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Accomplishments in Modern Orthotic Patient Management—Indications for the Future[1]

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In considering the enormous magnitude and the uniqueness of the accomplishments that have been made in the prosthetics and orthotics professions within the past ten years, it seems appropriate that we review together and reflect upon these achievements in an effort to determine our directions and emphases for the future. A positive and exciting revolution has taken place in our field for which several important factors merit recognition.

First—The backbone of our profession—namely, the existing national and international schools of prosthetics and orthotics.

Second—The creation and close collaboration of our international professional organizations.

Third—The gifted foresight, wisdom and strong leadership demonstrated by past and present leaders of each of these organizations.

Fourth—The publication of professional journals, newsletters, and bulletins, disseminating new ideas resulting in improved orthotic and prosthetic clinical processes which, in turn, have had the effect of improving the individual orthotist's and prosthetist's services to his/her patients.

Fifth—The many meetings, in addition to existing international educational programs, taking form as seminars, assemblies, and international congresses such as this one.

Sixth—Numerous physicians, and others within the health care professions, who have taken an active and direct interest in our professional growth.

As a result of these efforts, orthotics and prosthetics have evolved from relatively little known professions (as compared to the older and more classical allied health professions) and have gained respect among all the rehabilitation disciplines. The orthotist and prosthetist are now important—and necessary—members of the clinical team because we have developed professionally to a fuller understanding of the great variety of patients, their disabilities and their needs, as these relate to our services. We can now, better than ever before, participate actively and effectively in the total rehabilitation management of the disabled patient. *Physical restoration of the severely physically handicapped person cannot be achieved without the services of the orthotist and/or prosthetist.*

I wish to review with you *some* of the achievements which are only indicators of

the progress made by many of our colleagues throughout the world. Naturally, some of these innovations and developments may not yet be in general use, but through dissemination of information and transfer of technology, they will be available to all our colleagues in time to come.

My discussion at this point will turn primarily to orthotic patient management as I am an orthotist and better versed in orthotics than prosthetics.

One of the best known accomplishments in our field in recent years is the development and use of new materials, especially thermoplastics—just to name a few, polypropylene, polyurethane and vitrathene, all having excellent physical properties and lending themselves to meeting the individual patient's orthotic requirements much more satisfactorily than conventional orthotic materials. These new materials are lightweight, have great resistance to fatigue, possess excellent moldability, afford improved hygiene and cosmesis, are available at a reasonable cost, and permit relatively simple working methods. A large patient population, with diagnoses of cerebral vascular accident (or stroke), polio, peripheral nerve injuries, and many other disabilities resulting in ambulation disorders, is now able to function with much less difficulty and without sacrificing safety because of the innovations in usage of such materials.

With the introduction of the variety of plastics, we are now able to do our job with great accuracy and proficiency. In addition, some of the devices lend themselves to central fabrication, thus simplifying the manufacturing techniques of systems that are individually adapted to the patient.

A good example is the simple drop-foot orthosis for which the orthotist takes the measurements of the patient's lower limb, identifying the standard module corresponding to those measurements, and individually tailors the orthosis for his patient. Results: elimination of the shoe-brace attachment, improved ambulation, less energy expenditure.

