Former Patient Designs Prostheses With Emphasis On Functionality

By LORI J. BATCHELLER, MPT

Imagine losing a limb in the height of youth, or at any age, for that matter. Coming to terms with such a loss can be a painful process; yet what seemingly devastates and disables some can for others lead to a new career and an opportunity to help those with similar disabilities.

For Bob Radocy, the loss of his left arm while a senior in college has led to a career designing prosthetic hands. Mr. Radocy was involved in a motor vehicle accident in 1971.

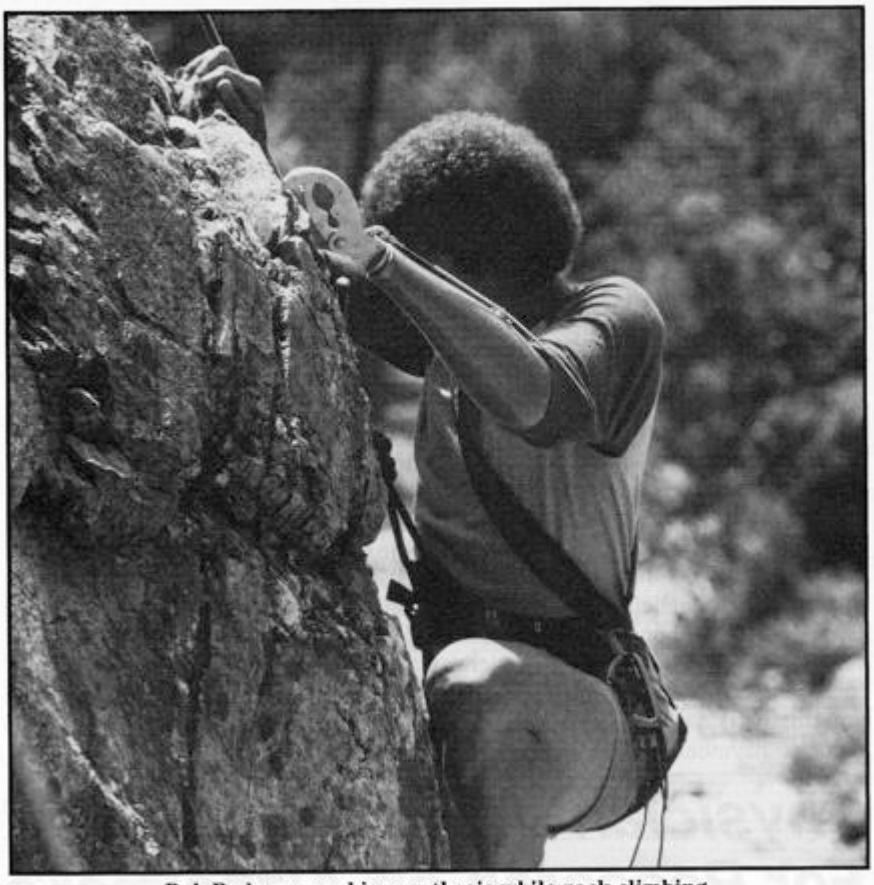
"My car collided into a truck and I was left as a below-elbow amputee," he said. This was at the age of 22, while he was attending college in Florida. Six months after the accident, Mr. Radocy was fitted with his first prosthesis, a standard split hook device. He wore this prosthesis for five years while he worked as a field engineer, and after being transferred to Denver he decided to make a career change.

"I actually wanted to become a physical therapist," Mr. Radocy said, "but because of my grades I was discouraged in this endeavor." Instead, he chose to pursue a master's degree in recreational therapy at the University of Colorado.

During this time, Mr. Radocy became dissatisfied with his split-hook prosthesis and started to research patents. He then incorporated his structural drafting experience from previous jobs with the information he was learning in graduate school and designed his first prosthesis.

"The first one cost about $700 to make. I designed it during my first year of graduate school and had a machine shop build it," Mr. Radocy said. The model was based on the size of his own hand.

"It couldn't feel through [my split-hook prosthesis], and it didn't seem like a functional component," he said.



Bob Radocy uses his prosthesis while rock climbing.

'Being able to recreate shows people they can go back to their previous activities.'

In order to be truly functional, the prosthesis requires bilateral gripping power for instances in which heavy objects requiring both hands are picked up. The split-hook design reduces the function to a pinch only, Mr. Radocy said, stressing the need for a prosthesis that more closely emulates the human hand.

With this in mind, Mr. Radocy devised a prosthesis which utilizes a three-chuck pinch. The design also gives palmer grip for cylindrical, rounded objects. With his prosthesis, gripping power emulates that of a human hand (60-70 pounds for females and 100-110 for males).

In 1979 Mr. Radocy started his Boulder, Colo.-based company, SPA, with a professor from the University of Colorado. His partner also shared an extensive understanding of disabilities as he was disabled during the Vietnam War era. Funding for their company came from a business loan for disabled persons, and soon Mr. Radocy and his partner decided that simply marketing one product was not enough. The following year they brought out a second model.

Financial problems in 1982 resulted in Mr. Radocy's partner leaving the business, and at that time he turned to designing children's prostheses.

More than anything else, Mr. Radocy describes the main focus of his prostheses as "function." For instance, in addition to the advantages of the three-chuck pinch and palmer grip, the SPA system is an active hooking system with a voluntary closing.

