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Problems in Footwear for the Leprosy Patient

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This paper deals mainly with leprosy patients in towns and cities who require either surgical footwear made to measure or normal footwear which can be adapted surgically.

I would first like to take up the case of amputation of the great toe. The balance of the foot is normally dependent on take-off through the great toe itself, and when it is found necessary to amputate it for Hansen's disease, one is left with the problem of the necessity of balancing the foot rather than accommodating to the absence of the great toe. Although this has to be done naturally to maintain the shape of the shoe, quite often there is some deformity in the remainder of the foot that needs special attention (Figs. 1 and 2).

FIG. 1. Amputation of the great toe. Ulcer under first metatarsal.

Loss of the great toe usually means that the patient will throw his weight on the outer side of his foot, and it is important to maintain the balance necessary to bring the weight through the whole of the metatarsal heads. Usually this can be done by adding an outside wedge to the sole, well back behind the heads of the metatarsal, in order

FIG. 2. Bilateral great toe amputation.

to throw the weight well forward on to the great toe area. Care must be taken to see that the weight is evenly distributed. Sometimes a very thin metal plate must be added along the inner border to prevent the shoe from bending. I try to avoid this whenever possible. The actual block for the big toe can be made, preferably, of Plastazote, and should be fitted in such a way that when the foot goes forward there is no pressure on the end of the amputation stump. The toe block should be fixed on an insole so that it can be taken out easily for adjustments.

Plastazote is foamed polyethylene of closed-cell construction, cross-linked to ensure extreme lightness. It is nontoxic. When heated to a temperature of 140°C., it can be applied directly to the limb and moulded. As Plastazote consists of 90 per cent

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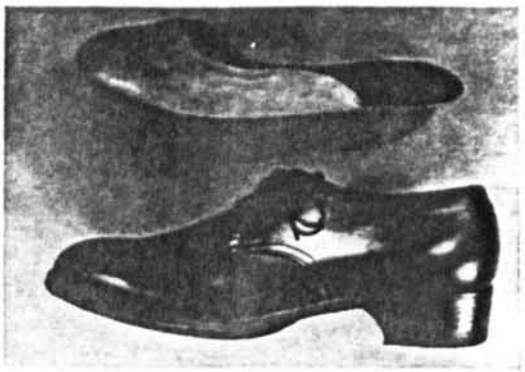

FIG. 3. Toe block for amputation of toes. Rocker sole for amputation of toes.

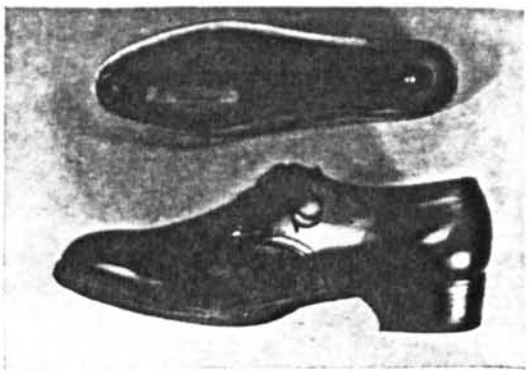

FIG. 4. Steel plate fixed to insole to fit into shoe.

nitrogen and 10 per cent polyethylene, the surface heat is quickly lost, and therefore the compound is immediately acceptable to the patient without fear of burning. Depressions taken in Plastazote by this method under pressure will not alter unless the material is reheated, because it has a memory of 140°C. When cool, Plastazote is very easy to cut and shape as required. If a depth above one inch is necessary, extra layers will fuse together at a temperature of 140°C.

In the case of amputation of all the toes, it is necessary to fit a full insole with suitable padding to relieve the weight of the metatarsal heads. Often in this type of amputation one is left with a very high arch, and a well moulded cavus insole with a metatarsal support should be carefully fitted on the same insole to which the toe amputation block is fitted.

It is usually necessary to fit the Plastazote toe block at least one size, i.e., a third of an inch away from the end of the foot. Again it must be ensured that the balance is even, and it may be necessary to provide an adequate rocker to the sole to improve walking, because, when a patient has lost the forefoot, the balance of rocking forward is completely lost. Some stiffening must be added to the sole to prevent the front of the shoe from turning up. A steel plate is fixed to the insole of the shoe down the center of the foot. Spring steel with sufficient flexibility to bring the foot straight must be used (Figs. 3 and 4).