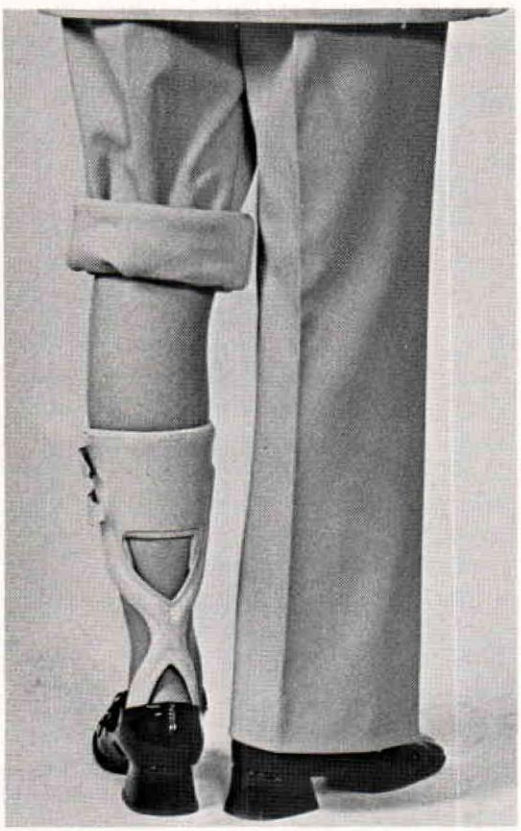

Fig. 1. Example of how new materials led to new design concepts is this ankle-foot orthosis.

In spinal orthotics, plastic material has made a fantastic impact by facilitating the central fabrication of devices such as the Milwaukee Frame. It is used for the entire device itself as a pelvic girdle replacing the steel bands and leather corset.

In traumatic spinal orthotics, a plaster-of Paris cast was formerly used to immobilize the spine for a period of eight to ten months. Now, the cast is routinely re-

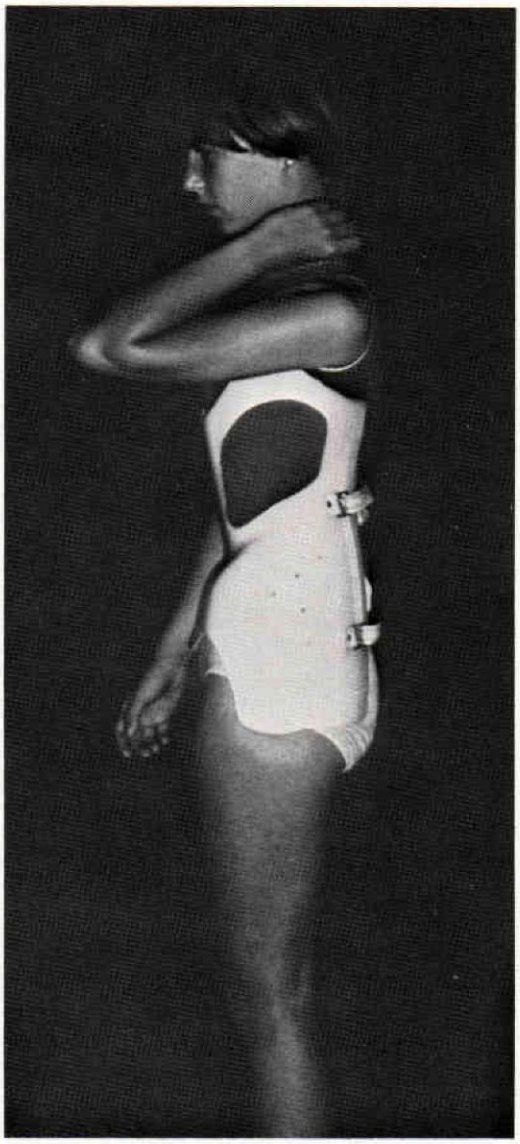

Fig. 2. Centrally fabricated Milwaukee Frame made totally from thermoplastics.

placed by an upholstered plastic jacket that can be applied when the patient is sitting or maybe even ambulating, but can be removed while the patient is resting in bed. In addition to maximal spinal immobility, the jacket allows the patient almost normal hygienic activities that before were very complicated and time consuming. Furthermore, the patient becomes functional in his rehabilitation program at a much earlier stage than previously when the cast was in use.

