ARCH SUPPORTS

Problems of Fittings and Materials with Special Reference to the Use of Nyloplex

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Arch supports in many forms and types for the treatment of ailing, symptomatic feet are known and accepted universally. They provide surprising results in relieving foot complaints when properly prescribed as for type and material and then constructed and fitted by competent technicians.

This article will not attempt to set forth principles or recommendations governing the diagnosis of foot complaints or the prescribing of supports. Rather we will attempt to cover (1) causes for failure and unsuccessful use of supports (2) advantages and disadvantages of conventional materials (3) a solution to some of the problems.

FITTING PROBLEMS:

Granted that proper diagnosis and prescription have been made, successful use of the support is dependent primarily on its construction and fitting the patient's foot. Knowledge of basic foot anatomy is essential for this. Fitting properly embodies the length, breadth, and height of the support and without the correct relationship of each to the foot as well as to the shoe, no support will completely fulfill its task.

The heel of the removable support should fill the space in the heel of the shoe for the support to be comfortable and to stay in place. When too narrow, it will leave a mark on the foot and possibly cause discomfort where the heel overhangs. If too wide, it will slide forward or distort the shoe. The height, width and location of the longitudinal section must be adequately appraised to perform its intended function of restoring balance to the foot. If the apex of the longitudinal arch be too far posteriorly or anteriorly, comfortable and adequate correction of pronation can not be effected. Similar reasoning applies to the metatarsal support and to any other correction being attempted. Good judgement based on training and experience plays a big role in this determination and then, even with the experts, subsequent alterations may be necessary. The use of stock "ready made" supports in retail shoe stores and many orthopedic shops has satisfied a number of foot sufferers, but not near the number they are reputed to have relieved. Many patients who receive some degree of relief feel that they should be satisfied and resigned to their use, whereas more satisfactory results could be obtained if the supports were made to suit their requirements.

MATERIAL PROBLEMS:

Often patients are fitted properly, but negative results may be due to the material used. Who has not heard one of the following complaints: arch supports are too heavy; too hard; too cold; too dirty and odorous; they make the shoes too tight for my foot; they flatten out; they have not done me any good.

Materials for supports may be classified into two groups: (1) rigid or semi-rigid materials molded or hammered to a model of the foot. (2) soft materials cut or ground to fit the foot. The former category includes, stainless steel, monel, leather and plastics such as celastic, cellulose

acetate and thermosetting laminating materials. Supports made from these materials are not so dependent on the shoe for holding their shape as the latter catagory. These soft materials, such as felt, sponge rubber, lattery category. There soft macork and cork compositions are fabricated into pads as supports, and then cemented into shoes.

Rigid metal supports offer two formidable problems: (1) specialized skill and hard labor are required to properly form them to the desired anatomical conformation, making them more costly. (2) their rigidity "crutches" the foot to the extent that no exercise is permitted, and often this factor cannot be tolerated by the wearer. Weight, but not corrosion, is a factor with stainless steel and monel. Aluminum, on the other hand is light but subject to corrosin, to even with a leather covering.

The softer materials offer more flexibility and they are less expensive to the patient than the rigid types. Plaster impressions are seldom used in the fabrication process. Usually weight bearing ink prints or caliper measurements are all that is required. The pads are cemented into the shoes and with a number of shoes, this sometimes can exceed the cost of removable supports. The life and quality of these types are directly dependent on the quality of the shoe. Sometimes it is questionable with the soft shank, poorly constructed shoes women and children wear, whether or not the patient receives adequate support.

A NEW MATERIAL:

Generally speaking, arch supports ideally should have flexibility with durability, hold the correction, yet be elastic. They should be thin and light, corrosion proof and free from holding odors. In many cases, they must not be rough on delicate hosiery or noticeable in open counter shoes.

This "ideal" material must be suited for individual shaping with a simple molding process. Quick alterations and adjustments also must be possible. And, finally, these demands for the ideal support should be met with moderate cost to the patient.

Only through long and tedious research was it possible to develop a new plastic combination, nylon and methacrylate, which offers so much in the way of an ideal arch support material; one that had the characteristics and physical properties as outlined above. This new combination with the strength characteristics of nylon and the workabilty of plexiglas, is in a class by itself.

The prelude to this development began with the early experimentation with plexiglas. It molded beautifully but the supports broke after short use.

Compared to the methacrylate (plexiglas) material, Nyloplex* *has 100%* greater impact strength, and proportionately is more ductile yet more resistant to cold flow and deformation from weight bearing. It is able to withstand considerable weight without noticeable deformation. Even after having been subjected to deformation over a long period of time, it will return to its original shape. This makes it ideally suited for orthopedic use.

