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POST HOSPITAL FOLLOW-UP OF THREE BILATERAL UPPER-LIMB AMPUTEES

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In a recent period of one year, we admitted to the Kessler Institute for Rehabilitation three married white males, ages 37, 38, and 41, all with a history of sudden onset of traumatic bilateral upper-limb amputations. They were all admitted for their rehabilitation training between two and four months after their injuries, and none had been exposed to prosthetics or training in their use. All three were of working-class backgrounds with rural or small-town educations and working experiences. In addition, their interests and hobbies were similar.

One of the patients had bilateral above-elbow amputations, and the other two had bilateral wrist-disarticulation amputations. Each was fitted with a standard upper-limb prosthesis with a figure-eight, O-ring harness. The terminal devices were Dorrance hooks and hands of different varieties depending on their needs and future vocational goals. Each, during their stay at the Institute, achieved a significant level of independence with their prosthetic hooks. This independence included a completed course in driver education with re-licensure following retesting by the motor vehicle bureau. Every attempt was made to interest the patients in future reemployment, either with their former employer or in a position more compatible with their present disability. This was successful in one instance, partially successful in the second, and a failure in the third.

We thought that it would be interesting to visit them in their home environments two years after their discharge from the Institute to ascertain their level of prosthetics use and independence. The visit was made by the co-author of this article, a person who had been personally involved in the prescription, fitting, and training of each of the patients as their occupational therapist. She also worked in close liaison in each case with their activities-of-daily-living nurse in their functional retraining in the vital area of self-care. She had a personal concept in each case of what they had accomplished and was thus able to better assess their losses and their gains over the intervening two years since they had been trained.

The primary objective of the visit was to assess their levels of independence both with and without their prostheses. She would also determine their dependency on the prostheses as well as their present level of prosthetics skill. Of interest also was the follow-through towards the vocational, avocational, and self-help goals that had been set for each individual patient at the time of his discharge. An attempt was made in two of the cases not to provide the patients with the Dorrance hands because it had been our experience that, in most instances when hands were prescribed for bilateral amputees, the patients found them to be useless items which decreased their functional ability and therefore ended up unused, on the shelf. It had always appeared to us that it was the exceptional bilateral upper-limb amputee who developed a skill in the operation of the prosthetic hands. The usual response was rejection. In both cases, however, the patient insisted on being fitted with the hands as well as the hooks in spite of our counsel, and they were accommodated. We were interested to learn the level of hand use after two years.

Each of the patients was contacted and expressed delight in our interest and in the impending visit. They were then visited for two days each in Pennsylvania, Virginia, and Tennessee at their homes and places of employment. Interviews with their families, friends, and employers were carried out when feasible. The following report is a summary of the results of these visits:

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CASE REPORT NO. 1

J.M., a 41-year-old white male, sustained third-degree electrical burns on July 1, 1970, while working as a journeyman lineman. Bilateral below-elbow amputations were performed initially, but subsequent revisions were necessary which left J.M. with bilateral above-elbow amputations (Fig. 1).

He was first admitted to Kessler Institute for Rehabilitation on September 17, 1970, and remained until December 16, 1970, participating in a program of pre-prosthetics and prosthetics training. During this period, he was trained initially in the use of a temporary prosthesis for the left arm only, and later with a right temporary prosthesis after resolution of an infected sebaceous cyst on the right stump. He was discharged with a temporary right and a permanent left prosthesis, and returned in February to receive his permanent right prosthesis. He was readmitted on February 10, 1971, and remained until February 23, 1971. At discharge, he had been fitted and trained with two permanent prostheses.

THE PROSTHESES

J.M. was provided with bilateral conventional, above-elbow prostheses with spring assists for elbow flexion bilaterally. Hosmer wrist-flexion units, two #555 Dorrance hooks, two Dorrance #7 hooks (farmer's hooks), and Dorrance hands. He received an extra single-harness attachment which allowed either prosthesis to be worn independently of the other. The terminal devices were interchangeable.

SOCIAL HISTORY

Mr. and Mrs. J.M. and their teenaged twins live in Knoxville, Tennessee. There is also a married daughter living nearby and his wife's mother lives next door. It appears to be a closely knit family.

