SELECTED CASE REPORTS FROM THE CHILD AMPUTEE PROSTHETICS PROJECT, UNIVERSITY OF CALIFORNIA, LOS ANGELES

By Robert Mazet, Jr., M.D. and Harry Campbell, C.P.

Editor's Note: This is the third in a series of case reports from the Child Amputee Prosthetics Project, University of California, Los Angeles. Previous reports appeared in the September 1959 issue of this Journal, pages 44-50, and in the December 1959 issue, pages 49-53.

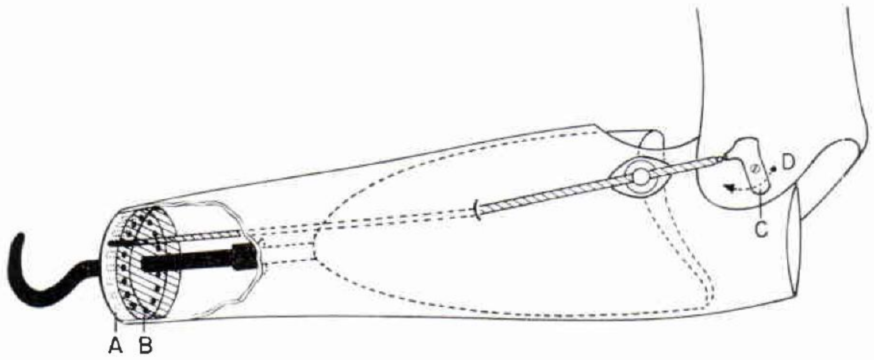
The Child Amputee Prosthetics Project is an outgrowth of the Research Program in Upper Extremity Prosthetics which commenced in the Engineering Department at U.C.L.A. in 1946. The desirability of including children in the investigative program became evident several years later. In 1953, the Department of Prosthetics asked Dr. Robert Mazet to institute a research program in children's prostheses at the Marion Davies Clinic. This was done in cooperation with Dr. Craig Taylor from the Department of Engineering and Dr. Milo Brooks of the Department of Pediatrics. Soon after the inauguration of the program, it became evident that some financial support was necessary. A grant from the U. S. Children's Bureau administered through the state's Crippled Children's Services was secured in 1955 and has supported the organization since that time. This effort has always been a multidisciplinary activity. In addition to orthopedists, engineers and pediatricians, there are, on the staff, a psychologist, a social service worker, two prosthetists and three amputee trainers. Other consultants, such as plastic surgeons, dentists, cardiologists, etc. are called in when needed.

V—R.G.

A 15-year-old boy sustained bilateral below-elbow amputations as the result of a chemical explosion in his home laboratory in 1953. Surgical revision and closure were done within a few hours. Healing was without incident. Moderate stump tenderness persisted for several months. The right forearm was 5 inches in length, the left 5½ inches. There was 15° pronation and 10° supination on the right, 20° and 15° on the left. Four months post trauma, he was supplied with prostheses. An experimental forearm rotation unit (right), wrist flexion units (B), with interchangeable Northrop 2 load hooks and APRL hands were incorporated in these.

His family afforded him maximum support and understanding. He made exceptionally good adjustment to his handicap from the beginning. He became a constant prosthesis wearer and a very good user with minimal training. His case folder is replete with notations such as "replaced broken retainer," "new cable today," "broken spring in 2 load hook," "right rotation unit had broken spring," indicating constant hard usage. He is of above average intelligence, and was happy to co-operate in evaluating the various devices he used. In September 1956, he was given a strait and a canted Dorrance hook. He rejected the hands within a year, since they were functionally much less useful to him than the hooks.