TECHNICAL DATA:

Nyloplex is a clear, transparent plastic with a light golden tint. It is a thermo-plastic which following heating, not to exceed 280°F, becomes soft, rubber-like and very easily shaped to a patient's foot or a model thereof. Heating the material may be accomplished by a number of methods but in any case, it is imperative that the temperature be controlled and not allowed to exceed the prescribed maximum limit. Only electric hot plates, sandwich type enclosed grills (see illustration) or ovens with automatic temperature controls are recommended. Heating time for the ma-

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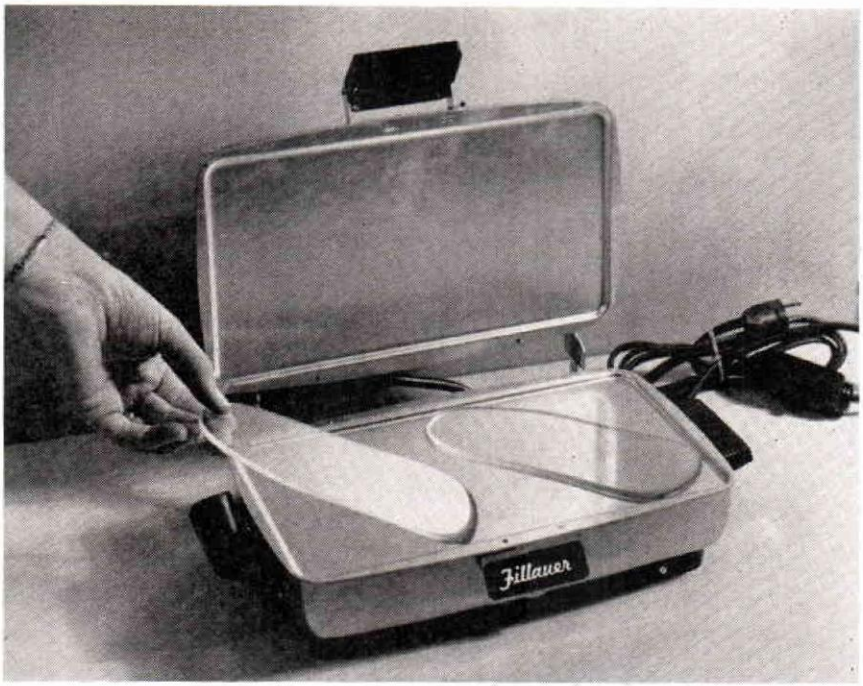

Use of Simple Heating Device.

terial varies with the type heater, but in any case, the heaters should be allowed to reach maximum heat, before inserting the material. Nyloplex should be left on heated plates for only 2 minutes, while in an oven 10 minutes is maximum time. It is advisable to turn over the blanks once or twice during the heating process. When using an oven, they should be placed on glass or smooth metal. The danger of overheating cannot be over emphasized as permanent damage takes place in the way of crystallization and brittleness in the material. Darkening of the material is indicative of this condition. Nyloplex that has been heated too long is considerably darker in contrast to normal Nyloplex and too brittle to be used for supports. For this reason the shaping process should not be repeated more than a few times. A well worked support can be recognized by its light, even coloring.

MOLDING PROCESS

When a positive plaster mold technique is used, certain suggestions are offered which would not apply in cases where metal supports are being made. The first is that a 5/16 or 3/8 round rod should be cast in the model so as to protrude 3″ to 5″ beyond the toes to provide a handle that can be clamped in a vise during the molding of the support. This enables the operator to easily place the heated Nyloplex blank over the model and wrap it with an Ace type bandage. The second is the necessity for building up on the model the lateral border and the heel margins so that the support will not have an excessively cupped heel or elevated lateral margin. This altering of the model is best and easiest accomplished with plaster just after the positive model is poured and stripped. If a metatarsal raise is desired, the corresponding area in the model should be excavated with slight exaggeration.

And last, to protect the glass-like surface during the forming procedure, it is advisable to cover the plaster model with a thin soft felt or, preferably with horsehide coated with nylon lacquer. If the covering is cemented to the model with rubber cement it can be easily removed later and re-used many times. The heated Nyloplex blank can be handled with cotton gloves while it is removed from the heater and positioned on the model. Quickly the blank can be hand shaped to the model and then wrapped in place with a bandage. A felt pad over the metatarsal and longitudinal areas will help form the support to the model.

