Clinical Education and Requirements—A Prosthetist's Views

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THE PROSTHETIST'S ROLE IN THE CLINIC

We have discussed the many responsibilities of the prosthetist as well as the qualities he needs to meet them. One of those responsibilities relates to his position as a member of the clinic team. Here he is in contact not only with the patient but also with physicians and members of other paramedical disciplines.

In order to make a meaningful contribution to such a clinic, it is essential that his education and experience be diversified so that he is qualified to discuss all aspects of amputee rehabilitation. Courses in public speaking and public discussion help to prepare the prosthetist for this role. In a clinical climate it is not enough for the prosthetist to be fully familiar with all prosthetic principles. It is equally important that he be able to discuss these principles in terms easily understood by all other members of the team. It is essential that he be specific in his language. He must not only know but also be able to explain the properties of all materials used in his field. The advantages as well as the shortcomings of different designs and constructions have to be enumerated. His mind must be flexible in order that he may understand and evaluate the physician's recommendations.

At this point it should be mentioned that the prosthetist should not only have full knowledge of all anatomical terms used in the field of prosthetics, but he must also be familiar with the physiology and kinesiology of the various joints since the physical therapist and also the occupational therapist will discuss the training of the amputee with him.

It is self-evident that, in a clinical situation, the prosthetist is looked upon as a professional only if he acts and behaves as such. His manner of speech, the way he dresses and his cooperation with other members of the team determine his acceptance within the group.

It is almost mandatory that in addition to a well-rounded training in the science of prosthetics, the prosthetist's education should include the foundations of different areas of medicine. He must acquire a general knowledge of the skeleton. Any amputation by necessity will lead to the removal of some bony tissue. What are the names of the different bones? What is their cellular structure? How does the skeleton support the body? What is the effect of an amputation on the affected extremity and on the body as a whole?

Equally important is the study of muscle action, and the interplay between the muscles and the skeleton. The purpose of a prosthetic device is the reestablishment of function. Since the function of an extremity depends upon muscular activity, the prosthetist must know the origins, insertions, and functions of the muscle groups which activate the extremity. This knowledge helps him in the design of joints for artificial limbs, but even more important it helps him determine the design requirements of the best socket for a given amputation.

INFLUENCE OF SURGERY

Since the construction of a socket is greatly influenced by the amputation surgery, the clinically trained prosthetist must be familiar with the various surgical techniques. Guillotine amputation, myoplasty, myodesis, primary and secondary closure, cineplasty, disarticulation, and many other surgical terms are constantly used during prosthetic clinics.

The type and location of the scar and the suture materials may all affect the healing of the stump. The prosthetist must be familiar not only with surgical techniques and surgical terms, but he should also be prepared to discuss the level of amputation with the surgeon and the influence of this level on the function of the prosthetic replacement. Advantages and disadvantages of different levels of amputation from the prosthetic point of view have frequently influenced surgical judgment.

Quite often pain will lead to the rejection of an artificial limb. What is pain and what causes pain? The prosthetist has also to learn about such factors as neuromata and phantom sensation. Both of these phenomena have led to the rejection of a prosthetic device. Only infrequently can an adjustment of the socket influence either one, nevertheless discussion with the physician may provide a clue to alleviation of the difficulty.

ENGINEERING AND BIOMECHANICS

Engineering principles must be fully understood because the alignment of an artificial leg is dependent upon the laws of physics and biomechanics. Pressures within the socket depend on the area over which forces can be distributed. Pressure-sensitive and pressure-tolerant areas require different treatment. Stability within the stance phase as well as the swing phase of ambulation is governed by weight and force lines.

Acceleration and deceleration of the lower leg in an above-knee amputation are controlled by the laws of the compound pendulum. Mechanical and hydraulic friction mechanisms available to control the swing of the shank and foot must not only be fully known and understood, but the prosthetist must also be able to discuss the characteristics of these devices with the group in order to arrive at a prescription from which the amputee will derive the greatest benefit.

With the advent of external power, especially in applications to upper-extremity prostheses, a new era of prosthetics is emerging. What are the indications for pneumatic versus electronic systems and how do these systems influence the various functions of the prosthetic mechanism? What is the hardware tolerance of any given amputee?

It is well known that the emotional reaction to an amputation varies considerably from patient to patient. Therefore, the prosthetist has to be able to recognize that a prosthesis will only fulfill the functional and emotional requirements to a limited degree depending upon the degree of acceptance by the patient.

The foregoing discussion indicates only part of the qualifications that the clinical prosthetist must possess if he is to function in his role as a member of the amputee treatment team.

How can this diversified knowledge be acquired? One would think that a good technical background is most important because the prosthetist's responsibilities on the team are primarily of a mechanical nature. Extensive experience as a technician in a well organized facility would best prepare him for this responsibility. In addition to this mechanical training, academic training is needed in many fields that are only tangentially related. Courses which would prepare him for public discussion and psychological understanding, for example, are taught in a liberal arts college. Anatomy, physiology and kinesiology are taught in medical schools. Materials, design engineering and biomechanics are taught in engineering colleges.

In order to prepare a clinical prosthetist it would therefore seem to be essential that a training program which cuts across these fields