He reported a preference for the lyre-shaped fingers, he liked the wide opening of the 5x hook, but in general preferred the precision of the 2 load hook to the elastic tension of the Dorrance models. The APRL hook was rejected because it gradually lost the last fraction of an inch of pinch, and



WRIST ROTATION UNIT

When elbow is extended the cuff swings around axis of elbow joint, pin D rotates, activating bell crank lever C, which pulls on cable withdrawing pin from hole in rotating disc of wrist unit A. The stump rotates inner socket, dotted line, which in turn rotates shaft to which terminal device is fixed. Outer socket and stationary disc B do not rotate.

he felt he could not depend on it. He liked it for sustained constant pinch, as in holding a sandwich. He consistently resisted every suggestion that his wrist flexion and the rotation units could be dispensed with. They have been of great use to him. He finds the 2 load hooks are more useful for fine work at home and in school. For heavy work, he uses Dorrance 5x hooks.

He expressed a desire for an adapter which would enable him to shoot a pistol. One was fabricated and he uses it well. This device has been previously described.[1] Other hobbies have been experimental gardening, doing his own mechanical work on his car, and working in his dark room.

It is now almost six years since his initial fitting. His enthusiasm for the wrist rotation and flexion units persists. The original experimental APRL double-walled active wrist rotation unit succumbed to five years of hard usage. A new one was improvised by modifying a standard passive Hosmer PL-100 wrist unit. Outside the standard single-walled forearm socket, a second socket was fabricated. The outer socket, or shell, contains the Hosmer wrist unit. A ½″ tube threaded ½ x 20 was incorporated into the distal end of the inner socket (Fig. 1). The end of the threaded tube is fixed into the rotating portion of the wrist unit. Pro-supination of the inner socket then rotates the wrist unit and terminal device while the outer socket remains stationary. Control of the positive lock is by means of a cable from elbow hinge to pin in wrist unit. A lever (C) attached to elbow hinge puts tension on the cable to pull pin out of its slot in movable disc A and unlock unit when elbow is extended. Active rotation is then possible. The outer socket, and fixed disc B do not rotate. Elbow flexion permits the pin to drop back into its slot, locking the wrist in the desired degree of rotation.

He is presently employed full time as a sales representative for a photographer's shop. This case demonstrates: (1) the utility and desirability to a young amputee of the wrist rotation unit, (2) the feasibility of fabricating such a unit by modifying commercially available components, (3) rehabilitation of a patient who desired to be self supporting.

[1] See "Pistol Attachment Device," page 62 in Prosthesis for the Child-Research Notes, Harry E. Campbell, Orthopedic and Prosthetic Appliance Journal, 12, 57-64, 1958.

VI—F.G.

Experience in bilateral fitting of short AE and shoulder disarticulation prostheses by the several groups interested in these problems at UCLA has repeatedly demonstrated that cross interference of the controls is a serious problem, which significantly interferes with function of the devices and is often exceedingly exasperating for the patient. On numerous occasions it has been necessary to abandon bilateral fitting in these people in order to permit unilateral function which has a useful range, is smoothly performed, and does not require the patient to divide his attention and efforts in shutting out the interfering involuntary movement of the opposite prosthesis.

In January 1956, an 11½-year-old boy was referred to the CAPP for prosthetic prescription. At the age of 8, he had backed up too near a caged bear. The animal tore the left arm off near the shoulder. Astonished and incensed at such misconduct on the part of the bear, he instinctively tried to retrieve the part with his remaining hand. The bear promptly disarticulated the right shoulder (Fig. 1). He had been using prostheses made elsewhere for two years, with reported fair function. These needed replacement. The left stump was 1″ in length, dictating SD prosthesis on both sides. A right prosthesis and left shoulder cap with UCLA (canted) shoulder plates,[1] nudge control elbow lock, manual wrist rotation, and 88x hook were fitted in April (Fig. 2). There were six siblings and no father. The mother needed both financial and psychological assistance.

The boy exhibited practically no prosthetic use. Nine training sessions with several minor adjustments to prosthesis and harness and addition of D ring to trouser zipper, resulted in limited use for eating, dressing, and toilet activities. The therapist from his local school was present at the final session to work out a program for him. His psychological adjustment to this handi-

[1] Unilateral Equipment for Bilateral Shoulder Amputees, in Manual of Upper Extremity Prosthetics, Dept. of Engineering, Univ. of California, Los Angeles, 1958, p. 294.