An alternative method of forming the Nyloplex is to make or rework a shoe press so that it will have a thick, soft forming pad for a base. This is easily made of 1" foam rubber covered with felt. A section of hard felt placed in the longitudinal arch area will assist in forming the plastic to the model, especially when a pes cavus condition exists. As with the model, the final surface in contact with the plastic ideally is horsehide with a nylon coating.

In 10 to 15 minutes or as soon as the Nyloplex has cooled below 125°F, the supports can be removed from their models. If a proper size blank has been selected, it is possible that no alteration may be necessary. Occasionally, when it is deemed necessary to further raise the metatarsal area it can be accomplished with localized heat and thumb pressure.

As with other types it is proper that the supports fit the patient's shoe without crowding. Whatever method of trimming is used, whether sawing, grinding, or sanding, one precaution should be observed and that is to avoid over heating the margin or surface, with high speed tools or wheels. As warned previously, over heating causes brittleness and stresses in the material. There is one important safe-guard to assure long service life in the support. All scratches and tool marks should be carefully removed by buffing. This is equally as important as the caution to avoid over heating, as inferior work on the edges will result in premature breakage. The same buffing compounds recommended for Plexiglas is ideal for Nyloplex.

SUBSEQUENT MODIFICATION:

Later, the supports may require correction or alteration of an area e. g. the metatarsal raise. For this type of adjustment localized heating is necessary and may be accomplished in one of several ways. 1. By means of a hot air heat gun. 2. By means of a flame heat source as an alcohol lamp or bunsen burner. 3. With a suitably shaped heated metal rod.

When using a flame as a heat source, a distance of 4 to 8 inches should be maintained between the heat and the Nyloplex. The material is not a good conductor of heat so the heat must not be too great. It is recommended that a coating of oil be applied to the area before heating to dissipate the heat. The operator wearing cotton gloves can feel the Nyloplex become pliable and can easily and quickly make the alteration.

CLEANING:

A special advantage of Nyloplex will be found in its easy cleaning. Supports made of Nyloplex can be washed in lukewarm water or soapsuds and then rubbed clean with a soft rag, preferably of glove material. The use of brushes or similar cleaning agents such as sand or commercial abrasives is to be avoided, since Nyloplex would be scratched by them. If dirt cannot be removed with soapsuds, the supports may be rinsed in diluted soda.

Care has to be taken not to use very hot water for cleaning Nyloplex, since by thermic reaction, it would then revert to its original shape and would make reshaping necessary. It may be warped by excessive heat.

Experiences made with Nyloplex since 1948 are extremely encouraging. The experience gained from publications and wearing tests are here summed up. There is general agreement on the fact that the main advantage of Nyloplex is the ease with which it can be shaped. A considerably simpler, yet better, fitting than can be obtained with other kinds of supports can now be taken for granted. To this is added the ease with which it can be corrected. After local heating, the longitudinal or transversal arch can be changed at will. This adaptability makes it possible repeatedly to reshape long worn supports, so that replacement is unnecessary.

Even a complete reshaping of worn supports is possible. This remolding, however, cannot be repeated indefinitely. After Nyloplex has taken on a darker coloring by repeated heat-molding, it loses its elasticity and will break soon after. Another point which is emphasized again and again is this very elasticity. The supports do not in the least interfere with the elastic action of the foot. By using supports of suitable thickness the spring action has a wholesome effect in stimulating the foot muscles. Even after being subjected to a great weight, the supports revert to their shape. There is for instance a report on a beer-truck driver who would regularly crush or break the usual light metal supports within one week. He had already been better satisfied with Plexiglas, whose elasticity is far below that of Nyloplex. This shows that Nyloplex will come up to the highest expectations. It is also mentioned that the patients do not feel the hardness of Nyloplex on account of its elasticity, whereas they frequently complain about metallic supports.

Nyloplex as an arch support material possesses a total of characteristics not found in any other single material. These are lightness with strength, moldability with durability, elasticity, cleanliness and ease of adjustment.

(Nyloplex blanks available in all sizes 1 to 13 at:
Fillauer Surgical Supplies, Inc.
Box 1678
Chattanooga, Tenn.
Materials, heater and hot air gun data available from above.)

Welcome

Cordial greetings are extended to these new members of OALMA:

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Otto Bock Distributing Agency (Associate Member), H. D. Fahrenholtz, Representative, 375 West Fourth Street South, Salt Lake City, Utah.

C. N. Orthopedic Company, Charles Nagat, Partner, 329 W. Madison Street Baltimore, Maryland.

Pierre W. Delaby, Pierre W. Delaby, Owner, 127 Rowland Circle, Fayetteville, North Carolina.

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Lyman Dickinson, Lyman Dickinson, Owner, 624 Third Avenue, Watervliet, New York.

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