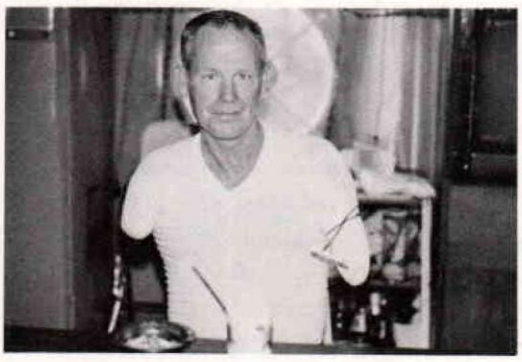

Fig. 1. J.M. without prostheses.

While at the Institute, J.M. presented himself as an emotionally stable, outgoing individual who related easily in a straightforward manner. He showed excellent control of the underlying reactive depression. He appeared to expect unrealistic goals from the prostheses and failed to realize the effort that would be required on his part to operate them. Throughout his stay, he made mention of ideas he planned to try out at home related to adapting carpentry tools and self-care devices, suggesting an enthusiastic desire to increase his independence. His vocational goals appeared to be minimal since the compensation and disability pensions from his place of employment would be sufficient for his and his family's financial needs, thus rejecting other types of employment. He did talk of opening a furniture shop in partnership with a friend, but this never developed into a firm vocational goal.

VISIT TO PATIENT'S HOME—SUMMER 1973

Mr. M. was asked for his thoughts and criticisms of his prostheses. He felt that they were too hot and heavy. He did wear them for at least 6½ to 7 hours daily but he removed them more frequently during the hot summer months. He felt they were a definite necessity, feeling lost without them. The #7 hooks (farmer's hooks) and the functional hands had been discarded; he found them both too heavy. The farmer's hooks had been prescribed with the belief that they would be useful for his anticipated carpentry work. Most annoying to him was the fact that the cable on the left prosthesis had broken about every two to three months. This left side had become his dominant extremity because it was the longer stump and therefore received the greater work load. He had had a second prosthesis fabricated in Tennessee since his discharge using these as a spare. He wears seven rubber bands on the left and three on the right to improve his tension of grasp.

It was clear that Mr. M. had developed more skillful use of his prostheses in the interval since discharge. Strength of shoulder and scapular musculature had increased and he could now activate each individual prosthesis independent of the other with relative ease. He did not have spring assists put on this second pair of prostheses, because they tore his clothing and were of little functional value. It was our feeling that he no longer needed them because of the increase in strength in both stumps and his improved expertise in their use.

Self-Care Activities

It became clear during the interviews with the patient that in spite of his increased strength and his improved functional performance with the prostheses, the patient was actually less independent in some areas of activities of daily living than he had been at the time of his discharge from the hospital. The most glaring lack was in the area of the self-help innovative equipment which he talked about so often during his hospitalization. There was none in evidence.

Dressing: In the hospital, by using a dressing pegboard frame with hooks, with the board attached to the foot of the bed, the patient had been independent in dressing. At home he had never completed the construction of the dressing frame. His dressing activities were very slow and he requested and received a great deal of assistance from his wife. He had specially tailored Banlon shirts which fit higher and more snugly in the axilla, reducing the restrictions of movements which the regularly available shirt caused by its looseness in axillary fit. He wore specially made T shirts with stump-sock sleeves and he found these to be of great value, alleviating the need for manipulation of additional stump socks. He needed assistance donning his prostheses.

Feeding: At discharge, he was independent in eating and cutting his food, and he could handle sandwiches with a "sandwich holder" with which he was provided. He now needs his food cut and no longer uses the sandwich holder, but is otherwise independent.

Personal Hygiene: He was independent in bathing and talked about having a soap dispenser, rotating brushes, and an overhead heating lamp placed in the bathroom. He did none of these things and is dependent in bathing, being fully bathed by his wife.

Toilet Function: He managed cleaning after toilet independently but with effort, and he used a hook attached to the wall to assist with the replacement of shorts and pants. He remains independent. He wears nylon shorts which he finds easier to adjust. He cleanses himself by wrapping the paper around the left hook, flexing the wrist unit with the hook in the mid-position, and unlocking the elbow. Upon reaching back, the elbow locks and remains stable for the task.

General Activities: He was and still is independent in managing faucets, turning keys in locks, turning most doorknobs, operating light switches and in using the telephone. He keeps money in his shirt pocket and asks the cashier or salesperson to reach for the money needed and to replace the change.

Top Priority Activities for Mr. M.

