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An Alternative Approach to Fitting Partial Hand Amputees

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Figure 1. The prosthetist is often faced with having to treat cosmetically the length of the residual limb in the partial hand amputee.

Some surgeons believe in saving as much of the residual limb as possible when performing an amputation. Because of this, the prosthetist is sometimes faced with the challenge of producing a prosthesis for the upper limb amputee who may, in the opinion of many prosthetists, have too much of the original limb left to treat cosmetically (Figure 1). We are accustomed to having room for a wrist unit at the end of the socket to contain the terminal device. For those of you who have run into this situation, I would like to share what I have found to be a successful solution.

These amputees are usually strong, and eager to use the affected limb to its full advantage. They are also usually unwilling to have surgical revisions made. In most cases, by the time of prosthetic intervention, the residual hand is already being used to assist the sound side. In addition, little atrophy may be apparent due to the partial usage.

Selection of a terminal device may be a problem because of the length of the device added to the traditional prosthesis. The Prehensile Hand® which is available through Therapeutic Recreation Systems, Inc.,[1] has the ability to set the functioning surfaces of the device in the proper relationship with the extremity (Figure 2).

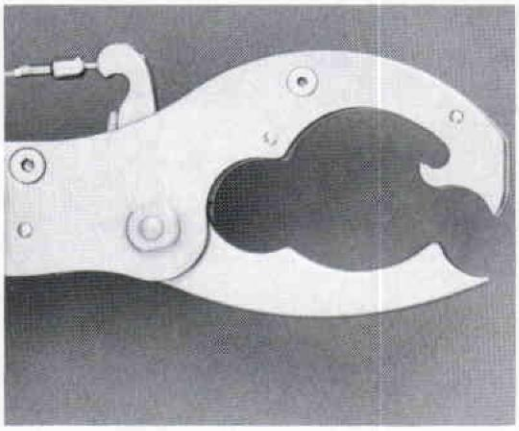

Figure 2. The prehensile hand, supplied by Therapeutic Recreation Systems.

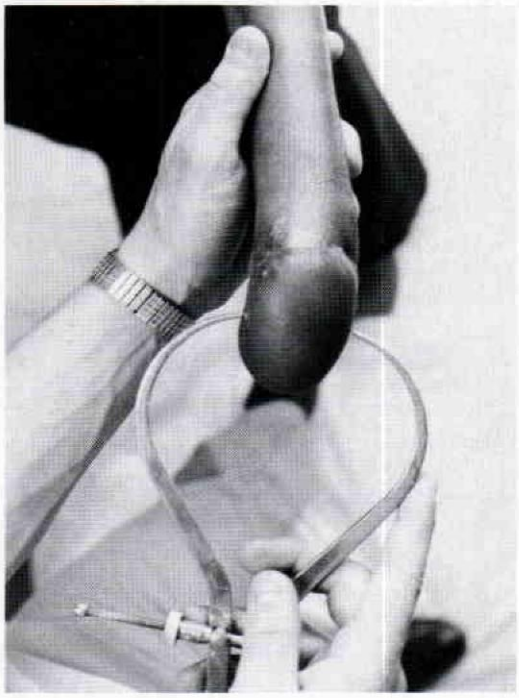

Figure 3. As a result of the bulbous shaped distal end, suspension may be achieved easily.

Furthermore, this voluntary closing terminal device blends well into the natural reflex habits of the amputee, so the ease of its use is also a plus with this type of prosthesis.

The advantages of the partial hand amputation become apparent as one forms the socket. As a result of the bulbous distal end, suspension may be achieved easily by the use of an expandable dorsal window (Figure 3).

The same provisions for the loading and unloading of forces are taken in making the negative mold as with any other upper limb casting procedure (Figure 4).

Supination and pronation are not usually blocked at this level. Full advantage can be taken of this control by getting a narrow medio-lateral dimension with the negative mold (Figure 5).

