Polyvinylchloride Gel in Orthotics and Prosthetics

Part I

Preparation and Application of Silicone Gel

by

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The gel pads that have been used in orthotics and prosthetics for the past several years have brought considerable improvement in prosthetic and orthotics devices and in patient care for the prevention of decubitus ulcers. Because of the high cost of this material, however, many patients have had to do without these much-needed pads. One reason for the cost is that the gel formula has been based on silastic material which is very expensive. Now, however, a polyvinylchloride (P.V.C.) gel has been developed without silicone or silastic basics, and consequently, the cost has been significantly reduced. Moreover, this new material offers several advantages over the gel previously used.

P.V.C. gel has been in use at the University of Michigan Medical Center for about two years. We have found it very easy to work with, particularly since the "stickiness" inherent in such substances can readily be controlled by the

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Figure 1

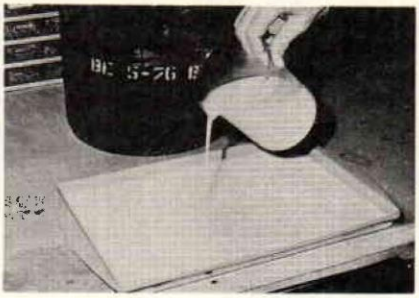

Figure 2

application of talcum powder after the gel has been processed and cooled. This simple factor greatly facilitates the covering of pads.

The key to the gel's effectiveness is its ability to displace pressures. One danger in being bedridden or confined to a wheelchair is that skin under constant pressure tends to break down, resulting in the bedsores called decubitus ulcers. At this Medical Center we have used P.V.C. gel in wheelchair pads for more than 50 patients. We have also designed and fitted breast prostheses, as well as pads of all shapes for assistive devices and artificial limbs. In our rehabilitation ward we have two gel mattresses, 36″ x 24″ x 1″, in constant use; this size covers the spinal area completely, and with separate pads for heels, elbows, and head, all pressure sites are adequately protected.

Directions for processing:

1. Mix thoroughly.

P.V.C. gel comes from the manufacturer with thick settlings at the bottom of the can. The gel must be mixed until the viscosity is uniform. Fig. 1.

2. Heat at 330°F.

In the first stages of heating, the viscosity is somewhat reduced. Fig. 2. Thereafter the gel thickens and becomes clear, and at the pouring stage the viscosity returns to approximately the same as before heating. Fig. 3. The time required is about 30 minutes at 330°F. for 2 ounces of gel, and about 3½ hours for a wheelchair pad 16″ x 16″ x 2″.

3. Pour into molds or pans.

The gel can be heated in a teflon-lined mold of the intended size and shape, or it can be heated in a larger container and poured into the proper molds. Fig. 4. It is important that the molds be lined with teflon for ease in removing the gel after it has cooled. If teflon is not available, the inside of the mold may be sprayed with silicone, which also helps to prevent sticking.

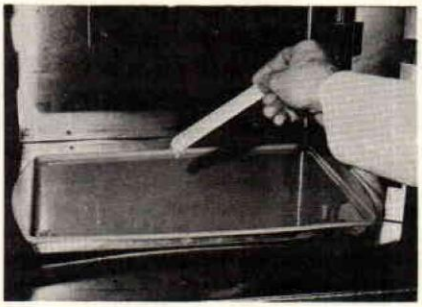

Figure 3

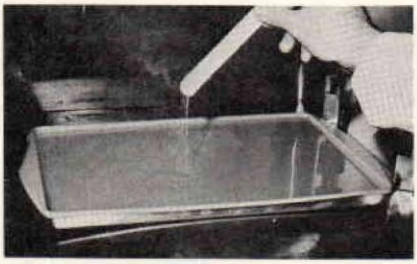

Figure 4

4. Cool to room temperature.

The gel should cool at room temperature before it is handled. The time required depends on the thickness of the pad—a ¼-inch sheet takes about 60 minutes, whereas a sheet the size of a wheelchair pad takes 6 to 8 hours. The time can be shortened by placing the molds in a cooler room.

