the metatarsal palettes.

Preferably the sole has means to stress, from the strike of the step usually performed by the heel, the articular receptors located between the talus and the calcaneus.

The said means consist in a subcalcaneal longitudinal profiled channel, or console, of increasing thickness from the heel to an area located substantially directly below the neck of the talus.

Said console is positioned either on the upper face of the sole or on the lower face of the sole performing an additional stiffening function.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and features will emerge more clearly from the following description of several variations, given by way of non-limiting examples, of the orthopedic sole according to the invention, with reference to the accompanying drawings, in which:

FIG. 1 is a bottom view of the orthopedic sole according to the invention,

FIG. 2 is a side view of the orthopedic sole according to the invention,

FIG. 3 is a schematic view of a longitudinal section of the orthopedic sole with a foot resting on it,

FIG. 4A to 8A are top views of the removable corrective elements of the orthopedic sole according to the invention,

FIGS. 4B to 8B are side views of the removable corrective elements of the orthopedic sole represented in FIGS. 4A to 8A,

FIG. 9 is a top view of a variation of the orthopedic sole according to the invention,

FIG. 10 is a side view of the variation of the orthopedic sole according to the invention represented in FIG. 9,

FIG. 11 is a bottom view of a second variation of the orthopedic sole according to the invention,

FIG. 12 is a side view of the second variation of the orthopedic sole according to the invention represented in FIG. 11,

FIG. 13 is a schematic view of a longitudinal section of a device for measuring the footprint in order to determine the appropriate size of the orthopedic sole according to the invention,

FIG. 14 is a top schematic view of the template of the footprint-measuring device enabling the size of the sole to be determined on the basis of the position of the metatarsal heads in relation to the calcaneus, i.e. in relation to the patient's heel.

DETAILED DESCRIPTION OF THE INVENTION

For obvious reasons of simplifying the description, only one sole according to the invention will be described, corresponding to the left foot for example, the right sole being deduced by symmetry.

With reference to FIGS. 1 and 2, the sole according to the invention has on its lower face a semi-rigid corrective element capable of providing a so-called inner retrocapital support 1, on the back part of the first metatarsal head, and/or a so-called median retrocapital support 2, on the back part of the second and/or third and/or fourth metatarsal head, and/or a so-called outer retrocapital support 3, on the back part of the fifth metatarsal head. Said inner 1, median 2 and outer 3 retrocapital corrective elements are advantageously connected to the sole in a removable manner. On its lower face, the sole has at least one recess 4 extending from the inner edge to the outer edge of the sole, opposite the metatarsal heads, and in which the inner 1, median 2 and outer 3 retrocapital corrective element or elements are capable of being positioned. The walls of the recess 4 are inclined towards the inside of said recess 4 from its bottom to the edge of the said recess, i.e. to the lower face of the sole, in order to form a lip 5 at the edge of the recess 4. This recess 4 is capable of accommodating at least one of the inner 1, median 2 or outer 3 retrocapital corrective elements represented in FIGS. 4A to 6B. Each retrocapital corrective element 1 to 3 is substantially triangular in shape and has at its periphery a chamfer 6 so that the lip 5 at the periphery of the recess 4 holds said retrocapital corrective elements 1 to 3 in place in said recess 4.

Clearly, the edge of the inner retrocapital corrective element 1 and of the outer retrocapital corrective element 3 which is adjacent to the inner and outer edge of the sole respectively when the said elements 1 and 3 are inserted into the recess 4 does not have a chamfer 6.

Furthermore, the inner 1, median 2 and outer 3 retrocapital corrective elements are made of a more rigid and denser material than the material of the sole and are inserted into the recess 4 by elastic deformation of the lip 5 thereof.

It will be noted that the particular shape of the recess 4 and the retrocapital corrective elements 1 to 3 prevent any inadvertent movement, as well as any escape, of said corrective elements during walking or running.

Moreover, it will be observed that the retrocapital corrective elements are not in contact with the foot, thus avoiding any injury to the plantar skin such as cuts, blisters, clefts or suchlike. Nevertheless, it is very clear that the inner 1, median 2 and outer 3 retrocapital corrective elements can be positioned on the upper face of the sole without departing from the scope of the invention.

Advantageously, with reference to FIGS. 1 and 2, the sole has on its lower face a recess 7 positioned in front of the metatarsal heads, at the plantar cushion, said recess 7 extending from the inner to the outer edge of the sole, and capable of receiving a so-called lower anterocapital element 8 having pre-cut lines 9 in order to enable the creation of a hollow beneath the callus or calluses and/or skin disorder. These pre-cut lines 9 delimit removable elements. These removable elements extending opposite the calluses are
removed in order to create a hollow on the lower face of the sole. Moreover, in the same way as before, the walls of the recess 7 are inclined towards the interior of the said recess 7 from their bottom up to their respective edge in order to form a lip 5 round the edge of the said recess 7. The said lower anterocapital element is flat and has round its periphery, along its proximal and distal edges, a chamfer 6 in order to ensure that it locks into the recess 7. In this particular embodiment, the anterocapital element 8 has 4 pre-cut lines 9 extending from the proximal edge to the distal edge respectively of the said anterocapital element 8.