Figure 4. Provisions for the proper loading of forces begin, as always, with a good cast.

Figure 5. Supination and pronation control may be maintained by obtaining a narrow medio-lateral dimension in the negative mold.

Fastening the terminal device to the prosthesis is accomplished by removing the threaded male base plate, which is attached to the Prehensile Hand with two hard screws, and applying a new foundation, which is created by duplicating the same dimensions of the distal end of the base plate with a piece of S.T. 2024, ¼" × 2" aluminum bar and riveting a stabilization bar (Figure 6). Another plate of stainless steel is shaped to fit the flat surface of the aluminum base and yet be contoured to the volar distal end of the socket. This base plate is to be laminated into the socket.

The new socket base plate is tapped to receive screws placed through clearance holes in the aluminum base. Other multiple holes are drilled in the stainless steel base plate to increase the mechanical bond created at the time the plate is laminated into the prosthesis.

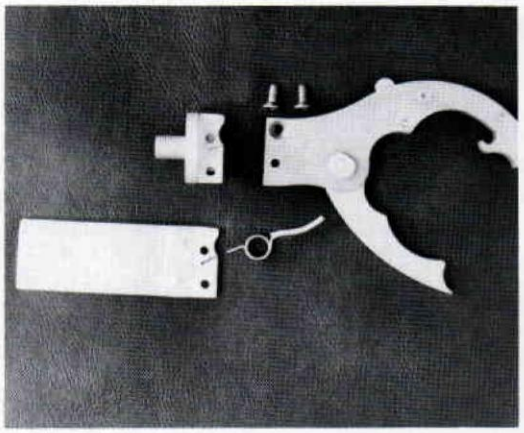

Figure 6. The component parts of the terminal device showing the new adapted flat base plate which replaces the threaded standard base plate.

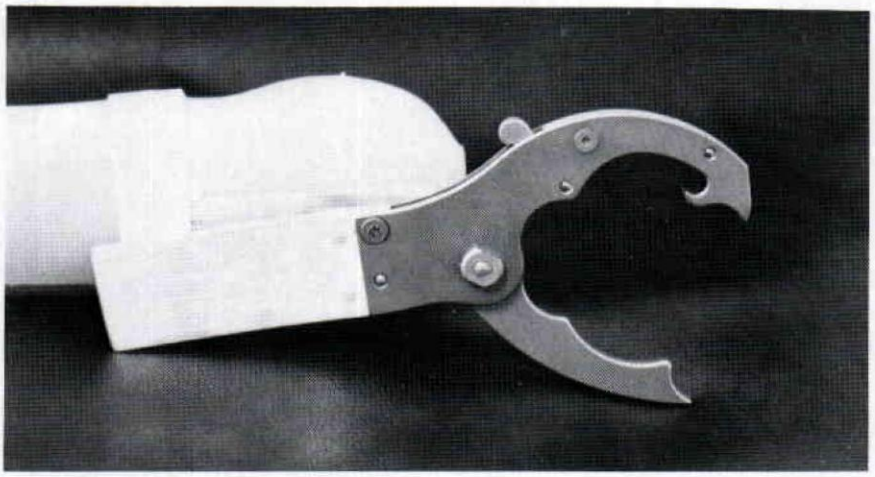

Figure 7. At the time of the trial fitting, adjustments may be made to place the terminal device in the position of best function.

At the time of the trial fitting, examine the socket as usual, and make any necessary adjustments. The stainless steel plate can now be positioned to hold the prehensile hand in the most functional position (Figure 7).

To complete the prosthesis, laminate the stainless steel plate in place and align the terminal device. Don the prosthesis using the dorsal window and the Velcro® straps. The cable may now be aligned (Figure 8).

We have found that a #9 harness affords the best function of the device (Figure 9). The adaptability of the amputee with ease of function has been gratifying. He not only can perform intricate movement, but is also capable of heavy manual labor as well (Figure 10).