Amputations of toes in cases of leprosy need special attention; one has to be very careful in housing the remaining part of the foot because of the loss of sensation, and to prevent ulceration, if possible, for any breakdown of the skin causes a wound that is difficult to heal. The method that I adopt is to use one-inch Plastazote; I take an impression of the partial foot on this. The Plastazote is cut to equal the full length of the other foot and it can be rockered up (Fig. 5). By using one-inch Plastazote it is possible to obtain a first-class depression of any part of the foot that is likely to be ulcerated; the springiness of the material around that area will often encourage healing if there is an ulcer, or certainly prevent an ulcer from developing by careful moulding. An extra piece of Plastazote may be added in the long arch, by the fusion method I have described, if it is required. It must

FIG. 5. Amputation of all toes illustrating moulding Plastazote to depress metatarsal heads.

be understood that in these cases one cannot house this type of support in one-inch Plastazote in an ordinary shoe, and this will have to be accommodated in surgical footwear.

An amputation through the mid-metatarsal area means leaving a foot which is difficult from the point of view of walking forward. In this case I mould to the remaining portion of the foot a very deep Plastazote support in the front and a one-inch Plastazote (Figs. 6, 7 and 8) base.

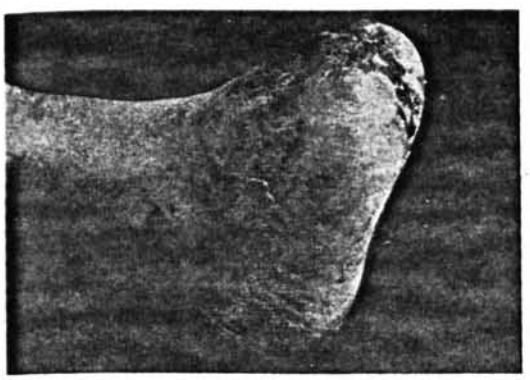

FIG. 6. Amputation through mid-metatarsal area.

The next case I would like to illustrate is a leprosy patient who had had considerable trouble with his footwear for a number of years. The soles of his feet were in very poor condition because of a certain amount of ulceration. While his feet were anesthetic he was in considerable discomfort from worry about his condition, as he earned his living as an entertainer, and was much concerned about the appearance of his feet. Ever since the age of 36 years his prescription was for surgical shoes with full sponge rubber insoles, sponge rubber metatarsal pads, sponge rubber toe-blocks, with wedges built in to accomodate the deformity. Sometimes his feet were in a fair condition; sometimes they became worse. He had periods of hospitalization, during which he had some additional amputations. In 1965 he was admitted to the hospital again after a certain amount of trouble with ulcers.

FIG. 7. Plastazote toe block with high front moulding to accommodate the amputation (Fig. 6).

FIG. 8. Plastazote prosthesis. Alternative method to Fig. 7.

Progress was very slow and unsatisfactory until, in 1967, I started to use Plastazote supports for him. Care was taken to make plaster casts of both his feet for surgical footwear, and to mould Plastazote to the base of his feet under pressure. Fig. 9 indicates his condition before the amputation of his toes as they were some five years ago. He has now been wearing surgical boots, with well made Plastazote insoles,

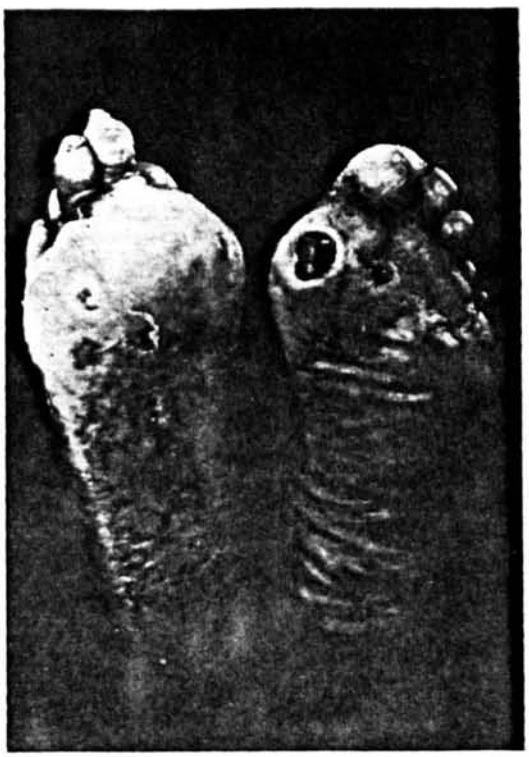

FIG. 9. Condition of feet before amputation of toes.

and is quite happy with his condition. There is no sign of ulceration, and the base of the remainder of his feet now looks very healthy.

The next case is that of another leprosy disability. The patient has had all his toes amputated, with exception of the great toe. Fig. 10 shows what is left of his foot. For a number of years he had an ulceration below the head of the fifth metatarsal, as the figure shows. It is noteworthy that the foot looks rather unhealthy. For a number of years the patient had his shoes made for him, being accommodated in the usual way with a toe block, with a very good, thick sponge rubber insole and a varus wedge to throw the weight back on to the great toe. Usually these patients cannot obtain good balance, but the problem with this patient was that he wanted more acceptable footwear.