5. Remove from molds.

Before handling the gel, sprinkle it with talcum powder Fig. 5. Then begin at one corner, using your fingertips, and carefully "peel" the gel from the mold Fig. 6. Apply talcum to the whole unit after it has been removed.

6. Apply a two-layer cover.

The pad must be covered to prevent the oil from penetrating

Figure 5

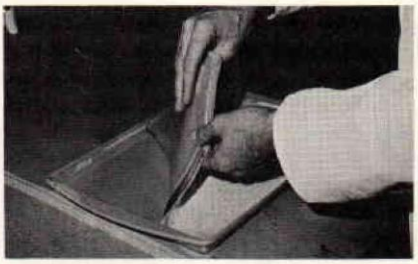

Figure 6

through the cloth cover. We have had good results by covering the pads with a polyethylene film (e.g., Tuftane)[1] before the outer cover is applied. The outer cover is usually a soft leather. Fig. 7, A, B, C. For wheelchair pads we use 12-inch cotton stockinette under the Tuftane film cover Fig. 8.

After the gel has been processed and cooled it can be reclaimed by reheating to a liquid form and used for a different application. Thus no material is wasted.

Equipment:

pyrex beaker
teflon pans
oven or bunsen burner or hot plate
tongue blades or paddle for stirring
tuftane film
cotton stockinette

Extended applications:

Very thin pads, or pads which will be exposed to rough treatment, can be reinforced with fabric. Our practice is to laminate a thin piece of cotton or nylon mesh material in the lower third of the pad thick-

1. Atco Surgical Inc.
450 Portage Trail
Cuyahoga Falls, Ohio

Figure 7A

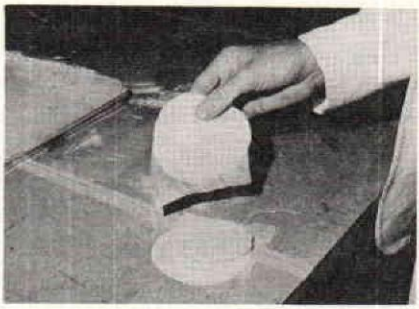

Figure 7B

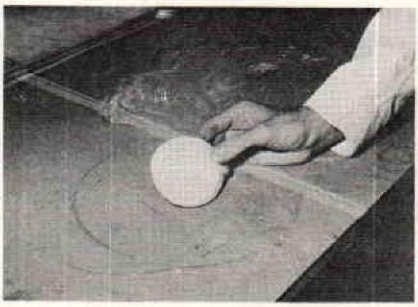

Figure 7C

ness. Cheesecloth works very well. Fig. 9.

Like the gel previously used, this new material is relatively heavy; a wheelchair pad, for example, weighs about 19 pounds. Patients who transfer such pads from chair to bed or to a car should be provided with a carrying case, for ease in handling as well as protection of the pad. Fig. 10. To help reduce the weight we have experimented with combinations of materials, for example pouring a layer of P.V.C. gel over a layer of polyester foam. In reducing the weight this also tends to reduce the efficiency of the pad; nevertheless the technique may be specifically useful for devices such as breast prostheses, where appearance and weight are more important than resistance to pressure.

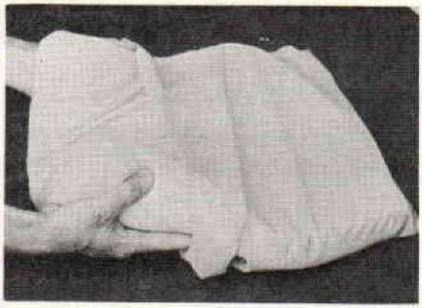

FIGURE 8

FIGURE 9

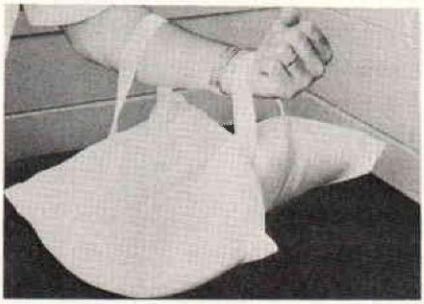

FIGURE 10

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