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THE USE OF A SPLIT-THICKNESS GRAFT TO COVER THE SKIN DEFECT IN A KRUKENBERG AMPUTATION

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One of the authors¹, in 1948, published his technique of the Krukenberg operation and reported a series of cases in which this method had been employed during and after World War II. This lobster-claw type of amputation has proved particularly useful in the rehabilitation of persons who have lost both hands or the greater parts of both hands, because the holding surfaces of the two branches have touch sensation and give assurance for many functional activities.

To maintain sensation, the skin incision is so devised that the contact surfaces of the radial and ulnar branches are covered with the patient's own skin. This leaves a sizable defect, the full length of the dorsal aspect of the ulnar branch. In the past, this defect was covered by a pedicle skin graft from the abdomen, so that weeks of immobilization were required before the pedicle could be freed; the resulting atrophy from disuse of the muscles attached to the ulnar and radial branches materially delayed rehabilitation and influenced the active function and grasping power in the stump.

In August 1948, the suggestion was offered by Thomson that, with a dermatome, a split-thickness skin graft could be applied to this ulnar defect, allowing function of the branches to be started a few days after operation,—even before the pressure dressing was removed.

A favorable case for a Krukenberg operation was that of J. K., a worker, sixteen years of age. Both hands had been severely damaged in an industrial accident, several months earlier. The left hand and distal portion of the forearm had been amputated, leaving a healed stump 19 centimeters in length. On the right hand there remained the thumb, the second metacarpal, and stumps of the third and fifth metacarpals. A previous plastic procedure had given him a functional grasping surface between the first metacarpal and the thumb.

On August 12, 1948, a Krukenberg operation was performed on the left stump. A split-thickness skin graft was procured with a dermatome from the dorsum of the right thigh to cover the ulnar defect. On the fifth day, dressings were changed and active motion of the branches was started. These efforts were, of course, minimal at first, because protective dressings were required over the wounds. After the stitches had been removed at the end of ten days, a program of active rehabilitation was started; the patient left the hospital on September 19. At that time the opening angle of the branches was 20 degrees and the speed was seventy-six times a minute (Figs. 1-A and 1-B).



FIG. 1-A



FIG. 1-B

J. K. Appearance of pinchers and split-thickness skin graft on ulnar branch September 8, 1948, less than one month after operation.

Fig. 1-A: Note the extent of loss of right hand as the thumb presses against the radial branch of the left forearm.

Fig. 1-B: Showing the range of active spreading of the branches.



FIG. 1-C



FIG. 1-D

Shows active spreading and closing of the branches of Krukenberg stump in April 1950, twenty months after surgery. The function of the right hand is also shown.

The patient has not been seen by the authors since he left the hospital, but he reported on April 4, 1950, that he uses his Krukenberg stump for all purposes, that he has direct, hinge-like movement to an opening angle of 30 degrees with no discomfort; that the split-thickness skin graft has some sensation, although it is not so acute as the skin on the other parts of the branches; and that the skin now looks almost the same as normal skin.

Since the experience with this case, a dermatome split-thickness skin graft has been used in every Krukenberg operation with excellent results and no failures of the graft to take.

A split-thickness skin graft to cover the dorsal ulnar skin defect of the Krukenberg operation has the following advantages:

1. It simplifies the operative technique by eliminating the need of an abdominal pedicle graft.
2. It is much more comfortable for the patient to have his arm free during healing of the wound.
3. It enables early use and rehabilitation of the branches, thus providing an economic advantage.
4. The graft assumes a very normal skin appearance and develops a measure of sensitivity.

1. KALLIO, K. E.: Recent Advance in Krukenberg's Operation. *Acta Chir. Scandinavica*, **97**: 165-188, 1948.