Orthotists have developed a variety of techniques for handling the new plastics. One widely used technique is drape molding, which is used in conjunction with corrugation where material thickness must be carefully controlled to achieve either the necessary rigidity or flexibility. Another method of handling these materials is the familiar vacuum molding technique. This method produces a very uniform replica of the mold being used. After the fitting and fine tuning are completed on a patient with any of these devices, it is essential that the orthotist carefully instruct him as to wearing time during the initial period necessary to build up tissue tolerance because of the contour fitting technique used.

Obviously, the introduction of these excellent new substances and technologies resulting in new design concepts, has constrained the orthotist to acquire more comprehensive knowledge of patient disabilities as they relate to biomechanics, pathomechanics, and muscular dysfunctions. The acquisition of this knowledge has fostered a closer working relationship between the orthotist and the physician, as well as with others on the rehabilitation team including the patient himself.

Great strides have been made in restoring function to the upper limb for patients with spinal cord injuries, brachial plexus injuries, peripheral nerve injuries, and other impairments affecting the upper limb.

Prevention and/or correction of such deformities are predominantly accomplished by applying a three-point corrective pressure system to the flexion contracture, whether it be the fingers, wrist, elbow, shoulder or knees.

Electronics is now affording us new and

practical means of restoring hand function. The new systems are electronically powered and operated. Additionally, they have reached a high degree of reliability. One device, weighing only seven ounces, can provide a C5-6 quadriplegic with a controllable, but powerful, five-pound finger prehension. This is more than adequate to manipulate any objects used in daily living activities—even the telephone—from a wheelchair (sitting) position.

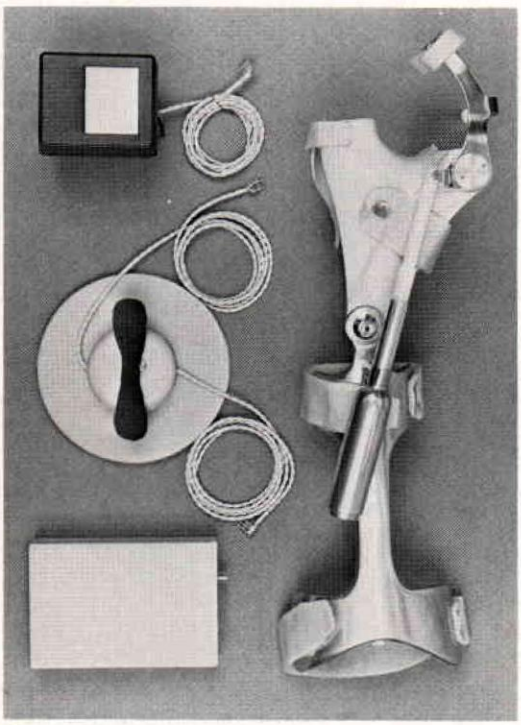

Fig. 3. Advancement made by combined technologies is in the form of microelectronics as used in orthotic patient management.

For the even higher C4-5 quadriplegic patient, where more sophisticated orthotic assistance is needed, pneumatically or electronically powered systems can help him attain some useful upper extremity function.

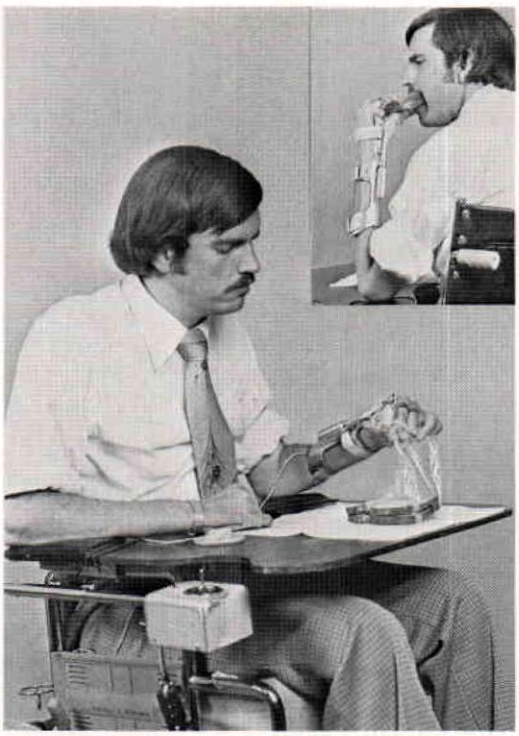

Fig. 3A. Quadriplegic patient using the more efficient and simplified electronically powered finger prehension orthosis replacing the pneumatic system he previously used.