Thus, with reference to FIG. 3, the retrocapital corrective elements 1 to 3 exert an upward pressure P1 onto the back part of the corresponding metatarsal head(s) enabling the excessive pressures that cause the formation of the callus or calluses to be corrected. And the hollow or hollows 7 formed by removing the movable parts of the anterocapital element 8 between the pre-cut lines 9 allow the sole to be compressed into the hollow when a pressure P2 (FIG. 3) is exerted during walking limiting rubbing against the callus D on the upper face of the sole simultaneously making walking much more comfortable.

As the appearance of calluses is often due to a problem of posture causing excessive pressure on the metatarsal heads, the sole according to the invention advantageously has posture-correction means. Thus the sole, with reference to FIGS. 1 and 2, also has a second so-called anti-varus or anti-supination recess 10, generally rectangular in shape, located along the outer edge of the sole and extending from the cuboid to the first recesses 4 of the retrocapital corrective elements and a final so-called hemi-dome shaped anti-valgus or anti-pronation recess 11 located along the inner edge of the sole under the plantar vault. In the same way as described above, the wall of the anti-varus 10 and anti-valgus 11 recesses is inclined towards the inside of the said recesses 10 and 11 from their bottom to their respective edge in order to form a lip 5 bordering the said recesses 10 and 11. Each of the anti-varus 10 and anti-valgus 11 recesses is capable of accommodating an anti-varus 12 and anti-valgus 13 corrective element respectively, represented successively in FIGS. 7A, 7B and 8A, 8B; the anti-varus corrective element 12 is generally rectangular in shape and the anti-valgus corrective element 13 is a semi-dome. Each of these corrective elements is flat and made from a more rigid and denser material that the material of the sole: these elements also have round their periphery a chamfer 6 in order to ensure that they lock into their respective recess.

According to a variation of the sole, the said retrocapital corrective elements 1, 2 and 3, the anterocapital element 8 and the anti-varus 12 and anti-valgus 13 corrective elements have fixing means capable of cooperating with additional fixing means connected to the lower face of the sole.

These means can consist for example in lugs projecting from the upper face of the corrective elements 1, 2, 3, 8, 12 and 13 and capable of cooperating with corresponding holes located at the bottom of corresponding recesses 4, 8, 10 and 11, corrective elements 1, 2, 3, 8, 12 and 13 therefore not having a chamfer and the recesses 4, 8, 10 and 11 not having a lip 5.

Alternatively, these means can consist in loops and/or hooks capable of cooperating with hooks and/or loops in order to form Velcro-type fixing means.

Moreover, it is very clear that the corrective means 1, 2, 3, 8, 12 and 13 can be fixed removably onto the lower or upper face of the sole by any appropriate means well known to a person skilled in the art without departing from the scope of the invention.

According to a particularly advantageous variation, with reference to FIGS. 9 and 10, the sole has on its upper face, means to stress, from the strike of the step usually performed by the heel, the articular receptors located between the talus and the calcaneus and means guiding the progression of the foot along the physiological axis of the gait as described in French Patent Application 2 676 918, filed by the applicant. These means basically consist in a profiled channel, called a console 14, and a set of profiled elements 16, 17, 18 distributed along the entire length of the sole to create a rail around which the foot is guided.

The console 14 extends longitudinally from the heel to the front end of the calcaneus, just vertically below the neck of the talus. The said console 14 has a thickness that increases from the heel to its front end 15. By way of a particular example, the height of the console 14 increases gradually from 1 mm to 2 mm from the heel to its front end 15.

The set of profiled elements 16, 17, 18, from the back forwards, i.e. from the heel towards the tip of the foot, consists of a subcapahclidan profiled element 16, a subcapahclidan profiled element 17 and a media-tarsian axial means 18. The subcapahclidan profiled element 16 extends along the console 14 towards the interior of the foot in the manner of a semi-dome. This subcapahclidan profiled element 16 has in this example a height of about 2 mm and thus extends the front end 15 of the console 14.

The profiled subcapahclidan element 17, in the top view, according to FIG. 9, has the shape of a bean corresponding generally to the projection of the shape of the cuboid on the sole. This element 17 is located on the outer side of the subcapahclidan element 16, its convexity turned backwards, at about 45° from the median longitudinal axis of the sole. The thickness of the said element 17 increases from the side towards the centre and from the back forwards gradually to reach a height of about 4 mm.