FIG. 10. Amputation of toes 2, 3, 4, and 5.

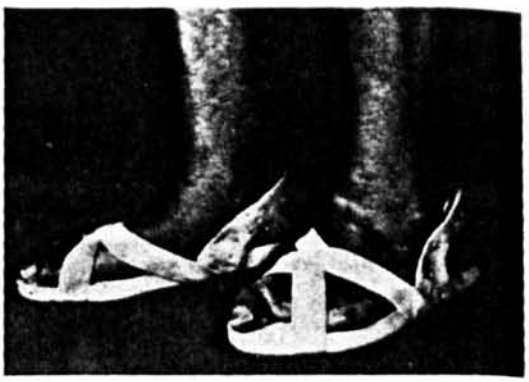

FIG. 11. Plastazote sandals to accommodate feet after amputated toes.

Figs. 11 and 12 illustrate a pair of Plastazote sandals made of one-inch Plastazote with elastic across the top and a heel piece also made of Plastazote. In order to counteract slipping we have put some extra padding inside, as can be noted at the left. The patient is now able to wear this type of sandal in the house and also on holiday; he considers it to be a very great advantage both for his summer footwear and for use in the house. It will be agreed that it is a great comfort to obtain freedom from uppers over

FIG. 12. Plastazote sandals illustrating elastic straps.

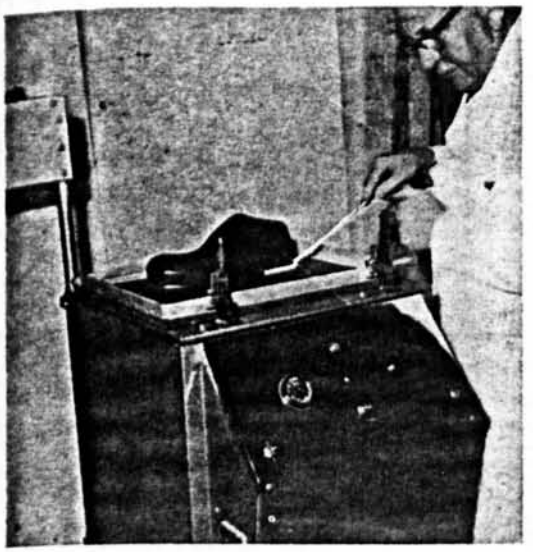

FIG. 13. Vacuum-formed Plastazote over the last, seat-forming tool being pressed around heel to permit good grip of the Plastazote around the seat.

FIG. 14. Last and Plastazote ready to be removed from the platform of the vacuum-forming machine.

the foot in this type of deformity. There has been no question of any ulceration at all since this support has been supplied.

Patients who have had an ulcerated condition of their feet are often in hospital for a considerable period because they cannot wear their normal footwear. By using vacuum-formed Plastazote for the uppers, and micro-cellular soles and heels directly attached to the Plastazote, extraordinarily light and comfortable footwear can be provided. This footwear is made very quickly, and the vacuum forming is carried out over the cast or last of the affected feet (Figs. 13, 14, 15, 16, 17, 18 and 19).

In the light of a number of cases in which the old method of sponge rubber insoles with pads and toe blocks was used, there is no doubt that patients with partial amputation of the foot prone to ulceration, and with deformities that result in uneven balance, derive enormous benefit by having

FIG. 15. Edges of the white lining of the Plastazote thinned down so that this can be lasted over the base of the last.

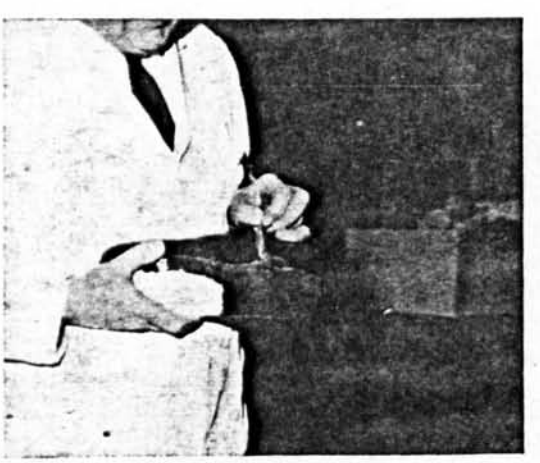

FIG. 16. Plastazote lasting over the last and stuck to Plastazote insole.