Driving: He had had the ignition key and signal control adapted (Fig. 2) and has a knob on the steering wheel (Fig. 3). He can use the tractor lawn mower (Fig. 4), and has a foot-control choke on it (Fig. 5). He can hook up and release the trailer, which is used to transport the tractor, to his car independently. Mr. M. does a great deal of mowing for the church and also for his neighbors whom he charges.

Carpentry: He does some refinishing of old furniture and has constructed simple pieces. He can use the power saw, sander, and planer but not the hammer.

Church Activities: He has continued to be active in his church, especially with children. During the summer he was principal of vacation Bible School, and last fall he led the exercise group for football training.

Fig. 2. Switch-key control on car.

Fig. 3. Steering-wheel control knob.

Fig. 4. J.M. on his tractor mower.

Fig. 5. Choke control on J.M.'s tractor.

CASE REPORT NO. 2

J.S. is a 37-year-old male who sustained severe crushing injuries and subsequent amputations of both hands on May 28, 1970, while operating a press at work. He was admitted to Kessler Institute on September 28, 1970, with a diagnosis of bilateral wrist disarticulation and was discharged on November 6, 1970 (Fig. 6).

He participated in a pre-prosthetics and prosthetics training program and, while he waited for the permanent prostheses to be fabricated, a temporary prosthesis was provided. He was fitted with a Viennatone myoelectric hand on this temporary prosthesis—purely on an experimental basis. He soon became proficient in control of this hand. He became most proficient in the use of his prosthetic hooks and rejected the hands because of their weight and operational noise.

THE PERMANENT PROSTHESES

Conventional bilateral wrist-disarticulation prostheses of laminated plastic were provided. J.S. received two Dorrance #555 hooks and two #7 Dorrance hooks and Dorrance hands. No difficulties were encountered in training.

SOCIAL HISTORY

Mr. and Mrs. J.S. live in the village of Goode, Virginia, with their 3 children ages 11, 9, and 7. They live next to his brother-in-law's 400-acre farm and Mrs. S's parents also live in the same town. This is also a very close-knit family.

Mr. S. showed good adjustment to his disability. He was quiet, straightforward, and even-tempered, However, he also came to Kessler Institute with great expectations regarding prosthetics function. His vocational goals were to return to his former occupation as a machine operator.

HOME VISIT—SUMMER 1973

J.S.'s Thoughts and Criticisms of the Prostheses

The prostheses were a part of him and were worn all day. The hands were rarely worn. . . "only to a wedding and a couple of funerals." He found they were too heavy and clumsy. The Dorrance #7 hooks were used occasionally; he found them most useful for house painting, but they were of no value for driving. He favored the #555 hooks and used them almost exclusively. The cables frayed frequently but he had them replaced with heavy-duty cable and has had no repairs since. He uses four rubber bands on each hook.

Self-Care Activities

J.S. is almost completely independent in self-care, although this is not surprising in view of his levels of amputation. However, he too finds dressing the most frustrating activity.

Dressing. He still requires help with buttons because he finds it takes too long. He continues to don and remove his prostheses but does need help with T shirts. His wife has sewn stump socks to the sleeves.

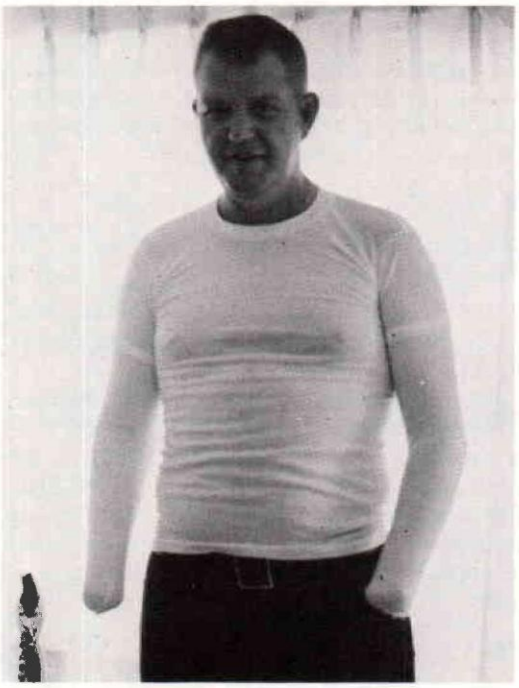

Fig. 6. J.S. without prostheses.

Feeding. He remains independent. He can cut food but most times it is done for him by a family member. Sandwiches are a problem.

