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Splinting with a New Thermoplastic Material

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PLASTER OF PARIS splints for the hand, wrist, and fingers have been used successfully in our clinic for more than 550 patients.[1] The relatively short life of plaster splints often offsets their advantages, however, especially if the patient is discharged and is unable to return for a replacement when necessary.

A material which can be handled safely and fashioned into a well-fitting splint simply and quickly was sought. We have been working with both synthetic and natural balata since 1965 in co-operation with the Department of Chemistry of Delaware State College. The sheets of material used for fabricating the splints were made from compounds based on transpolyisoprene which has long been used for golf ball covers and has unique thermoplastic characteristics. Transpolyisoprene and certain of its analogs harden by a crystallization process unlike most thermoplastics and are particularly useful for making splints and supportive therapeutic devices.[2] It becomes plastic, self-adherent, and moldable when heated above 50 degrees Centigrade. Once softened, it can retain these thermoplastic characteristics for several minutes below the softening temperature before hardening to a rugged semirigid state.

Natural balata (precipitated), synthetic balata,* and blends of the two polymers were tried. The basic polymers were compounded with pigment, titanium dioxide, and an FDA-approved stabilizer. Milled stock was then pressed to smooth finish sheets 130 mills thick using conventional procedures.

Experience indicates that both the natural balata and the synthetic balata work equally well. As a practical matter we expect to continue to use the synthetic balata because of its considerably lower cost. This is a firm (but not rigid) substance whose surface has a slight degree of "give" in contrast to the glass-hard finish of other available materials which have been tried. This is important from the point of view of patient comfort and tolerance.

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* From the Polymer Corporation, Ltd., Sarnia, Ontario, Canada.

FIG. 1. Functional wrist splint.

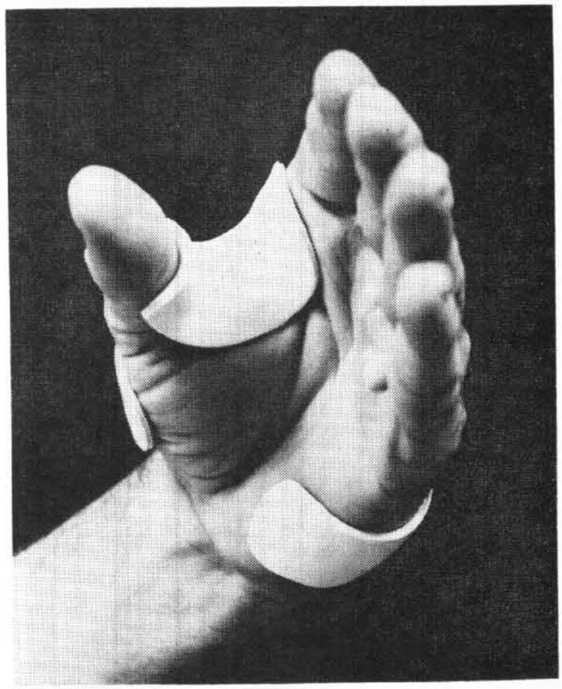

FIG. 2. Opponens splint.

Properly compounded, synthetic balata is white, resists soiling, and is readily cleaned with soap and water; it is therefore entirely acceptable cosmetically. It does not crumble or crack like plaster of Paris.

PREPARATION OF THE SPLINT

In preparing the splint, a sheet of balata is dipped into hot water (just under the boiling point). In ten or fifteen seconds it has softened enough for shaping, and can be applied to the skin without burning. At this stage it can be cut with ease using ordinary scissors. It molds very well, conforming to the contours of the wrist and fingers, as well as to the individual joints of fingers. Sufficient time is available for completely molding the splint before it begins to stiffen (about two minutes). The material is then hardened rapidly by dipping in ice water. To retain a good fit, the splint is not removed from the hand, but the patient is asked to dip the hand in ice water repeatedly until the degree of firmness is adequate to maintain its shape and form. This takes about thirty seconds. An interesting and useful quality is that if more time is required for cutting and molding, the material is simply kept in hot water a little longer, thereby increasing

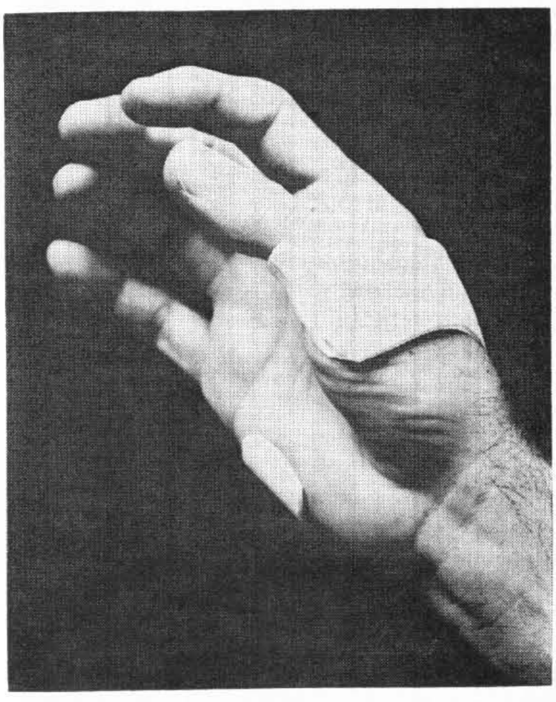

FIG. 3. Splint to stabilize metacarpophalangeal joint of the thumb.

the time during which it remains soft. In addition to its inherent capacity for being shaped, balata can also be stretched, a quality which enhances its total adaptability for splints. When warm, it also has the characteristic of sticking to itself which is of value when making various forms of cylindrical splints.

A sharp edge may be left after cutting the balata with scissors. If the rough edge is in contact with the skin or capable of causing discomfort, it is easily softened by heating with an alcohol lamp, and then rolled smooth.

A total of thirty-four splints have been fabricated using balata. Almost all of these have been wrist and finger splints. A functional wrist splint which permits manual function while protecting the inflamed and painful wrist has been its chief use (Fig. 1). Another use has been for opponens splints (Fig. 2). Most of the other fabricated splints have been used for stabilizing specific joints such as supportive splints for the metacarpophalangeal or interphalangeal joint of the thumb (Fig. 3).

CONCLUSION

Balata splints have been successful in most instances and achieved the desired purpose. They substitute well where plaster has been previously used. It would appear at this time that the balata splint in a practical sense is permanent in that it will last for a number of years.

Another material, Orthoplast Isoprene,* has recently become available, and unlike Orthoplast Vinyl appears to have characteristics similar to the synthetic balata reported here.

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* Manufactured by Johnson and Johnson.

REFERENCES

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2. Larson, Lester M., Canadian patent 746,291 (1966).