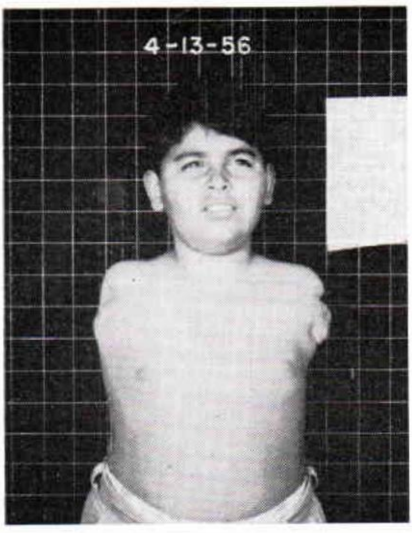


Figure 1—Showing very short left AE and right SD amputations.

Figure 2—Showing single right prosthesis.

cap was quite good, but an underlying fear and uncertainty appeared on testing.

Two months later he demonstrated better general use; specifically, he used pen, pencil, and hammer. Unfortunately conflict developed between patient and local therapist causing him to avoid training whenever possible. His mother reported good use in household tasks, and complete urinary independence. Five months after receiving the device he felt that he could not go to the movies without it as he would not be able to go to the toilet alone. At the end of a year there was much spontaneous use. He attended a camp for handicapped children the next summer where he made a good adjustment. He became an exceptionally facile single prosthesis user with good understanding of mechanisms, use, and limitations of the device. He was, therefore, after fifteen months of use, selected for evaluation of bilateral devices. Trial fitting with two arms was made. On the left there was perineal strap activation of forearm flexion and TD operation. Biscapular abduction was utilized for these on the right. He could handle two prostheses when their controls were thus separated.

A special bowling attachment has enlarged this boy's sphere of activities with beneficial results (Fig. 3). His efforts in this are being sponsored by a local bowling establishment, and he is attaining some proficiency in the sport.

Good use of a single prosthesis in a bilateral SD amputee is more valuable than poor use of bilateral prostheses, particularly where there is cross control interference. When separated, non-interfering controls are used, bilateral function is considerably greater.

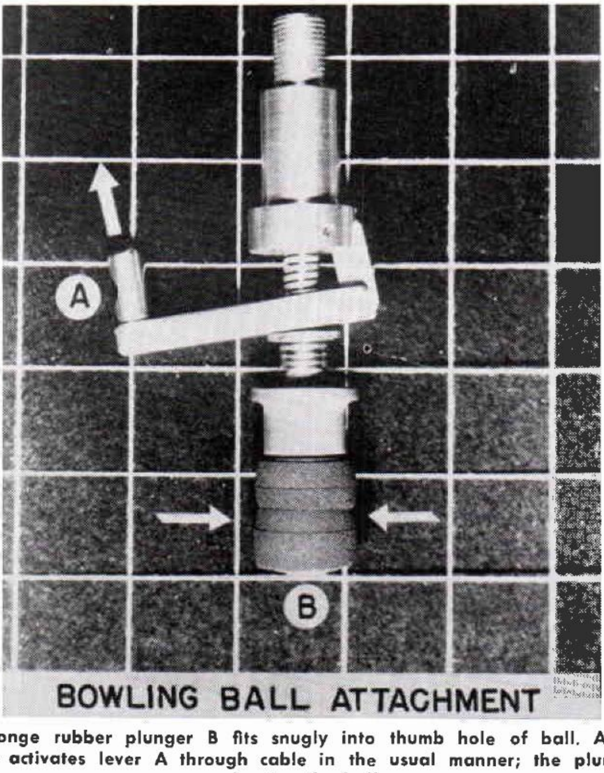


Figure 3—Sponge rubber plunger B fits snugly into thumb hole of ball. At the end of swing patient activates lever A through cable in the usual manner; the plunger contracts releasing the ball.