Personal Hygiene. He remains independent. He uses a sponge mitt over his stump for bathing. An electric razor is held between his stumps for shaving. He uses a cuff on the stump to hold his toothbrush.

Toilet Functions. He remains independent.

General Activities. He can still manage faucets, most doorknobs (round slick ones are difficult), can manage keys, light switches, and the telephone. He uses a wallet and can reach into his shirt pocket for money. He also cooks simple meals.

Top Priority Activities for Mr. S.

Farming. Mr. S. has not returned to employment but helps his father and brother-in-law on the 400-acre farm. He can use the tractor and can even lift bales of hay weighing 50 to 70 lbs.

Driving. He needs only a ring on the steering wheel and is independent.

Carpentry. He does furniture refinishing, and has made night tables and sold them. He is able to use the power saw and sander, can manage the electric drill and, although he finds the regular screwdriver impossible, he can use the screwdriver attachment with the power drill. Hammering is not a success except for light taps.

Gardening. Planting, using a hoe, and mowing the lawn can all be accomplished.

Sports. Hunting is very important to Mr. S. Friends and his wife helped him design a special shotgun harness and anterior metal piece for stabilization of the gun (Figs. 7-10). These adaptations make hunting possible. Mr. S. is now president of the local gun club.

Social Activities. He enjoys square dancing during the winter months.

Fig. 7. J.S. shooting specially adapted rifle.

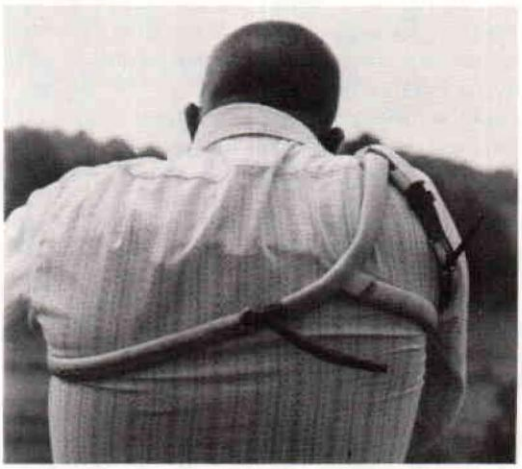

Fig. 8. Special harness for rifle shooting.

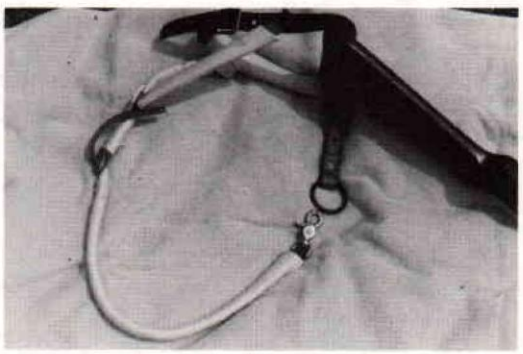

Fig. 9. Another view of the special harness designed by J.S.

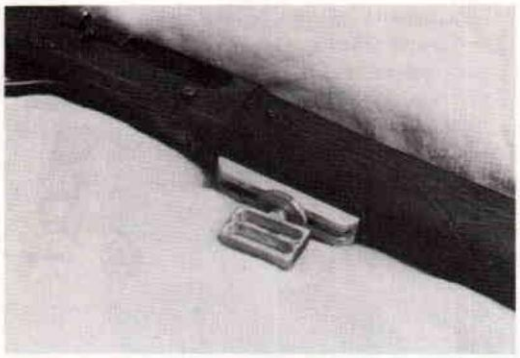

Fig. 10. Close-up view of special stock fitting for J.S.'s rifle.

CASE REPORT NO. 3

G.B. is a 38-year-old white male who was injured in an explosion while at work in a chemical plant on April 19, 1971. Bilateral amputations were necessary leaving him with a left wrist disarticulation and a right transcarpal amputation (Fig. 11). He was admitted to the Kessler Institute for Rehabilitation for pre-prosthetics and prosthetics training on June 21, 1971, and remained until August 13, 1971. A temporary right prosthesis was provided so as to allow him more function during the pre-prosthetics training period.

THE PERMANENT PROSTHESES

Conventional bilateral wrist-disarticulation-type prostheses with a Dorrance 88X hook for the right and a #555 hook for the left and two Dorrance hands were provided.

SOCIAL HISTORY

Mr. B. and his wife live in Tamaqua, Pennsylvania, with their three children ages 16, 15, and 11. This is a small, practically one-industry town where Mr. and Mrs. B. were born and raised. Mr. B's parents live nearby.

