

# The Growth and Development of Orthopedic Appliances\*

By W. FRANK HARMON

President, The Orthopedic Appliance and Limb Manufacturers Association;  
President, The Atlanta Brace Shop, Atlanta, Ga.

The Orthopedic Brace Industry is making every effort possible to effect the transition from an industrial status to a professional level that will, we trust, eventually be recognized and respected by the medical profession, the layman, and the victim of circumstances who require the assistance that trained and certified orthotists are able to give.

To trace the growth of this field of endeavor, it is necessary that we turn back the pages of time briefly and survey the progress made starting with the earliest information that we have available and finally bringing to attention the ultimate aims and objectives as we now see them.

Braces and splints are nothing new. Sometime in dim and unrecorded history man must have discovered the relief from pain which splints afforded, regardless of how crudely or inadequately they may have first been conceived. He soon discovered that variations in even crude designs afforded greater comfort and relief. This age-old urge of man to preserve himself in the best physical form possible has served as a constant stimulus to improve and perfect orthopedic and surgical appliances. It is the constant quest for technical improvements that has created an industry whose sole excuse for existence is the necessity for providing assistance of a mechanical nature to be used in conjunction with the treatment prescribed by the physician or surgeon.

Archeologists have discovered numerous bones of prehistoric races and our knowledge of them comes from these remains rather than from writ-

ten records. Many of these skeletons indicate the successful joining of broken bones, but there is no tangible evidence to irrefutably indicate the orthopedic use of braces or splints by primitive man.

## The First Splints

Possibly the earliest known period which furnished visual and authenticated evidence of the use of splints in ancient times is during the Egyptian Dynasty which flourished about 2600 years B.C. or 4500 years ago.

The British Medical Journal published in March of 1908 contained a report of the professor of Anatomy at The Egyptian School of Medicine at Cairo: "I have been fortunate enough," writes the author, "to have had the opportunity of examining two sets of splints which had been applied to fractured limbs almost at the dawn of Egyptian history—roughly about 5000 years ago. These are certainly the oldest splints which have come to light in any part of the world . . . they are the earliest surgical appliances ever discovered." We quote further: "These splints must have been quite useless as a support for a broken bone although they formed a protective casing completely around a damaged limb. It was quite obvious at a glance that their only purpose could have been to fix the knee joint and by that means ensure some degree of comfort or rest to the damaged member."

Hippocrates, the Greek Physician and the most celebrated practitioner of antiquity and the man known as

\* Presented at the Symposium on Socio-Economic Aspects of Orthopedic Engineering, Dec. 30, 1955; 122nd Annual Meeting, American Association for the Advancement of Science, Atlanta, Ga.

"The Father of Medicine" entered upon a disturbing scene in the 4th Century B.C.: Under a line of Pharaohs, a powerful military state was developed in Egypt and a remarkable cultural and physical attainment ensued during the period from 2400 to 1500 B.C. The maintenance of high physical standards was based to a considerable degree on religious convictions which called for the extermination of the congenitally defective, the deformed, the halt, and the blind. Apparently two reasons were paramount for this practice. The primitive code annihilated the infirm for survival while the Spartans eliminated or destroyed the imperfect for supremacy.

Hippocrates brought to the confused period of his era the fundamentals of humanitarianism to eliminate the shadows which had for so long persisted. For almost 2000 years after Hippocrates, braces, splints, and manipulations constituted almost the sole line of treatment for all types of orthopedic problems.

Some 350 years later another great teacher pleaded for human sympathy for the handicapped and the oppressed and taught the glory of humanitarian tolerance. Thus with the birth of Christianity the hard lot of the crippled and maimed was greatly ameliorated.

But after the cross on Calvary, the torch of tolerance flickered faintly and only here and there lighted the way for the handicapped. Orthopedic help for the incapacitated lapsed into near somnolence for more than 1500 years. The whole social structure in this dark period was again one of the survival of the fit.

Brace making did not become an art until the 17th Century, and the transition of the armorer-blacksmith, who was the original brace maker, to the present day orthotist parallels closely the transition of the barber-surgeon of the 14th Century who at that time was considered a craftsman

while the physician had already attained professional rank and commanded the respect of society.