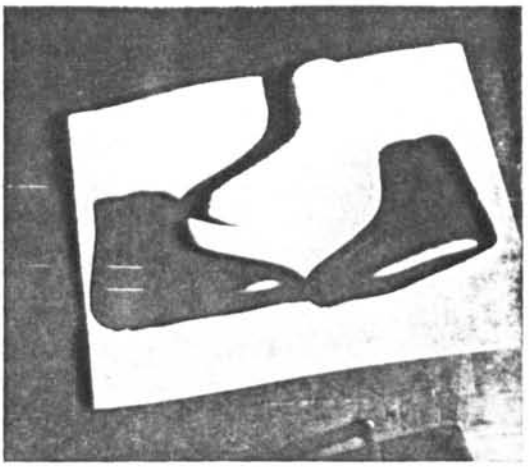

FIG. 17. Plastazote boot, upper vacuum-formed in two halves.

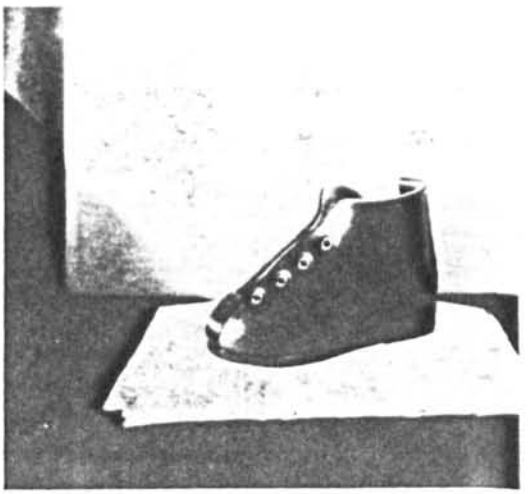

FIG. 18. Completed Plastazote boot.

Plastazote insoles moulded directly to the base of their feet. Another advantage is that Plastazote is completly washable although water-repellent, and can be perforated for ventilation if required.

It is important, however, to remember that when the Plastazote supports have been in use for a period of time it is always necessary to reinforce the supports by adding quarter-inch thick Plastazote under the depressed area. This should be fixed to the original support by a rubber solution (Fig. 20). The support itself should not be remoulded.

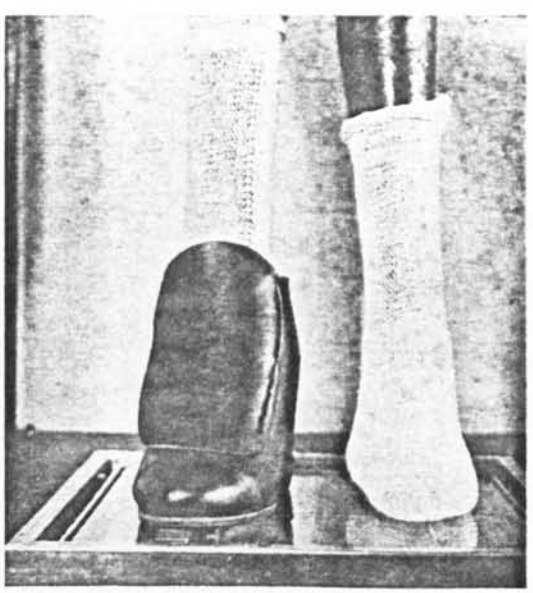

FIG. 19. Plastazote boot for leprosy patient.

SUMMARY

This paper deals with footwear for partially amputated feet of patients in towns and cities who require either surgical footwear made to measure or normal footwear which can be adapted surgically. It includes (a) problems associated with amputation of the great toe, including balance, relief of pressure, and stiffening to prevent deformity, (2) unilateral amputation of all toes and associated complications, (3) bilateral amputation of all toes, with similar complications, but with the added possibility of rocker soles to correct the gait, and (4) amputations through the midtarsal area where major prostheses are necessary. Descriptions are given of the use of sponge rubber, cork and Plastazote for weight distribution and relief, and of the manufacture of suitable footwear by the vacuum-forming method.

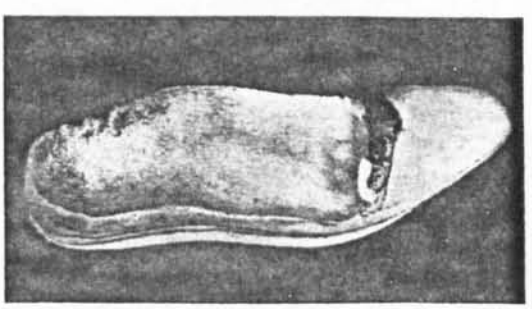

FIG. 20. Plastazote insole for leprosy foot showing reinforcing layers underneath the original insole and added as required.