Krukenberg Amputationplasty for Loss of the Hand

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Children unfortunate enought to be born with only one hand certainly learn to lead virtually normal lives as the sound hand learns to master the challenge of manual dexterity. Children born without hands certainly learn to use their feet for the basic requirements of living, such as feeding. On the other hand adults unfortunate enough to loose one limb certainly suffer a considerable disability. They can well manage with a single normal hand. The adult patient who has suffered a loss of both hands finds that they are unable to cope with the basic requirements of life such as feeding, washing or the basic sanitary functions of life.

Fig. 1 Radius and Ulnar are split apart.

During the First World War, some German troops when they caught civilians pilfering army property penalized these people by chopping off both their hands at the wrist. Towards the end of the war there were a considerable number of patients wandering around Europe without hands. Krukenberg devised an operation to provide these patients with a simple pincer which enables them to fulfil the primary functions of life.

In the Krukenberg amputationplasty operation the forearm is divided into radial and ulnar portions (photograph No. 1), the two working together in a movement which is up and down pincer rather than rotatory. It applies to only forearm stumps and the minimum length required for the satisfactory performance of this operation is 17 cms from the lateral epicondyle. A second requirement is that the skin of the forearm should be virtually normal with a sensory supply to the amputation scar. The third requirement is that the patient should have been unfortunate enough to have sustained a bilateral amputation.

The skin of the forearm is incised in such a fashion as to leave two long strips of normal skin, one on the radial and one on the ulnar border, of the forearm. The lateral cutaneous nerve of the forearm will supply sensation to the radial component and the medial cutaneous nerve of the forearm will supply sensation to the ulnar component.

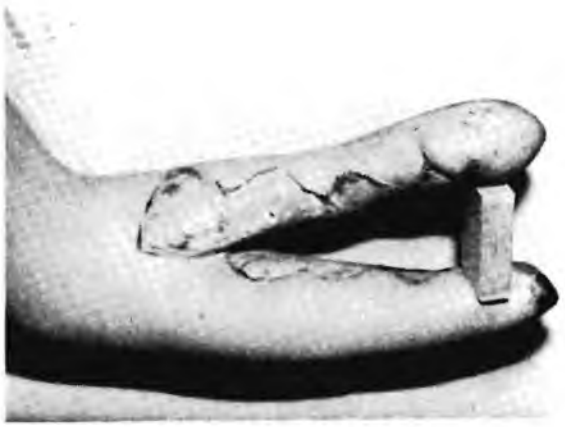

Fig. 2 Skin with a sensory nerve supply is rotated to the inner sides of the pincer. The raw areas are covered by free skin grafts.

The distal radio-ulnar joint ligaments are then divided and the muscles of the forearm on both the volar and dorsal surfaces are carefully separated while the interosseous membrane is carefully divided until the bone ends spread widely for a distance of 5 inches. The radius spreads from the ulnar by the bi-ceps muscles, the extensors of the wrist and the brachial radialis muscle. These are left with the radius. The flexocarpi radialis muscle and pronator teres are also left with the radius to help it squeeze against the ulnar which it does with moderate strength. The muscles are not removed because the jaws of the pincer must be vascularized to keep warm. The skin flaps are then partially lifted and rotated on to the inner aspect of the pincers over the tip. This will provide sensation to the pinching surfaces of the tips of the jaws. The remaining raw areas of muscle belly that have been exposed are covered by thick free skin grafts. (Photograph No. 2.) The first dressings are carried out after about 10 days and one would expect this wound to be healed at between 2-3 weeks. Immediately following healing the patient should start the programme of re-education to use the pincer for normal functions. (Photographs 3 and 4.)

The function of the pincer is to separate the radius and ulnar using a mixture of pronation and supernation of the radius on the ulnar. They will always lose part of their span. This will decrease down to a distance of perhaps 1½-2 inches. They learn at least reasonable dexterity and at least a moderate degree of power in the pinch grip. One would expect these patients to learn to use these pincers at least sufficiently adequately to fulfil the normal functions of life and many learn to hold a pen to write and earn a living with this stump.

The results are not however cosmetically acceptable, but the patients are well pleased. (Photograph No. 5.) The ability to feel between the jaws of the pincer usually far outweigh the advantages of an artificial limb. This operation is very popular in Germany where it has proved necessary to rehabilitate many patients who have lost both their hands during the war. At the Oscar Helene Herm Hospital 700 of these operations have been carried out since 1938.

This operation is not suitable for a patient with one normal hand as he will not use it. For the blind it may be necessary for them to feel with the tip of their stump. Particularly with the double amputee the Krukenberg works better, faster and more efficiently than does even the bilateral cineplasty amputee. Also when desired for heavy work a regular prosthesis with split hooks may be worn over the double stump.