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A NON-STANDARD ABOVE-ELBOW PROSTHESIS FOR A MULTIPLY HANDICAPPED PATIENT

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The multiply handicapped above-elbow amputee may find the standard prosthesis for that level too elaborate and cumbersome. When this is so a non-standard prosthesis which accommodates the limited potential of the wearer is indicated.

A 71-year-old female, who was referred to the UCLA amputee clinic by an occupational therapist, had a left elbow disarticulation at the age of six due to trauma. Although she was fitted with a prosthesis at that time, she discarded it later, and for many years performed daily activities satisfactorily with the sound arm and the amputation stump.

At age 70, the patient had a cerebrovascular accident that resulted in paralysis of the right arm and leg. As a consequence, she required assistance in all self-help skills, but learned to ambulate to a limited degree in a wheelchair using her unaffected left leg.

Upon examination, the patient had normal range of gleno-humeral motion on the amputated side. The presence of the wheelchair interfered with scapular motion and humeral extension. Her muscular strength was good, although she tired quickly.

During the initial evaluation the patient explained that her main priorities were independence in feeding and in operating the wheelchair brakes. She assured us that cosmesis was of minimal concern. To these we added several other requirements of the prosthesis. It would have to be light, require minimal training, and be versatile enough to allow an increasing variety of tasks.

A standard above-elbow prosthesis was considered, but several disadvantages precluded its use. The patient possessed neither the energy nor the agility required to operate and position the prosthesis in space, such as is necessary for eating.

Owing to the patient's physical limitations, a non-standard prosthesis was designed. The functional objectives were achieved with a double-walled socket, a passive adjustable elbow joint, and a short forearm section. A Dorrance 99X hook was used (Fig. 1).

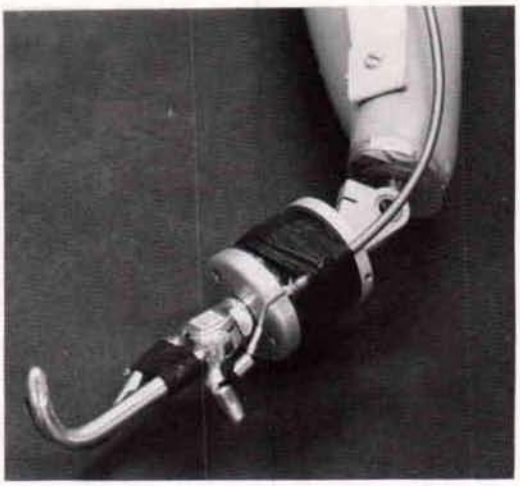

Fig. 1. Special purpose elbow-disarticulation prosthesis provided a hemiplegic. A Hosmer "Universal" shoulder joint is used for the elbow joint.

The socket was trimmed proximally to facilitate maximum range of motion. Distally, it was flattened enough to stabilize the epicondylar area sufficiently to make humeral rotation useful.

A Hosmer "Universal" shoulder joint was used as an elbow joint (Fig. 1) because it permits a wide range of adjustment about three axes; 360° of elbow rotation, 360° of forearm rotation, and 200° of elbow flexion and extension. Specific prepositioning allows for each task to be performed with maximum efficiency. For example, the prosthesis can be adjusted to a position where the terminal device can hold a spoon and maintain it level while food is picked up and placed in the mouth (Fig. 2). It can be oriented also to

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Fig. 2. Patient using the special purpose prosthesis shown in Figure 1 to eat.

facilitate other activities such as operation of the wheelchair brakes (Fig. 3). The patient prepositions the hook and forearm by pushing the prosthesis against the sound leg or the wheelchair armrest. The short forearm accommodates the length of a spoon or fork. Terminal device control was omitted during the initial training and evaluation period to avoid reaction to complexity.

After three sessions with the occupational therapist, the patient was able to feed herself after the eating utensil had been adjusted in the hook. She was given two more weeks of practice, then fitted with a standard single-control Bowden cable for active hook operation. The distal cable housing retainer was placed on the forearm to assure that the elbow position would not change during hook operation.

At the present time, eight weeks after beginning her training with the prosthesis, the patient is able to feed herself and operate the brakes of her wheelchair. She is improving her dexterity with the prosthesis by manipulating dominoes, tracing printed designs on paper, and watercoloring.

Fig. 3. Use of special purpose prosthesis shown in Figure 1 to operate wheelchair brake.