The media-tarsian means 18 is oval in shape, i.e. roughly the shape of a drop of water, widening towards the front and ending just before the metatarsal heads of the foot.

This media-tarsian element is domed; its height varies longitudinally from a height of 2.5 mm to reach a maximum height in the order of 3.5 mm, at about two thirds of its length. It will be observed that, during the progression of the step, the console 14 stresses the calcaneus of the foot, whether a flat foot or a high-arch foot, in order to prepare the continuation of the step under good conditions; then the subcapahclidan 16 and/or subcapahclidan 17 profiled elements which act as lateral stabilisers for the foot, encourage the foot to stay within the physiological rail of the gait and the media-tarsian element 18 prepares the terminal digitigrade phase of the step by distributing the support of the foot under the metatarsal palettes so that this support remains channeled along the axis of the second metatarsal head through which the physiological axis of the gait passes.

Advantageously, the sole has on its upper face an upper anterocapital element called the upper plantar pad 19 extending from the inner edge to the outer edge of the sole in front of the media-tarsian element, having a general bean shape, and made of a flexible material so as to provide cushioning when walking: This upper plantar pad 19 is between 2
and 4 mm in height and is made of any flexible material well known to a person skilled in the art.

According to a final particularly advantageous variation, with reference to FIGS. 11 and 12, the sole has means to stress, from the strike of the step usually performed by the heel, the articular receptors located between the talus and the calcaneus and means guiding the progression of the foot along the physiological axis of gait. These means basically consist in a profiled channel, called a console 14, and a set of subcaphoideaian 16, subcutaneous 17 and mediotarsian 18 profiled elements distributed along the entire length of the sole to create a rail around which the foot is guided. Moreover, the sole has, in the same way as before, an upper plantar pad 19. This variation differs from the previous one by the fact that the console 14 is located on the lower face. In this way, apart from its function of stressing the articular receptors during the strike of the step, the console 14 has a straightening function.

In order to enable the rapid supply of soles to patients, the invention also includes a conventional foot cast taking device 100, with reference to FIGS. 13 and 14, enabling a foot cast to be taken by the transfer of ink or by the deformation of foam for example, well known to a person skilled in the art, and a transparent or translucent template 110 having pre-defined lines 120 corresponding to the position of the metatarsal heads for different sizes. Thus, all that is required is to take the patient’s foot cast then match the rear part of the template to the rear part of the heel of the cast thus taken and read the corresponding size. As the rear part of the foot cast is 6 mm further forward than the rear part of the heel, the template has been designed with this difference in mind. All that is then required is to insert the retrocapital corrective elements 1 and/or 2 and 3 into the recess 4 corresponding to the size measured and cut the lower anterocapital element 8 of the sole at the cutting lines 9, if necessary, in order to create a corrective sole to eliminate the patient’s callus or calluses. Said callus or calluses disappear in about a month and the correction made prevents any appearance of new calluses.

Lastly, it is very clear that the examples just given are merely particular illustrations and are in no way limiting as regards the fields of application of the invention.

1. Orthopedic insole adapted to be inserted into a shoe or the like for relieving and/or treating skin disorders and/or calluses and/or metatarsal pain, comprising at least one semi-rigid corrective element producing an inner retrocapital support, over a rear portion of a head of a first metatarsal, and/or a median retrocapital support, over a rear portion of a second and/or third and/or fourth metatarsal head, and/or an outer retrocapital support, over a rear portion of a fifth metatarsal head.

2. The insole according to claim 1, wherein said corrective element is positioned on a lower face of said insole.

3. The insole according to claim 1, wherein said corrective element is connected to the insole in a removable manner.

4. The insole according to claim 3, wherein said corrective element has fixing means cooperating with matching fixing means connected to a lower face of the insole.

5. The insole according to claim 4, wherein the lower face has at least one recess extending from an inner edge to an outer edge of the insole, opposite the metatarsal heads, and in which the corrective element is positioned.

6. The insole according to claim 4, wherein said corrective element has on one of its faces loops and/or hooks cooperating with hooks and/or loops.

7. The insole according to claim 1, wherein, on a lower face, a recess is located in front of the metatarsal heads, at a plantar pad, said recess extending from an inner edge to an outer edge of the insole, and receiving a lower anterocapital element having pre-cut lines in order to enable creation of at least one hollow under the callus or calluses and/or skin disorders.

8. The insole according to claim 1, further comprising an anti-varus or anti-supination corrective element inserted in an anti-valgus recess a lower face of the insole, along its inner edge, under a plantar vault.

9. The insole according to claim 1, further comprising an anti-varus or anti-supination corrective element inserted in an anti-varus recess a lower face of the insole, along its outer edge, at a plantar vault.

10. The insole according to claim 1, further comprising, on an upper face, means guiding progression of the foot along a physiological axis of gait.

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