It was not until the 18th Century that the word "Orthopedic" was coined by Nicholas Andre, a professor of medicine at the University of Paris *Orthos* (straight) and *Paidios* (child). Orthopedic surgery until the latter part of the 19th Century was limited by the inability to control infection. It was not until 1842 that Crawford W. Long, for whom a modern hospital in Atlanta is named, performed the first surgery under anaesthesia.

### Dr. Hugh Owen Thomas

One of the first brace shops of which we have knowledge was in the home of Dr. Hugh Owen Thomas. In addition to a formal medical education, Dr. Thomas had the advantage of the secrets handed down by his family who represented several generations of bone-setters. He was a prolific designer of original apparatus. His influence, because of the simplicity of his designs, is still present in our modern appliances. Each brace was tailored to the patient's individual requirements. It is important to remember that he considered the style or design of the brace to be relatively secondary to the fit and adjustment to the individual. After spending a day caring for his patients he spent most of his evenings in his work shop making braces and splints that would be applied upon completion.

During the latter half of the 19th Century the orthopedic surgeon often maintained one or more brace makers in his office. Mechanical surgery was frequently used to describe this division of medicine. Gradually, however, as the orthopedist became more surgically minded, the brace technician moved out of the doctor's office, established his own brace shop and began to serve a number of surgeons and physicians rather than



one. Hence the birth of the brace shop or facility as it is known today.

The artisans of the brace shop were usually men of limited education who had served long years of apprenticeship, usually with their father, to emerge eventually as the proprietor of a small establishment that might include assistance from the mother or other members of the domicile.

Methods, processes, and procedures were usually closely guarded secrets that were not to be divulged. Consequently an air of suspicion surrounded any attempt to promote cordial relationship among operators of hostile establishments.

### **Today: Cooperation**

Fortunately, however, in recent years, we find a reversal of the aforementioned trend. Today every effort is being made, not only to acquire greater knowledge and skills, but to distribute that information regarding materials, design, and technique in a manner that will contribute to more effective bracing for everyone concerned.

Here I quote from the Federal Trade Commission trade practice rules for the orthopedic appliance industry as promulgated November 13, 1954, "Believing that the interest of the orthopedically handicapped is its first concern, the industry favors making available to all its members and the general public any improved technique that may be used or developed by any of its members in respect to the making, fitting, aligning, or servicing of industry products. Further, the industry desires to be an active and cooperative factor in all progressive developments of improved techniques that will contribute to the welfare and comfort of the orthopedically handicapped."

We have gone to great length to familiarize you with the background of orthopedics and its relationship to the general field of medicine in order



W. Frank Harmon, C.O.

that you may more fully comprehend the problem of the orthotist or brace maker and his relationship to the orthopedist, the physiatrist, and their patients.

Now let us digress for a few moments while we consider a few elements that control or at least exert a tremendous influence on the successful operation of an orthopedic appliance facility.

As was mentioned earlier, the first known brace shop was in the home of Doctor Hugh Owen Thomas, and his activity in this field was in the evening after allowing for a normal day's work caring for his patients. This was followed by the trend toward the establishment of small private workshops where the brace maker could serve more than one surgeon or physician. Since no formal training had been given in the field of orthopedics it was left to the individual doctor to design or devise or direct the construction of any mechanical apparatus he considered necessary in the treatment of his patients. Consequently apparatus and equipment took on the characteristics

of the locale in which they originated. Thus they frequently bore little resemblance to the apparatus and equipment used by surgeons and physicians on similar problems in other sections of the country or world. Since there was little unity of thought or procedure it is little wonder that we found the lack of cooperation that existed until recent years.

We now find that by working together, greater achievement is possible in every phase of our relationship with the medical profession and their patients. We are recognizing the importance of teamwork and cooperation.

In 1946, the Orthopedic Appliance and Limb Manufacturers Association was founded for the express purpose of accomplishing this objective, and we now have about 95% of the eligible firms in the United States as members.

By working in close harmony with each other and being fortunate to receive excellent cooperation from the medical profession we are making progress that a few years ago was not even dreamed. The result will be reflected directly to the patients whom we serve.

#### **1948: Certification**

In 1948, sponsored by our trade association, the industry made another forward step when the American Board for Certification of the Prosthetic and Orthopedic Appliance Industry was conceived and became a reality.