Along with these notable orthotic innovations, there are additional services emerging—namely, through biomedical engineering and the rehabilitation engineering groups.

There was an initial period when the rehabilitation engineer as well as the rehabilitation community were not sure how to interpret the engineer's role in the overall patient management. The introduction of this new element into the system had a particular impact on the orthotist and prosthetist. After some eight years, it is evident that the biomedical engineer, and more specifically the rehabilitation engineer, does not supplant the orthotist and prosthetist, but instead each functions in a supportive role with the

other to enhance the quality of life for the severely handicapped.

Thus far, biomedical engineering has made its greatest impact in the area of *environmental controls,* which have proven immensely important and useful for people who need assistance beyond what an orthotist can provide. Through the use of a variety of electronic systems, the patient is able to control his environment very effectively, providing some degree of independence.

In rehabilitation engineering, *mobility aids* are valuable engineering contributions toward helping the handicapped return to an independent lifestyle. These devices are becoming very popular in the United States. A prime example of mobility aids is the highly sophisticated van that even the severely handicapped person can drive independently and which has a built-in wheelchair lift that he can control independently.

Fig. 4. A major contribution through rehabilitation engineering is the development of a multitude of vehicles that can be operated independently by severely handicapped persons.

The foregoing has been a review of what we have accomplished and what we have to build on. But we are facing grave problems in the *sheer numbers* of people throughout the world needing orthotic and prosthetic services as contrasted with the number of persons available to meet those needs.

The few statistics that are available to us on an international basis are surely incorrect—or at best, incomplete.

As professionals and members of our various professional orthotic and prosthetic organizations, we have a clear obligation to set about providing the additional manpower to serve those in need. Our obligations and responsibilities now extend beyond merely assuring that we ourselves are professionally are technically competent. We must become advocates for the changes which are vital to diminish the horrendous and unacceptable chasm between the people we have taken care of and those yet to receive our help.

It is not for us to say, "Can we afford to do it?" Rather, we must answer the question, "Can we afford *not* to do it?"

Specifically, and on a practical level, we must first speak to the matter of education. I propose that we initiate an international student exchange program to provide dissemination of knowledge across national boundaries on both an undergraduate and graduate (continuing education) level. The program could be structured and conducted by a committee or group composed of members from our national and international organizations. It could best be funded by the federal governments of the participating members. Curriculum committees would be established so there would be as little duplication of effort as possible among the institutions; so that students would be

channeled to the institutions whose programs best meet their needs, the needs of their patient populations, and degree of technical sophistication extant in their areas. Other groups chosen from our membership would monitor quality of teaching and effectiveness of the exchange programs.

Indeed scattered efforts have been made by individuals and institutions or organizations in various nations to conduct exchange programs from time to time, but what we seek here is a concerted and centrally coordinated effort under the sponsorship of one entity.

Continuing with educational needs, we must increase our sharing of orthotic and prosthetic developments and expand the knowledge base—in the news media, where appropriate, to the general populace, and in our professional and technical publications to health professionals. We must increase our efforts to work with other medical professional organizations—the orthopedic surgeons, for one example—to educate those disciplines to the need and proper use of orthotic and prosthetic services for their patients.

Lastly, in our discussion of educational needs, we must work through our national organizations and our national governments for the establishment of additional schools for undergraduate training. This might include both an increase in the number of technical schools as well as establishment of orthotic and prosthetic programs within our colleges and universities.