Mr. B. presented himself as an extremely quiet individual who never initiated conversation, though he was extremely cooperative and hard working as a patient.

PRE-VOCATIONAL EVALUATION

This patient was closely followed by this department of the hospital since it was possible, in this instance, to make contact and visit with his employer. He showed good potential for desk work, using calculators, typing (12-15 wpm), writing, and handling papers.

Two months after discharge, he was reemployed and given a position as a driver for a van-type truck which he used to taxi employees and transport mail from building to building within the grounds of this large plant. He was also equipped with a one-way radio.

HOME VISIT—SUMMER 1973

Mr. B's Thoughts and Criticisms of the Prostheses

Mr. B. is the most independent of these three cases, probably because help is not so readily available.

The prostheses are worn all day and there is no question in his mind that he could ever be without them. He wears four rubber bands on the right dominant hook and three on the left. The hands have been worn only "three or four" times since his discharge because he found them "cumbersome." The cables fray every four to five months.

Work

Mr. B. is content with his position and is employed full time. His employer is well pleased with him, finds him dependable, and stated he has proved to be a safer driver during the winter than other employees (Fig. 12).

Self-Care Activities

Feeding. He remains independent; his wife cuts meat when they eat out.

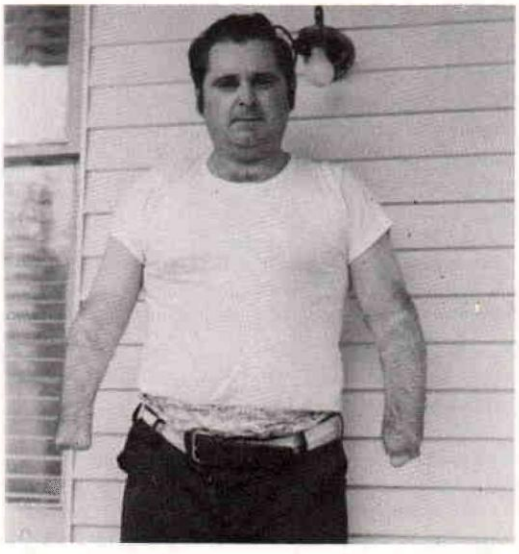

Fig. 11. G.B. without prostheses.

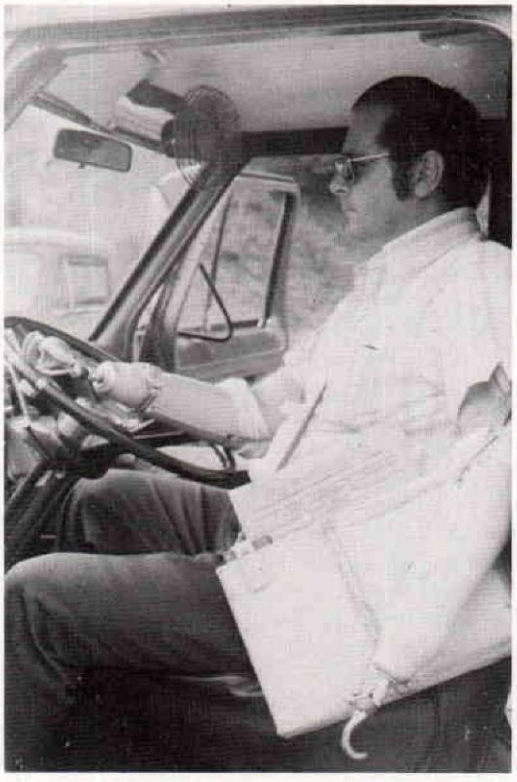

Fig. 12. G.B. at the wheel of the company van.

Grooming. He remains independent.

Personal Hygiene. He uses a sponge mitt over his stump when bathing.

Toilet Functions. He remains independent.

Dressing. Buttons are still a problem; he needs assistance.

General Activities. He remains independent except for some doorknobs. He has surgical tubing on the fingers of the right hook and this helps increase traction. He keeps his wallet in his shirt pocket and can manage it independently.

Sports

Hunting. This was very important to Mr. B. so when Mr. S. from Virginia wrote us about his shotgun harness, his address was passed on to Mr. B. and he had a harness fabricated for himself from photographs received from Mr. S. They continue to correspond with one another and exchange ideas (Figs. 13 and 14).

