

Project Study Undertaken by Duke University Medical Center

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The Duke University Medical Center has received a three-year grant from the Vocational Rehabilitation Administration for a research project titled "Use of Temporary Plaster of Paris Pylons Preparatory to the Fitting of a Permanent Above-Knee or Below-Knee Prosthesis." The project director is Dr. J. Leonard Goldner. Assistants are Dr. Frank W. Cloppinger, Dr. Donald McCollum, Bert R. Titus, C.P.O., Robert O. Gooch, C.P., and Grace Horton, R.P.T.

The three-year study of the use and construction of plaster and plastic pylons is directed toward the following goals:

1. To obtain more specific information about temporary plaster or plastic pylons while they are being used by patients prior to construction of a permanent prosthesis in both above-knee and below-knee amputees.

2. To determine if it is possible to develop a rapid, inexpensive method for making above-knee and below-knee plaster pylons. At the present time, a physician member of the amputee clinic teams requires about two hours to construct an ordinary plaster pylon. We will attempt to reduce this time to approximately thirty minutes, thereby making it possible to make pylons for more patients and to obtain more pertinent information.

3. To determine if it is possible to increase the amount of shrinkage and the rapidity of shrinkage in both the above-knee and below-knee amputee. If this is possible it will then allow earlier fitting, better psychological adjustment and improved physical conditioning with earlier return to work or home activities.

4. To provide information in the below-knee amputee concerning a transitional prosthesis used between the conventional limb and transfer to a patellar-tendon-bearing prosthesis with the primary purpose of obtaining stump shrinkage prior to construction of the permanent below-knee prosthesis.

5. To evaluate use of the total contact plastic pylon as an inexpensive, light prosthesis prior to application of an adjustable limb and prior to final fitting with a permanent plastic prosthesis.

6. To determine the feasibility of utilizing available metal shins and Sach feet on plaster pylons and below-knee plastic pylons.

7. To determine whether or not the current criticisms directed toward the use of pylons are correct or can be disproven, *i.e.*:

- (a) Poor gait pattern
- (b) Damage to the stump with pylon
- (c) Psychologically not desirable because of appearance
- (d) Adequate fit not possible
- (e) Too much time necessary to make an appropriate pylon

8. To determine whether a pylon is a practical, inexpensive method of determining whether or not certain patients will be able to utilize and tolerate a permanent prosthesis both physically and psychologically.

9. To determine if the pylon increases the amputee's aptitude for the adjustable limb.

10. To determine if the pylon decreases the now frequent necessity of making a new socket for the patellar-tendon-bearing amputee within a year after the original prosthesis has been provided.

11. To determine the efficiency of the Veterans Administration Prosthetics Center casting jig for making both the above-knee and below-knee plaster pylons.

12. To determine the effect of increased work associated with use of a plaster pylon on the patient's circulatory system as well as his general well being. No detailed studies of the field of work physiology are planned for this particular aspect of the program, although a natural outgrowth of this initial study could be observations using work physiology methods to determine the effort required to use the pylon as compared with the adjustable limb and the permanent prosthesis. This study would be included in a new Clinical Research Unit, now in the final planning stage.

The proposed study is a research project. The information obtained may be applied directly to most amputee patients being seen by the Amputee Clinic Team for examination and preliminary treatment prior to prescription for construction of a permanent prosthesis. This study may lead to improved preparation of patients who are converting from a conventional limb to a patellar-tendon-bearing limb, or from a conventional above or below knee socket to a total contact socket. Presumably, less expense will be involved in providing artificial limbs by eliminating the extra socket, and physical function of the patient might be improved as evidenced by good gait pattern and greater endurance attained because of a more constant fit if shrinkage of the stump can be done rapidly and a plateau reached quickly. Psychological benefits would accrue to most patients, but particularly the geriatric group, who might not be considered candidates for a conventional prosthesis, but who might well be managed with a temporary plaster pylon for a long enough period of time to determine whether such pylon with appropriate extensions could be used. The study is primarily research, in that data obtained by observation, questioning, and observation of performance, along with photographic records, will be utilized.

During the first five months of study 22 unilateral BK patients, 2 bilateral BK patients, 11 unilateral AK patients and one AK-BK patient have been fitted. Three of the unilateral BK's are now wearing their permanent PTB prostheses and two of the unilateral AK amputees are wearing plastic total contact suction sockets. The patients are both men and women, and range in age from 18 to 82 years of age.

The VAPC casting jig has been used for part of both the AK and BK pylons, and the UCB total contact casting stand and the NYU flexible brim casting technique for part of the AK pylons. An evaluation of which of these systems is the most efficient is not possible at the present time.

All patients have been started out on plaster pylons with the exception of the two bilateral BK amputees. Because of the weight and strength factors these patients were started on plastic pylons made over a plaster cast using the PTB technique but without the use of Kemble liners. These were made as total contact hard PTB sockets.

Some of the other BK amputees also have been switched to plaster pylons as the second pylon, to better distribute the weight as the stump approaches condition and size for fitting with a permanent prosthesis. These were all made as total contact hard sockets without Kemble liners. A number of the AK amputees also have been fitted with a plastic socket as their second pylon, partially because of the lightness of weight and better control of the fast distal shrinkage of the stump.

The study will continue and further reports will be made by members of the project.