While the split hook, a passive closing system, uses humeral flexion or bilateral scapular adduction to activate the hook, Mr. Radocy found this arrangement extremely limiting. Instead, the SPA system uses humeral flexion and bilateral scapular adduction with the addition of elbow flexion to create an active hooking system with voluntary closing.

The Army Prosthetics Research Lab also has designed a voluntary closing

(See RADOCY, page 40)

Disabled Athlete Designs Line of Prostheses

RADOCY

(Continued from page 4)

prosthesis, the APR hook, but Mr. Radocy said the prosthesis "looks like a hook." His prosthesis can be described as "not a hook, not a hand," Mr. Radocy said. It utilizes titanium for the side plates and polyurethane rubber for the gripping surface, thus making it durable.

Since developing its first design, Mr. Radocy's company now offers a variety of prosthetic devices geared toward both function and recreation, called the Super Sport Devices. As an avid golfer, rock climber, archer and windsurfer, Mr. Radocy said a real need exists for prostheses which are functional in a recreational and sports setting. In order to play a sport such as basketball, for instance, an athlete needs a hand with a palmer surface.

As a solution, one Super Sport model uses the volar surface of the palm to control the action of the ball. The wrist flexion and extension of this prosthesis also allow more natural movements necessary for gymnastics such as tumbling and floor activities, emulating normal wrist movement. The hand even serves as a protective aide for the stump as it absorbs and stores energy, and it serves to protect other players in sports such as racquetball from possible injuries from the prosthesis.

In addition, Mr. Radocy designed a golf device not only to simply hold a club, but also to enable the golfer to have power and control. With these needs in mind, the golf device has a flexible wrist, duplicating wrist flexion and extension with forearm supination and pronation. The device can be used competitively as well as functionally, and it is, as far as Mr. Radocy knows, the only prosthesis designed for tournament play.

Meanwhile, an upper extremity amputee does not have supination and pronation, a factor Mr. Radocy has taken into account in designing a swimming device. The prosthesis has "flexing fingers," a paddle which collapses and opens to enhance adaptability for different strokes. The "hand" opens in response to the downward stroke and closes, offering less resistance, coming out of water.

By using the design of a lacrosse stick head, Mr. Radocy has designed a bi-directional glove for baseball which eliminates the need to pronate. This enables the player to react spontaneously to the oncoming ball, just as an able-bodied player would. Named the "Hi Fly Fielder," this prosthesis conforms to mitt size requirements of the baseball association and comes in child and adult sizes.

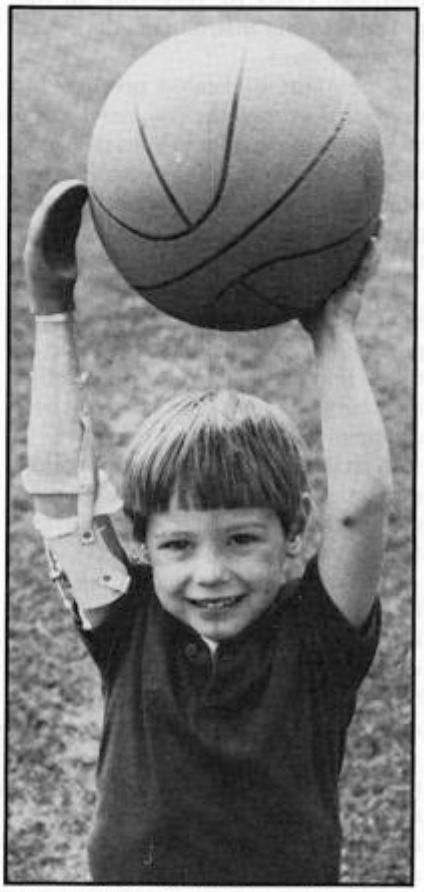
In designing his prostheses, Mr. Radocy wanted to create products which were "in a reasonable price range for a person who can then excel and be competitive with a two-handed person."

As such, Mr. Radocy said that an advantage of his products is that the voluntary closing system with an anchored cable allows a user to feel the amount of energy being used through the harness.

In this way, the user can discriminate the amount of force being used, and the system can be learned relatively quickly. Retracting the shoulders to open the hand harmonizes with the body's normal movements and muscle use.

With an anatomical hand, resistance is proportional to output, and Mr. Radocy's prosthesis offers the same control. Generally, the split-hook device is more difficult to learn and uses an adduction pinch which is not functional, he said. Electronic hands, although more aesthetically pleasing, are expensive and subhuman in performance tests, he added.

In describing his own prostheses, Mr. Radocy acknowledged the importance of their functional advantages, also providing a tip of the hat to the important role that physical therapists and doctors can play in rehabilitating an injured person.



A user of Mr. Radocy's prosthesis enjoys playing basketball.

"There is a real psychological aspect which is the key to rehabilitation. Being able to recreate shows people they can go back to their previous activities," he said.

Lori J. Batcheller is a practicing physical theapist and a freelance writer residing in Boulder, Colo.

Long-Term Care Conference Calls for Sessions

A "call for sessions" has been issued for the 8th Annual Private Long Term Care Insurance Conference to be held on Sept. 8-10, 1992 in San Francisco.

The meeting provides a forum for the exchange of knowledge and practical strategies related to long-term care insurance.

It is attended by insurance company representatives, consumers, providers, state and federal government officials, agents, brokers, and advocates for the aged.

Interested speakers should contact Diane Johnson Fulton of the Blue Cross and Blue Shield Association at (202) 626- 4792, and completed proposals must be received by March 30, 1992.