We also face the task of capturing the young person, at the time of career choice, for the prosthetic and/or orthotic sciences. Ours is a solid, scientifically-based health service, and we must convey that fact to the students we are seeking to attract. However, the teaching curricula must continuously be updated to follow the rapid changes in technology and services. In addition, the quality of instructors must be re-evaluated at various times, to insure that the student receives training that provides him with the proper base from which to exercise his responsibility as a professional.

Second, in concert with our educational endeavors, is the need for more and better organized petitioning of our national governments for increased research and development funds. It is not inconceivable that we will reach a stagnation point as more and more funds are diverted to other purposes, or to other disciplines within the medical area.

As to the actual practice of our professions, I re-emphasize the need for more collaboration among all of us. If we are to standardize, if we are to achieve central production of modular units, if we are to attain a high level of quality not only in production of actual appliances but also in provision of professional consultative services, we must work one with another so that we do not become isolated and in-grown. Through these efforts, we would also have the mechanisms for evaluation of systems developed throughout the world. This is imperative if we are to increase the physicians' confidence and interest in us and in the merit of our services; if we are to convince the politicians of the need for governmental support; and most importantly, if we are to provide the genuinely useful services that our patients have every right to expect from us.

We have much to be proud of, but we also have weaknesses and areas where improvement is desirable. We still have much to learn in the area of professional relationships both among ourselves and with other health practitioners. A fair degree of the unsatisfactory working relationships in the past has stemmed from the fact that some of our activities were viewed as being strictly commercial while others were recognized as being academic or professional.

We must take a look at ourselves and scrutinize our own participation in the health care delivery system. We are no longer simply providers of a physical product. That is an outmoded concept. We provide professional services of which the actual physical product is only a part. We are full-fledged members of the clinical patient management team. And being so, we must make available to the patient the highest quality services resulting from our experience, training, and education in a highly specialized field. As the initial manifestation of our changing role, the prosthetist and orthotist must become more active in the prescribing process of orthotic and prosthetic devices. It is folly to expect all physicians to be knowledgeable and current, not only in their own milieu, but also in our profession, considering the myriad of refinements and alterations that have been made in traditional devices as well as the many entirely new and sophisticated systems that have been developed.

Consequently, it is up to us to accept this responsibility without delay in order that the patient will receive the very best orthotic and prosthetic services and systems tailored specifically for him.

From the foregoing discussion, I have thus extracted the following points which are put to you for consideration as GOALS of our professional society, as well as for us individually:

1) To enhance *educational opportunities* in the prosthetic and orthotic sciences, especially to promote *student exchange.*

2) To update *teaching curricula* and re-evaluate instructor training methods.

3) To *petition for government funding* for prosthetics and orthotics research and development.

4) To develop and increase *collaboration* among ourselves.

5) To *conduct an international survey* to include: number of disabled; nature of their disabilities; number of physically handicapped being served; number of those only partially served or not served at all; number and distribution of orthotists and prosthetists, those in private practice and those in academic programs.

6) To *enlarge the role* of the qualified prosthetist and orthotist in *prescribing* prosthetic and orthotic services.

7) To enhance the professional image of the orthotist and prosthetist by *formal recognition* of colleagues making outstanding contributions in our profession.

I sincerely believe it is a proper and vital task for our association to address itself to these goals through the creation of study groups, operating committees, and secretariats. We are now strong enough to become even stronger. Although we are old as far as our unique work is concerned, we are young in organization and few in number.

But, if we stand united behind our goals, we will surely grow. There must be universality of purpose among us; we must all strive for the same high level of excellence.

I challenge you to see your individual role in an enlarged sense; you will then have taken the first step toward fostering recognition and acceptance of the professional orthotist and prosthetist throughout the medical and allied health professions.

Footnotes

[1]Keynote address presented at the Eighth Congress of the International Association of Orthotists and Prosthetists; October, 1978; Madrid, Spain.

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