This Board has done more to elevate the standards and qualifications of orthotists and orthopedic appliance facilities throughout this country than any other group of events in our history. We have by no means achieved perfection but by our continued efforts in this direction we are drawing closer to our objective of contributing the maximum toward the welfare and comfort of all, who

by force of necessity, are required to use our services.

Only a relatively few years ago all braces were made of some form of steel; many were hand forged, heavy, awkward, and cumbersome. Even today there exists a need for appliances made of strong steel particularly when it is necessary to control abnormally strong muscle segments to obtain desired patterns of behavior as is sometimes found in cerebral palsy, or again when certain occupational conditions demand the maximum in strength and endurance.

#### **New Materials**

However, with the advent of a new era in metallurgy, we have found that many of our original ideas in brace fabrication have become obsolete. It became necessary to formulate a new conception of certain types of bracing. For example: poliomyelitis frequently leaves an individual with either a partial or complete loss of use of certain muscles or groups of muscles. Normal movement is labored, extremely difficult or impossible without the aid of supportive or assistive braces or apparatus. The application of heavier steel braces would often further incapacitate or handicap the victim of this unfortunate circumstance. For this reason the use of aluminum has found favor among many groups of medical personnel and the brace men who fabricate and fit appliances where additional weight would hinder rather than promote a more rapid rehabilitation. Aluminum in its chemically pure form would not be acceptable in most phases of bracing since in its natural state it is very soft and would not stand up under normal usage, but science has found that by combining other elements including copper, manganese, and magnesium that the strength of the alloyed metal, properly heat treated, can be increased many times its original strength. It must be borne in mind, however, that points of excess strain



and stress should be further reinforced or even replaced by a harder or more durable substance. Certain types of stainless steel and monel metal are highly desirable for such points.

It is possible that a brace can be made from the best materials obtainable, and it can be mechanically perfect; it can be polished to the brightest finish and covered with the softest and most durable leather, but if it does not fit properly it is worthless. For this reason every effort is being made to train the personnel in our industry not only to be able to make the appliances that may be needed, but to be able to properly interpret the prescription and fit the potential user with the appliance that will give the most satisfactory functional results.

In spite of all the professional knowledge and technical skill which have already been applied to orthopedic appliances, they still fall short of the perfection which has so persistently been sought. There still appears to be a missing ingredient.

This may be mainly an inability to fuse two divergent skills which are, in fact, both seeking the same common denominator. The brace maker expresses his professional pride in his ability to interpret into structural materials the orthopedic surgeon's prescription for a corrective or supporting brace. The orthopedic surgeon, on the other hand, makes the

diagnosis and prescribes the means and manner of treatment. He also uses his professional skill to the utmost, but every day increasing calls are made upon him for additional, newer knowledge.

Thus, the higher the orthopedic surgeon's level in scientific bracing, the more exacting in turn is the brace maker's problem of precise mechanical production. His "artisan's or fabricating knowledge," to meet the newer standards of the orthopedic surgeon, already embraces a vast field of technical information. Complicated and profound subjects which never entered the mind of the old-time brace maker or doctor have now become, under such exacting demands, of intense interest to both.

To supplement the knowledge and skill of both doctor and brace maker, engineers and scientists are bringing to bear the specialized knowledge of their particular fields. In time, this assistance may result in improvements never before contemplated.

The general public is becoming more conscious of the tremendous number who wear braces and corrective appliances and of the many more who could and should wear them. As designs of newer and more physiological aids are developed, more and more people will find advantage in orthotic appliances which are fitted to their comfort and satisfaction.

---

#### Dr. Gillette Honored

• *Dr. Harriet E. Gillette* of Atlanta, Ga., has been granted the Richard Kovacs Memorial Fellowship for 1956. The Fellowship carries with it a \$1,000 award, to help defray expenses of a qualified person to attend the International Congress of Physical Medicine at Copenhagen August 20 to 24.

Dr. Gillette, who is the daughter of a physician, has had an outstanding

record in the field of physical medicine and rehabilitation. Since 1951 she has been in the practice of physical medicine and rehabilitation in Atlanta, Ga. In 1955 she was named Woman of the Year by the American Medical Women's Association. Dr. Gillette is well known to members of OALMA and attended the 1954 Assembly at Atlantic City and the 1955 session at New Orleans.