Fishing. Mr. B. was given a body harness with a fishing-rod support while he was a patient at Kessler Institute. He has since discarded this harness and has rings only, taped to the fishing rod. He gets assistance in placing the hook; the reel is automatic (Fig. 15).

Fig. 13. G.B. shooting his rifle with adaptations suggested by J.S.

Fig. 14. G.B.'s "shooting" harness.

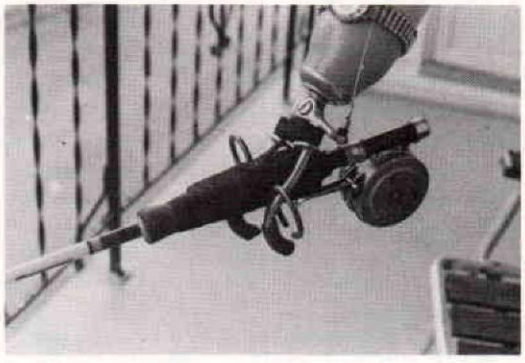

Fig. 15. Fishing rod with rings.

DISCUSSION

The problems of the traumatic bilateral upper-limb amputee are necessarily great, affecting every aspect of living. Each patient presented here was faced with the need for emotional adjustment, first to traumatic injury and amputations, and then to the alien world of prosthetics. Within a matter of months, they had to adjust to these new worlds and develop a new pattern of

independence within the confines and framework of present-day prosthetics. They did not have the advantage of "growing up with their disability and their prostheses" as do children with congenital deformities. They were and still are fully aware of what losses they have suffered as a result of the loss of hands and elbows and what limitations the prostheses offer even at their most functional level.

As was expected, the bilateral above-elbow amputee had the greater prosthetic and emotional adjustments to make and was the least skilled in activities of daily living and in independence. However, his level of functional ability is high and, taking into consideration his educational background, one must reach the conclusion that he is doing well. If the need for more independence were there, we feel that he could achieve a higher level. The compensations of our social system to the injured worker have taken away his need for employment and he therefore has not pushed to achieve any type of vocational goal.

He is functioning in his family unit, partially dependent but adequately self sufficient, and able to aid in some of the chores and tasks. His dependent areas are primarily in self-care. With improvisations and some simple additional devices he could achieve a more independent status. He knows this but for some undetermined reason prefers his partially dependent role. This may, in a way, justify his failure to seek employment.

The two patients with the wrist disarticulations have achieved an admirable level of physical, social, recreational and work independence. This again could be prognosticated. Each was trained in prosthetics use and independent living in a relatively short time and has maintained or improved upon this since discharge from the hospital. Each was given the benefit of a full program of rehabilitation in addition to their prosthetics fitting and training.

All three amputees were exposed to the atmosphere of the rehabilitation center with a full team effort. Medical supervision, psychological counseling, social service evaluation and assistance to both the patient and his family, and training and testing in the vocational area to assess their vocational skills for the future, were provided in addition to their prosthetics needs. Each patient adjusted to his new problem in his own way and took advantage of the rehabilitation team as his needs required. The results were considered uniformly satisfactory and still are two years later. These patients are three severely disabled individuals who have returned to their homes, their families, their social milieu and to full- or part-time employment. Each in his own way can be considered a successful case.

Each accepted his prostheses with little problem and quickly became aware of their positive and negative aspects. As each paraplegic wishes to walk and rejects the advice against it for medical reasons and demands his chance, so here each one rejected the advice against the prosthetic hand, insisted on his chance to try, and in the end rejected the device. Each has developed a dependence on the prosthetic hooks to the point that functionally they are lost without them. Each continues to use the prostheses every day stressing once again the value of proper preparation and training to develop success for prosthetics use.

SUMMARY

We have presented three cases of upper-limb traumatic amputees who received their prostheses and training by the same rehabilitation team. Each man was visited in his home environment two years later and found to be dependent on his prostheses with the functional hook attachment, and to have rejected the functional hand and specialized farmer type of hook. Each still maintained a significant level of independence of self-care, with the bilateral above-elbow amputee, as expected, showing the most dependency. Their success with their prostheses and ease of acceptance, in our view, bear out the positive aspects achieved when the patient is exposed to the full team rehabilitation approach in a rehabilitation center. Their treatment consisted not only of prosthetics prescription and training in use, but also psychological preparation and counseling, social service assistance to both the patient and his family, and vocational exploration and assistance. The results to date are most encouraging.