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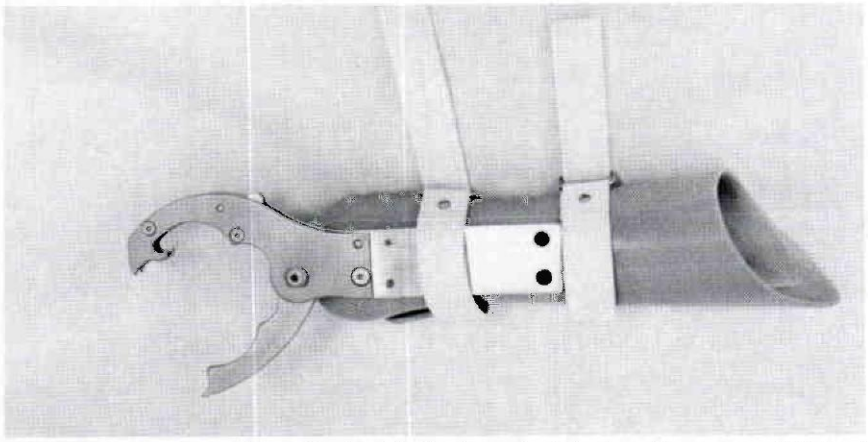

Figure 8. The completed prosthesis with final terminal device alignment and Velcro® closures.

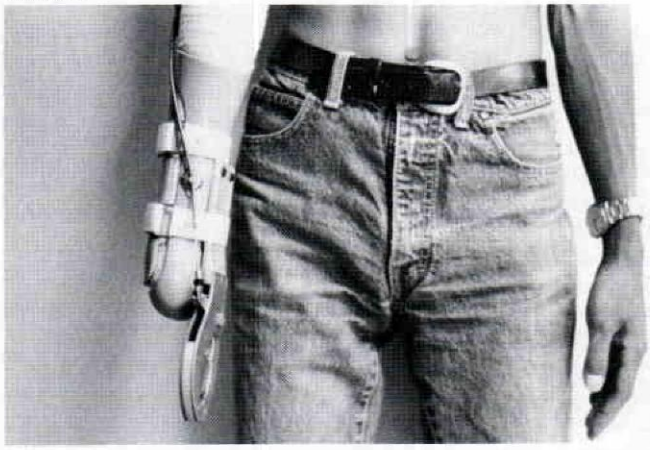

Figure 9. The appearance of the finished prosthesis on the patient demonstrating approximation of length.

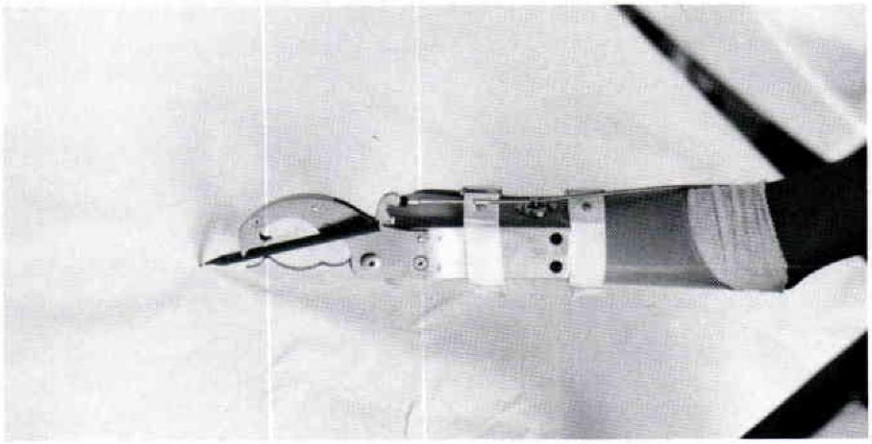

Figure 10. The patient, while able to participate in heavy manual labor, is also capable of intricate movement.